This article was published on-line on October 8, 2017
Final version June 13, 2018

Essays in ECONOMIC & BUSINESS HISTORY

The Journal of the Economic & Business History Society

ISSN 0896-226X
LCC 79-91616
HC12.E2

THE GROWTH OF THE JAPANESE ELECTRIC POWER INDUSTRY AND THE WORLD BANK'S REQUEST TO INCREASE DEPRECIATION COSTS BETWEEN 1951 AND 1973

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This study investigates the growth of the Japanese electric power industry following increases in the ratio of the depreciation cost to fixed assets and the construction of new electric power stations which employed depreciation cost as a funding mechanism. In addition, it reveals the determinant of the increase in the ratio of depreciation cost to fixed assets by using multiple regression analysis. This analysis shows that the World Bank's request to increase depreciation costs contributed to the increase in the ratio of depreciation cost to fixed assets; however, the actual loan experience of companies borrowing from the World Bank did not. Thus, the World Bank's request was effective only in the execution of loans. The role of the World Bank was significant for the growth of the Japanese electric power industry between 1953 and 1961, but was minimal after 1962. On the other hand, the increase of revenue from the demand increase and the fall of the ratio of cost to revenue contributed to the continuous increase of the ratio of depreciation cost to fixed assets.

Introduction

This paper explores the impact that a World Bank-induced change in an accounting method—specifically the way depreciation could be assessed—had on the growth of the Japanese electric power industry in the mid-20th century. Depreciation is an accounting procedure, which

discounts the book value of fixed assets during the life of those assets.[1] Of the several depreciation allocation methods available to a company, two of the most popular are the straight-flat method and the fixed-rate method.[2] To prevent the rise of the electricity rate, the Japanese government essentially adopted the straight-flat method for calculating the electricity rate between 1951 and 1973.

Depreciation cost has been used not only in the calculation of the electricity rate, but also in the calculation of Japanese electric companies' profits. Depreciation cost is without cash-out when it is recognized. In essence, depreciation cost has a similar function to internal reserves. Thus companies could use depreciation costs as a source for funds to construct new electric power stations. The companies booked the depreciation value calculated by the straight-flat method in calculating their profit in 1951. The companies gradually increased the depreciation cost and booked more value than that calculated by the straight-flat method after 1952. As a result, the increase of depreciation cost gave companies a new source of funds with which to construct new power stations.

The Japanese economy underwent a significant period of growth between 1951 and 1973.[3] Rapid economic development during this period increased demand for electric power within Japan. To address this sudden increase in demand for electricity, Japanese electric power companies constructed many electric power stations. The companies mainly borrowed funds from banks to construct electric power stations in the 1950s (see Table 1). I pay close attention to the World Bank's loan to four

[1] This procedure is necessary because the value of a fixed asset gradually falls over the course of its life. The purchasing amount of a fixed asset is allocated as cost during the asset's life. Each fiscal year, the company must decide on an allocation method.

[2] The amount of depreciation is the same each year in the straight-flat method and the depreciation ratio and the book value are the same in the fixed-rate method. If calculated early in the fiscal year, depreciation determined via the fixed-rate method is larger than depreciation calculated via the straight-flat method.

[3] The growth rate of nominal GDP between 1955 and 1970 was 15.1 percent in Japan, which exceeded the growth rates in the United States and multiple Western European countries (Industrial Survey Department of Industrial Bank of Japan, 1984:4).

Japanese electric power companies—Kansai, Chubu, Hokuriku, and Kyushu—in 1953, 1958, and 1961 because the World Bank requested an increase in the depreciation cost and a change in the electricity rate (electricity charge or power rate).

Robert Millward (2005), William Hausman, Peter Hertner, and Mira Wilkins (2008), and Judith Clifton, Pierre Lanthier, and Harm Schröter (2011) describe the "nationalization" or "domestication" of the European electric power industry during the 1950s and 1960s. These studies demonstrated that the ownership and regulation of electric power companies in Europe were different from the ownership and regulation of electric power companies in Japan, which were privatized in 1951. Many studies have explored the Japanese electric power companies between 1951 and 1973. Richard Samuels (1987) showed how Japanese electric power companies were regulated using the concept of "reciprocal consent." In this context, a relationship of reciprocal consent suggests that in return for control over markets, the Japanese electric power companies gave the state jurisdiction over those markets. Therefore, in their negotiations with Japanese electric power companies, the Japanese government acted as a "guarantor" (Samuels 1987, 260). Although Samuels effectively explained the negotiation between the Japanese government and Japanese electric power companies between 1945 and 1980, he did not explain the role the World Bank played in negotiations with the Japanese government. This study demonstrates the effect of the World Bank on the growth of the Japanese electric power industry thorough negotiations between the World Bank, the Japanese government, and the Japanese electric power companies.

Given the electric power companies' autonomy from the Japanese government, Takeo Kikkawa (2004, 348) argued that the companies increased depreciation independently of the government, thereby increasing their capital ratios and enabling the construction of efficient thermal power stations between 1955 and 1973. Although I agree that the Japanese electric power companies were independent from the government, Kikkawa (2004) did not examine the determinants of the increase in depreciation costs—and specifically whether the increase in the electricity rate following the World Bank's request contributed to the increased depreciation cost.

Through an analysis of the negotiation with World Bank in 1953, Laura Hein (1990) indicated that both the companies and the Japanese government had been responsible for repaying the aforementioned loans to Kansai, Chubu, Hokuriku, and Kyushu (Hein 1990, 257-66). In addition, Hein (1990) argued that funds from Japan Development Bank, other banks, and US firms (e.g., Westinghouse and General Electric) played key roles in the growth of the Japanese electric power industry. Although I agree with Hein's assertion, the World Bank and other fund providers differed in that during the negotiation of loans with the Japanese government, only the World Bank insisted upon the alteration of the electricity rate and the increase of the depreciation cost. Devesh Kapur, John Lewis, and Richard Webb (1997) and Edward Mason and Robert Asher (1973) discussed the World Bank's loans to Japan in 1953 and 1958. Kapur, Lewis, and Webb (1997, 282 and 286) indicated that the World Bank requested an increase in the electricity rate in 1953 and 1958. However, Kapur, Lewis, and Webb (1997) and Mason and Asher (1973) did not discuss the effect of the World Bank's request on the growth of the Japanese electric power industry. In addition, neither study explored the World Bank's encouragement to increase depreciation.

Expanding upon the previous research, I propose the following two hypotheses. First, the increase of the electricity rate affected the increase in the ratio of depreciation cost to fixed assets. In particular, the increase of the electricity rate by the World Bank's request affected the increase of the ratio of depreciation cost to fixed assets more than the increase of the electricity rate would have absent the World Bank's request. The World Bank's request itself was salutary for the increase of the ratio of depreciation cost to fixed assets. Second, the increase of electric power revenue and the fall of the ratio of electric power cost to electric power revenue encouraged the ratio of deprecation cost to fixed assets to increase.

Growth of the Japanese Electric Power Industry (1951-1973)

One of the primary characteristics of the current Japanese electric system is its exclusive reliance on private companies. Established in May 1951, the current electric power system consists of nine private companies: Hokkaido Electric Power Company, Tohoku Electric Power Company,

Tokyo Electric Power Company, Chubu Electric Power Company, Hokuriku Electric Power Company, Kansai Electric Power Company, Chugoku Electric Power Company, Shikoku Electric Power Company, and Kyushu Electric Power Company (abbreviated to Hokkaido, Tohoku, Tokyo, Chubu, Hokuriku, Kansai, Chugoku, Shikoku, and Kyushu, respectively).

With an average annual growth rate of 11.6 percent, the demand for electric power in Japan increased rapidly from 1951 (36 billion kWh) to 1973 (421 billion kWh) (Public Utilities Bureau of the Agency for Natural Resources and Energy and the Federation of Electric Power Companies of Japan 1982, 53 and 63). Both household and industrial demand increased rapidly between 1951 and 1973. Household demand rose from 6 billion kWh in 1951 to 71 billion kWh in 1973 and industrial demand rose from 23 billion kWh in 1951 to 263 billion kWh in 1973. The main factor behind the increase in industrial electricity demand was the increase from the metals and equipment industries. Electricity demand for steel and nonferrous metal was 4 billion kWh in 1951 and 100 billion kWh in 1973 and electricity demand for equipment was 1 billion kWh in 1951 and 18 billion kWh in 1973 (Public Utilities Bureau of the Agency for Natural Resources and Energy and the Federation of Electric Power Companies of Japan 1982, 53 and 63). The factor that drove the household increase was the spread of home electronics, including electric washing machines, refrigerators, and monochromatic televisions. The diffusion rate of these household electronic goods was less than 20 percent in 1958 and more than 80 percent in 1969 (Public Utilities Bureau of the Ministry of International Trade and Industry 1971).

To facilitate the increase in electric power generation, Japan increased its production capacity in that 22-year timeframe. In 1951, Japanese electricity generation capacity was roughly eight million kW; by 1973, this figure had grown to 95 million kW (Public Utilities Bureau of the Agency for Natural Resources and Energy and the Federation of Electric Power Companies of Japan 1982, 9 and 13).

Table 1 shows that between 1951 and 1975, the sources from which funding was secured to construct the power stations changed significantly. For example, between 1951 and 1955, 63.4 percent of the funds were acquired from loans. By the period between 1966 and 1970, however, this

Table 1

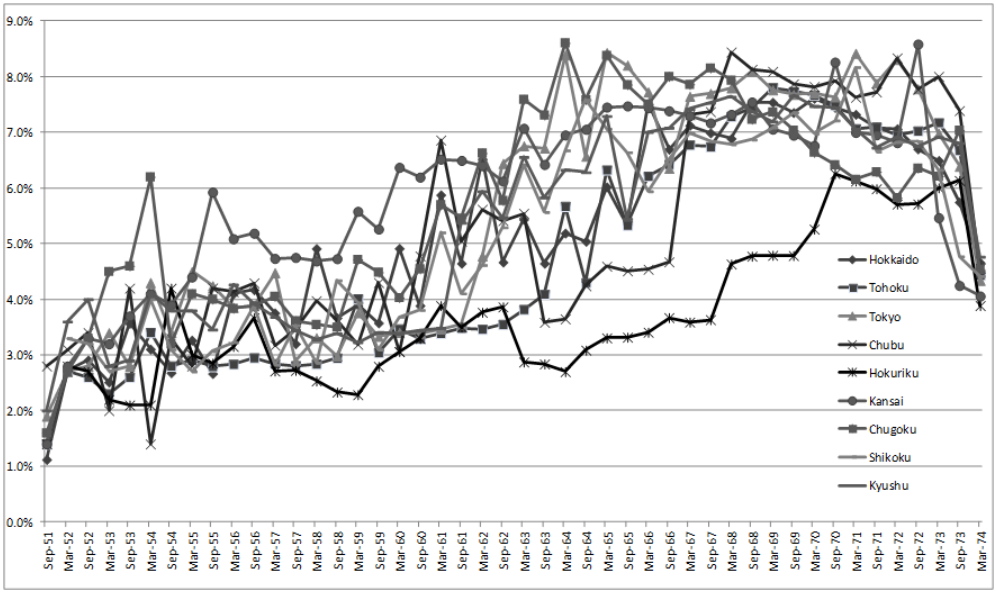
Sources of Funding for Nine Electric Power Stations between 1951 and 1975

Year	1951-1955		1956-1960		1961-1965		1966-1970		1971-1975	
	Amount	%	Amount	%	Amount	%	Amount	%	Amount	%
Construction cost	514,802	74.2	1,063,172	66.8	1,647,940	63.1	2,570,167	58.4	6,152,012	64.3
Debt payment	162,609	23.4	523,043	32.9	964,015	36.9	1,829,011	41.6	3,409,311	35.7
Others	16,090	2.4	5,483	0.3	0	0	0	0	0	0
Sum	**693,501**	**100**	**1,591,698**	**100**	**2,611,955**	**100**	**4,399,178**	**100**	**9,561,323**	**100**
Depreciation cost	96,502	13.9	240,981	15.1	655,642	25.1	1,155,837	26.3	1,583,841	16.6
Stock issuance	39,814	5.7	134,418	8.4	204,661	7.8	219,289	5	512,159	5.4
Bond issuance	59,998	8.7	327,603	20.6	521,859	20	1,029,903	23.4	2,580,699	27
Loan	439,710	63.4	817,325	51.3	921,449	35.3	1,491,695	33.9	4,119,682	43
Others	57,477	8.3	71,371	4.6	308,344	11.8	502,454	11.4	764,942	8
Sum	**693,501**	**100**	**1,591,698**	**100**	**2,611,955**	**100**	**4,399,178**	**100**	**9,561,323**	**100**

Sources: The Public Utilities Bureau of the Ministry of International Trade and Industry and the Federation of Electric Power Companies of Japan (1962, 1971, 1982).
Note: All amounts are in millions of yen.

figure had dropped to 33.9 percent. By contrast, costs associated with depreciation accounted for only 13.9 percent of the funds between 1951 and 1955, but this figure had risen to 26.3 percent by the period between 1966 and 1970.

Figure 1 summarizes the depreciation behavior of the nine electric power companies. In Figure 1, the ratio of depreciation cost to fixed assets was calculated by doubling a half-year's depreciation cost and dividing that value by the average value of fixed assets at the end of previous term and fixed assets in the current term. All Japanese electric power companies increased their ratio of depreciation cost to fixed assets between 1951 and 1970.



Sources: *Yukashoken Hokusho* (Semi-Annual Reports), 1951-1973, for the following Electric Power Companies: Hokkaido, Tohoku, Tokyo, Chubu, Hokuriku, Kansai, Chugoku, Shikoku, Kyushu.

Figure 1
Ratio of Depreciation Cost to Fixed Assets in Nine Electric Power Companies

A Synopsis of the World Bank's Loans

Table 2 provides a summary of the World Bank's loans to Japanese private electric power companies from 1953 to 1961. The data in Table 2 show that

four Japanese electric power companies borrowed a total of USD 143 million from the World Bank for seven projects in 1953, 1958, and 1961.

Table 2
World Bank's Loans to Japanese Private Electric Power Companies

Date Signed	Beneficiary	Project	Loan (1,000 US$)	Interest (%)	Redemption Period (Year)
October 15, 1953	Kansai	Tanagawa thermal power station	21,500	5	20
October 15, 1953	Kyushu	Karita thermal power station	11,200	5	20
October 15, 1953	Chubu	Yokkaichi thermal power station	7,500	5	20
June 13, 1958	Kansai	Kurobe No.4 hydroelectric power station	37,000	5.625	25
June 27, 1958	Hokuriku	Arimine hydroelectric power station	25,000	5.625	25
September 10, 1958	Chubu	Hatanagi No.1 & No.2 hydroelectric power station	29,000	5.75	25
March 16, 1961	Kyushu	Shin-Kokura thermal power station	12,000	5.75	20

Source: World Bank Tokyo Office (1991).

Historically, when the World Bank provided funds to the Japanese electric companies, the Japanese government guaranteed the repayment of the loans. Furthermore, the World Bank has tended to carefully evaluate potential borrowers' financial capacities, the markets in which they operate, and other factors that might affect their ability to repay loans. In the case of the Japanese electric power companies, the World Bank evaluated Japanese electricity rates, often requiring the Japanese government to increase those rates (Technical

Operations Departments 1953,14-5). As a result of the agreement between the Japanese government and the World Bank, the Japanese government promptly established and maintained appropriate rates for a sufficient time to allow the companies to finance their construction projects (World Bank 1953).

In 1953, 1958, and 1961, the respective dividend rates of Chubu, Hokuriku, Kansai, and Kyushu were all between 10 percent and 12 percent. The interest rates associated with the corporate bonds issued by these four companies during this timeframe ranged from 7.408 percent to 8.934 percent (Industrial Bank of Japan 1970). The redemption period for these corporate bonds was between 5 and 7 years. The terms of the World Bank's loans provided a more advantageous method of funding the electric companies' construction projects than stock and corporate bonds in terms of both financial costs and the redemption period (see Table 2).

Given the relative advantages associated with the World Bank's loans to electric companies, a question emerges. Why did only four of nine companies borrow funds from the World Bank when loans were the most advantageous option for funding projects? [4] The answer to this question relates to the World Bank's tendency to investigate borrowers, their growth plans, and the industries in which they operate. If the World Bank determined that a company was an unsuitable borrower, it could decline applications for a loan. For example, Tokyo planned to borrow money from the World Bank between 1959 and 1961, but was unable to for two reasons (*Yomiuri Shimbun* 1959). First, the World Bank judged Tokyo's plans to construct multiple hydroelectric power stations to be risky and inefficient. Ultimately, the World Bank determined that thermal power stations provided a viable alternative to hydroelectric power stations, making the latter obsolete (*Yomiuri Shimbun* 1960). Second, around 1960, the World Bank began limiting loans to Japanese companies. At that point, the World Bank determined that Japanese companies were more trustworthy, and therefore, were more capable of securing loans from foreign private financial institutions, thereby negating the need to borrow from the World Bank (*Yomiuri Shimbun* 1961).

[4] I am not familiar with any material that would explain why Chubu, Hokuriku, Kansai, and Kyushu borrowed from the World Bank and the remaining five did not borrow from the World Bank.

Chubu, Kansai, and Kyushu secured loans from the World Bank on October 15, 1953 for the construction of thermal power stations (see Table 2). Initially, these companies planned to borrow from the Export-Import Bank. However, after Japan became a member of the World Bank in 1952, Japanese electric companies shifted their focus to the World Bank for their long-term financing needs (World Bank Tokyo Office 1991:18-20).

In 1958, Kansai, Hokuriku, and Chubu again secured loans from the World Bank (see Table 2). President Eugene Black came to Japan for the first time in May 1957 to promote the World Bank's loans to Japanese electric power companies (World Bank Tokyo Office 1991, 31-32). In discussions with Hayato Ikeda, the Finance Minister of Japan, Black said the loans to the Japanese electric companies would increase by USD 300 million from 1958 to 1960. The 1958 loans were intended to assist in the construction of hydroelectric power stations. In particular, Kansai's Kurobe No.4 hydroelectric power station project represented one of the largest investment projects in Japan in the 22-year period between 1951 and 1973.

To finance the construction of the Shin-Kokura thermal power station, Kyushu borrowed funds from the World Bank on March 16, 1961 (see Table 2). The negotiations were quite difficult. Kyushu initially planned to finance the construction of a hydroelectric power station using a loan from the World Bank, but the World Bank rejected that project because the construction of a thermal power station was a cheaper alternative. To construct the hydroelectric station, Kyushu planned to borrow USD 22 million (8.1 billion yen), which would have covered 40 percent of the total cost (*Asahi Shimbun* 1960a). However, the thermal power station project would have required Kyushu to borrow only 5.1 billion yen from the World Bank. Moreover, because the Kyushu region produced substantial amounts of coal, the World Bank determined that a thermal power station would prove a more suitable project to finance (*Asahi Shimbun* 1960a). For these reasons, Kyushu was forced to change its project; rather than construct a hydroelectric power station, it built a thermal power station (*Asahi Shimbun* 1960b).

The Electricity Rate System in Japan and the World Bank's Request

The Japanese government has regulated the electricity rate since 1931. At first, the government calculated the total income of electric sales by adding the minimum necessary costs that the electric power companies incurred to

provide electricity in the calculation of the electricity rate. These costs include labor costs, fuel costs, maintenance costs, tax and depreciation costs, and business rewards (i.e., capital costs, like dividends and interest expenses). Next, the electricity rate for consumers of electricity of various magnitudes was calculated based on the total costs. This calculation method is referred to as "the fully distributed cost method." When the electricity rate increases, it does so for both large and small consumers of electricity, because the total costs increase. The electricity rate for each company and each area is different because the total costs for each company are also different.

The Japanese government needed to achieve two different, incompatible goals. The first of these goals involved the provision of cheaper electricity; the second was to ensure the stability of the electricity provided. If the electricity rate was too cheap, electric companies experienced difficulty turning a profit, thereby diminishing their ability to supply stable electricity. Therefore, the World Bank and electric power companies requested that the Japanese government increase the electricity rate to promote the provision of a stable supply of electricity. The World Bank and electric power companies insisted that the government adopt an accounting procedure that increased the cost of depreciation, thereby increasing the electricity rate. By contrast, consumers of electricity preferred that the increase in the electricity rate be restrained. To address the concerns of the World Bank, electric companies, and electricity consumers, the Japanese government decided on a compromised electricity rate. To determine the appropriate increase in the electricity rate, the government evaluated the proposed sources of electricity and their financial data. Ultimately, the Japanese government decided on an increase in the electricity rate that was lower than that originally requested by the electric companies.

Table 3 shows the mark-up percent of the electricity rate between 1951 and 1973.[5] Nine companies increased the electricity rate in 1951, 1952, and 1954. However, one or two companies increased the electricity rate between 1955 and 1973. In addition, the frequency of the increase of the electricity rate was only seven times in 18 years.

Figure 2 shows the index of nominal and real electricity rates between 1951 and 1963 and the index of nominal and real electric utility expenses

[5] In 1966, Chugoku's electricity rate fell.

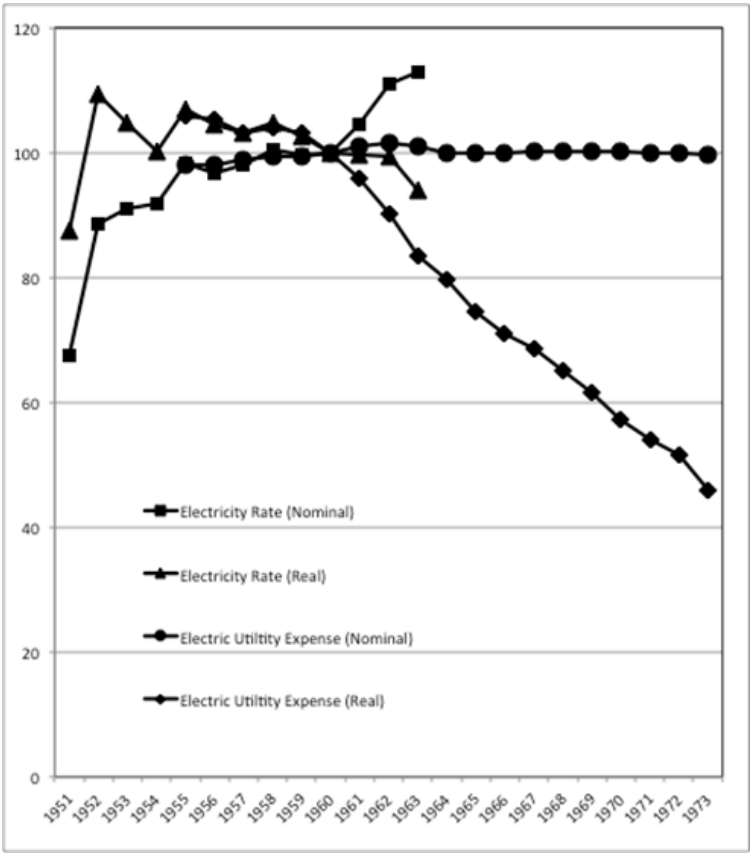
between 1955 and 1973; both indexes are 100 in 1960. The index of the nominal electricity rate increased consistently between 1951 and 1963 whereas the index of the real electricity rate fell after 1952. The index of the nominal electric utility expenses was around 100 between 1955 and 1973, but the index of real electric utility expenses fell rapidly. The electricity rate and electric utility expenses were the determining factor for the profitability of electric power companies, but they increased less than the general price between 1951 and 1973.

Table 3
Increases in Electricity Rates

Date (dd/mm/yyyy)	Company	Raised %
August 13, 1951	All	30.1 (average)
May 11, 1952	All	28.0 (average)
October 1, 1954	All	11.2 (average)
July 14, 1957	Tohoku	17.8
July 14, 1957	Hokuriku	18.14
March 21, 1961	Kyushu	10.5
August 5, 1961	Tokyo	13.7
December 1, 1962	Tohoku	12.6
April, 1 1965	Chubu	7.89
August 9, 1966	Hokuriku	6.38
September 29, 1973	Kansai	22.23
September 29, 1973	Shikoku	17.75

Source: Federation of Electric Power Companies of Japan (2012:132-136).

The electricity rate increased less than the general price because electricity consumers opposed the increase of the electricity rate. For example, the number of objections (198 people) was more than the number of approvals (168 people) in the public hearing for customers about the 1954 increase (The House of Councilors 1954, 9-10). Therefore, the companies could not increase the electricity rate easily.



Source: Minami (1965, 12), Statistics Bureau, The Prime Minister's Office (1982).

Figure 2
Index of Electricity Rates and Electric Utility Expenses (1951-1973)

The Increase of Electricity Rate in 1954

For the loan of 1953, World Bank staff members travelled to Japan to determine whether it would be useful for the World Bank to lend to the Japanese electric power companies. On October 28, 1952, these staff members instructed the electric power companies to demonstrate whether the current electricity rate could financially support the replacement of the old plants with new ones (Electric Utility Enterpriser's Forum. 1952:1). The companies responded to World Bank staff by claiming that depreciation of the plants was not a desirable option for paying off their debts. In a report based on their

findings in relation to the Japanese power companies, the World Bank's Technical Operations Department argued that "the power rates charged will have to be increased fairly substantially over the next few years if the companies are to cover costs, attain financial stability and raise adequate equity capital, in appropriate ratio to debt financing, to meet new capital requirements" (World Bank 1953a,14).

In accordance with the judgments of the World Bank, the Japanese government was forced to increase rates relatively quickly (World Bank 1953b, 7). However, the World Bank remained unconvinced that the rate problem was resolved by the Japanese government's actions. The bank's report indicated that the companies' methods for calculating the electricity production rate were flawed. At that time, the electricity rate was computed based on overall cost, including all operating expenses, depreciation cost, taxes, interest charges, and dividends on capital stock of 15 percent (World Bank 1953a:14-5). The Technical Operation Department, however, insisted that "this method didn't consider the revaluation reserve as capital for rate making purposes, although its assets counterpart is recognized for depreciation purposes" (World Bank 1953a:14). Japanese companies, including electric power companies, revalued their fixed assets three times in the early 1950s to improve their capital structure. The revaluation reserve is the balance between the current value after the revaluation and the book value before the revaluation, and is a component of net assets.

Nonetheless, the Japanese government raised the electricity rate an average of 11.2 percent for the nine electric power companies in October 1954. These changes in the electricity rate affected the behavior of the companies with respect to their calculation of depreciation. According to the data in Figure 1, Chubu's depreciation ratio rose from 1.4 percent in the second half of 1953 to 2.8 percent in the second half of 1954; Kansai's depreciation ratio rose from 3.7 percent in the first half of 1953 to 5.9 percent in the first half of 1955; and Kyushu's depreciation ratio rose from 2.9 percent in the first half of 1953 to 4.3 percent in the second half of 1955. These data suggest that the rise in the electricity rate encouraged a parallel rise in the ratio of depreciation to fixed assets between 1953 and 1955.

New Rate System

Discussions related to the calculation of the electricity rate began on July 14, 1957, when Tohoku and Hokuriku raised their rates. In December of that

year, the Japanese government established the Power Rate Investigation Council to discuss the new rate system.

The method for calculating business rewards as a part of calculating the electricity rate was changed in 1960. Until 1960, business rewards corresponded to the electric power companies' capital costs, and were calculated as the sum of their dividends, surpluses, and interest expenses according to the electric power company's capital structure (World Bank 1959c). This method for calculating business rewards restrained the electricity rate, because the government permitted only minimum capital costs. The revaluation reserve, which accounted for a large percentage of capital, was not considered in the calculation of business rewards. In addition, the method for calculating capital cost described above gave electric power companies no incentive to reduce their capital costs. Because the cost to produce electricity had fallen, the electricity rate would also fall if companies reduced their capital costs. Thus, the World Bank requested that the method for calculating the electricity rate be revised.

As a result of compulsory discussions, the Council delivered a report on the electricity rate in December 1958 (Public Utilities Bureau of the Ministry of International Trade and Industry 1960, 7-8). In the report, the Council argued that the electricity rate should be increased to permit companies to finance an increasing proportion of costs associated with future development (World Bank 1959c). As a result, this calculation was modified to reflect a fair return basis. In a fair return basis, business rewards are calculated in accordance with the value of business assets and the reward rate decided from the weighted average cost of capital for debt and net assets. Specifically, business rewards are equal to the value of business assets multiplied by the reward rate. Reward rates are calculated in accordance with the standard capital-to-asset ratio (50 percent in 1960), the debt-to-asset ratio (50 percent in 1960), the standard capital cost of total equity (8.5 percent in 1960), and the standard capital cost of debt (7.5 percent in 1960), which are decided on the basis of the average capital cost of electric power companies (Public Utilities Bureau of the Ministry of International Trade and Industry 1960:64). More specifically, the reward rate (8 percent in 1960) is equal to the standard capital cost of total equity multiplied by the standard capital-to-asset ratio plus the standard capital cost of debt multiplied by the standard debt-to-asset ratio (=

8.5 percent × 50 percent + 7.5 percent × 50 percent). In addition, the revaluation reserve included business assets.

The fair return basis incentivized companies to keep their capital costs low, because the reward rate was fixed (8 percent in 1960) regardless of electric power companies' capital structures. As a result, the companies' profits would increase if they reduced capital costs. The adoption of a fair return method induced an increase in the electricity rate. According to estimation of the Ministry of International Trade and Industry (MITI), if the electricity rate for the nine companies was recalculated in 1960, their collective costs would increase by 19 billion yen, representing 4.7 percent of all costs for generating electricity (Public Utilities Bureau of the Ministry of International Trade and Industry 1960, 45-6). The respective increases in each company's electricity rate were not simultaneous, but occurred as each company asked the government to allow for the increases. Ultimately, the new rate system was implemented in 1960, and the fair basis return calculation method was put into effect.

The World Bank attended to these discussions very closely, as the new rate system would likely become a key element of the negotiations for the loans it provided (World Bank 1958). Therefore, The Minister of International Trade and Industry sent a letter to the World Bank President in May 1958 (Ministry of International Trade and Industry 1958), indicating that the Council was expected to reveal its findings in a report to be released later that year. The letter further indicated that the Japanese government hoped to increase power companies' revenues in the 1959 fiscal year. Although the fair basis return system was adopted, the World Bank did not think highly of the change in calculation method or the report of the Power Rate Investigation Council. After the findings in the report were formally announced, the World Bank internally discussed the report during April–May 1959, determining its findings to be weak and claiming that "the Council recommended little change in current practices" (World Bank 1959b). In the World Bank's estimation, the report "emphasized the stabilization of electric rates rather than the necessity of a proper return to the industry," because the straight-flat method was adopted even in the new rate system. These comments reflected the World Bank's continued concern about the deterioration in the financial positions of the power companies to which it loaned money (World Bank 1959a). Most notably, the World Bank was concerned about financial deterioration resulting

from increasing construction costs, greater expenses for developing a new area, and perhaps most importantly, an unrealistic depreciation policy that made it impossible for companies to generate sufficient reserves, forcing them to rely on debt financing (World Bank 1959b). Given these concerns, in a letter to the MITI, the World Bank stressed that substantial improvement in the financial positions of the companies would not be achieved without fundamental changes to their power rate systems. Ultimately, in March 1959, the World Bank informed the Japanese government that it "would not feel justified in concluding negotiations for any further power project in Japan until appropriate action has been taken to ensure that the power companies will be able to finance their continued expansion while maintaining a sound financial position" (World Bank 1959d). The World Bank's position on this matter was reflected in its negotiations related to the loan to Kyushu in 1961.

The Electricity Rate Increase of 1961

The World Bank requested that the electricity rate be raised in the Kyushu area in the Kyushu loan in 1961 (*Asahi Shimbun* 1961). As a result of this request, the electricity rate in Kyushu increased by 10.5 percent in March 1961. This was the first increase calculated using the new rate system adopted in 1960. With the increase in Kyushu's electricity rate, Kyushu's depreciation ratio rose from 3.5 percent in the second half of 1960 to 5.9 percent in the second half of 1961 (see Figure 1).

The Japanese government decided the electricity rate by adding the minimum necessary costs that the electric power companies incurred to provide electricity between 1951 and 1973. The government adopted the straight-flat method consistently in the calculation of depreciation cost, which consisted of the necessary costs for electricity supply to keep the electricity rate down. Under the government's electricity rate policy, the electricity rate justifiably increased in the recalculation of the electricity rate when companies constructed electric power stations and the fixed-asset volume increased. However, the electricity rate increase was not granted even if companies raised the depreciation ratio to above that calculated by the straight-flat method, because the allowable depreciation cost in the fully distributed cost method was calculated automatically by the straight-flat method in the approval of the electricity rate increase between 1951 and 1973. There was no relationship

between the depreciation ratio to fixed assets in accounting practices and the depreciation ratio in the calculation of the electricity rate.

Statistical Analysis: Data and Methodology

I analyze the variation of the ratio of the depreciation cost to fixed asset in nine companies between the accounting period ended in March 1954, the accounting period when the World Bank's loans started, and the accounting period ended in March 1974 by using their semi-annual reports. To determine what affected the variation of the ratio of the depreciation cost to fixed assets, I apply multiple regression analysis to the sample. Specifically, I estimate two separate models. The first model includes a dummy variable that turns on if the electricity rate increased due to the World Bank's request in the previous financial period. The second model replaces this dummy with one that turns on if the electricity rate increased *without* the World Bank's request in the previous financial period. I examine the difference between the increase of the electricity rate by the World Bank's request and that without its request by comparing the first model and the second model. My hypothesis, as outlined in the introduction, is that the ratio of the depreciation cost to fixed assets will be affected more strongly when the World Bank requests the rate increase than when it does not. The analysis of the two models will help ascertain the validity of the hypothesis.

The model for analyzing the factors affecting the variation of the ratio of the depreciation cost to fixed assets is specified in equation (1).

$$\Delta Ratio = a_0 + a_1 \times \Delta Revenue + a_2 \times \Delta Cost/Revenue + a_3 \times \Delta Interest/Debt + a_4 \times \Delta Dividend + a_5 \times Rate\_WB + a_6 \times Company\_WB + a_7 \times Period + \varepsilon \quad (1)$$

$\Delta Ratio$ (percent) = the ratio of the depreciation cost to fixed assets – the ratio of the depreciation cost to fixed assets in the previous financial period.

$\Delta Revenue$ (percent) = (electric power industry revenue – electric power industry revenue in the previous financial period) ÷ the electric power industry revenue in the previous financial period. As explained above, the companies did not increase the depreciation cost because their

profitability was low. The increase in revenue will recover the profitability of the companies and increase the depreciation cost. I examine whether the increase in revenue caused the depreciation cost to increase.

Δ*Cost/Revenue (*percent) = the ratio of electric power industry cost to electric power industry revenue – the ratio of the electric power industry cost to the electric power industry revenue in the previous financial period. The reduction in the ratio of cost to revenue will also recover the profitability and increase the depreciation cost. I examine whether the reduction in the ratio of cost to revenue caused the depreciation cost to increase.

Δ*Interest/Debt* (percent) = interest expense × 2 ÷ [(interest-bearing debt + interest-bearing debt in the previous period) ÷ 2] – interest expense in the previous period × 2 ÷ [(interest-bearing debt in the previous period + interest-bearing debt two periods before) ÷ 2]. Interest is one of the cost items and belongs to capital cost. The reduction in the percentage of interest cost in debt will also recover the profitability and increase the depreciation cost. I examine whether the reduction in the percentage of interest cost in debt caused the depreciation cost to increase.

Δ *Dividend* (percent) = (dividend amount – dividend amount in the previous period) ÷ dividend amount in the previous period. The depreciation cost may be kept low if the manager wants to increase the dividend because the profit available for the dividend increases if the depreciation cost decreases. I examine whether the increase in the dividend amount caused the ratio of the depreciation cost to decrease or not.

Rate_WB = Dummy set to equal 1 if the electricity rate increased by the World Bank's request in the previous financial period, and 0 otherwise. Increasing the electricity rate by the World Bank's request will recover the profitability of the companies and increase in the depreciation cost. I examine whether increasing the electricity rate as per the World Bank's

request affected the variation of the depreciation cost to fixed assets or not.

Company_WB = Dummy set to equal 1 if the electric power companies had borrowed from the World Bank, and 0 otherwise. The World Bank supervised the depreciation approaches of borrowers. If the supervision of the World Bank was continuously effective, the ratio of the depreciation cost to fixed assets of the companies that borrowed from the World Bank would be higher than that of the companies that did not borrow from the World Bank. I examine whether the supervision of the World Bank continuously affected the variation of the ratio of the depreciation cost to fixed assets or not.

Period = Dummy set to equal 1 if the accounting period is from the accounting period that ended in March 1954 to the accounting period that ended in September 1961, which was the next accounting period when Kyushu's electricity rate increased by the World Bank's request, and 0 otherwise.

Next I specify equation (2) to determine how the ratio of the depreciation cost to fixed assets changes when electricity rates rise without the World Bank's request. Again, the point of this exercise is to compare the coefficients on the rate change dummies in the two models to determine whether or not the World Bank's actions impacted this ratio.

$$\Delta Ratio = a_0 + a_1 \times \Delta Revenue + a_2 \times \Delta Cost/Revenue + a_3 \times \Delta Interest/Debt + a_4 \times \Delta Dividend + a_5 \times Rate\_NWB + a_6 \times Company\_WB + a_7 \times Period + \varepsilon \quad (2)$$

The variables in this equation are defined the same as in equation (1) with one exception:

Rate_NWB = Dummy set to equal 1 if the electricity rate increased without the World Bank's request in the previous financial period, and 0 otherwise.

Empirical Results

Table 4 shows the descriptive statistics and Table 5 presents the results of examining the factors that contributed to the variation of the ratio of the depreciation cost to fixed assets in models (1) and (2).[6] The ratio of the depreciation cost to fixed assets increased at the statistically significant level when the electric power industrial revenue increased, and the ratio of cost to revenue fell, at the statistically significant level when the electricity rate rose by the World Bank's request in the previous period in model (1). The ratio of the depreciation cost to fixed assets increased at a statistically significant level when the electric power industrial revenue increased, and the ratio of cost to revenue fell down in the second model, but the increase of the electricity rate without the World Bank's request did not affect the variation of the ratio of the depreciation cost to the fixed assets. Regardless of whether the companies borrowed from the World Bank or whether the accounting period was before the accounting period ending September 1961, the variation of the ratio of interest to the interest-bearing debt and the variation of the dividend amount did not affect the variation of the ratio of the depreciation cost to fixed assets in both models (1) and (2).

Table 4
Descriptive Statistics (N = 369)

Variable	Mean	Max	Min	Standard Deviation
ΔRatio	0.03%	2.64%	-3.12%	0.84%
ΔRevenue	6.47%	42.12%	-19.84%	7.13%
ΔCost/Revenue	0.58%	22.74%	-14.42%	4.59%
ΔInterest/Debt	-0.27%	12.68%	-7.63%	2.79%
ΔDividend	8.32%	79.74%	-40.00%	15.61%
Rate_WB	0.01	1	0	0.10
Rate_NWB	0.04	1	0	0.20
Company_WB	0.42	1	0	0.49
Period	0.61	1	0	0.49

[6] Most cross correlations between variables were low. In only a couple of cases were they higher (in absolute value) than 0.3: the cross correlation of -0.57 between delta ratio and delta cost/revenue and of 0.37 for delta ratio and delta revenue.

Table 5
Multiple Regression Analysis (N = 369)

	(1)	(2)
ΔRevenue	0.04	0.04
	(.00)	(.00)
ΔCost/Revenue	-0.10	-0.10
	(.00)	(.00)
ΔInterest/Debt	0.00	-0.00
	(.98)	(.93)
ΔDividend	0.00	0.00
	(.84)	(.76)
Rate_WB	0.75	-
	(.02)	-
Rate_NWB	-	-0.20
	-	(.24)
Company_WB	-0.02	-0.01
	(.75)	(.90)
Period	0.03	0.00
	(.70)	(.97)

Note: Coefficient with P-values in parentheses, (1) Adjusted R^2 = 0.44, Model P-value = 0.00, VIF<1.13, (2) Adjusted R^2 = 0.44, Model P-value = 0.00, VIF<1.14**.**

From the statistical analysis, the electricity rate increased, except for the case in which the World Bank's request did not encourage the ratio of the depreciation cost to increase. This was because the rate of increase in the electricity rate was lower than companies required owing to electricity customers' dissenting opinion. The final reduction in companies' requirements for the increase of the electricity rate was 56.4 percent in 1951, 4.8 percent in 1952, and 4 percent in 1954 (Public Utilities Bureau of the Ministry of International Trade and Industry 1951, 331; 1952, 322; 1955, 164). In 1954, the electricity rate in Chubu, Kansai, and Kyushu increased at the World Bank's request (simple averaged increase rate of three companies was 11.5 percent) and the electricity rate of the other six companies increased (simple averaged increase rate of six companies was 13 percent). The rate increase by the World Bank's request was lower than the rate increase of the other six companies. The World Bank's request did not directly encourage the higher rate. Nevertheless, the reason that the increase in the electricity rate by the

World Bank's request encouraged the ratio of the depreciation cost to fixed assets to increase was that the World Bank requested the Japanese government and Japanese electric power companies to increase the depreciation cost. I conclude that the World Bank's request itself—and not the increase in the electricity rate—might have encouraged the ratio of the depreciation cost to fixed assets to increase.

In addition, the experience of companies borrowing from the World Bank did not affect the ratio of the depreciation cost to fixed assets. This shows that the World Bank's request was effective only in the execution of loans. On the other hand, the increase of revenue and the fall in the ratio of cost to revenue encouraged the ratio of depreciation cost to fixed assets to increase. The increase of electricity demand and increased electric power industry revenue was continuously effective in increasing the ratio of depreciation. An increase of revenue due to an increase in electricity demand might be more effective in increasing the depreciation rate than increasing revenue due to the increase in the electricity rate because the increase in the electricity rate without the World Bank's request was not effective for increasing the ratio of depreciation cost to fixed assets.

Conclusion

The increase of the depreciation amount contributed to the growth of the Japanese electric power industry through the construction of electric power stations using depreciation cost as a funding mechanism. Four Japanese electric power companies borrowed money from the World Bank to construct power plants between 1953 and 1961. As argued by Hein (1990), loans—including World Bank loans—played a significant role in the growth of the Japanese electric power industry. However, the ratio of loans to funding decreased from 63.4 percent to 33.9 percent and the ratio of depreciation cost to funding increased from 13.9 percent to 26.3 percent between 1951 and 1970 (see Table 1). How could Japanese electric power companies increase the ratio of depreciation cost to funding? In other words, what determined the increase in the ratio of depreciation cost to fixed assets between 1951 and 1973?

This study hypothesized that the increase in the electricity rate encouraged the recovery of profitability and increased depreciation cost. As argued by Samuels, the Japanese government was able to establish the electricity rate and control the electricity market. In the case of the World Bank's loan, as argued

by Kapur, Lewis, and Webb (1997), the World Bank requested an increase in the electricity rate, so as to increase the depreciation cost.

The statistical analysis showed that the increase of the electricity rate, except as a result of the World Bank's request, did not contribute to the increase of depreciation cost. Conversely, the increase of the electricity rate by the World Bank's loan did contribute to the increase of the ratio of the depreciation cost to fixed assets because the World Bank requested an increase of depreciation cost from the Japanese government and Japanese electric power companies when it lent funds to the power companies. However, companies' actual experience of borrowing from the World Bank did not contribute to the increase of the depreciation cost. The World Bank's request was effective only in the execution of loans. The role of the World Bank was significant for the growth of the Japanese electric power industry between 1953 and 1961, but was negligible after 1962.In contrast, the increased revenue due to increased demand and the fall in the ratio of cost to revenue contributed to the continuous increase in the ratio of depreciation cost to fixed assets between 1951 and 1973.

As Japan changed from a developing to developed country between 1951 and 1973, the electric power industry grew around various stakeholders. Electricity consumers objected to the increase in the electricity rate in spite of the need for an increase because of considerations for the growth of the industry. Conversely, the World Bank and electric power companies often requested increases in the electricity rate to increase the depreciation cost. The Japanese government considered all these interests in implementing policy. Japanese ownership and regulation were different from the Western European electric power industry, which was characterized by "nationalization" or "domestication" in the 1950s and 1960s, in contrast to Japan's experience of exclusive reliance on private electric power companies after 1951.

Acknowledgements

Materials from the World Bank Archives were received from Professor Takeo Kikkawa, Tokyo University of Science. I would like to express my deepest gratitude to Professor Kikkawa for these materials. This work was supported by JSPS KAKENHI Grant Number 26780197.

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