Energy, Geopolitics and Information Production

A Narrative on Trading Companies in Imperial Japan[*]

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Abstract

A profit source for trading companies is matching demand with supply in highly differentiated markets. For this, intensive communication with both the demand and supply sides is essential. In the first age of globalization, building such networks globally was critical. We study how major trading companies navigated a sensitive transaction in imperial Japan: the procurement of shale oil retort facilities for Manchuria. Our archival research with confidential company documents reveals that trading companies logistically supported engineers from Japanese buyers to meet engineers from Western suppliers in person and visit plants in the West to acquire tacit knowledge beyond written specifications.

Keywords Information production; trading company; oil shale retort; first globalization.

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Introduction

There are two sources of profit in the financial industry. One is the arbitrage of differences in valuations of already issued debt instruments. The field comprises competitive markets that are open to potentially infinite market participants. The faster the processing of revealed information is, the higher the return. The other source is the evaluation of potential investment projects or debt instruments, including corporate financing for future projects, the underwriting of common stocks and bonds, and advice for mergers and acquisitions. Matching the private information of potential debtors or bought-out companies with information about risk premiums demanded by potential investors yields profit. Such markets are, by definition, monopolistic or oligopolistic (Fama and Laffer, 1971; Gonedes, 1975; Campbell and Kracaw, 1980; Fried, 1984; Chemmanur, 1993; Corwin and Schultz, 2005; Qian et al., 2015).

Similarly, trading companies have two sources of profit: arbitrage in competitive commodity markets, such as those for oil, grain, metal, and gum, and matching buyers and sellers in differentiated high-end markets. The latter markets include those for intermediate products and the final consumption goods from the aerospace, energy, and defense industries. By definition, industry information on both sides is private. Sharing information between potential transaction partners makes profit for the agent (Hsing, 1999; Wu et al., 2014). Naturally, this market is not competitive. Thus, when matchmaking, trading companies earn profits at much higher rates than in competitive commodity markets.

Information production is generally possible through bilateral trades between original sellers and buyers without intermediary agents on platform networks that connect them (Achrol and Kotler, 1999). Such direct information exchanges are more likely if the industry is mature (Schrader, 1991). The development of information and communication technologies and so-called platformers has enabled a broader range of information production (Perren and Kozinets, 2018).

However, if technological uncertainty is high, buyers and sellers might struggle to identify each other. Additionally, in differentiated markets, interactions with potential clients, whether

from supply or demand, should be mostly in person because the potential seller has not yet found a potential buyer or because the potential buyer has not yet found what it actually needs. The potential buyer might find the additional information it truly needs through in-person meetings with potential sellers and visits to operation sites to access tacit knowledge about new technologies and ongoing research and development, which might be hard to transmit as written specifications. Coordinating such in-person meetings, trading companies will earn much higher commissions per transaction than in operations in competitive commodity markets.

The period from the late nineteenth century to the early twentieth century was the first age of globalization (Mauro et al., 2006, 1–45). Throughout the globalization process, "business trips" for in-person meetings and "face-to-face" relationships were crucial for information production (Miller, 2003). Trading companies were a driving force in building such a global network (Boon and Storli, 2023).

Additionally, in Japan, leading trading companies, such as Mitsui & Company (Mitsui Bussan) and Mitsubishi Corporation (Mitsubishi Shoji) (Morikawa, 1970; Wilkins, 1986, 1990; Yonekawa, 1990; Abe, 1997; Mizuno and Prodöhl, 2019), linked information from the supply side in the West with domestic clients. Japan's defense and energy industries in the interwar period were still seeking newly developed technologies from the West.

Just as Western Europe depends on Russian gas, imperial Japan was dependent on American oil for its navy even as it was building aircraft carrier groups whose imaginary enemies were the US and the UK. Additionally, just as China has depended on advanced technologies from the US, imperial Japan depended on Western technologies to modernize its military capabilities. Diversifying energy sources and developing its own technology were both issues that imperial Japan faced as well. Thus, this Japanese case in the interwar period has geopolitical relevance today.

One of the solutions in imperial Japan was the development of the oil shale industry in Manchuria. As described below, after trials, the South Manchuria Railway developed an

internal heating retort system, one which had just been adopted by Estonia and for which the research had just begun in the US. Japanese trading companies connected potential sellers of elemental technologies in the West with the buyer, the South Manchuria Railway, to facilitate a meeting between the engineers of the buyer and potential sellers and make tours of plants with advanced facilities to acquire tacit knowledge.

This paper studies the behaviors of the largest trading companies, Mitsui & Company and the Mitsubishi Corporation, in a sensitive transaction in imperial Japan, the procurement of oil shale retort facilities for the Fushun Coal Mine of the South Manchuria Railway in the 1920s. By doing so, we can determine how trading companies produced "information" in highly differentiated and profitable markets. For this purpose, we performed archival research, relying on confidential documents issued by and to American branches of Mitsui and Mitsubishi that were confiscated by the US as assets of a hostile state. The rest of the paper is organized as follows. Section 2 describes the geopolitical context of the oil shale industry in Manchuria and the transitional state of the shale industry. The 1920s was an industrial turning point when the Scottish external heating system for retort was replaced by internal heating systems. Section 3 specifies our focus and presents our methodology. Section 4 describes how Mitsui and Mitsubishi approached engineers from the South Manchuria Railway, who debated whether to adopt reliable but costly Scottish external heating technology or develop an internal heating system. Section 5 discusses the roles of trading companies to conclude the paper.

1 Geopolitical context and the oil shale industry

1.1 Geopolitical context

In the early twentieth century, Manchuria was a crucial geopolitical area for the Republic of China, the US, the USSR, and the Empire of Japan. It was also a center of growth in northern China (Gottschang, 1987). Russia built and operated the Chinese Eastern Railway in Manchuria starting in 1897. As a result of the Russo-Japanese War in 1904-1905, Japan

acquired the southern Manchurian part of the Chinese Eastern Railway and reorganized it as the South Manchuria Railway. The USSR inherited the remaining part of the Chinese Eastern Railway in 1917. Seeing Soviet Russia as a common threat, Zhang Zuolin (Chang Tsuo-lin), the warlord of Manchuria, and the Empire of Japan cooperated until the imperial army of Japan assassinated Zhang in 1928 (Matsukata, 2001, 258–266, 293–348).

The South Manchuria Railway became an experimental lab in which Japan could test advanced technologies. For instance, the fastest train under Japanese control before 1945 was the limited express "Asia", which operated on the South Manchuria Railway (Oyama et al., 2019).[1]

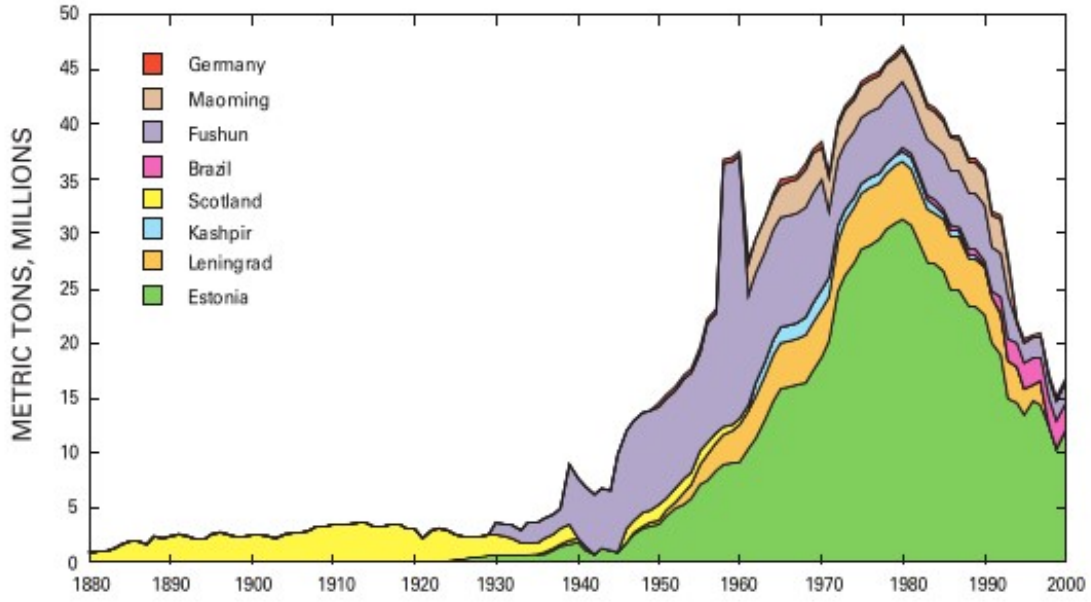
1.2 Oil shale industry in transition

In the mid-nineteenth century, the Scottish shale oil industry was leading the global oil industry. However, from the late nineteenth century on, oil production from oil wells in the US and the Middle East increased and achieved price competitiveness. Although Scotland had the longest history in the oil shale industry, Scottish shale began to lose its competitive edge in the 1920s because of the petroleum products imported from Russia, Romania, Mexico, the Dutch East Indies, and the US (Gavin, 1924, 91–96). Therefore, as imperial Japan was planning to develop oil shale extraction in Manchuria in the 1920s, the oil industry was in a transitional phase. While UK, specifically Scottish, technology had been stably operating and well established, its competitiveness in the global market began to decline (Okamura, 1926, 277; Butt, 1965; Harvie, 2010; Gallois, 2012; Dean, 2018; Craig and Underhill, 2019). These issues were exacerbated by another emerging source of shale oil, Estonia, as shown in Figure 1.

[1] The steam locomotive that pulled the express, the model Pasina (renamed the model SL 7 by the People's Republic of China after the war), is displayed in the Shenyang Railway Museum (http://www.China.org.cn/english/olympic/218670.htm: Accessed on March 6, 2023).

The provincial government of Estonia first sent experts to Scotland in 1919 to consider adopting Scottish retorting technology. The experts who visited the Scottish shale oil plant found that the Scottish technology would not work for Estonian shale because it was chemically different from Scottish shale. Therefore, in 1921, the Estonian government decided to build its own technology based on German internal heating technology that had been developed for coal retort, and the plant was completed in 1924. After that point, Estonian shale oil output surged (Tammiksaar, 2014).

Figure 1: Output of shale oil from Estonia, Russia, the UK, Brazil, China and Germany, 1880–2000.



Source (Dyni, 2006, 38).
Notes: Estonia: Estonia deposit; Russia; Leningrad and Kashpir deposits; UK: Scotland and Lothians; Brazil: Iratí Formation; China: Fushun and Maoming deposits; Germany: Dotternhausen.

One difference between the Scottish technology for oil shale retorting, represented by the Pumpherston type, and other new technologies was whether internal or external heating was used. The Scottish-type retorting plant had distilling pipes covered by a wall inside the chimney, so the fire surrounded the distilling pipe. This basic structure was established in the late nineteenth century and was used throughout the 1920s (Beilby, 1897; Henderson, 1897; Brownlie, 1929). Meanwhile, internal heating for retorting from coal to oil had been quickly developing in Germany since the early twentieth century (Fischer, 1924, 76–80; Fischer, 1925, 88–94). The application of internal heating designed for coal retorting to the retorting of kerogen shale was straightforward.

In the US, an experiment to compare internal heating with external heating was implemented by the Bureau of Mines from 1926 to 1929. A standard Pumpherston commercial type was adopted as an external heating retort, and the Nevada-Texas-Utah type of the N-T-U Company, California, was adopted as an internal heating retort (Gavin, 1928). Based on the results, the Bureau of Mines implemented the N-T-U process experimentally in a larger plant from 1946 to 1951 (Lankford and Ellis, 1951; Hull et al., 1951). The N-T-U process adopted internal direct heating by internal combustion. The Union Oil Company in California also began an internal heating process in 1943 (Russell, 1980, 107). Both the N-T-U and Union Oil processes were considered to have the advantage of "better heat economy" (Hull et al., 1951, 9). However, after 60 years of experimental study, the US oil shale industry had not achieved true commercialization (Russell, 1980, 102). As traditional Scottish retorting continuously lost its competitive edge to natural petroleum, only the oil shale industries in Estonia and Manchuria commercially produced natural petroleum (Russell, 1980, 3) before the so-called "shale oil revolution" in the US in the 2000s.

1.3 Our case: The shale oil project in Manchuria

Among the most geopolitically and technologically urgent issues for the Empire of Japan in the 1920s was the diversification of fuel sources. The imperial navy almost solely depended on oil imported from the US, while the relations between the US and Japan were strained. One possibility for the navy was shale oil in the Fushun Coal Mine owned by the South Manchuria Railway. Kerogen shale was found in Manchuria in 1909, and then the South Manchuria Railway began studies on the kerogen shale industry (Okamura, 1926, 1930).

While both the navy and the South Manchuria Railway aimed to produce oil by retorting kerogen shale from Fushun, the two groups' priorities did not necessarily match. On the one hand, the navy aimed to diversify oil sources and prioritized the reliability of oil production. On the other hand, even if it was partially state-owned, the South Manchuria Railway had to earn a profit. Its priority was therefore cost performance.

Experts from the South Manchuria Railway, the navy, and the army formed a council for procurement, which met 21–28 May 1925. Tadao Kimura, a researcher at the Central Laboratory of the South Manchuria Railway, had studied retorting methods for two years prior to 1924 and supported the Scottish method (Okamura, 1926, 278).

The council first decided to adopt the Scottish technology Kimura recommended with strong support from the navy, which believe the technique would produce early results. However, the navy also demanded cost reduction (Yamamoto, 2003; Iizuka, 2003).

Estonia began to operate a plant with an internal heating system that proved to be successful in 1924. Inspired by this, the South Manchuria Railway began experiments with the internal heating method in 1925 and concluded that internal heating based on the German Mondgas method would work better, particularly given that Fushun kerogen included less oil than Scottish kerogen. Kinzo Okamura, department chief of the Fushun Coal Mining Industry within the South Manchuria Railway, led the development of the internal heating system. In 1926, the internal heating method was established, the results of experiments were published in an expert journal, and the South Manchuria Railway decided to build an original retort (Okamura, 1926; Oshima and Uchida, 1926).

The South Manchuria Railway began to construct retorts in 1928, with fully operational retorts appearing in 1929 (Okamura, 1926; Journal of the Society of Chemical Industry, 1929, 1180; Okamura, 1930). Kerogen shale in different regions, such as Scotland, Fushun, and California, has different chemical compositions (Eguchi, 1927, 1928a,b; Jones, 1950). Thus, chemical studies and engineering sophistication should be integrated in the construction of kerogen retorts.

2 Method and materials

We focus on the critical year of 1924, when promising technology was not yet proven, as the well-established Scottish shale industry was losing its competitive edge and the Estonian plant

began its operations. In particular, we examine how the largest trading companies, Mitsui & Company and the Mitsubishi Corporation, approached two essential engineers from the South Manchuria Railway, Tadao Kimura and Kinzo Okamura.

To arrange visits to plants to see how they worked and finally to procure plants or patents, the South Manchuria Railway needed assistance from trading companies. For the trading companies, profit was only earned at the last stage, procurement. To obtain an order for procurement, trading companies competed for requests to visit oil shale plants and research sites in the US, Europe, and Scotland. Securing informative plant tours would make experts from the South Manchuria Railway seriously consider procurement of the technology, and they would pay a fee, including the cost to the trading company for securing an arrangement between plant manufacturers and the South Manchuria Railway.

Therefore, the primary role expected of trading companies was offering valuable, practical meetings between potential sellers and the South Manchuria Railway. To this end, trading companies needed information about people familiar with technologies related to the oil shale industry and plant operation globally. This information would have helped better match experts from the South Manchuria Railway with potential sellers.

To study what trading companies were truly doing, we need first-hand documents that record trading companies' communication with Kimura and Okamura. Usually, such documents are classified as very confidential and inaccessible to researchers. However, after Japan attacked the US in 1941, any assets, including the confidential documents of trading companies with branches in the US, were labeled as enemy assets and condemned. After the Pacific War, the documents were transferred to the National Archives and Records Administration (NARA) and made public. We rely heavily on the documentation Mitsui and Mitsubishi kept for meetings with engineers such as Kimura and Okamura from the South Manchuria Railway. By doing so, we can study what trading companies were doing, which would have been impossible if the Pacific War had not happened. We also partially rely on

documents held by Mitsui Bunko, the archive of the Mitsui group. Therefore, our methodology is archival research that qualitatively describes the behaviors of trading companies.

3 Roles of trading companies

3.1 Handling business meeting costs within trading companies

While Mitsui & Company considered the time spent gaining internal expertise on potential clients to be critical, the imputation of such social spending costs became an issue. Social spending, including allocating specialized staff, searching for potential sellers and providing technical advice, was highly likely to provide the company as a whole with a higher margin per transaction than operations in competitive commodity markets. However, for financially independent branches, use of their own social spending to advise the potential clients of another branch implies a positive externality. Without addressing the issue, social spending for information production across the trading company as a whole inevitably becomes less than optimal.

The following is a statement from the director of the Hong Kong branch during a 1921 conference involving representatives from the global branches of Mitsui & Company as part of a project to address this issue.[2]

> At the Hong Kong branch, whenever a ship arrives, the amount of visitors from the east, west, south, and, in particular, north [Japan] bringing references issued by a board member at headquarters is numerous. In fact, to accommodate them, one or two specialized staff members need to be in charge of handling their visits. If we do not care for them, the reputation of our company will be hurt, so we are

[2] "Mitsui Bussan shitencho kaigi gijiroku (Minutes of branch managers' conference of Mitsui & Company)," 1921, pp. 588–589, Mitsui Bunko.

> dedicated to treating them kindly. However, we have insufficient capacity, such that we invite them to dinners at company residences, still accounting for about one thousand dollars in expenses per month on social spending by the Hong Kong branch, with 99% spent on visitors with references issued by other branches. Of course, some branches offered to transfer payments for such costs to the original requesting branch; however, the procedures for cost transfers are burdensome, so the Hong Kong branch often simply absorbs the costs incurred. However, we expect that if the social spending costs inevitably rise further, social spending should be debited from the branch that originated the request for a meeting with the visitor.

Responding to this statement, the sales department manager at headquarters suggested that the London branch and the New York branch appoint staff specialized in social interactions with potential clients. However, the suggestion was dismissed because the aim "wouldn't be satisfied by those who were good just at English but not at business."[3] Critical to visitors from authorities such as the South Manchuria Railway, the navy, and the army was concrete technical advice that notified them what the procurement of an item would enable them to do.

For global operations of Mitsui & Company, while the Hong Kong branch was a gateway to the East, the San Francisco branch was the gateway to the West after the First World War. The burden incurred by the San Francisco branch rose accordingly. The following is an excerpt from a letter sent by the San Francisco branch manager to headquarters in 1924.[4]

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[3] "Ryokosha ni taisuru shokaijo hakko kata no ken (On issuance of letters of introduction of visitors), 7 May 1924, in "Kaigiroku (Minutes of round-robin decisions)" of Executive Managing Directors, Bussan 2372, Mitsui Bunko.

[4] "Ryokosha ni taisuru shokaijo hakko kata no ken (On issuance of letters of introduction of visitors), 7 May 1924, in "Kaigiroku (Minutes of round-robin decisions)" of Executive Managing Directors, Bussan 2372, Mitsui Bunko.

Whatever the reference indicates, we end up having to take care of visitors, and it costs us.

1. ...snip...
2. Moreover, their questions are so eccentric, such as how thick the asphalt of road surfaces is in San Francisco, wanting to see facilities of some pier of the port, on railways, and so on. Visitors are either from the public or private sector, and their specialties are broad, so we do not necessarily know the answers from A to Z, and we quite often have to study them. Such questions include those that would have been better asked in New York or London, but they want to convey some stock of knowledge to us when they land here, and we should have to answer that we don't know about what we don't know, but in reality, we have to keep their company and make some sort of suggestion.

   ...snip...

   If our staff spends one hour, it costs approximately 2 dollars. If someone has to send a message by telegraph, time is needed for stenography, or [there are] sightseeing costs, such as for a taxi ride. If they are in our office, they interrupt our business by talking loudly so that we have had to prepare a reception office to quarantine them, which also costs more than simple business purposes.

Visitors to the San Francisco branch from Japan were experts in their field, often engineers. Although the letter complained about questions from such visitors, the questions were likely asked to test the knowledge of the trading company's staff. For example, the thickness of "the asphalt of road surfaces" is a crucial factor that determines the construction cost and durability of the road. In-person observation at facilities is critical to acquire tacit knowledge about operations beyond what can be ascertained through academic journals. The complaint about

visitors wanting to convey their knowledge indicates that visitors suspected and confirmed that the trading company's staff were not engineering experts. This was possibly because the trading companies' staff were mostly graduates with a degree in business or law, not engineering. The technical expertise of business or law degree holders and that of engineering degree holders differed. This point is related to the roles of trading companies expected by client companies, as studied below in Section 4.2. Overall, accommodating visitors was felt to be quite burdensome and costly for the staff of the San Francisco branch.

The issue was keenly felt particularly because each branch was an accounting entity. In other words, what the manager of the San Francisco branch of Mitsui & Company truly wanted to discuss was imputed social spending. His point was that the cost of social spending directly incurred by the San Francisco branch should be redirected to the branches of origin when each branch's earnings were calculated.

In response to this request, in May 1924, Mitsui & Company introduced an imputation system for social spending under which the cost incurred by a visitor's destination branch was imputed to the original branch that had issued a reference for the visitor. The system of notification for the branches also mentioned that origin branches should not misguide visitors into expecting extravagant business entertainment.[5] The aim of social interactions was not to have tasty dinners but to produce information.

3.2 Logistical support for the client

Key members of the council in charge of the procurement of shale oil retort facilities were Tadao Kimura, a researcher at the Central Laboratory of the South Manchuria Railway; Kinzo Okamura, the department chief of the Fushun Coal Mining Industry under the South

[5] "Ryokosha ni taisuru shokaijo hakko narabini setsugu hiyo tsukekaekata (On issuance of letters of introduction of visitors and imputation of costs of attending visitors), 10 May 1924. RG131, Entry62, BOX82, National Archives and Records Administration (hereafter NARA).

Manchuria Railway; Keido Uehara, a researcher at the Fuel Fabrication Plant and engineer major with the Imperial Navy; and Kanji Kurihara, a Professor at Meiji Vocational College and engineer at the Tokuyama Coal Briquetting Plant of the Imperial Navy. This group sought technical information from across the globe in 1924 to prepare for the council meeting planned in 1925. In particular, Kinzo Okamura from the South Manchuria Railway and Kanji Kurihara from the navy took critical roles in procurement decisions (Okamura, 1926; Yamamoto, 2003).

In 1923, Tajiro Shirahama, the manager of the equipment division of the General Accounting Department, and Jo Ushijima, the manager of railway operations of the Department of Railways of the South Manchuria Railway, planned an official trip to London to study oil shale retort facilities. The director of the Dalian branch of the Mitsubishi Corporation sent a letter to the director of the London branch. The letter was titled "On the effects of attending clients on official trips" and requested that someone from the London branch greet Shirahama and Ushijima.[6]

> We earn truly noteworthy profits when your branch and other branches courteously treat clients who make official trips from this region, and because of that, we would like to note what we expect just in case, and please kindly convey this to the director of your branch and the managers of divisions in charge.
>
> 1. Although we would like to express our appreciation to our clients at the South Manchuria Railway and other authorities who favor us, we should be careful about gifts. They often hesitate to accept a dinner invitation, and even if we tactically invite them to less conspicuous dinners, they don't appreciate it that much, such that it is just waste of money.

[6] Letter from Seiichi Mishima, the Manager of Dalian Branch, Mitsubishi Corporation to Takeo Kaji, the Manager of the London Branch, "Gaiyusha settai no koka ni kakaru ken (On effects of attending clients on official trips)," October 24, 1923. RG131, Entry42, BOX375, NARA.

2. Specifically, we have almost no such opportunities for government officials.
3. Therefore, while we deeply understand that it causes extra trouble for them, we request, as a branch in the East, that overseas branches consider treating clients who make official trips courteously.
4. We absolutely do not wish other branches to spend large amounts to satisfy the material needs of visitors, and it would be sufficient to communicate with them seriously and courteously, as is our established habit.
5. For travelers far from home, hospitality by fellow Japanese would be far more valued than money and would become a pleasant memory that is remembered for a long, long time, as demonstrated by the clients who come back to this branch and express cordial gratitude to the overseas branches of our company.
6. In addition, whenever gentlemen from the South Manchuria Railway or other organizations are dispatched overseas, they are on a mission to study industrial machines and further on a mission to procure them which they are accredited to do, or these trips are a step toward future promotions.
7. Mitsui & Company, which is a little ahead of our company in human resource management, internal information exchanges, and advertising, dispatches internal engineers from here [Shanghai) or engineers who work abroad to attend to the researchers of facilities that cost hundreds or thousands of yen, such as the grain elevator of the South Manchuria Railway and the washing plant. [Mitsui & Company] pays the cost to dispatch them to the East from overseas operations, and by doing so, pursues an order of consignment from the South Manchuria Railway and, in case of open bidding, attempts to become preferred in the market.

8. Although our company takes its own path and does not need to follow Mitsui & Company, we could gradually move forward and assume that an increase in our personnel will be accompanied by a review of the names of official overseas travelers and that internal transmission of the information discovered will be strongly pursued; in this, we cordially ask for your appropriate handling of our request.
9. While we understand that you believe that engineers on overseas trips should be the most highly respected, so-called clerical staff should not be overlooked, since they will be promoted someday to department manager or division manager. The difference in returns on treating them well cannot be immediately materially compared with the situation of the engineers.

There are three critical points in this letter. The first is that potential clients from the South Manchuria Railway, the imperial army, and the imperial navy did not want to have extravagant dinners. This might be because they wanted to save time but also because of the stringent probes by investigators under the Constitution of the Empire of Japan of 1889. Under constitutional law, both judges and prosecutors were perfectly independent from the legislature and administration, including the military (Mitani, 1980). Judges and prosecutors were defined as directly serving the emperor such that they were always internally promoted. Neither the cabinet nor the military was allowed to intervene in their promotions. Thus, law enforcement activities, such as the investigation of corruption, were much more stringent before 1945. The staff of the South Manchuria Railway and officers of the navy and army therefore feared that their procurement activities would be suspected of corruption (1, 2, and 4).

The second critical point is that potential clients still wanted to interact with their fellow Japanese overseas (5). Therefore, potential clients did not need dinners but did need time from Japanese staff overseas.

The third and most important point is that potential clients desperately wanted to access information about brand new technologies in the West, and to meet the demand, the rival Mitsui & Company dispatched internal engineers to give advice and suggestions to engineers and officials in the delegation who were in charge of procurement and were likely to be promoted to managerial positions (6–9). Forming global links between potential demand and supply sides, that is, through information production, was the most critical task for trading companies in highly differentiated high-end markets.

In August 1924, Kinzo Okamura planned to visit, through the Dalian and Yokohama ports, the US, Britain, Germany, and Sweden. The Dalian branch of the Mitsubishi Corporation wanted to be involved in the project. Thus, the director of the Dalian branch sent a letter to the headquarters of the Mitsubishi Corporation.[7]

> We asked Mr. Okamura to give us an opportunity to meet and have dinner, but he declined because he arrived in Dalian this morning, the home of the South Manchuria Railway, so we could not have such an opportunity...snip... We would like you to meet him [before his departure to the US].

Concerned about allegations of corruption, Okamura declined dinner at Dalian.

Receiving the letter from the Dalian branch, Kyohei Kato, the executive managing director, and Kono Yoshitoshi, the vice director of the Division of Machinery at the Mitsubishi Corporation headquarters, met Okamura on 16 August 1924 and heard about the aim of the trip and his requests to visit plants in the US. Then, headquarters informed branches in North

[7] Letter from the Headquarters, Mitsubishi Corporation to Fukusaburo Ueno, the Manager of the New York Branch, Mitsubishi Corporation, “Mantetsu Bujun Tanko Kogyokacho Okamura Kinzo shi no ken (On Mr. Kinzo Okamura, Department Chief of the Fushun Coal Mining Industry, the South Manchuria Railway)” in “Letters of Introduction,” 16 August 1924. RG131, Entry42, BOX375, NARA.

America of his intention to visit.[8] The director of the Fuel Division, the Mitsubishi Corporation, sent a letter to the San Francisco branch describing this point.[9]

> The gentleman [Kinzo Okamura] is an engineer from the South Manchuria Railway and is dispatched to Europe for the procurement of kerogen shale that is currently attracting attention, and on the way to Europe, he said that he wants to visit the Avon Refinery of the Associated Oil Company. For our company, taking care of him would greatly favor us in procuring kerogen shale machines and selling related products, and if we fail to do so, he would be attended by Mitsui & Company on a visit to a General Petroleum Corporation...snip... refinery. We would like you to attend to him following the attached memorandum about the meeting.

The letter reports that Kinzo Okamura wanted to visit the Avon Refinery of the Associated Oil Company, from which the Mitsubishi Corporation had imported oil, and warns that Mitsui & Company had approached him. The General Petroleum Corporation, California, granted exclusive sales rights in Japan to Mitsui & Company. Therefore, the Mitsubishi Corporation suspected that Mitsui might invite Okamura to visit a General Petroleum plant.

The director of the Dalian branch of Mitsubishi also sent a letter to the director of the San Francisco branch noting that[10]

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[8] Letter from the Headquarters, Mitsubishi Corporation to Fukusaburo Ueno, the Manager of the New York Branch, Mitsubishi Corporation, "Mantetsu Bujun Tanko Kogyokacho Okamura Kinzo shi no ken (On Mr. Kinzo Okamura, Department Chief of the Fushun Coal Mining Industry, the South Manchuria Railway)" in "Letters of Introduction," 16 August 1924. RG131, Entry42, BOX375, NARA.

[9] Letter from Kazushige Tsutsumi, Division of Fuel to Shuzo, Shimatani, the Seattle Branch, 19 August 1924, in "Letters of Introduction". RG131, Entry42, BOX375, NARA.

[10] Letter from Seiichi Mishima, Director of the Dalian Branch, Mitsubishi Corporation to the Director of the San Francisco Branch on "Mantetsu Bujun Tanko Kogyokacho Okamura Kinzo shi goshokai no ken(Introduction of Department Chief of the Fushun Coal Mining Industry, the South Manchuria Railway)" in "Letters of Introduction," 2 August 1924, RG131, Entry42, BOX375, NARA.

> Although Mr. Okamura is originally an electrician (who earned a Bachelor of Engineering from the Imperial University of Tokyo), he is sent on a serious mission for the procurement of machines for the currently planned kerogen shale industry of Fushun,...snip..., when the project is finally implemented, given the circumstances, he is also expected to hold a prominent position, and so we should of course, ingratiate ourselves. Additionally, he is a substantially important person, in order to be prepared for the planning of the second term, and thus, we would like you to attend to him dutifully.

Meanwhile, branches of Mitsui & Company also shared information about Kinzo Okamura. Seko, the director of the London branch of Mitsui & Company, sent a letter to the Seattle branch.[11]

> Mr. Kinzo Okamura, Department Chief,...snip... plans to visit Britain to make a decision on procurement for the oil shale plant currently planned by the South Manchuria Railway, and according to the Dalian branch, he is going to depart Yokohama on August 19...snip.... We expect that the director of the Division of Machinery and the director of the Dalian branch have also requested that you attend him, and this is not only for this particular project, as he is a very important person to our company such that, although we understand that you are busy, we dare ask you to attend to him with particular kindness when he passes through your city. Takada & Company and some others would surely pursue him and so please be careful not to be outdone by them.

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[11] Letter from Seko, Supervisor of the London Branch, Mitsui & Company to the Manager of the San Francisco Branch, “Mantetsu Kogyokacho Okamura Kinzo shi no koto (On Mr. Kinzo Okamura, Department Chief of the Fushun Coal Mining Industry, the South Manchuria Railway),” 31 July 1924, RG131, Entry64, BOX3, NARA.

In the end, Mitsui succeeded in being the only one to attend Okamura, and the Mitsubishi Corporation failed to approach him in the US. On the West Coast, the director of the San Francisco branch of Mitsui & Company exclusively accompanied Okamura, and other companies such as the Mitsubishi Corporation could not approach him.[12] Then, Okamura traveled to New York via Chicago. The New York branch of Mitsui & Company reported as follows.[13]

> A letter from the San Francisco branch noticed that Engineer Okamura is going to arrive in Chicago on September 17, and so we have dispatched [the New York branch's] staff there. Responding to the requests from the gentleman [Okamura] and by our suggestions, we are ready to accompany him in visits to many plants. Although Takada & Company also sent staff to Chicago, it seems to be simply to accompany him for sightseeing....snip... However, engineers from the Mitsubishi research division have already been studying oil shale for several years...snip... and have substantially rich data and other materials on the issue that he might consider, but we have heard that Mitsubishi started late on this issue...

Kinzo Okamura traveled to the US in 1924 to visit refineries in California and other sites. Representatives of the San Francisco and New York branches of Mitsui & Company accompanied his visits. However, after observation, he concluded that shale retort in the US was still only under study and not yet complete, and hence, "after all, the 'Scotch' method would be currently a safe choice."[14]

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[12] "Ryokaku dosei annai (Summary of sates of visitors)," RG 131, Entry67, BOX2, NARA.
[13] Letter from Department of Machinery, Division of Machinery, the New York Branch, Mitsui & Company to the London Branch of Division of Machinery, "Mantetsu Bujun tanko hikiai yubo ketsugan kanryu sochi narabini Okamura gishi no koto (On inquiry of the oil shale retort facilities by Fushun Coal Mine, the South Manchuria Railway and Engineer Okamura)," 2 October 1924, RG131, Entry64, BOX3, NARA.
[14] From the Department of Machinery, the New York Branch, Mitsui & Company. to the Director of the San Francisco Branch, 2 October 1924.

However, the US technology Okamura wanted to see was not the first priority for the South Manchuria Railway, as was understood by the Mitsui & Company branches in North America. The New York branch of Mitsui & Company pointed this out in a letter on 24 October 1924 to the London branch as follows.[15]

> Regarding the trip plan of Mr. Kinzo Okamura, we talked to the San Francisco branch and dispatched our staff to Chicago and accompanied him in visiting many plants and carefully watched his behavior. However, from Chicago on west, there are no retorting facilities for kerogen shale, so we accompanied him to visit the retorting facility of Ford Motors in Detroit and for others, mainly the pulverized coal burning equipment of electric power plants and some others...snip... According to Engineer Okamura, regardless of whether the "Hartman" or "Dillon Oil Company" or "Reed Holdings" method is used, this technology is still in the research stage, so it should not be immediately sent to Fushun to be built up. In summary, he seems to want to visit there [London] as soon as possible and wants to study the "Simon-Carves"[16], which we recommend, and the "Craig"[17], which Takada & Company promotes, and other Scottish systems, and he wants to hear detailed reports from engineers who are already there or dispatched to there and then proceed to concrete decision-making.

Emanuel W. Hartman acquired patents for oil shale equipment in 1925: for a gas-extracting apparatus, this was patent 1,537,114; for a shale-distilling apparatus, this was patent

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[15] Letter from Tokujiro Hirata, the New York Branch, Mitsui & Company to Supervisor Seko, the London Branch, "Mantetsu Bujun Tanko hikiai yuboketsugan kanryu sochi no koto (On inquiry of oil shale retort facilities by the Fushun Coal Mine, the South Manchuria Railway)," 2 October 1924, RG131, Entry64, BOX3, NARA.
[16] A business jointly organized by Henry Simon and François Carves in 1878 (Dickinson, 1943). Currently, Simon Carves Engineering Limited is a subsidiary of the ECI group, which is a subsidiary of Mitsui Engineering & Shipbuilding. https://ecigrouponline.com/simon-carves-engineering/ Accessed February 15, 2022.
[17] A.F. Craig & Company, Limited, 1866–1982, Paisley, Renfrewshire, Scotland. University of Glasgow Archive Services https://archiveshub.jisc.ac.uk/data/gb248-ugd173/1-15andgb248ugd185 Accessed February 17, 2022.

1,546,659; and for an annular hearth oven, this was patent 1,608,597 (Klosky, 1949, 109, 114, 138). Although Okamura was interested in new technologies in the US as an engineer, he did not consider them appropriate for procurement. By contrast, with the long history of the Scotch oil shale industry, British manufacturers were ready to supply reliable equipment types.

Meanwhile, Tadao Kimura, a researcher in the Central Laboratory of the South Manchuria Railway, traveled in the other direction through Europe and arrived in the US in February 1924 to visit various plants. The New York branch of Mitsui & Company reported on Kimura's visit in a letter as follows:[18]

> Mr. Tadao Kimura, Engineer of the South Manchuria Railway, visited this city on February 25 on the way back from London to Tokyo...snip... He talked with us on kerogen shale...snip... He considered the Hertman Process to be more worthy of study than...snip... Mr. Okamura did and reported it to the headquarters of the South Manchuria Railway. Given that the South Manchuria Railway ordered Mr. Kimura to study the process, we expect that the South Manchuria Railway is paying substantial attention to the method. The gentleman has not been accompanied by Mitsui much for some reason, so we have noted this but, unlike last time, this time, he seems to be comfortable with Mitsui. This seems to be because the London branch made an effort and because of the failure of Takada & Company.[19] We knew we should not miss this opportunity, and so we attempted to approach him.

[18] Letter from Department of Machinery, the New York Branch, Mitsui & Company to Department of Mining, Division of Machinery, the Tokyo Branch, "Mantetsu hikiai yuboketsugan kanryu sochi no koto (On inquiry of oil shale retort facilities by the South Manchuria Railway)," 26 February 1925, RG131, Entry64, BOX2, NARA.

[19] Takada & Company was in a financial crisis at that point.

When Kimura returned to Yokohama, Japan from the US, the Department of Mining in the Tokyo Branch of Mitsui & Company contacted him and reported their meeting to the Department of Machinery in the Dalian Branch on 20 April 1925.[20]

1. His assessment of the British retorting facilities for kerogen shale.

> His behavior in the UK was as the London branch has reported each time, and his critiques of the manufacturers of the facility in the country are mostly as follows. Regarding "Craig" & Co., Ltd., with which Takada has a relationship, and "Simon-Carves", which our company recommends, Mr. Kimura seems to firmly consider "Craig" & Co., Ltd. to be the best manufacturer. While "Craig" & Co., Ltd. has already produced "oil shale" facilities for Scottish Oils, Ltd. and is generally recognized as the manufacturer proficient in the industry. "Simon-Carves," Ltd. has never produced these kinds of facilities... It should go without saying that we should choose [Craig & Co.]. However, Craig & Co. is secretive about everything, and furthermore, employees of the London branch of Takada & Co., its agent, are useless, and so I do not believe procurement through Takada & Co. is necessary (it smells a little fishy), and if there is any other importer, they had better deal with products from Craig & Co., so he seemed to implicitly indicate our company could switch [to Craig & Co.].

2. His critiques of German producers.

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[20] Letter from the Department of Machinery, the Tokyo Branch, Mitsui & Company to the Department of Machinery, the Dalian Branch, "Mantetsu gishi Kimura Tadao shi yuboketsugan kanryusochi shisatsu kicho dan no koto (On talk by returning Mr. Tadao Kimura, Engineer of the South Manchuria Railway)," 20 April 1925, RG131, Entry64, BOX2, NARA.

The "Thyssen"[21] method Mitsubishi recommends is not worth thinking about at all. Regarding this, I pointed out each demerit in the face of expatriates of Mitsubishi stationed in Germany. Although Mr. Katsuyama at Mitsubishi defended it as much as possible, his scientific study was extremely primitive, and none of his defenses were persuasive. (He only said),the internal heating retort facilities by "Mondgas"[22] that Mitsui recommends are not so interesting to me (he might have avoided criticism because it was in answer to my question). In general, none of the German facilities were invented for "oil shale" but were only for the low-temperature retorting of coal. Facilities developed for coal could surely be utilized for "oil shale" after minor changes in design. However, while experimental facilities of such applications to "oil shale" are being attempted in various places to see if they are practical and workable, there are very few plants of commercial scale other than those in the UK, which makes us wonder how different "oil shale" must be from coal. Meanwhile, I admit that German products are sophisticated and superior to the others in extracting byproducts. Therefore, there should be debates regarding whether South Manchuria Railways is to adopt German products immediately.

3. Products in the US.

[21] Thyssen, established in 1867, merged with Krupp, established in 1811, to create Thyssenkrupp in 1999.
[22] Deutsche Mondgas- un Nebenprodukten Gesellschaft, Berlin.

> I returned to Japan through the US and was ordered to visit and observe the "Hartman" method[23] and "Trumble" method.[24] I am concerned that "mechanical troubles" could occur with both the "Hartman" method and the "Trumble" method. In particular, the "Hartman" method is still under study, and I cannot imagine that the current model could be utilized for the "shale" of Manchuria. However, the "Trumble" method has a substantial advantage in coal retorting.
>
> In summary, during the talk, Mr. Kimura, in general, still intends to argue for the construction of a large-scale plant using the "Scottish" method. Meanwhile, he seemed not to appreciate Mr. Okamura very much and spoke as if he assumed authority over this facility; hence, we expect hereafter that the Dalian branch will be very worried about the negotiations. Executive officers of the South Manchuria Railways would surely value suggestions from Mr. Kimura, and hence, we would like you to carefully approach him...

Regarding the US method, the Hartman rotary continuous retort adopted external heating (Hamor, 1925, 157), and the Trumble oil cycle distillation adopted internal heating using "superheated steam" (Lyder et al., 1925, 290).

As Kimura mentioned above, coal retorting had been well established (Fischer, 1924, 76–80). The issue was whether its application to kerogen shale retorting was feasible.

In summary, Kimura prioritized reliability and recommended Simon-Carves, which had worked with the Scottish oil shale industry; he did not think highly of the German Mondgas. Additionally, Kimura did not appreciate Okamura, who valued the internal heating system

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[23] Hartman Rotary Continuous Retort by Hartman Syndicate Company, Ashland, Oregon (Hamor, 1925, 156–157).

[24] Trumble Oil Cycle Distillation Plant by Trumble Oil Shale Cycle, Company, Alhambra, California (Hamor, 1925, 166).

suggested by Mondgas. As described in Section 2.3, Okamura took the lead in developing an internal heating system from 1925. However, as of 1924, Kimura valued the Scottish external heating technology and wanted to reject Okamura's suggestion for an internal heating system.

Mitsui & Company also contacted other members of the committee. When Kanji Kurihara from the navy stayed in the US between 23 and 28 October 1924, on the way back from Europe, the New York Branch accompanied him and coordinated his visit to shale retort facilities using the Hartman method. When Keido Uehara from the navy stayed in Los Angeles from 2 to 10 October 1924, the headquarters and the New York Branch arranged his visit to oil fields in California. Thus, engineers belonging to the navy also visited sites in the US in person and acquired tacit knowledge there [25].

The headquarters and Dalian Branch of Mitsui & Company closely shared information on the procurement policy of the South Manchuria Railway. The Dalian Branch analyzed their prospective procurement policy in March 1925 while requesting information on competitors, about which headquarters might have had better knowledge, such as the following.[26]

> While products from continental Europe have also been under study [by the South Manchurian Railway], it is still speculated that the "Scottish" method is largely the most promising, also given our relationship with the navy. Among the "Scottish" method facilities, it is currently unpredictable whether "Simon-Carves", whose agent we are, or "Craig" & Co., whose agent is Takada & Co., will be procured, and furthermore, there is not yet a consensus even among people in charge within the South Manchurian Railway. Since Takada & Co. has recently fallen into bankruptcy, it is naturally very unlikely that the South Manchurian

[25] The Seattle Branch, Mitsui & Company, "Ryokaku dosei annai (Smmary of states of vistors)," RG131, Entry67, BOX2, NARA.

[26] Letter from Deputy Branch Manager, the Dalian Branch, Mitsui & Company, to Director of Division of Machinery, the Tokyo Branch, "Mantetsu Bujun Tanko yuboketsugan kanryu sochi no koto (On oil shale retort facilities of the Fushun Mine, the South Manchuria Railway)," 2 March 1925, RG131, Entry64, BOX2, NARA.

> Railway will procure the facilities of “Craig” & Co., and therefore, the Mitsubishi Corporation or another trading company will surely make efforts to replace Takada & Co. in importing “Craig” & Co. products and to obtain orders. Thus, at this moment, although we cannot directly approach “Craig” & Co., given the relationship with “Simon-Carves,” it would seriously disadvantage us if “Craig” & Co. collude with a powerful trading company such as the Mitsubishi Corporation. Therefore, what about making “Craig” & Co. tentatively collaborate with Takada & Co. to produce what “Simon-Carves” designs, or, if the South Manchuria Railway nominates “Craig” & Co., seeing whether there is room to negotiate with Takada & Co. to agree that we will deal with “Craig” & Co.? Also, please tell us what you predict about the possibility that the Mitsubishi Corporation will work with Takada & Co.

The letter indicates where trading companies’ efforts were going. As described in Section 2.3, while the council decided to try the Scottish method first in 1925, engineers from the South Manchuria Railway, led by Kinzo Okamura, began experimenting with retort with internal heating in 1926. After the success of the experiment, the company built a retort system with internal heating in 1928 that began operating the following year. Trading companies were not involved in the critical moments of such technical decisions. Instead, they were hunting for information regarding procurement candidates, and to obtain such information, agents of trading companies accompanied engineers from the South Manchuria Railway on visits to sites in the West. This does not mean that trading companies were useless in producing information. They arranged in-person visits to sites in operation, which gave engineers tacit knowledge, and they delivered information about the prices of candidate facilities, which was critical for procurement.

4 Conclusion

There were two feasible options for the South Manchuria Railway: the reliable but energy-wasting Scottish external heating system and an internal heating system that was possibly less expensive but still only under development. The former was supported by the navy, the primary customer for the produced oil. Leading engineers of the South Manchuria Railway preferred the latter for its profitability.

What Mitsui & Company and the Mitsubishi Corporation did during the selection process was provide logistical support for the staff of the South Manchuria Railway in visiting advanced facilities in operation. Engineers of the South Manchuria Railway had the knowledge to evaluate the facilities they observed in person and did not need technical advice from trading companies. However, they absolutely needed assistance to observe facilities in person. Mitsui and Mitsubishi logistically supported such "business trips" to establish "face-to-face" relationships (Miller, 2003).

Such requests could be met only by the largest trading companies, such as Mitsui and Mitsubishi, which had experience in brokering procurements by the Japanese government and large Japanese companies. Unless their Western counterparts actually recognized the possibility of procurements supported by proven trading companies, they would not have coordinated in-person visits.

In summary, the arrangement of in-person meetings between potential buyers and sellers was how these trading companies "produced information." Such activities remind us of the "information production" of investment banks. Investment bankers, usually business degree-holders, are not necessarily experts in the technologies they handle. Maintaining dense networks with companies and suggesting possible matches is their method of information production. In highly differentiated markets, trading companies' roles were essentially the same.

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