More Valuable than Gold:
Korean Tungsten and the Japanese War Economy, 1910 to 1945*

Chad Denton

A central component of the Japanese government’s foreign policy after the First World War was its desire to control and secure access to strategic minerals necessary for munitions production. Two-thirds of the world supply of these strategic minerals—including metals like copper, lead, molybdenum, nickel, tungsten and zinc—was primarily under the commercial control of American and British interests. American geologists and foreign policy experts assumed that Anglo-American sanctions combined with the lack of mineral deposits in East Asia would prevent Japanese attempts at economic autarky. Yet these experts failed to appreciate the importance of the Korean peninsula. Korean minerals—in particular tungsten—enabled the Japanese war economy to partially withstand the economic strangulation of the Allied blockade and bombings in the last years of the war. After the war, Korean scholars documented, in great detail, the Japanese exploitation of these resources, yet this scholarship does not show how these Korean resources fit into the larger resource base of the so-called “Co-Prosperity Sphere.” This article examines the origins, development, and consequences of Japan’s exploitation of Korean mineral resources from 1910 to 1945 through a case study of tungsten and uses two distinct sets of sources: first, reports and studies produced by American geologists from the 1920s to the postwar period and, second, Japanese mining reports and statistics produced in Korea and Japan during the colonial period.

Keywords: tungsten, gold, Japanese empire, war economy, mining

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Introduction

In February 2012, Warren Buffet announced that he would invest eighty billion won (US$75 million) in a South Korean mine that had shut down in the 1990s. When it reopens, the Sangdong mine in Kangwŏn province will produce an estimated seven percent of the global production of tungsten—a metal essential for the creation of special steels. Those who attended primary school in South Korea in the 1960s should know about tungsten. They might remember the school maps that showed the locations of the rich tungsten deposits on the Korean peninsula or the textbooks that discussed tungsten’s important role in the world economy. South Korea’s chief export in the postwar period, tungsten was a key part of Park Chung Hee’s economic modernization program. Following his 1961 coup, Park Chung Hee appointed his colonel Pak Tae Joon (Pak T’aejun) to head the badly mismanaged state-run Korea Tungsten Corporation (Taehan chungsŏk). In three years, Pak Tae Joon turned the company around and became the first CEO of the newly established POSCO steel company. At least one generation in South Korea has some awareness about tungsten and its role in South Korean industrialization, but few today know that the history of this mineral in Korea dates back to 1911. Korean tungsten, mined by both Korean and Japanese companies, supplied Japanese industry in the 1930s and propped up the Japanese wartime economy in the late 1940s. After the war, American occupation authorities encouraged its mining and export as a way for Korea to acquire much-needed foreign exchange.

Very little has been published in English about mining during Korea’s colonial period. This lacuna is surprising given the wealth of English-language

2. Don Miller, “Why Warren Buffett is Loading Up on Tungsten,” Money Morning: Your Daily Map to Financial Freedom, June 11, 2012, http://moneymorning.com/2012/06/11/why-warren-buffett-is-loading-up-on-tungsten (accessed 6 May 2013). Because tungsten is a chemical element that does not exist in nature outside of a compound, technically the term for the metal is tungsten trioxide (WO₃). The element is also known by its Germanic name, “wolfram.” The word “tungsten” will be used throughout this paper to refer to WO₃ or its common designation of tungsten concentrate.
3. Interview with Professor Ji-Hyun Lim, Hanyang University, Seoul, Korea, May 2, 2013.
primary source material about the subject. American and European missionaries described Korean mining practices and the scramble for foreign concessions in the late nineteenth and early twentieth centuries. American and British geologists, economists, and foreign policy experts published extensively about Japanese efforts to acquire the mineral resources of East Asia in the 1920s and 1930s. The United States Strategic Bombing Survey in Japan and the United States Military Government in Korea documented the Japanese exploitation of Korean minerals in studies published after 1945.

These materials complement existing Japanese and Korean literature, both contemporary and post-1945, which tends to view the history of Korean mining through the narrow lens of either the national or the colonial framework. Indeed, the economic history of Korean tungsten is a way to break down the binaries between the entrenched historiographical paradigms of “colonial modernity” and “exploitation.” This essay—in the spirit of “new imperial history” or “the imperial turn”—proposes a move to the transnational, with an emphasis not only on the flow from colony to metropole but also on how changes at the imperial periphery shaped those internal flows.

Yet this study would be incomplete if it were to focus solely on the multidirectional flow of ideas, practices, and materials between colony and metropole. In her introduction to A New Imperial History, Kathleen Wilson called for scholars to “recognize alternative modes and sources for understanding the past, to probe at the limits of historical knowledge, and to make the ‘subaltern’—from indigenes to women, and all others rendered silent or invisible by the historical archive—‘speak.’”6 When writing the history of Korean mining—replete with statistics, maps, official reports, geological surveys, and lists of wages—it is easy to overlook the miners. In particular, one group on the margins of Korean history has remained entirely invisible: the independent surface or “placer” miners. Using traditional methods, these rural Koreans independently worked stream beds and surface deposits, sifting or crushing rock to extract the precious metal. Unlike the underground conscripted miners whose suffering can be rendered through unfeeling accident reports or through vivid memoirs, these independent placer miners worked outside the control of authorities and thus left few records, though their gold (and later tungsten) dust—which fed an enormous underground economy—did attract the attention of customs agents. It is these men, and women, who offer a more

fundamental challenge to the paradigms of progress and victimization.

The stage will be set with the transnational perspective in order to frame Korean mineral resources within the larger geopolitics preceding the Second World War. In the years after the First World War, world leaders began appreciating the threat to national security posed by the supply of strategic resources. This vision of a world of finite resources controlled by a small number of great powers informed Japan’s aggressive territorial conquests in the first half of the century as well as its rhetoric of a “New Order” and “Co-Prosperity Sphere” in East Asia. Central to Japanese strategic thinking was control of the Korean peninsula with its rich, underdeveloped mineral resources needed to wage war. Using American, British and Japanese sources, it is possible to show how and why the Japanese plunder of Korean minerals shifted focus from gold to critical metals according to the larger needs of the Japanese empire. The most significant among several strategic minerals needed for Japanese munitions production was tungsten. A survey of the mining of Korean tungsten and the consequences of that mining for the Japanese empire from 1911 to 1945 shows how the exploitation of Korean tungsten fit within the broader strategy of Japanese resource acquisition during the Pacific War. Finally, throughout this essay, a close look at the mining practices of Korean independent placer miners from the 1880s to the 1950s reveal not only deep continuities but also a striking degree of Korean agency and expertise.

Japan and “The Problem of Raw Materials”

In a prescient 1936 article, the American scholar Catherine Porter described Japan’s “mineral deficiency” and the potential geo-political consequences of that deficiency, arguing that “a germ of conflict [lies] in the natural resources which are unevenly distributed throughout the world.” Using publicly available statistics as well as recently published geological studies, Porter showed how much the Japanese economy depended on a mineral supply controlled by the United States and Great Britain and how that dependency fueled the Japanese drive for self-sufficiency. She concluded her article with an understandable sense of urgency: “The immediate problem before the world is . . . how to avert conflict among those who have and those who fear.”

7. Catherine Porter, “Mineral Deficiency Versus Self-Sufficiency in Japan,” Far Eastern Survey 5, no. 2 (Jan. 15, 1936): 9–14, 14. After graduating from Cornell University, Catherine Porter became a secretary of the American Council of the Institute for Pacific Relations (IPR). In 1935 she became the managing editor of Pacific Affairs. She was also a regular contributor to (and later
Porter was one among many in the 1920s and 1930s who recognized the danger posed by the uneven distribution of the world mineral supply. The First World War had revealed not only the extraordinary raw material demands of modern warfare but also the extreme vulnerability of their supply to blockades, embargoes, and export controls. After the war’s end in 1918, economic controls had continued to disrupt the world supply of raw materials. These controls particularly affected developed countries with few natural resources like Japan. In the fall of 1921, a League of Nations report called attention to the “detrimental effects” of tariffs and other duties “on raw materials essential for the economic life of other countries.”

A year after Porter’s article, in January 1937, the League of Nations created a “Raw Materials Committee” that attempted to resolve potential conflicts over claims to mineral resources. At the first meeting of the committee, the Japanese representative demanded “the abolition of all export restrictions on raw materials, the relinquishment of all endeavors to form monopolies of such materials, permission to all races to immigrate into undeveloped territories, the adoption of the principle of the Open Door and lastly, the restoration of international trade.” Yet at that time in its colonial possessions Japan was restricting exports of raw materials, creating monopolies, closing borders, preparing to expropriate foreign assets, and blocking international trade.

Japan used its status as a “have not” power—a nation deficient in natural resources—to justify its territorial conquests. In September 1937, just three
months after the outbreak of the second Sino-Japanese war, a Japanese propaganda pamphlet claimed that “in these days of economic seclusion...[t]he less favored countries are under the pressing necessity of devising some means by which to facilitate their acquisition of the needed raw materials.” These stated means included “cultivating friendly relations with her neighbors.”

Central to the Japanese government’s claims of resource deficiency was the case of metals. These deficiencies were severe. A table published in 1930

Table 1.

<table>
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<th>Germany</th>
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<th>United Kingdom</th>
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<tr>
<td>Zinc</td>
<td>*</td>
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<td>*</td>
</tr>
</tbody>
</table>

Key: (A) Minerals available in large quantities for export (B) Minerals adequate to meet domestic demands, partially dependent on foreign sources (C) Minerals inadequate to meet domestic demands, partially dependent on foreign sources (D) Minerals for which the country depends almost entirely on foreign sources (*) Status of the country is improved when minerals under commercial or political control of that country, but situated outside its boundaries, are included with the domestic resources. Source: J.W. Furness and L.M. Jones, Mineral Raw Materials, trade Promotion Series, No. 76, Bur. Foreign and Domestic Commerce, U.S. Department of Commerce, 4–7, 1929, as published in Leith (1931).


14. Bain, “World Mineral Production and Control,” 706–710. Bain included a series of charts that showed where minerals were mined and who had commercial control over them. In 1932
illustrated the relative access of the United States, Germany, France, the United Kingdom, and Japan to the following strategic metals: aluminum, antimony, chromite, copper, iron, lead, manganese, mercury, nickel, tin, tungsten, and zinc. For these metals, Japan had no supply large enough to export. Only for copper and zinc did Japan have a supply “adequate to meet domestic demands without appreciable excess or deficiency.” For chromite, manganese, and iron Japan remained “partially dependent on foreign sources” while for the remaining metals Japan depended “entirely on foreign sources” (see Table 1). 

Though the table accounted for mineral resources “under commercial or political control of that country, but situated outside its boundaries,” the mineral resources of Japan’s colonies were surprisingly not considered. To make up these deficits, the Japanese government turned not only to Korean iron, lead, zinc, and tungsten but also to Korean gold—as foreign exchange to purchase the strategic minerals it lacked.

A Land Rich in Gold

In Corea: The Hermit Nation (1882), the American minister William Elliot Griffis cited the following passage by the Arab geographer Ibn Khordadzbeh as the first mention of Korea in the West: “What lies on the other side of China is unknown land. But high mountains rise up densely across from Kantu. These lie over in the land of Sila, which is rich in gold.” That both a ninth century Arab geographer and a nineteenth century American missionary chose to describe the Korean peninsula as “rich in gold” underscores the prominent place of gold in Korean history.

together the US and UK held commercial control over 66 percent of the supply of the world’s strategic metals. The combined percentages of British and American ownership for each metal were the following: chromite (84%), copper (79%), iron (48%), lead (81%), manganese (55%), mercury, molybdenum (99%), nickel (89%), tin (33%), tungsten (40%), vanadium (100%), zinc (74%).


16. William Elliot Griffis, Corea: The Hermit Nation (London: W.H. Allen & Co, 1882), 2; Shannon McCune, “Arab Accounts of the Geography of Korea,” Research Monographs on Korea, series G, no. 1 (Chicago: Korean Research Associates, 1948), 2. It should be noted that Griffis did not actually travel to Korea. The closest he got was Tsuruga and Mikuni. He compiled all the information he could find about Korea at that time and included documents brought to him by American and Japanese diplomats, surveyors, scholars and naval officers who had visited the country.

17. In his research on Korean currency during the Yi dynasty, however, James Palais has shown
Some of the earliest documentation of mining in Korea comes from works published by men like Griffis—European and American missionaries, businessmen, and diplomats who traveled to Korea and Japan in the late nineteenth century. From 1882 to 1897, men such as Ernest Jakob Oppert, William Carles, Georges Curzon and J. Hunter Wells described an undeveloped land with relatively untouched gold reserves. These reserves had been historically controlled by the royal government but were ready for exploitation by foreign firms.\(^{18}\) Beginning in 1885, the Korean Royal Household’s Bureau of Mining began encouraging Korean entrepreneurs to prospect new deposits, set up companies, and import foreign technology and foreign miners. These efforts largely failed.\(^{19}\) In 1895, the Korean court issued a mining concession to the American James R. Morse for the Unsan district in North P’yŏngan province. King Kojong subsequently issued concessions to firms from Germany (1897 and 1908), Great Britain (1899 and 1905), Japan (1900), and France (1901). The most successful of these was the Unsan mine, which remained under American control until its takeover by the Japanese in 1939.\(^{20}\)

The extensive documentation of this American concession has skewed the picture of Korean mineral extraction in the English-language scholarship on

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colonial Korea. More broadly, the focus on the large mining concessions, which specialized in the mining of underground veins, has left out the considerable activities of the independent Korean placer miners who panned the ore out of streams. References to the illicit smuggling of gold out of Korea as well as the rampant “prospecting and freebooting” rarely describe the “prospectors and freebooters” themselves.

These Korean placer miners were ubiquitous in the mountain valleys of the peninsula. As the geologist David Gallagher has pointed out, “because the bedrock occurrences of gold are numerous and widespread, nearly every stream in Korea can be regarded as a potential prospect for gold.” In 1897, the missionary American J. Hunter Wells described his impression of these Korean gold miners:

The placer process, in which as many as 3,000 Koreans are said to have been at work, is the easiest and most common method. [...] On entering the small valleys in the north, a newcomer is struck by the many large mounds, like huge ant-hills or unkept royal graves, lining the little rivers. These are the washed-over gravel and dirt, which has yielded no one knows how much gold. [...] The process of separating the free gold from the large mass of pyrites is very tedious, but to see the glittering gold, tho but in pin-points, lends a fascination to the business that is pleasurable and exciting.

Horace Allen made a similar observation a year later: “The whole country has been, as it were, honeycombed by native miners in the past, and, to please the native miners and promote further prospecting, these people are given mining

21. In Bruce Cumings’s Korea’s Place in the Sun: A Modern History, Japanese mining only really surfaces after 1939. For example, Cumings described how Horace Allen advised King Kojong to counteract Chinese influence by giving “the gold mining franchise to an American company” and Kojong subsequently “doled out Korea’s resources as if from a Chinese menu: column A—gold mines, railroads, a new electric system for Seoul—went to Americans.” Bruce Cumings, Korea’s Place in the Sun: A Modern History (New York: Norton, 1997), 124–125. For a more recent popular history that reinforces this picture, see Donald G. Southerton, Intrepid Americans: Bold Koreans—Early Korean Trade Concessions and Entrepreneurship (New York: iUniverse, 2005).


23. David Gallagher, Mineral Resources of Korea, vol. IIIa, Gold (Seoul: Mining Branch, Industry & Mining Division, United States Operations Mission to Korea, 1963), 2 VI.

rights for one year on new properties.”25 These miners were quite mobile. In 1904, Angus Hamilton pointed out that the Korean miner did not mind the irregularity of Korean gold deposits because “his outfit costs at the most a few shillings, and his belongings are easily transported to any distance as circumstances demand.”26

In 1906, the American missionary Homer Hulbert published a photograph of these Korean placer miners (see Figure 1).27 Four men crouch next to a small stream bed and pose for the camera while holding their large gold pans or baskets. In the same work, Hulbert described how these miners even managed to access surface deposits with crude shafts:

The Koreans build a fire on the ledge, and when the rock is hot they throw on water, which cracks the quartz and makes it possible to dig it out with their rude picks. [. . .]  They crush the ore beneath great round granite boulders, which are rocked back and forth over it by the use of levers or handles fastened to its sides.28

Hulbert also stressed that these activities occurred at a “distance from constabulary control.”29

Indeed, independent Korean miners working placer deposits, either legally or illegally, usually escaped the notice of authorities.30 The gold dust they panned and traded, however, occasionally attracted the attention of customs agents, particularly in the late nineteenth and early twentieth century trade with Qing China.31 The panning and smuggling of gold—and later other metals—

29. Ibid., 274.
30. Man-gil Kang, “Ch’ông Yak-yong’s Policy Proposals for Mining and Industry,” Korea Journal 25, no. 9 (September 1985): 17–24. Kang cites a passage from the Kyŏngse yup’yo [Design for good government] that dates the presence of illegal placer miners to at least the eighteenth century: “As the country is mountainous, it abounds in gold, silver, copper and iron. […] Neither official ban of their development nor stealthy mining of them by wily people is tolerable. What is considered reasonable is for the government to mine gold, silver and copper at its own expense and punish private miners severely like counterfeiters” (21).
continued during the colonial period and even after the arrival of the Americans in 1945.

Though Japan acquired a mining concession in 1900 and began aggressively investing in Korean mining operations after 1905, Japan's intensive exploitation of Korean minerals did not begin until after Annexation in 1910.32 From 1911 to 1917 the mining office of the Government-General carried out a detailed survey of Korean mines to determine the location, type, and quality of Korean mineral deposits. To facilitate access of Japanese capital to these resources, the Governor General promulgated the Korean Mining Ordinance in 1915 and created a geology research office in 1918. The Governor General also established

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a Mining Department in the Keijō Higher Industrial School in 1916. By 1920, the Japanese controlled 80 percent of mineral production in Korea. 33

As the economic historian Young-lob Chung shows, one way the Japanese maintained this control was through the issuing of mining permits: “the number of mine permits granted to and operated by Japanese was about two-thirds to twice that of the Koreans.” 34 In many cases, “Japanese officials licensed good mines to Japanese and poor mines to Koreans,” in some cases, this unfair licensing caused Korean mines to go bankrupt. 35 In terms of total mineral output, between 1910 and 1917, the Japanese controlled only one-quarter of the total. That number rose to two-fifths after 1918 and reached three-quarters by 1932. In 1933, Japanese mines produced 82 percent of total mineral output, 90 percent in 1936, and more than 90 percent after 1940. 36

What exactly was being mined? A secret military report published in 1941 offers a revealing snapshot of Korean production of non-ferrous metals. Created as part of the Production Expansion Plan, the report gave a statistical breakdown of the total production of non-ferrous metals, by mine and by refinery. A simple way to compare the relative importance of these production levels is through a comparison of the percentage of mining sites exploiting each metal. In 1941, out of Korea’s 131 mining sites devoted to non-ferrous metals, these were the relative percentages for each metal: gold (51%), lead (20%), copper (15%), graphite (15%), zinc (7%), fluorite (4%), mica (3%), asbestos (2%), and mercury (1%). 37 Though these figures do not include coal, iron, or ferro-alloys, it is clear that the 67 gold mining sites—which included four placer mine deposits—represented a large proportion of the resources in capital and labor being devoted to mineral production.

The preponderance of Korean gold mines was the result of deliberate Japanese policy. Soon after Japan’s invasion of Manchuria in the fall of 1931,
the Governor General of Korea, Ugaki Kasuhige (1931–1936), announced a policy to dramatically increase subsidies of Korean gold production. These subsidies worked. From 1925 to 1938, Korean gold production increased sixfold, surpassing Japanese gold production for the years 1938 and 1939 (see Chart 1a).

Korean gold provided much of the foreign exchange Japan needed to purchase the raw materials for military production. These military needs increased with the onset of the second Sino-Japanese War. In September 1937, Ukagi’s successor as Governor General of Korea, Minami Jirō, announced the Gold Mining Act instituting the Five Year Plan for Gold, legislation intended to resolve the balance of payments problem, modernize the Korean mining industry, and help lower unemployment. In May 1938, Minami promulgated the Law to Increase the Production of Major Minerals in Korea. The law designated twenty-five ores as having an importance for the National Defense Industry. Besides providing additional subsidies for silver and iron ore, the law also allowed for the government appropriation of private mines. The following year, in September 1938, because of Korea’s designation as an “advance military supply base” Minami’s Government-General “laid plans for a rapid development of military-related industries, including light metals.”

The availability of inexpensive hydropower in the north, as well as large subsidies, allowed for the development of electrolytic plants to produce aluminum and magnesium.

41. Chŏn Soktam and Ch’oeYungyu, Chōsen kindai shakai keizai shi, 270. This was the complete list: (1) gold (2) silver (3) copper (4) lead (5) tin (6) antimony (7) mercury (8) zinc (9) iron (10) pyrrhotite (11) chrome (12) manganese (13) tungsten (14) molybdenum (15) nickel (16) cobalt (17) graphite (18) coal (19) mica (20) alum (21) barite (22) fluorite (23) magnesite (24) gold nugget (25) iron sand.
42. Kang, A History of Contemporary Korea, 140.
44. Kang, A History of Contemporary Korea, 140.
1a. Comparison of Korean and Japanese Gold Production (in kilograms)

1b. Applications to Mine Gold / Silver Ore in Korea


_Chart 1_. Evolution of gold ore production.

**Chart 2.** Production of strategic ores in Korea.
The beginning of the Pacific War in December 1941, which brought an end to all trade relationships between Japan and the United States, marked a turning point for the Japanese Empire’s mineral production. With trade interrupted, gold was no longer as useful for foreign exchange; there was nothing left to buy. In 1943, the Japanese government redirected all the resources used for gold production “in order to divert the manpower and materials to the mining of minerals more essential to the war effort.”

Gold mining sites that mined copper, zinc, and lead as a byproduct remained opened, but the rest of the Korean and Japanese gold mines were temporarily shuttered.

Using a combination of gold production statistics it is possible to compare Korean and Japanese production of gold from 1931 to 1943. Graph 1 shows the effectiveness of the measures taken after 1931 as well as the ineffectiveness of the exorbitant subsidies for gold. Production peaked in 1939 but subsequently fell. Not surprisingly, the production curve also matches the trend for the number of applications filed to mine gold or silver ore. Similarly, the effectiveness of the shift towards strategic minerals can be seen by pairing a graph of the number of applications filed to mine “ores necessary for munitions production” with the graph of Korean tungsten production (see graph 2).

A Japanese Government-General report in September 1944, titled “Non-

47. Gallagher, *Mineral Resources of Korea*, vol. IIIa, Gold, 7; Chaisung Lim, “Guest Editor’s Introduction,” special issue “The Evolution of a Wartime Economy in Colonial Korea, 1937–1945,” *The Review of Korean Studies* 14, no. 4 (December 2011), 14. In this essay, Lim includes a table that compiles the Korean production statistics from the “Production Expansion Plan” published by Yamazaki Shiro, *Seisanryoku kakujyū keikaku shiryō dai 9 kan* [Production expansion plan], vol. 9 (Gendai shiryō shuppan, 1996). These numbers are nearly identical to those published in the series of secret military reports from 1939 to 1942. I have used the numbers for “gold refining” from these reports for 1939 to 1942 for both Korea and Japan. These are more accurate than the official statistics after 1937 as given in the *Chōsen keizai nempō* [Korean Economic Yearbook] 1948 I, 81–83. For Korea, Gallagher’s numbers include the totals from placer gold mining, which are not included in the statistics of the *Chōsen sōran* [Chosen General Survey], 470 or the *Chōsen kōgyō no sisei* [Trend of Korean Mining].
49. These figures have been compiled by Yu Sūngyŏl, “Ilche ŭi Chosŏn kwangŏp chibae wa nodong kyeģup ŭi sŏngjang” [Japanese Empire’s control over Korean mining and the growth of the working-class], *Han’guk saron* 23 (1990), 410–411. Yu Sūngyŏl uses these figures to show how the Japanese mass-conscription of Korean labor to work in the mines contributed to the growth of the working-class. In this case, I am more interested in parsing out the different metals being mined that are represented in these numbers. That is not to say, however, that I aim to minimize the significance of this mass labor mobilization.
Table 2.

<table>
<thead>
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<th>Ore/Mineral</th>
<th>Korea</th>
<th>Japan</th>
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Key: ◎ Within the top 10 in the world in 1938, or there are plenty of reserves
○ there are considerable reserves or production
△ there are not much reserves or production
× there are extremely little or zero reserves or production


Ferrous Metals and Non-Metal Ores in the Peninsula,” underlined the importance of strategic minerals like tungsten. The author characterized Korean “underground resources” as having a relatively recent history—only 80 years—with “a rapid development under Japanese rule.” Though “the history

of mining in the peninsula” traditionally meant gold mining, the report outlined the recent shift to “special minerals.” For these, the report optimistically saw potential for “wonderful progress,” in part because these resources had a “supplemental relationship” with those of Japan and mainland China. The expectation for these resources was “extremely high” because of the “restricted” shipping “from the South, including Southern China.” The report bolstered its conclusions with the above table (table 2).

This table shows the relative importance of Korean tungsten, molybdenum, cobalt, graphite and nickel for the Japanese war economy at this time period. The inclusion of regions within the broader “Co-Prosperity Sphere” allows for the comparison of Korean mineral production with the larger supply situation. But the picture is static. It is clear that by 1944 Japan was in serious trouble. How did the larger supply situation of minerals change over time? And how did those changes in regions outside of Korea influence developments on the peninsula? To answer these two questions, it will be necessary to look at the specific case study of one ferro-alloy: tungsten. Whereas Japanese prewar planning and development of nickel and cobalt deposits was nearly nonexistent, and thus had a minimal impact during the wartime years, the extensive prewar development of tungsten deposits had a considerable impact by the end of the war.

Mining Korean Tungsten

Tungsten is an invaluable mineral in modern warfare, invaluable primarily because of its use in tool steel.52 Without a tungsten steel blade, it is very difficult to cut or shape armaments steel. According to the economic historian Alan Milward, “cutting machines using tungsten steel could run at five times the speed of those using carbon steel and could cut more deeply. Jobs taking hours with carbon steel took minutes with tungsten steel.”53 Because most of the world’s tungsten supply in the 1930s and 1940s came from China and Burma, Nazi Germany experienced a severe shortage during the war. Supply was so critical that France’s tungsten mines—the only source for tungsten in occupied Europe—were repeatedly attacked by the French Resistance.54 The

54. Ibid., 252.
supply situation for Japan, however, was not so critical, because of the availability of imports of tungsten, and later ferro-tungsten, from the Korean peninsula.

The history of tungsten mining in Korea is very well-documented because of its nearly continuous exploitation from the early 1900s until the present day. Tungsten occurs naturally in two kinds of ores: wolframite and scheelite. The Korean peninsula has significant deposits of both. Though inhabitants of the area near Kŭmgangsan had reportedly traditionally used tungsten as a medicine, wolframite was only discovered in Korea in 1908 and the first tungsten deposit in 1911. Nakamura Shintaro, an engineer working for the Government-General of Korea who later became a Kyoto University professor, discovered the tungsten deposit in Ch’angsŏng-gun, North P’yŏngan province. The following year Ogasawara Ken began mining a deposit in the Kŭmgangsan area.55

During the First World War, demand for tungsten rapidly increased. Technicians had discovered that tungsten steel could be heated “to dull redness” without losing its hardness. It was this quality that allowed tungsten steel blades to quickly cut other metals. Not surprisingly, production and exports of Korean tungsten (as well as gold and silver) saw a rapid development in this period. The Mitsui Mining Company opened the Kŭmgangsan (Kongo-san) mine, but many smaller mining operations cropped up throughout the peninsula. Demand was so high that independent Korean placer miners—who had previously only panned for gold—began “panning” for tungsten.56

The statistical records for this time period are incomplete and somewhat contradictory, but it is clear that war was good for business. Demand peaked sometime between 1916 and 1917. By one measure, there were 780 applications for permits to mine tungsten in 1916, then only 63 the following year, and 0 by the early 1920s.57 By another measure, it was estimated that production was 92 tons in 1916, 318 tons in 1917, 288 tons in 1918, under 59 tons in 1919 and nearly zero tons by 1920. But the same source indicated that these were the figures of the Mining Office; the Customs Office indicated production figures that were 3 to 5 times larger: 514 tons in 1916, 848 tons in

57. Government-General of Korea, Chōsen no jūseki kōgyō, 9–10.
1917, 1094 tons in 1918 and 192 tons in 1919. The disparity between the two suggests a significant amount of unregulated tungsten mining, much of that done by those Korean placer miners.

After a lull in demand caused most tungsten mines in Korea to shut-down in the 1920s, production picked up again in the late 1920s and continued to rise throughout the 1930s and 1940s (see Chart 2). Until 1937, all of the tungsten concentrate imported to Japan came from Korea. Carter Eckert used the example of the tungsten filaments used in everyday light bulbs to illustrate how Japan used Korea primarily as a source of raw materials and cheap labor: “the bulbs were actually fabricated in Korea. The filaments, however, were manufactured in Japan. Japan imported Korean tungsten and then exported it back to Korea in the form of filaments.” From 1925 to 1945, imports of Korean tungsten accounted for 60 percent of the needs of Japanese industry. Japan produced 10 percent domestically and met the remaining 30 percent from imports.

A fascinating document provides a window into the lives of the people who mined this ore in Korea. “Tōihi no higashiajia de” [A long time ago in East Asia] is the unpublished memoir of a recently deceased Japanese man by the name of Nakamura. Nakamura’s father, an engineer, worked for the Japan Mining Company (Nippon Kögyō) in Korea as the Chief of the Mining Office, and was stationed primarily in the north. In September 1939, Nakamura’s father transferred to the Kiju tungsten mine in Iryong-myon. The Japan Mining Company—the same company that bought out the American gold mining concession at Unsan in 1939—had purchased the Kiju tungsten mine in 1934 and had “installed modern machinery” to replace the “primitive” working methods. An article in the Asahi Shimbun in May 1938 noted that

58. Kondo, Chōsen no kögyō, 88.
60. Carter Eckert, Offspring of Empire, 145–146.
63. Fifth Section of the Planning Board, Shōwa 14 nendo bushi dōin keikaku ni motorsuku kuni betsu yuryū keikakubyō [Outline of imports in accordance with the material mobilization plan for fiscal year of 1939] (Tokyo: Fifth Section of the Planning Board, 1939), Japan Center for Asian Historical Record (hereafter JACAR), National Archives of Japan, Ref. A06030138800, http://www.jacar.go.jp.
Japan Mining had recently completed the sorting of ore at Kiju and was now ready to start refining operations.\(^{65}\)

Nakamura, who was a university student at the time, remembered going to the Kiju mining site to visit his father’s office. He discovered that those “primitive” methods had not been completely displaced by the new technology. While there he spent some time exploring the surrounding area. About two kilometers downstream on the river that ran through the mining site, he discovered that a smaller settler community of rural Koreans had migrated to this area. At the river, they carried out a practice he described as “sakōtori” [sand-ore picking], or “panning.” They collected the powdered tungsten ore and earned money by selling it upriver to the mining site. Nakamura was surprised at how lucrative this trade was, “it seemed expensive,” and he remarked that most of these settlers were “from farming areas.”\(^{66}\) This practice was widespread at the time.\(^{67}\)

In his description of the main mining site, Nakamura also noted the competitive relationship between his father’s company, Japan Mining Company, and Kobayashi Mining Company:

Next to the Kiju mine, the Paengnyŏn [Hyakunen] mine, which is almost the same size as the Kiju mine, has been developed. The Japan Mining Company [Nippon Kōgyō] and Kobayashi Mining Company [Kobayashi Kōgyō] are digging the valuable and expensive tungsten ores as if they are competing with each other.\(^{68}\)

Specializing in mining, refining and manufacturing, Kobayashi Mining was the largest Japanese tungsten company.\(^{69}\) According to the Chōsen sangyō nempō (Korea industry annual report), 95 percent of the tungsten production of the Japanese Empire came from Korea, and Kobayashi Mining Company controlled

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65. “Hitetsu kinzoku kaihatsu he” [Developing non-ferrous metals], Asahi Shimbun, May 29, 1938 (national ed.).
66. Nakamura, “Tōhi no higashiajia de.”
67. According to Gallagher, at the Sangdong mine, “it [was] reported that during World War II more than 1,000 persons were recovering fine-grained scheelite [the ore containing tungsten] from the stream as far as 10 kilometers below the mill by panning and blanketing.” Gallagher, Mineral Resources of Korea, vol. V, Tungsten and Molybdenum, 60.
68. Nakamura, “Tōhi no higashiajia de.” Nakamura’s observation confirms what economic historians of the colonial period have already shown: market forces operated within Korea’s so-called “controlled economy.” Lim, “Guest Editor’s Introduction,” 11.
69. Tōyō keizai shimpōsha (ed.), Chōsen sangyō nempō [Korea industry annual report] (Keijō: Tōyō keizai shimpōsha Keijō Branch, 1943), 77–101, 82. While the Japan Mining Company was part of the Nissan zaibatsu, the Kobayashi Mining Company was not affiliated with, nor were any of its shares controlled by, a zaibatsu.
75 percent of that output.\(^{70}\)

The story of how the Japanese capitalist Kobayashi Uneo—Korea’s “tungsten king”—managed to gain control of the Paengnyŏn deposit reveals the complexities of the tungsten market as well as the crucial role played by Korean entrepreneurs. The tungsten deposit at Paengnyŏn, just 8.5 kilometers southeast from the Kiju mine, was discovered in 1930.\(^{71}\) It took two days to reach the deposit from Seoul, using first a train, then a car, and finally continuing on foot. Two Korean men, Yi and Kim, found the site while traveling in a rural area. They then formed a partnership with three others and the five of them jointly applied for a permit to mine (#8909) on January 8, 1932 and they were approved on May 5, 1932. At that time, in May 1932, another Korean man, Wŏn Yunsu, applied for a permit (#9531) in an adjacent area. However, he had not yet discovered any tungsten deposits on that land. In October 1932, Wŏn took ownership of Yi and Kim’s claim (#8909), presumably buying them out, as well as another adjacent claim (#10331) owned by a man named Cho.\(^{72}\)

Wŏn owned the Paengnyŏn site, but the operations were run by the Nikka Mining Company. In 1936, 380 miners worked underground in two shifts, day and night, earning between 0.98 and 1.20 yen per day. Above ground, there were 440 unspecified “handymen” who likely operated the equipment to process the ore. They made 0.9 yen a day. Finally, there were also 68 women, children, and elderly men and women—in many cases family members of the workers—who sorted the ore by hand. They each made between 0.5 and 0.65 yen per day. Including additional transportation workers, supervisors, and those making charcoal, the total number of workers was 1200, with the addition of some 600 family members. These workers produced 37.25 tons of tungsten concentrate worth 20,077 yen in 1932, 99.5 tons worth 77,000 yen in 1933, and 282.4 tons worth 577,508 yen in 1934.\(^{73}\)

A profile of the company written by an engineer working for the Government-General described Wŏn in glowing terms as an ideal agent of the Japanese civilizing mission:

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70. Ibid., 79.
71. Gallagher, *Mineral Resources of Korea*, vol. V, Tungsten and Molybdenum, 16–17. Gallagher gives the geo-coordinates for both locations. Kiju was located at 38°57’N, 126°54’E and Paengnyŏn at 38°54.5’N 126°59.0’E.
73. Ibid., 20–21.
Mr. Wŏn was originally in the fruit business. He then used up all of his capital in a mining venture, but unfortunately, the venture did not succeed. He later saw the surface of the [Paengnyŏn] mining site and thought it looked promising and decided to take his chances. This is how he has succeeded today. Mr. Wŏn worried about the immorality at Paengnyŏn mine and so he encouraged the upper management and the miners not to drink alcohol and he banned the building of an on-site restaurant. Therefore, when I visited the site to do an inspection, I saw the residents, as well as houses and stores, but I did not see any drunkards walking around. [...] This mining site honors the mountain god in the same way Japanese businessmen do by holding festivals in April and September. During the festival, all of the workers eat together. Also, Mr. Wŏn established the Paengnyŏn public school to educate children and this school has benefited the inhabitants in the surrounding area. Recently he built a small hospital and the small rural village between the mountains has now been transformed into a peaceful utopia.74

The article concluded with further effusive words of praise and quoted Wŏn as saying that his motto was “the mining businessman should not pursue the mining profits only for himself.”75

Despite these altruistic intentions, Wŏn profited handsomely from his business venture. In February 1937, Kobayashi Mining bought the Paengnyŏn mine for 2,500,000 yen from Wŏn. At the time, it was the biggest tungsten mine in Korea. It is not clear from the documentation whether Wŏn was forced to sell or what the role of the Government-General was in this sale. Nor is it clear how widespread Wŏn’s experience was. There were several other Korean-owned tungsten mines, at least six were listed in a 1933 publication, but none nearly as significant as the Paengnyŏn mine.76

In January 1939, the Yomiuri Shimbun published an article about self-sufficiency in tungsten and cited Kobayashi’s Paengnyŏn mine as the reason why the Japanese did not have to worry about the increasing demand for tungsten in the future (90 percent of which was used in special steels).77 In addition to the Paengnyŏn mine, the Kobayashi Mining Company owned three

74. Ibid., 24–25.
75. Ibid., 25.
76. The Government-General of Korea, Chōsen no jūseki kōgyō [Tungsten mining in Korea] (Keijō: Chōsen kōgyōkai, 1933), 11–13. The names of the Korean owners were as follows: In Tonghwan 印東煥, Yi Man’gu 李萬求, Hyŏn Chuhyŏk 玄周爀, Yi Kuŏndong 李根東, Yi Pongok 李鳳玉, Kim Soŏnghyo 金成鉉. Unfortunately, it is not possible to determine whether any of these Korean owners were the same Yi or Kim who owned the first claim to the Paengnyŏn deposit. The first names of those two men were not provided in the 1936 report by Misawa Masami, “Tōyō daichi no shō aru tangušutenkō Kōkai-dō Taniyama-gun Hyakunen kōsan,” 20.
77. “Seisanryoku Kakuju no gendankai 4” [Present stage of production expansion], Yomiuri Shimbun, Jan. 12, 1939 (national ed.), 3.
other tungsten mines sites in Korea, the Nangnim (Rōrin or Bunryōrin) mine in the north, and the Talsŏng (Tatsujō) and Sangdŏng (Jōtō) mines in the south. Unlike the Paengnyŏn mine, all three of these additional mines were previously owned by Japanese.

Kobayashi Mining Company also operated the largest ferro-alloy plant in Korea, where tungsten was added to iron in order to create a special steel alloy. They built the plant in 1938 and its initial capacity of 100 tons per year increased to 20,000 tons in 1943. The company moved its tungsten ore to Sangwŏn, selected ores there, then sold 60 percent of the ore, and then moved the remaining 40 percent to the refinery in Oryudong, between Seoul and Inch'ŏn, where they converted the ore into ferro-tungsten. Initially, the Paengnyŏn mine supplied all the tungsten concentrates for the ferro-tungsten plant, but after 1941, the Sangdŏng mine, near the eastern Yongwŏl county of Kangwŏn province, began supplying tungsten. Though tungsten mining began in that area in 1916, it was only in 1939 and 1940 that explorations revealed a deposit that would produce 13,000 tons of tungsten concentrate during the war.

David Gallagher, an American geologist working for the Mining Branch of the United States Operating Mission to Korea (USOM/K), published a six volume report in 1963 that revealed the considerable increase in Korean mineral production during the wartime years. His statistics in the *Mineral Resources of Korea*, based on sources in Japanese, German, Korean and English, provide the best long-term picture available of Korean mineral production. Graph 2a, based on his statistics, reveals the sharp rise in production levels of tungsten from 1940 to 1944.

To understand why and how these production levels increased when they

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79. *Chōsen kōshō chōsa yōhō* [Bulletin on Korean mineral survey], vol. 14, no. 1 (Geological Survey, Government-General of Korea, October 1940), 4; *Chōsen kōgyō kaishi* [Korea mining report], vol. 20, no. 5 (Korea Mining Association, May 1937), 115; Katsuta Teiji, “1938 nen no Kobayashi kōgyō” [Kobayashi Mining Co. in 1938], *Tōshi sōdan* [Investment consultation] (Tōkyō: Chikura shōbō, 1937), 188.
did and the relative importance of this supply for the Japanese military, it is necessary to turn away from the history of tungsten mining in Korea and look at the place of tungsten within the Japanese military’s larger strategy for resource acquisition.

Korean Tungsten and the Japanese Empire

From the late 1920s through the 1930s, American geologists were quite dismissive of the potential for Korean minerals to have any noticeable impact on Japan’s resource situation. In fact, Charles Kenneth Leith, an expert on minerals and national security, concluded that if the entire mineral deposits of east and southeast Asia “could be combined, they would still be far inferior to those of Western Europe or the United States.” 83 In 1927, H. Foster Bain, the director of the US Bureau of Mines, published a detailed study arguing that “the Far Eastern countries do not contain such supplies of mineral resources as will permit the development of an industrial system according to Western standards.” 84 In his work, he used two different maps to clearly illustrate the larger regional distribution of antimony, tungsten, tin, copper, zinc, iron, and coal. 85 With the exception of the large quantities of Malay tin and Chinese antimony and tungsten, none of these mineral deposits exceeded 20 percent of world production. The iron deposits, scattered widely throughout central and northern China, the Philippine Islands, and the East Indies, were generally of low grade and required high mining costs. 86 The only minerals identified for the Korean peninsula were coal and iron.

After the First World War, Korean tungsten production was negligible not only because of slackening demand worldwide and the economic downturn in Japan but also because of China’s abundant supply. In 1932, of the world’s tungsten deposits, China had 55 percent, the Indian subcontinent had 21 percent, Malaya had six percent, Bolivia had five percent, and unnamed others had 13 percent. Of these deposits, however, China commercially controlled 55

85. “Map showing the percentage of the world’s production of various minerals derived from Far Eastern countries in 1924” and “Map showing location of principal coal, iron and copper deposits in the Far East” in Bain, Ores and Industry in the Far East, 22 and 72 (available online at http://archive.org/stream/oresandindustryi013363mbp#page/n37/mode/2up).
percent, Great Britain controlled 33 percent, the United States controlled seven percent, and “others” controlled five percent.\(^{87}\) In 1937, areas in China under the control of the Nationalist Government blocked exports of tungsten to Japan.\(^{88}\) The Japanese lost access to Chinese tungsten at the very time they were beginning the rapid increase of military production. Though Korean tungsten met some of that increased demand, the Japanese government had to turn to new markets for imports.

According to a handwritten document from the Japanese Planning Board written in 1939, a year when Korean production reached 3,969 tons, the Japanese government intended to import an additional 5,125 tons, possibly to create a strategic stockpile. The breakdown of projected imports included 1667 tons from the United Kingdom, 1538 tons from Hong Kong, 898 tons from the United States, 769 tons from Bolivia, and 253 tons from the Philippines.\(^{89}\) After the winter of 1941–1942, just 35 percent of those imports would be available to Japan in occupied Hong Kong and the Philippines.

If figures from a postwar Allied report can be believed, the actual tungsten imports in 1939 came well under the goals of the Japanese Planning Board and did not include imports from the United States or the Philippines. Out of a total 2,429 tons of tungsten concentrate, 14 tons came from China, 385 tons from Hong Kong, 33 tons from Malaya, five tons from Burma, 66 tons from Bolivia and Peru, 26 tons from Spain, 650 tons from Great Britain, and the remaining 1,250 tons from Korea. The discrepancy in these figures might be due to different ways of measuring tungsten-bearing ores and tungsten concentrate. Nevertheless, they clearly show Korea’s economic importance to the Japanese Empire.\(^{90}\)

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87. Bain, “World Mineral Production and Control,” 708. Another way to visualize the relative dominance of Chinese and South Asian control of the tungsten supply is by looking at the percentage of total production held by each tungsten producing country from 1918 to 1937. Though published in two separate Japanese sources, Government-General of Korea, Chōsen no jūseki kōgyō [Tungsten mining in Korea] [Keijō: Chōsen kōgyōkai, 1933], 2–3 and “Tangusuten-ni tsuite” [About tungsten ore], Chōsen kōgyō [Korea mining] (Korea Mining Association, December 1940), 40–41—the figures primarily come from a British trade publication called The Mineral Industry (1931, 1939). From 1918 to 1937, China produced 51 percent of the world’s tungsten, Burma produced 17 percent, the United States seven percent, Bolivia five percent, and Portugal four percent.


89. Fifth Section of the Planning Board, Shōwa 14 nendo busshi doin keikaku.

Even after Japan conquered much of East Asia, Southeast Asia and the South Pacific, establishing the so-called “Co-Prosperity Sphere” and intensifying mineral exploitation, many allied observers still assumed that mineral shortages would eventually cripple the Japanese war economy. The British economist Paul Einzig wrote a short book arguing as much in 1943. In *The Japanese ‘New Order’ in Asia*, he pointed out that the “Co-Prosperity Sphere” was “more or less deficient in some essential alloy metals, such as antimony, nickel, molybdenum and cobalt” and concluded that “if...the war should continue for years, Japan will begin to feel the effects of the deficiencies in copper, nickel and other metals.”91 Einzig did suggest, however, that the “co-prosperity sphere” had “ample resources of tungsten.”92

Einzig’s positive assessment of Japanese access to tungsten was due, in part, to the possibility of increased production in areas under Japanese control. For example, tungsten was discovered in Hong Kong in 1935, it was mined (and exported) until the 1941 invasion, but then the Japanese took over the tungsten mine from 1942 to 1945.93 Nakamura’s father, the Chief Engineer of the Kiju Mine, left for Hong Kong in 1942 to undoubtedly participate in this effort.94 They were less successful in their occupation of the Philippines, where it appears no tungsten resources were effectively exploited.95 In either case, though the Production Expansion Plan for tungsten indicated projected imports of 1,303 tons from occupied territory in 1942 and 3,740 tons in 1943, it is unlikely that these import goals were reached with the Allied attacks on Japanese shipping.96

The greatest production increase in tungsten under areas of Japanese control occurred in Korea. By 1943, Korean production had nearly doubled to 7,056 tons. Shortages faced by Japan in the last years of the war were undoubtedly due to Allied destruction of shipping, rather than any difficulty with Korean production. The Sangdong mine alone accounted for 18 percent of all tungsten consumed from 1933 to 1945 throughout the entire Japanese Empire. Broken down by year, in 1943, Sangdong’s 1,781 tons of tungsten accounted for 19 percent of total consumption in the Japanese Empire, in 1944, its 2,398 tons

92. Ibid., 73.
94. Nakamura, “To¯ihi no higashiajia de.”
95. USSBS, *The Effects of Strategic Bombing on Japan’s War Economy*, 50.
accounted for 31 percent, and in 1945, its 903 tons accounted for a remarkable 71 percent of the total output.97

In the conclusion of The Japanese ‘New Order’ in Asia, Einzig argued that rather than concentrating their forces on the slow, incremental “island-hopping” campaign designed to ultimately deliver a “knockout blow at Japan,” the Allies should take a defensive posture of economic strangulation: “a relentless warfare against Japanese shipping.”98 The Americans did not pursue this policy, yet American postwar assessments confirmed not only that Einzig was right but also that he actually underestimated Japanese vulnerability to economic warfare.99 These assessments also underscore the strategic importance of Korean tungsten and other minerals in the last years of the war. As Allied bombing, air-dropped mining of harbors, and submarine warfare devastated the Japanese merchant marine, Korean minerals continued to flow to mainland Japan.

The United States Strategic Bombing Survey, first enacted in November 1944 to study the effects of allied bombing in Germany, began its survey of postwar Japan in early September 1945.100 To a large extent, their 1947 report on Coal and Metals in Japan’s War Economy agreed with Einzig, Leith and Bain’s assessment of Japan’s critical weakness in minerals.101 The report’s introduction described Japan’s insufficient supply of coal, iron, aluminum, copper, lead, tin, nickel, cobalt, and chrome.102 Yet despite these weaknesses, the

98. Ibid., 142–143.
100. USSBS, The Effects of Strategic Bombing on Japan’s War Economy. Appendix A B C (USSBS, Over-All Economic Effects Division, December 1946). Based in Tokyo, with offices in Nagoya, Osaka, Hiroshima, and Nagasaki, The survey team of 300 civilians, 350 officers, and 500 enlisted men interviewed over 700 Japanese officials and translated thousands of documents in order “to secure reasonably accurate statistics on Japan’s economy and war-production, plant by plant, industry by industry” (iii). They published their results in 108 reports.
101. USSBS, Coal and Metals in Japan’s War Economy (USSBS, Basic Materials Division, April 1947). The 215-page report was subdivided into separate reports on coal, coke, iron and steel, and the light and non-ferrous metals of aluminum, magnesium, copper, lead, zinc, and tin. Each report followed roughly the same format: an introduction describing the significance of the material for Japanese military production, an analysis of the prewar and wartime production and consumption of that material, an assessment of the effects of Allied attacks targeting that material, a conclusion determining whether or not those Allied attacks were successful, and an appendix containing detailed statistical tables.
102. Ibid., 1.
report claimed that for several metals Japanese prewar planning had been sufficient and Allied bombing had done little to cripple the mineral supply. Moreover, Korean minerals played an important part in shielding Japanese vulnerability, especially in the case of copper, lead, aluminum, and zinc.\textsuperscript{103}

The situation for Korean iron and steel was more complicated. Though the steel industry in Korea was “less significant” than that of Manchuko, it still provided “some pig iron and increasing amounts of iron ore…to Japan.”\textsuperscript{104} The expansion of Korean iron ore production at the Mozan mines in northeastern Korea was “moderately successful,” more than doubling from 1943 to 1944. That this increase occurred late in the war was no accident because Korean ore required “a minimum of transportation and could move across the relatively safe Japan Sea.”\textsuperscript{105} Nevertheless, Japanese plans in 1945 to relocate an Osaka steel plant to Ch‘ŏngjin, Korea failed miserably: “The plant was completely dismantled in the spring of 1945. Part of the equipment finally reached Ch‘ŏngjin; some of it was sunk on the way, and at the end of the war crated pieces of machinery still remained at the old site.”\textsuperscript{106} The report concluded that “the air-borne mining of Japanese and Korean ports and of the Shimonoseki Straits beginning early April 1945 killed the hopes of the steel industry.”\textsuperscript{107}

The steel industry was the key chokepoint of the Japanese war economy. Several times the report highlighted the particular vulnerability of alloys used to create special steels:

\begin{quote}
Japan has always relied on foreign sources for most of its ferro-alloy ores […] Accordingly, the prewar ferro-alloy requirements of the Japanese steel industry could only be met by substantial imports of molybdenum, nickel, tungsten, vanadium, chromium, cobalt, and manganese ores and concentrates. This lack of domestic raw materials then, made the Japanese steel industry almost completely dependent upon water-borne imports. In modern military terms this can be characterized as high vulnerability to economic strangulation by blockade.\textsuperscript{108}
\end{quote}

Though the report had no accurate statistics for the supply of these metals, interviews with Japanese metallurgists confirmed that by 1945 Japanese

\begin{flushleft}
\textsuperscript{103} Ibid., 128, 142, 147, 153.
\textsuperscript{104} Ibid., 63.
\textsuperscript{105} Ibid., 69.
\textsuperscript{106} Ibid., 70.
\textsuperscript{107} Ibid., 70.
\textsuperscript{108} USSBS, \textit{Coal and Metals in Japan's War Economy}, 63. See also page 71: “Japan was almost entirely dependent upon imports for her supplies of cobalt, nickel and tungsten ores and, to a lesser extent, for molybdenum, chrome and manganese ores.”
\end{flushleft}
industry had only five percent of the cobalt and ten percent of the nickel required for forging special steels. The tungsten and molybdenum supply, though also severely reduced by 1945, provided 65 percent of the need (see Table 3).

The report did not include an independent assessment of the role of Korean minerals, but a compilation of all of their existing data on Korean production of various ores and metals reveals some broad patterns. Rather than consider Korean statistics on their own—which does reveal marked increases in 1943 and 1944 for several metals—it is more useful to consider them as a percentage of total production within the larger territories of Japan, Korea, Manchuko, China, and Formosa (see Table 4). From 1940 to 1944, Korea supplied less than one percent of ingot and ordinary steel as well as ferro-chromium and ferro-manganese alloys; between three and four percent of ferro-silicon and alumina; between five and seven percent of coal, blister copper, zinc metal, and aluminum; between 16 and 18 percent of magnesium, ferro-molybdenum, and iron ore; and nearly half of the crude lead and ferro-tungsten.

According to these statistics, Korea’s percentage of critical minerals did not exceed 50 percent of the production within the Japanese Empire. The numbers for iron ore and coal match the picture given by H. Foster Bain in his 1924 work, while the numbers for magnesium, ferro-molybdenum, lead, and ferro-tungsten are larger than expected. Indeed, by 1944 the ferro-tungsten being produced by the Kobayashi ferro-tungsten refinery was accounting for 73.4

Table 3. Percent of requirements of alloying elements available in Japan proper, fiscal years 1940–45.

<table>
<thead>
<tr>
<th>Element</th>
<th>1940</th>
<th>1941</th>
<th>1942</th>
<th>1943</th>
<th>1944</th>
<th>1945</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cobalt</td>
<td>50</td>
<td>20</td>
<td>10</td>
<td>5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Nickel</td>
<td>60</td>
<td>30</td>
<td>20</td>
<td>10</td>
<td>10</td>
<td>10</td>
</tr>
<tr>
<td>Tungsten</td>
<td>100</td>
<td>100</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Molybdenum</td>
<td>100</td>
<td>100</td>
<td>65</td>
<td>65</td>
<td>65</td>
<td>65</td>
</tr>
<tr>
<td>Vanadium</td>
<td>100</td>
<td>100</td>
<td>70</td>
<td>70</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Chromium</td>
<td>100</td>
<td>100</td>
<td>90</td>
<td>60</td>
<td>60</td>
<td>60</td>
</tr>
<tr>
<td>Manganese</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>70</td>
<td>70</td>
</tr>
<tr>
<td>Silicon</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>100</td>
<td>72</td>
<td>70</td>
</tr>
</tbody>
</table>

Source: Iron and Steel Control Association (Tekkō tösei kai), November 1945, in USSBS, *Coal and Metals in Japan’s War Economy*, 74.

109. Ibid., 74.
percent of the production within the Japanese empire. Though Allied attacks on Japanese shipping “starved” Japan’s steel industry “to death,” that industry would have died much sooner without the supply of these Korean minerals.

Korean Tungsten and the Republic of Korea

The fact that a single mine in Korea during the final months of the Second World War provided 71 percent of the tungsten production for the entire Japanese Empire clearly underlines the geo-political and strategic importance of Korean minerals for the Japanese wartime economy. Because Japanese economic officials understood Korea as a source of raw materials and cheap labor, their plans to develop refining capacity and lay the groundwork for a robust steel industry were, in the words of the United States Strategic Bombing Survey, “too little and too late.” The lure of Korean gold blinded these colonial officials to the value of Korea’s marginal, low-grade cobalt and nickel. For Korea, and the rest of the world, it was a good thing that Japanese wartime planners underestimated Korean resources. The case of tungsten, Japan’s

110. USSBS, Coal and Metals in Japan’s War Economy, 70.
“successful” mineral extraction in Korea, reveals how Korea potentially could have acted as a much greater buffer to the relentless Allied assault on Japanese shipping had more mineral resources been developed.

Throughout the Cold War, however, the United States government certainly understood the strategic importance of Korean metals. With mineral deposits locked up behind the iron curtain in the Soviet Union and China, South Korean tungsten fed the American steel industry. Those tungsten exports in the 1950s and 1960s also provided critical foreign exchange that supported the South Korean economy, a key ideological and diplomatic goal of the US State Department.111 This careful attention to Korean resources, however, waned after the fall of the Soviet Union and the opening of China. In the 1990s, Chinese exports forced the closure of the Sangdong tungsten mine.

China is also part of the reason why Warren Buffet is now reopening the Sangdong mine. For two months in the fall of 2010, the Chinese government temporarily blocked exports of rare earth minerals to Japan, threatening the production of everything from hybrid cars and smartphones to wind turbines and guided missiles. China, which controls 95 percent of the world’s supply of these minerals, used this form of economic warfare to force the Japanese government to release a Chinese fishing captain who had rammed his trawler into a Japanese coast guard vessel.112 This incident has raised awareness about the potential geo-political consequences of the unequal geographic distribution of strategic raw materials. Most recently, in his book titled The Race for What’s Left: The Global Scramble for the World’s Resources (2012), Michael Klare makes the same argument that Catherine Porter made in 1936, namely, that as the world’s supply of natural resources diminishes, the potential for armed conflict increases.113 These resources, according to Klare, include not only hydrocarbons and rare earth minerals, but also common metals such as gold, silver, iron, aluminum, copper, lead, tin, and nickel.

Once the Sangdong mine is back in operation, it is projected to produce 7 percent of the world’s supply of tungsten. That number, however, is half of the

111. For details on how the American occupation administration encouraged these exports, see E.A.J. Johnson, American Imperialism in the Image of Peer Gynt: Memoirs of a Professor-Bureaucrat (Minneapolis: University of Minnesota Press, 1971), 187.
world’s supply outside of China. Our world today faces a similar situation to that facing the world powers in the 1930s, with the exception that whereas the United States and Great Britain controlled two-thirds of the world supply of strategic metals in the 1930s, China now controls 95 percent of them. No matter what happens, the mineral wealth of the Korean peninsula will continue to play a central role.

Conclusion

For Koreans, the story of the Sangdong mine’s origins are complicated. On the one hand, it was primarily Japanese geologists and mining expertise that located most of Korea’s major tungsten deposits.114 Using that knowledge, the Kobayashi Mining Company, a powerful private Japanese company, took control of the four largest tungsten deposits, brought in the latest machinery, exploited the deposits with Japanese capital and Korean labor, and created a ferro-tungsten refinery that laid the groundwork for the postwar South Korean steel industry. Korea Tungsten eventually produced over 70 percent of Korean total exports at its height between 1950 and 1970 and clearly paved the way for POSCO’s success today. A South Korean Taehannnyusū newsreel from 1959 outlined this progressive vision of South Korean industrialization. Over images of a dynamite blast, workers shoveling ore, and dusty piles of slag, the narrator’s voice intones:

Even though there are limitless underground resources in Korea, we have had to abandon them for several years since the liberation of Korea due to the absence of infrastructure for their development. However, the government has started efforts to develop over 200 types of underground resources and has succeeded in opening the tungsten mine in Kangwŏn-do, the largest in Asia, which has contributed greatly to earning foreign currency.115

This was the narrative provided to school children in the 1960s.

On the other hand, the largely forgotten colonial origins of the Sangdong mine underscore the human suffering during colonial Korea’s wartime industrialization. Korean conscripts faced horrific conditions in Japanese mines,

especially towards the later years of the war, as they were forced to maintain the flow of Japan’s strategic metals.

But these are not the only two ways of understanding the postwar legacy of Korean tungsten mining. There is another, deeper continuity that challenges both the narrative of progressive modernization and the narrative of tragic victimization. In the fall of 1945, the infrastructure of Korea’s mines was decimated. Gold mines were flooded. Tunnels had caved in. Mills and machinery had been destroyed. It took a year before American authorities could begin to rehabilitate South Korea’s largest tungsten mines.116 Responding to global market trends, they began to inventory stockpiles of tungsten in October 1946 and the newly opened Sangdong mine produced 43 tons that month.117 By the end of December 1946, tungsten production had crept up to just 182 tons.118 Even as the Sangdong mine began to recover in the spring of 1947, most other tungsten mines remained un-operational, and then a summer flash flood in August cut off access to the Sangdong mine and destroyed several buildings and a section of the plant.119

In the fall of 1947, however, the monthly *Summation* reported on Sangdong’s progress, but then noted something particularly surprising:

Sangdong is the only mine which is producing tungsten and turning it directly into government channels, although the Dalsung mine, which belongs to the same Kobayashi Company is being brought into production. The remaining four potential producers of tungsten—Chungyang, Okbang, Wolak and Namyang—are all in a state of semi-idleness, and the small amount of tungsten concentrates produced in these four mines flow freely into any available market. [...] Theoretically the Chungyang mine was closed 13 August 1945. When this mine was visited on 26 August 1947 by personnel of the Bureau of Mining, the condition of the property indicated that it had been systematically looted which has left the entire property in a very poor condition. The residents of the area are now processing the waste piles and picking some ore from the veins in the underground workings. They now have a stock of 15 metric tons of wolframite concentrate, assaying about 60 percent tungsten tri-oxide.120

In the aftermath of war, this Korean mining village had reverted to its pre-

117. SUSMAK, vol. 3, no. 13 (October 1946), 43.
118. SUSMAK, vol. 3, no. 16 (January 1947), 43.
119. SUSMAK, vol. 3, no. 19 (April 1947), 32; *Summation of US Military Government Activities in Korea*, vol. 4, no. 23 (August 1947), 73.
120. SUSMAK, vol. 4, no. 24 (September 1947), 43–44.
modern practices in an effort to survive. A similar case occurred the following December when Korean authorities discovered a “gang of illegal workers” operating the closed Taichong Gold Mine. Rather than arrest the miners, however, their “illegally acquired equipment” was repossessed and the miners were all put on payroll. The mine opened the following month.121

The continued presence of independent rural Korean placer miners complicates the optics of the existing narratives of colonial mineral extraction. That a pre-colonial, “traditional,” practice of panning or handpicking minerals—documented in detail by the first Western missionaries to arrive in the peninsula—endured through the period of vast wartime mobilization cautions against seeing the development of this industry from entirely the perspective of colonial modernity. Similarly, though these statistics and tables have enumerated in great detail the extraordinary mineral wealth appropriated by the Japanese, this was not entirely a case of economic plunder solely by the Japanese corporations. In a very small way, these Korean placer miners also profited and survived by selling Korean mineral wealth. The history of colonial era mining, with its horrific working conditions, is no doubt a clear example of labor exploitation. Yet, these placer miners operated independently, in remote locations, perhaps out of the reach of colonial authorities. Though the historian has looked at the suffering below the ground, it is possible there are still stories of everyday life at the surface that have yet to be explored fully. The future history of Korean minerals needs to be written not only through the maps and statistics produced by colonial and postwar authorities but also through the traces of those who subsisted on the surface, at the margins, and in the mountains, who maintained their traditional livelihoods despite the rapid changes taking place around them.

121. SUSMAK, vol. 5, no. 27 (December 1947), 52. Though this American report does not include the Korean original, it is likely that “Taichong” refers to the Taejöng gold mine near Samsõ-myön in Changhŭng-gun in Chŏlla province. This mine, known as the Taisei, produced 7,839 grams of gold in 1941 and 29,808 grams of gold in 1942. See Gallagher, Mineral Resources of Korea, vol. IIIa, Gold, 46.