

# Japan's Coal Cartels in the Interwar Period

Toshitaka Nagahiro\*

## 1. INTRODUCTION

This study analyses the reasons for cartel success by focusing on Japanese coal cartels in the interwar period, especially 1922–1929 (i.e. before the Syowa depression of 1930–1931). Cartels were seen as playing an important role in coordinating various business activities in Japan before 1945. In particular, industries such as spinning, coal, steel, paper, cement, and electric power organized cartels to control the price or quantity of their commodities (Kikkawa, 1988).

Japan's coal industry dramatically developed during WW1. Coal production increased from 22,293,000 tons in 1914 to 31,271,000 tons in 1919. However, the coal industry faced a serious recession in 1920, and domestic coal producers determined to collude in 1921 established Sekitan Kōgyō Rengōkai (Federation of Coal Mine Owners (FCMO)), aimed at stabilizing coal prices and adjusting supply and demand. The FCMO cartel was called 'Sotan Seigen', that is, coal supply restriction, which meant that each coal mine in every coalfield was allowed a quota-restricted coal supply. In addition, the cartel was called 'Sekitan Tōsei', that is, coal control.

Cartels risk collapse because of cartel members' incentives to cheat (Stigler, 1964). According to the literature on cartel stability, cartels have to solve three problems: coordination, cheating, and entry (Levenstein and Suslow, 2006). However, cartel stability does not necessarily mean that competition among companies is restricted. This problem relates to the notion 'not cartels or competition, but cartels and competition' (Fear, 2007). Thus, this study examines the coal cartel's effects on industrial reorganization in the 1920s Japan.

## 2. COAL CONTROL

Coal supply restriction is the regulation of the supply of coal among coal mines but not that of

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\* Wakayama University. E-mail: [nagahiro@eco.wakayama-u.ac.jp](mailto:nagahiro@eco.wakayama-u.ac.jp)

production. A coal mine's quota is calculated by multiplying past coal supply by the restricted rate. In March 1921, FCMO assumed the balance of supply and demand to be equal, that is, stock equals supply minus consumption, and the organization estimated that the stock of coal should be reduced to one million tons (CCMA, *Jôgiinkai ketsugiroku*, 1921, p.209). Based on this level of stock restriction and because consumption was expected to be 23.3 million tons, the market supplied 22 million tons (calculated using a reduction of 17 percent on average during the years 1918–1920). However, inputting these numbers into the equality shows that 22 million tons (supply) – 23.3 million tons (consumption) = 1 million tons (surplus) is incomplete. The missing 2.3 million tons of market supply came from imports, outside suppliers, and state-run coal mines such as Yahata Seitetsu-sho (Yahata Steel Works).

The FCMO included Japan's main coalfields, such as Chikuho, Hokkaido, Joban, Ube, and Kasuya (Kôzô Okunaka, 1936, pp.4-5), which comprised multiple coal companies or coal mines organized by a coal mining association, such as Chikuho Coal Mining Association (CCMO). Each coal mining association was a 'local control organization' within the FCMO, which was the national coal control federation. In addition, in coalfields mined by a single company such as the Mike or Takashima coalfield, these companies participated in FCMO as solo members.

Each coalfield sent selected councillors to FCMO, however, these councillors tended to be from big coal mine companies in each coalfield. For example, from the Chikuho coalfield, big companies, such as the Mitsui Mining Company, the Mitsubishi Mining Company, Kaijima Mining Company, and Meiji Mining Company, were chosen to send councillors. Thus, the large coal mining companies held control. In addition, the number of councillors from every coalfield varied (Chikuho sent 19, Hokkaido had 9, Joban provided 6, Ube sent 4, and Kasuya counted 3 members) (Kôzô Okunaka, 1936, pp.5-6).

Regarding the determination of quotas, the quotas of each coalfield were initially set by the FCMO board of councillors. Thereafter, the quotas among the coal mines were decided in each coalfield. Each coalfield had an opportunity to submit their opinions regarding the quota to FCMO in advance.

Cartel activity was suspended in 1925 as the stocks of coal decreased (Kôzô Okunaka, 1936, p.8). However, it was restarted in 1926 because of the possibility of a price reduction. Table 1 presents the coal supply and demand in the years 1922–1930. In this term, supply from non-cartel producers and imports from foreign coal mines tended to increase, such as those from China Busyun; however, FCMO controlled most of the coal supply. The cartel supply increased in the years 1922–1924 and

stabilized in 1927–1929. Furthermore, the coal demand followed the same trend as the supply of the cartel. However, the cartel’s actual coal supply was lower than the total quota, indicating that some coal mines supplied less than their quota because of management difficulties.

The quantitative control of the FCMO stabilized the coal prices, which had risen sharply during WW1 but began to fall after the war. The coal prices, calculated by averaging four grades of coal, that is, Kyushu (first- and second-grade), Joban, and Yubari coal, rose from 8.8 yen in 1914 to 28.6 yen in 1920 and decreased to 16.77 yen in 1922 (Nôshômushô kôzankyoku, 1914–30). After the establishment of the cartel, the depreciation of the coal prices slowed and stabilized to 15.9 yen in 1923, 14.6 yen in 1926, and 15.2 yen in 1929.

The coal prices were the most stable during the period 1922–1929. To verify this, we examine the coefficients of variation (CV), defined as the ratio of the standard deviation to the mean. The stability is inversely correlated with this numerical value. Table 2 shows that the CV in the period 1922–1929 was the smallest. Compared with this period, the numerical value of the CV in non-cartel periods, 1906–1911 and 1912–1921, was high. However, the period 1930–1935, which was a cartel period, shows a higher numerical value than that of 1922–1929. The price fluctuations in the period 1930–1935, which fell and rose, were based on the Showa depression of 1930–1931 and the ‘economic recovery’ achieved by monetary and financial policies after 1932.

The coal cartel in Japan before the wartime planned economy after 1937 may have achieved its goal of adjusting the supply and demand. However, supply and demand differed between coalfields. Table 3 shows the coal supply in six Japanese coalfields, which are classified into three types of coalfields. The first type increased the coal supply (Mike, Hokkaido, and Ube coalfields), the second type reduced the coal supply (Saga and Joban coalfields), and the third type provided a stable supply (Chikuho coalfield). Thus, the reorganization of the coal industry progressed under the cartel activity in the 1920s.

This study focuses on Chikuho and Joban coalfields to investigate the operation of the cartels. Two coalfields are analysed because of their contrasting features. Figure 1 indicates in contrast with the concurrent insatiability of the Joban coal prices, Chikuho coal prices stabilized in 1922–1929. Against this backdrop, each cartel’s activities were diverse. Therefore, we investigate the activities of the Chikuho and Joban cartels in the following sections.

### 3. The Stability of Chikuho Coal Cartel

For the stability of the cartel, resolving exogenous problems, such as new firm entry, outside producers, and government policy, is crucial. In the Chikuho coalfield, the problem of new firm entry and outside producers was not significantly discussed in the 1920s among the coal mining companies because of the oligopoly structure of the cartel, characterized by the 11 major coal mine companies that participated in it (Table 4 lists these coal mining companies).

The coal industry of Chikuho started to develop from the opening of the port in 1854 by increasing the demand for ships. The industry showed remarkable growth because of increased domestic and foreign demand in the Meiji period. During this growth phase, the best mining areas were dominated by the big companies; new entry based on purchasing a mining area was difficult in the 1920s. According to Table 4, the 11 major coal mine companies held approximately an 80 percent share of Chikuho coal supply in 1921–1929. The most remarkable structural change was the performance of Teikoku Tangyo Company, who mainly purchased coal mines during WW1 and increased its share of the coal supply from 1.0 percent in 1921 to 5.7 percent in 1922 (Table 4). However, this company withdrew from the coal mining business in 1928 because of the declining profits. Thus, with the exception of Teikoku Tangyo Company, no significant structural changes occurred in the 1920s.

A notable feature in Table 4 is that the 11 major coal mine companies supplied more coal in the first half of the 1920s than in the last half of the 1920s: The rate of change for the years 1921–1924 was higher than that for 1926–1929. There were no significant changes in the share of the coal supply, shown by the standard deviation. Big coal mine companies continued to excavate new mine shafts or expand their mining area in the first half of the 1920s. For example, Sumitomo Coal Mining Company expanded the mining area of the third Tadakuma coal mine from 1922, and by the development of the sixth coal mine in 1923, achieved a 10 percent increase in comparison with the previous year (Nôshômushô kôzankyoku, 1923, 1924, p.171, p.191)

The changes in the 1920s were combined with management policies. In the first half of the 1920s, big coal mine companies aimed to cut their production costs by mass producing coal. They shifted from this management policy to one of reducing production costs by introducing coal mining techniques in the second half of the 1920s.

In 1921, a director of Kijima Mining Company said, ‘first of all, we are required to make a fiscal

austerity in our business, and also restrict coal production, getting into step with Chikuho coal mine owners' (Kaijima kôgyôgaisya, pp.11-25). However, this policy was changed to that of increasing output as early as 1922, because Kijima Mining Company said they had to extract coal more than they had to plan in order to compensate for the increases in labour wages. Although the company said they aimed to drop the production costs by introducing machines and a new method of coal mining in 1923, they indicated that higher-than-expected costs forced them to shift again to increasing their output intensively. Moreover, in 1924, the company pursued activism, which meant that increasing output was the chosen method of reducing production costs. However, it claimed that the production cost increased by 5 percent, because the digging at the work site was conducted too fast to conduct repairs, and the mining sites would often fill with stones.

Throughout this failure, a director of the Kijima Mining Company remarked in 1926 that they could not maintain activism anymore and that they regretted not achieving a desirable cost reduction that matched the reduction in coal prices (Kaijima kôgyôgaisya, pp.32-37). In this year, despite saying that the activism was maintained, a management policy termed 'improving efficiency' was introduced: The improvement of coal mining, haulage, and repairing methods, and the introduction of mining machinery. By 1927, coal mining methods shifted from room-and-pillar mining to long-wall mining, and mining machines such as drills, conveyers, and fans were introduced. Thus, the workforce was reduced, and productivity continued to improve.

The behaviour of the Kijima Mining Company—activism and improving efficiency—did not imply a deviation from collusion: Behavioural similarities can be seen in most large coal mine companies in Chikuho. As previously mentioned, these similarities are implied by the differences in the supply of coal for big companies between the first and second half of the 1920s.

Labour productivity rose in the second half of the 1920s. Iiduka coal mine (Mitsubishi Coal Mining Company substantially obtained its management prerogative in 1922) had been mining using a method of establishing a large amount of shafts repeatedly to save on fixed costs (Sanrô Humoto, 1961, pp. 68-69). However, this method transformed into one of integrating pitch heads and introducing coal mining machines. As a result, Iiduka coal mine's labour productivity increased from 7.5 tons in 1921–1924 to 10.6 tons in 1926–1929. Regarding these coal mining techniques, Chikuho's coal mine companies showed similarities. Table 5 shows that many coal mine companies increased their labour productivity similar to that of the Iiduka coal mine in 1926–1929.

All of these firm activities occurred within the cartel. In the 1921 coal supply restriction, it was determined that a coal mine having a new shaft plan and another special issue were made verdicts in the investigation committee (CCMA, *Sôkai ketsugiroku*, 1921, p.199). Although similar methods continued until 1927 (except 1925), a new shaft was newly defined in 1927 as a new pit mouth that started to supply coal after July 1926, except for a new pit mouth at an existing mining area, a new establishment of equipment and facilities including motor power, and the reopening of an abandoned mine (CCMA, *Jôgiinkai ketsugiroku*, 1927, p.536). Thus, the limiting of new shafts progressed into the late 1920s.

Despite the establishment of new shafts in big coal mine companies, the quota in the Chikuho coalfield was lower than the real supply of coal (Kôzô Okunaka, 1936, p.24). In 1921, Chikuho coalfield had a quota of 10,614,554 tons and supplied 10,130,590 tons, that is, the field was able to increase its supply by 484,000 tons. This tendency was similar in 1923 and 1924: According to its quota, Chikuho coalfield could increase its output by 2,239,000 tons in 1923 and 1,291,000 tons in 1924. Only in 1926 did the output of Chikuho coalfield exceed its quota by 53,000 tons. However, the coal supply did not fill the quota in 1927–1929: Chikuho coalfield was short 760,000 tons in 1927 and 208,792 tons in 1929.

This phenomenon depended on the activity of big coal mine companies. Figure 2 indicates that the coal supply of big companies increased in the first half of the 1920s and levelled off in the second half of the 1920s, whereas the figures for small companies were reversed. The industrial structure of the Chikuho coalfield created dominance for the big companies. The share of big coal mines in 1921 was 74.8 percent, and that of the small coal mines was 25.2 percent. Small coal mines were not able to exercise their quota because of management stagnation. Furthermore, small coal mines claimed ‘self-regulation’, which indicated that they supplied less than the quota, and the quota of big coal mine companies was reduced during the Showa depression of 1930–1931 (Toshitaka Nagahiro, 2009, ). Thus, the management stagnation of small coal mines enabled big coal companies to extend their coal supply in the first half of the 1920s.

There were differences among the 11 big coal mine companies. Table 4 indicates that while some companies increased their supply of coal, others did not. During the period 1922–1929, for example, Sumitomo Coal Mining Company and Meiji Mining Company greatly expanded the coal supply but Furukawa Mining Company and Kurauchi Mining Company reduced it. These companies, including

small coal mines, effectively restrained the increase of the coal supply in the Chikuho coalfield, enabling other companies to potentially expand their management.

The management transformation of the second half of the 1920s, that is, the efficiency improvements specified by Kaijima, accommodated the introduction of the imposed special charges of 0.5 yen per ton on companies supplying quantities over the agreed-upon quota (Kôzô Okunaka, 1936, p.9). It is reasonable that large companies with financial power paid the special charges and exceeded the quota. However, the level of payments of special charges in coal mines was low. From January to March 1926, the quantity of coal exceeding the quota was 41,844 tons and the sum of the special charges was 20,922 yen (i.e.  $41,844 \times 0.5$  yen); this figure was 1.4 percent of the total coal supply in the Chikuho coalfield (i.e.  $41,844$  tons /  $2,962,625$  tons) (CCMA, *Jôgiinkai ketsugiroku*, p.482, Chikuho Sekitan kôgyôkai, 1926, Nôgatashi, p.144) . Similarly, in 1928 and 1929, the excess supply was 3.2 percent ( $184,508$  yen /  $0.5$  yen /  $11,631,781$  tons) and 4.6 percent ( $260,329$  yen /  $0.5$  yen /  $11,333,123$  tons), respectively (Nôgatashi, p.144, 313).

In Kaijima Mining Company, the special charges of 0.5 yen per ton represented 14.3 percent of the production cost (Kaijima kôgyô gaisya, No. A8). Therefore, these charges were a burden to coal mines. Thus, a transformation into efficiency improvements enabled coal companies to accept high-level charges, which led to a steady quota from the coal mines.

The most important factor of the cartel stability in the Chikuho coalfield is the system that monitored the quota of individual coal mines using monthly statistics articles. These statistics articles, published by Chikuho Coal Mining Association (CCMA), consisted of ‘the statistics’ (*Tôkeihyo*) and ‘the monthly statistics’ (*Tôkeigetsupyo*).

‘The statistics’ listed the coal supply of all individual coal mines that belonged to CCMA for each coal type, such as lump and slack coal. The supply research was based on voluntary reports by the coal mines. The coal supplies of every transport location of individual coal mines in the previous month were included in ‘the monthly statistics’, based on the research of Moji Railway Company and Kokura Railway Company. The railway companies recorded the coal supply in order to prepare the coal cars. According to ‘the carriage of goods rule’ established in 1925, all stations had to submit their ‘coal transport report’ by the following morning and their ‘monthly coal transport report’ by the 5th of the following month to the transport section (Moji tetsudôkyoku unyuka, pp.203-208).

Both articles were sent to cartel members via post. Thus, the quota was monitored using the statistics

articles that published each individual coal mine's quota. In addition, the statistics had high reliability, because they were investigated by railway companies that were not directly connected to the cartel.

As previously shown, the existence of the Chikuho coal cartel included two phases. In the first phase, big coal mine companies supplied more coal by establishing new mines in order to mass produce coal and cut down costs in the first half of the 1920s. In the second phase, they introduced new mining technologies to reduce costs, consequently accommodating cartel activity and supplying a stable amount of coal. The first phase left the possibility of competition among coal mine companies, but the management transformation led them to strengthen the collusion supported by the monitoring system in the second half of the 1920s.

#### 4. The Instability of the Joban Coal Cartel

The Joban coal industry suffered from poor sales because of the increased competition among coalfields in the 1920s (Iwaki shishihensan iinkai, 1989, pp. 311-447). This was in part because of the relatively low quality of Joban coal, burning only 5,200 calories, in contrast to the 7,000 calories provided by Hokkaido coal. Thus, customers such as the Japanese Government Railways in eastern Japan forwent Joban coal in exchange for Hokkaido coal (Tetudôsyô keirikyoku kôbainika, 1927). However, although lower-quality coal tended to encourage the coalfield to expand demand to homes and small business in Tokyo and Yokohama, market expansion lessened because Ube coal had the same coal quality and produced less smoke (Iwaki shishihensan iinkai, 1989, pp. 320-321). Another factor was the drop in shipping charges from Kyusyu and Hokkaido to Tokyo and Yokohama; transport costs from both Wakamatsu (north Kyusyu) and Muroran (Hokkaido) to Tokyo and Yokohama were reduced continually from 1.45 yen in 1926 to 0.9 yen per ton in 1930 (Sekitan kôgyô rengôkai, 1937, p. 73). A Joban coal mine company said that they were subjected to pressure by Kyusyu and Hokkaido coals because of the sharp decline in the shipping charges (Iriyama saitai kabushikigaisya, 1927).

Figure 3 indicates the coal prices and production costs in three coal companies, Kijima Mining Company (Chikuho coalfield), Iriyama Colliery Company (Joban Coalfield), and Taiheiyo Colliery Company (Hokkaido coalfield). Regarding the Kijima Mining Company, despite the increase in productivity (see Table 5), the production cost slightly decreased in the second half of the 1920s. Therefore, the cartel, which stopped the drop of coal prices, contributed to business improvement. In

contrast, Iriyama Colliery Company's production cost did not decrease during the 1920s. The decline of coal prices in the second half of the 1920s may have pressured the company management. Both the production costs and the coal prices of Taiheiyo Colliery Company were lower than those of other companies, and it expanded its position in the market using a low-price strategy. Thus, as seen in the case of Iriyama Colliery Company, Joban coal mine companies hoped to not only stabilize coal prices but also raise them: They attempted to organize a price cartel, shown as follows.

The concentration rate of the top three coal mining companies in Joban coalfield increased from 42.6 percent in 1920 to 51.9 percent in 1925 and to 70.3 percent in 1932; thus, an oligopolistic structure was formed in the 1920s (Sendai kômusyo, 1921-1933, Tokyo kômusyo, 1921-1933). In particular, the production share of Iwaki Colliery Company was 16.4 percent in 1920, 32.0 percent in 1925, and 45.6 percent in 1932. The rise of the production share between 1925 and 1932 arose from the acquisition of Ibaragi Coal Mining Company, which was the second largest producer (with a 10.3 percent share) in Joban coalfield in 1925. Thus, the share of main coal mine companies in 1932 was, in descending order, 45.6 percent (Iwaki Colliery Company), 16.5 percent (Iriyama Coal Mining Company), 8.2 percent (Dainippon Colliery Company), 7.7 percent (Oda Colliery Company), and 7.0 percent (Furukawa Mining Company). Thus, compared with Chikuho coalfield, the production in Joban coalfield was dominated by Iwaki Colliery Company.

The withdrawal of Mitsui Bussan Company from Joban caused Iwaki Colliery Company to strengthen its influence. Mitsui Bussan Company, which was one of the major Japanese trading companies, handling 20 percent of domestic coal consumption, contracted with many coal mines in Joban during WW1 but began to leave the area after the war. In 1929, it agreed to sell coal only to Dainippon Colliery Company and Fudosawa Colliery Company (Mitsui bussan, *Jigyôhokoku*, 1920-34). In particular, when Dainippon Colliery Company, who received funds from Mitsui Bussan Company, faced a business slump in the 1920s, Mitsui Bussan seized Yuasa mine, which was one of Dainippon Colliery's main coal mines (*Dainippon tankô keiyakusyô*, 1925-1927). However, Mitsui Bussan Company did not have intentions to manage the mine, and severed the contractual relationship after settling the funding problems.

Like other coalfield, Joban's coal mines participated in FCMO in 1922, but its coal prices deteriorated in the first half of the 1920s (see Figure 1). In 1926, Joban's six coal mine companies, Iwaki Colliery Company, Okura Mining Company, Dainippon Colliery Company, Furukawa Mining

Company, Mitsui Bussan Company, and Yamashita Kisen Company, formed 'Mokuyô-kai' in order to collude on coal prices (*Jôbantan kyôtei mondai ni tsuite*, 1927). After the foundation of the cartel, coal prices stabilized in 1926-1927, but again started dropping in 1927 because Iwaki Colliery Company ignored a set price agreed by Mokuyô-kai.

A factor for this was also an internal conflict between Iwaki Colliery Company and its parent company, Asano Dôzoku Company (*Jôbantan kyotei mondai ni tsuite*, 1927). In 1927, Sôichirô Asano decided to donate one million yen to the harbour construction of Kohama; however, the board of directors in Iwaki Colliery Company rejected it. Sôichirô replaced the directors and traded Iwaki's coal directly through Asano Dôzoku Company, which did not participate in the price cartel. Moreover, combined with Kanto Nenryô's (another coal seller) dumping of coal, Joban's price cartel was on the brink of total collapse.

Against this backdrop, there was a management strategy to produce and sell as much coal as possible (*Iwaki tankô kabushikigaisya*, 1923, first half). Despite Mokuyô-kai's negotiations with Iwaki Colliery Company aimed at avoiding a reckless increase in production, a director of the company said that they were forced to move against the opinion of the president (Sôichirô) and not restrain the production and dumping of coal or set an agreed-upon price. Thus, Mokuyô-kai demanded that Iwaki Colliery Company follow the agreement or secede from the price cartel.

Although the directors of Iwaki Colliery intended to continue to work with the price cartel, Sôichirô's management policy encouraged coal dumping. Koga Haruichi, the general manager of Dainippon Colliery Company, attempted to intervene and introduced Sôichirô to Masanao Kobayashi, the representative director of Mitsui Bussan Company (*Jôbantan hanbai kyôtei ni tsuite*, 1927). As a result, Sôichirô promised to accept the cartel activity of Mokuyô-kai on condition that Mitsui Bussan limited the sales of Kyusyu and Hokkaido coals in Joban.

Because the Joban coal industry recession did not improve, the main coal companies (Iwaki Colliery Company, Iriyama Colliery Company, Dinippon Colliery Company, Furukawa Colliery Company, Ymashita-Kisen Company, and Mitsui Bussan Company) agreed to restrict production in 1928 (i.e. to restrict the coal supply) in addition to the national limitations set by the FCMO (*Dainippon tankô*, 1928-1929, *Tokiwa tankô kabushikigaisya kiyaku*, 1928). In 1929, the FCMO limited Joban's supply to five percent of the coal produced in the preceding year, however, Joban coal companies extended this limit to 15 percent because of excess stock.

Mokuyô-kai investigated the restriction on production: The investigation committee delegated by Mokuyô-kai inspected the quantity of coal production in each coal mine 2 days per month using reports that included the report provided to the mining inspection office, the daily coal mining report, and the report of transported coal (Kyôteisyo, 1928). Additionally, in contrast to the special charges imposed in Chikuho of 0.5 yen per ton, Joban coal mine companies that produced beyond the agreed-upon quantity were imposed far higher fines of 3 yen per overweight ton and provided a security deposit of 10,000 yen to Mokuyô-kai.

The monitoring of the cartel based on the transport report was similar to that conducted in the Chikuho coalfield. However, even though a monitoring system existed, the satiability of the cartel did not improve in the Joban coalfield. Although Iwaki Colliery Company agreed on the production restrictions in 1928, the agreement was ignored in the following year when Iwaki Colliery reduced the sale price to 0.5–1 yen lower than the agreed-upon price. Mokuyô-Kai urged Iwaki Colliery Company to reconsider this move; however, the cartel decided that Iwaki Colliery was not able to recover to the agreed-upon prices immediately. Member companies except Iwaki Colliery Company determined that they exerted considerable effort to increase the prices and not drop them. Thus, Mokuyô-Kai accepted the downward price pressure caused by Iwaki Colliery Company. Mitsui Bussan Company claimed to dissolve Mokuyô-Kai, but this claim was not accepted because the company lost its influence by withdrawing from the Joban coalfield.

Mokuyô-Kai planned to create a co-operative company to sell coal, but this strategy failed because of Iwaki Colliery Company's objections (Mokuyôkai iinkai no keika ni tuite, 1930). The purpose of establishing the co-operative company was to remove Iwaki Colliery Company's ability to set coal prices. Thus, Koga Haruichi proposed that co-operative sales of anthracite coal would account for only 30 percent of total production in Joban. Because the president of Iwaki Colliery Company (Sôichirô) accepted this proposal, Joban Muentan Hanbai-Gaisya (a co-operative company selling anthracite coal in Joban) was established in 1930, consisting of three companies: Okura Mining Company, Dainippon Colliery Company, and Iwaki Colliery Company (Jôban muen hanbai gôdô keika, 1930). However, this co-operative company collapsed because of the breakaway of Dainippon Colliery Company in the Syowa depression of 1930–1931 (Dainippon tankô, 1932, second half)

The instability of Joban coal cartel arose from the non-cooperative attitude of Iwaki Colliery Company, based on Sôichirô's management policy of producing and selling as much coal as possible,

which was similar to Kaijima's 'activism' in the first half of the 1920s. Iwaki Colliery Company continued using the methods abandoned by the Chikuho coal mine companies. However, other Joban coal mines were not able to oppose this strategy because they had difficulties introducing new coal mining techniques. For example, Iriyama Colliery introduced long-wall mining and tried to use coal mining machines such as coal cutters, electric drills, and air drills in the second half of the 1920s; these attempts increased productivity-per-worker from 57 tons in 1926 to 106 tons in 1930 (Iriyama saitan kaisya kibetsu seisekihyô, 1927). However, the level of the productivity was limited compared with that of Taiheiyo Colliery (Hokkaido), which reached a productivity of 160 tons per worker in 1926 and 206 tons per worker in 1930 (Mistui kôzan, 1941).

The unsuccessful introduction of these coal mining techniques arose because of geological features of the mines: mine-flooding and depth. The depth from the ground to the mining area was over 6,600 meters, which made it more expensive to mine than other coalfields. Iriyama Colliery Company claimed that the hot spring water from Yumoto fault obstructed the mechanizations required to reduce production costs.

## 5. CONCLUSION

Japanese coal cartels in the 1920s both succeeded and failed. The cartel of the Chikuho coalfield was a success, and that of the Joban coalfield was a failure. Comparing these two cases clarifies the stability of the cartels.

Regarding the market structure, although an oligopoly of big coal mine companies was seen in the Chikuho coalfield, a single dominant coal mine company was found in the Joban coalfield. Therefore, the market structure was an important factor of cartel stability, because the behaviour of companies in both coalfields diverged. However, monitoring of the cartel agreement was not a factor in cartel stability. In the Chikuho coalfield, the monitoring was indeed effective, but the Joban coalfield (with a stronger monitoring system than that of Chikuho) did not work well because of the deviation of the largest company, Iwaki Colliery Company.

Therefore, the most important factor for the stability of cartel was behavioural similarity among members. In the first half of the 1920s, the mass production system of the Chikuho coal mine companies matched the agreement of the cartel, which included the 'new shaft plan' and 'special

issues'; however, it also included the possibility of the cartel's collapse. The stability of cartel was assured when the management policies of the Chikuho coal mine companies shifted to cost reductions conducted by introducing new technology in the second half of the 1920s. This shift also applied to the cartel, who conducted measures such as introducing special charges. However, in the Joban coalfield, Iwaki Colliery Company continued using mass production in the 1920s; thus, the Joban cartel was unstable. Accordingly, the behavioural similarity linking the collusion to the management policy helped the Chikuho coalfield stabilize the cartel.

Competition and collusion coexisted in Japan's coal industry in the 1920s. First, there was competition among coalfields: Chikuho, which stabilized its cartel, maintained a competitive advantage, but Joban's competitiveness was diminished. Second, the reorganization of coal mine companies within the Chikuho coalfield occurred; both small and large coal mine companies declined. Thus, Japan's coal cartels of the 1920s affected industrial reorganization: Some cartels improved the management of member companies and others eliminated competition.

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TABLE 1 Coal Supply and Coal Demand, 1922-1930

	Coal Supply(m.tons)				Coal Demand(m.tons)				Total quota (Supply regulated by cartel) (2) (m.tons)	(2)-(1) (m.tons)	Coal price(yen)	
	Stock in pre year	Supply of Cartel (Real amount supplied) (1)	Supply of non cartel	Imports	Total	Stock in this year	Exports	Consumption				Total
1922		2,219	211	149	2,579	50	195	2,334	2,579	2,350	131	17.21
1923	50	2,292	208	200	2,750	110	185	2,455	2,750	2,853	561	16.91
1924	110	2,474	197	235	3,017	120	200	2,697	3,017	2,685	211	16.37
1925	120	2,576	179	216	3,091	164	297	2,630	3,091			15.57
1926	164	2,513	286	241	3,204	69	297	2,838	3,204	2,528	15	15.47
1927	69	2,644	308	308	3,329	105	255	2,968	3,329	2,782	139	15.84
1928	105	2,637	319	313	3,375	124	255	2,996	3,375	2,784	147	15.52
1929	124	2,685	369	360	3,538	154	241	3,142	3,538	2,681	-4	15.23
1930	154	2,418	317	299	3,189	170	256	2,763	3,189	2,405	-14	14.06

Source: Kôzô Okunaka, 1936, *Sekitan kôgyo rengôkai Souritsu juyugonenshi*, pp.24-27.

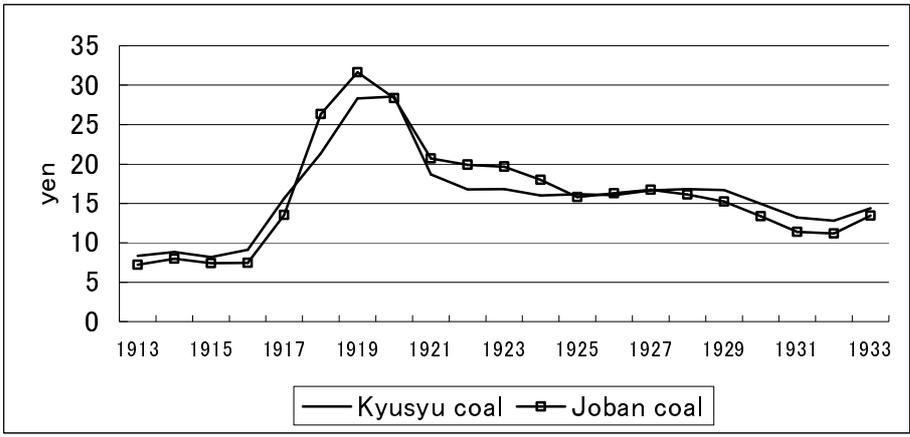


Figure 1 Kyusyu and Joban Coal Prices

Note:Kyusyu coal is Moji first grade coal, and Joban coal is Iwaki collery coal.  
 Source:Nōshōmu shō(Syōkō shō) kōzankyoku,*Honpō Kōgyō no Susei*, 1914-1936,  
 Chikuho Sekitan kōgyōkai,1935, *Chikuho sekitan Kōgyōkai gojyunenshi*, p.41.

Table 2 The coefficients of variation of coal prices

	years	average
I	1906~11	0.0867
II	1912~21	0.5346
III	1922~29	0.0571
IV	1930~35	0.0997

Note: The CV is calculated by the following 8 coal prices;  
 Kyusyu coal (first, second and third grade coal in Moji),  
 Joban coal (Iwaki colliery), Yubari coal and Chikuho coal  
 (superior, low and general class coal in Wakamastu)

Source: Nōshō mu shō (Syōkō shō) kōzankyoku. *Honpō Kōgyō*  
 no Susei, Chikuho Sekitan kōgyōkai, 1935, *Chikuho sekitan*  
*Kōgyōkai gojyunenshi*, p.41.

Table 3 The Coal Supply by mining district, 1922–1936

	Chikuho		Saga		Joban		Mike		Hokaido		Ube		Total	
	m.tons	%	m.tons	%	m.tons	%	m.tons	%	m.tons	%	m.tons	%	m.tons	%
1922	1,013	45.6	157	7.1	237	10.7	151	6.8	384	17.3	103	4.7	2,219	92.2
1923	1,033	45.1	142	6.2	232	10.1	150	6.5	420	18.3	123	5.4	2,292	91.6
1924	1,113	45.0	148	6.0	267	10.8	162	6.6	461	18.6	125	5.0	2,474	92.0
1925	1,168	45.4	156	6.1	249	9.6	166	6.4	500	19.4	134	5.2	2,576	92.1
1926	1,127	44.9	132	5.2	226	9.0	182	7.2	516	20.5	136	5.4	2,513	92.3
1927	1,163	44.0	124	4.7	223	8.4	204	7.7	584	22.1	127	4.8	2,644	91.7
1928	1,127	42.7	127	4.8	222	8.4	202	7.7	587	22.2	149	5.7	2,637	91.5
1929	1,124	41.9	120	4.5	218	8.1	215	8.0	629	23.4	156	5.8	2,685	91.7

Source: Kôzô Okunaka, 1936, *Sekitan kôgy rengôkai Souritsu jyugonenshi*, pp.24–27.

Table 4 The 11 Major Big Coal Mining Companies in Chikuho, 1921–1929: The Share of Coal Supply and Rate of Change for the previous year.

(%)

The name of firm	The share of coal supply									Standard deviation		
	1921	1922	1923	1924	1925	1926	1927	1928	1929	1922~24	1926~29	1921~29
Mitsubishi	12.8	12.5	13.5	14.3	14.9	14.3	13.4	13.8	14.1	0.713	0.339	0.731
Mitsui	13.3	12.0	13.0	11.8	13.0	12.5	12.6	12.5	12.8	0.662	0.145	0.475
Kaijima	10.4	11.5	12.5	12.6	12.4	12.7	13.2	13.3	13.2	0.881	0.230	0.883
Meiji	7.0	7.0	7.4	8.2	8.8	9.0	9.1	9.2	9.6	0.487	0.223	0.950
Kurauchi	8.0	7.3	6.4	6.6	6.1	6.1	5.8	5.7	5.3	0.637	0.290	0.778
Teikoku	1.0	5.7	7.4	7.8	7.6	6.6	6.1	5.0		2.690	0.663	2.059
Aso	5.2	4.8	4.9	5.5	5.6	6.1	6.1	6.4	7.0	0.257	0.371	0.675
Iduka	5.7	5.0	4.3	4.8	4.7	5.0	5.2	5.1	4.7	0.475	0.197	0.358
Taisyō	3.6	3.7	3.4	4.6	4.4	4.2	4.1	4.0	4.2	0.474	0.069	0.381
Furukawa	4.7	3.9	3.4	3.5	3.5	3.7	3.8	3.5	3.3	0.507	0.195	0.393
Sumitomo	2.5	2.9	3.3	3.4	3.2	3.2	3.1	3.7	3.7	0.346	0.264	0.343

The name of firm	Rate of change for the previous year									Average		
	1922	1923	1924	1925	1926	1927	1928	1929	1922~24	1926~29	1922~29	
Teikoku	507.8	30.7	13.1	2.2	-13.1	-4.9	-20.5			183.9	-12.8	73.6
Sumitomo	24.9	13.2	11.1	0.0	-1.6	1.1	13.8	0.5		16.4	3.4	7.9
Meiji	6.8	8.2	17.3	13.4	2.1	4.3	-2.1	4.2		10.7	2.1	6.8
Aso	-0.9	3.6	19.2	5.9	10.0	2.8	2.1	9.2		7.3	6.0	6.5
Kaijima	17.6	10.3	7.8	3.4	2.5	7.6	-3.1	-0.5		11.9	1.6	5.7
Taisyō	9.1	-7.0	46.2	0.4	-5.1	2.7	-6.3	4.7		16.1	-1.0	5.6
Mitsubishi	3.8	9.8	13.6	9.0	-4.2	-3.1	-0.1	2.2		9.1	-1.3	3.9
Mitsui	-4.5	10.3	-3.4	15.9	-3.9	4.5	-4.6	3.1		0.8	-0.2	2.2
Iduka	-6.1	-11.7	18.5	1.5	8.1	7.3	-6.6	-7.2		0.2	0.4	0.5
Furukawa	-12.3	-10.5	9.7	3.8	8.5	5.0	-11.9	-4.1		-4.4	-0.6	-1.5
Kurauchi	-3.2	-11.0	10.4	-2.3	0.1	-1.9	-4.9	-7.1		-1.3	-3.5	-2.5

Source: Chikuho Kōgyōkumiai, 1931, *Chikuho sekitan kōgyō yōran*, pp.92–106, Chikuho Kōgyōkumiai, *Chiku Sekitan kōgyō kumiai Tōkei hyō*, 1922–30, Chikuho Kōgyōkumiai, *Chikuho Sekitan kōgyō kumiai Tōkei getsu*, 1922–30.

Table 5 The Productivity of the Coal Mine Company in the Chikuho Coalfield

(tons)

The name of firm	The number of coal mines	1921	1922	1923	1924	1925	1926	1927	1928	1929	Average(1921-24)(A)	Average(1926-29)(B)	B-A
Aso	5	8.8	9.4	10.9	11.3	10.2	11.6	12.2	10.1	11.0	10.1	11.2	1.1
Furukawa	2	11.0	10.4	10.4	10.9	8.5	10.7	11.3	9.3	11.4	10.7	10.7	0.0
Kajima	2	7.9	8.4	9.1	8.8	9.5	10.1	10.5	11.7	11.8	8.5	11.0	2.5
Kurauti	1	7.9	9.4	9.2	11.0	8.9	8.2	9.7	8.1	10.5	9.4	9.1	-0.2
Meiji	3	9.3	9.7	10.0	10.4	11.1	11.4	13.3	14.0	14.7	9.8	13.4	3.5
Mitsubishi	5	7.4	8.6	9.2	9.3	9.3	9.6	10.6	10.7	11.8	8.6	10.7	2.0
Mitsui	2	8.2	9.4	9.5	9.8	9.1	11.7	13.8	11.8	13.3	9.2	12.6	3.4
Sumitomo	1	6.6	6.0	9.4	10.2	8.2	10.0	9.9	9.0	11.1	8.1	10.0	1.9

Note: The productivity is the total amount of the coal production/the total number of the miners in September, each year.

Source: Chikuho Kōgyōkumiai, *Chikuho Sekitan Kōgyōkumiai Getsupō*, each year.

(%)

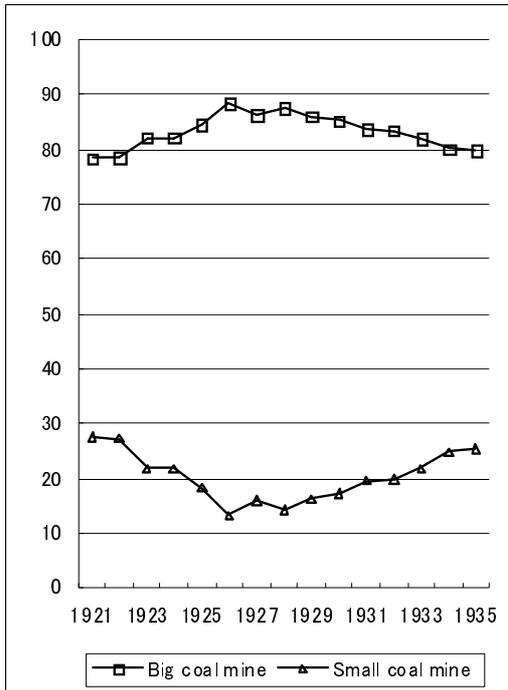


Figure2 The share of big and small coal mine  
Source: Kôzô Okunaka, 1936, Sekitan kôgyô rengôkai Souritsu jûgô nenshi, pp.52-53.

(Yen)

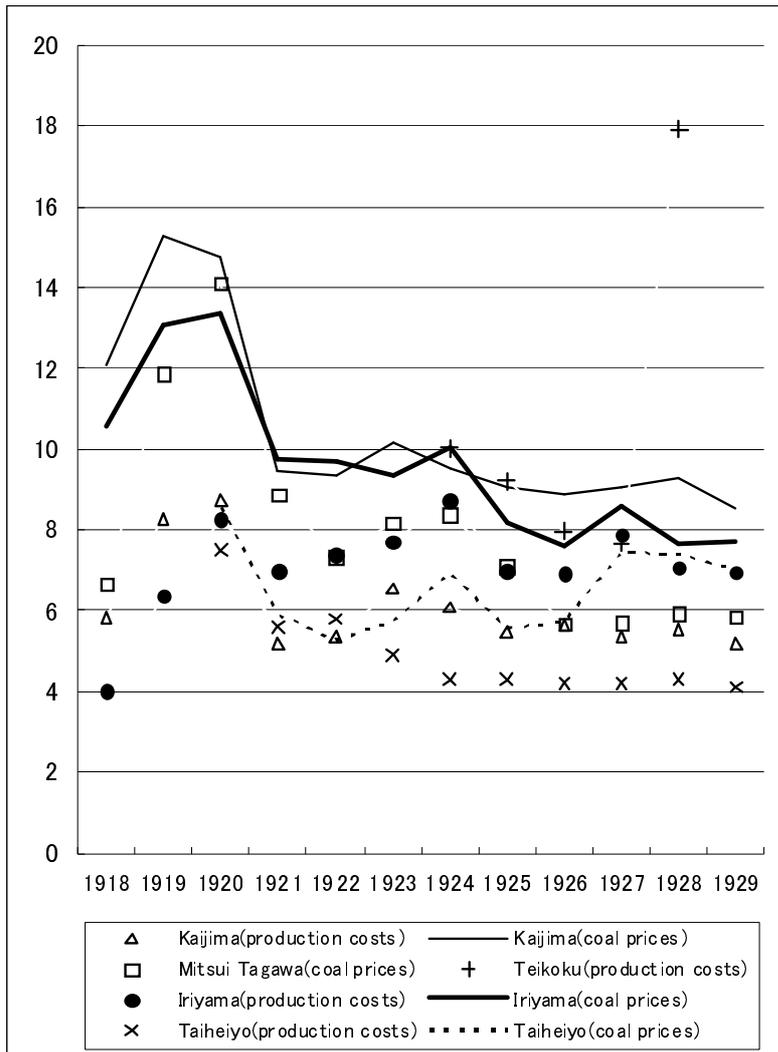


Figure 3 The production costs and coal prices  
Source: *Kajima shiryō*, *Tagawa kōgyōsyō enkakushi*, volume.1, *Teikoku tangyo kabushikigaisya*, *Eigyō hōkokusyo*, *Iriyama saitan kabushikigaisya*, *Jyu soritsu itaru syouwa gonon simoki genka narabi jyunriekikinsirabe*, and *Tyosasyo*, *Ōkura zaibatsu siryō*, No612/3, *Taiheiyo tanko enkakushi*, volume1.