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## **Part-Paid Stock, Corporate Finance, and Investment: Economic Consequences of the Part-Paid Stock System and Supplementary Installments in the Early 1930s of Japan**

**Takashi Nanjo\* and Makoto Kasuya\*\***

### **Abstract**

Under Japan's prewar capital stock system of joint-stock companies, rather than paying the full face value of a share in one lump sum, shareholders paid for stocks in multiple installments. This system was transplanted from industrialized Western nations during the Meiji Era to make it easier for investors to buy company shares and to promote capital concentrations. Company directors determined the amount of supplementary installments on part-paid stocks and when these installments were paid. The Commercial Code and Corporate articles of association specified sanctions for nonpayment, giving companies the backing needed to call in supplementary installments. Supplementary installments functioned as a last resort for corporate fund-raising in times of financial distress and played a role in corporate cash management and investment. Studies of historical documents such as financial statements and company histories show that in the early 1930s of the Great Depression, in a time of tight financial markets, many companies raised funds through supplementary installments, applying these funds to make investments and repay debts. As part of our study, we construct a new corporate financial data set with data on supplementary installments encompassing 174 firms, based on the Mitsubishi Economic Research Institute's *Honpo Jigyo-Seiseki Bunseki* (Performance analysis of Japanese companies) and Toyo Keizai's *Kabushiki Gaisha Nenkan* (Company Year Book) and estimate cross-sectional investment functions for the fiscal year of 1932. Regression results suggest that while corporate investments were subject to liquidity and debt constraints, supplementary installments stabilized corporate cash management and promoted corporate investment activities.

**Keywords:** part-paid stock; joint-stock company; corporate finance; investment; financial system; interwar period; Great Depression

**JEL classification:** E22, G32, G38, N15, N25

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## 1. Introduction

Recent policy discussions concerning reforms of Japan's financial system have focused on policies such as promoting changes in investment trends ("from savings to investment") and establishing effective systems of corporate governance.<sup>1</sup> A look back on how financial systems, capital markets, and corporate fund-raising functioned during the pre-World War II period may provide useful insights and suggestions relevant to current conditions. Recent literature on Japanese financial history has generally tended to view the financial system of prewar Japan as a direct finance-oriented one based on capital markets. Additionally, the complementary relationship between direct and indirect finance has increasingly been viewed as an essential aspect of the financial system of prewar Japan. In the area of corporate finance, research has proceeded on fund-raising based on stocks and bonds and on the roles played by shareholders and others in corporate governance.<sup>2,3</sup> This paper examines the relationship of supplementary installments on part-paid stocks, corporate finance, and investment activities in prewar Japan. The issues have rarely been analyzed to date in the literature, despite the major role played by part-paid stock and supplementary installments in Japan's prewar financial system.

In the capital stock system of prewar joint-stock companies, shareholders paid for shares in multiple instruments consisting of a first payment and subsequent supplementary payments, rather than paying the full face value in a lump sum at the time of subscription. This system was transplanted from industrialized Western nations in the Meiji Era and, along with the system of equity-collateral financing, expected to promote capital accumulation and concentrations. According to Shimura [1969, p.269], the direct goal of this system was to lessen the burden of dividend payments on unpaid capital through companies collecting capital as needed, as well as to reduce funding burdens on investors and shareholders that would have resulted if the system had required large amounts of single payment. Despite undergoing partial revisions alongside the establishment and amendment of the Commercial Code during

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<sup>1</sup> See Financial Services Agency [2004] concerning financial system reforms.

<sup>2</sup> For evaluation of the functions of direct and indirect finance in the prewar financial system, see Ishii [1999], Okazaki and Okuno-Fujiwara [1999], Teranishi [2007], Institute for Monetary and Economic Studies, Bank of Japan [2006], Kataoka [2006], Hoshi and Kashyap [2001], Miwa and Ramseyer [2002].

<sup>3</sup> With respect to corporate governance, Okazaki [1999b], Kasuya [2002], and Nakamura [2006] investigate the cases of *zaibatsu* and large companies. Okazaki [1999a] and Miyajima [1995] compare corporate governance in the prewar period to that in the postwar period.

the Meiji Era, the capital stock system of joint-stock companies allowing part-paid stocks and supplementary installments remained in place until amendments to the Commercial Code implemented during the post-war occupation.

The Commercial Code and corporate articles of association regulated sanctions that called for stocks to be seized and sold at auction if shareholders failed to comply with calls to submit supplementary installments by the deadlines announced. Given these requirements, these installments tend to be made “not at the shareholders’ convenience, but at the company’s” (Noda [1980], p. 214). Since companies were relatively free to use supplementary installments at their discretion in contrast to other means of fund-raising, such as bank loans and corporate bonds,<sup>4</sup> the part-paid stock system gave companies access to funds even when investors were unwilling to provide funds and financial markets were tight. Consequently, supplementary installments effectively functioned as “a last resort for corporate fund raising,” as described in the Japanese literature on financial history (Shimura [1969]).<sup>5</sup> According to the theory of corporate finance, given the information asymmetry between borrowers and lenders, companies were unable to raise sufficient funds, constraining corporate investment activities.<sup>6</sup> Collecting supplementary installments on part-paid stock may have helped ease such liquidity constraints and promoted corporate investment.<sup>7</sup>

This paper investigates the relationship between supplementary installments on part-paid stock, corporate finance and investment activities in interwar Japan, primarily in the early 1930s, drawing on both historical documents and firm-level financial data. The paper is organized as follows: Section 2 provides a brief overview of

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<sup>4</sup> However, this does not necessarily mean that managers had dominant influence in corporate governance. Okazaki [1999a] investigates the case for the strength of shareholders during the interwar period, arguing shareholders held ultimate control of corporate activities through the appointment and dismissal of directors at shareholder meetings. Managers’ decisions on supplementary installments were made within this framework.

<sup>5</sup> From the shareholders’ perspective, the fact that the company was free to make demands upon them to provide funds in the form of supplementary installments meant that they served as an option for the company from the time the shares were first underwritten. To what extent shareholders recognized this effect and whether they demanded additional returns in exchange for providing this option are important questions not addressed in this paper.

<sup>6</sup> Bernanke [1995, 2000], who analyzed the Great Depression in the United States, argues that asset deflation drove down the collateral value of borrowers’ net assets and asset holdings that reduced agency costs due to information asymmetry, impeding financial intermediation and exacerbating economic problems.

<sup>7</sup> Saito [2006] investigates Karafuto Industry as a case where supplementary installments eased liquidity constraints and induced overinvestment.

the establishment process during the Meiji Era of the capital stock system of joint-stock companies allowing part-paid stocks and supplementary installments; describes its institutional framework and functions; and examines, based on historical materials such as financial statements and company histories, the development of fund-raising and investment activities at representative companies that called in supplementary installments during the Showa depression of the early 1930s. Section 3 examines the effects of supplementary installments on corporate investment on a quantitative basis. Drawing on the Mitsubishi Economic Research Institute's *Honpo Jigyo-Seiseki Bunseki* and Toyo Keizai's *Kabushiki Gaisha Nenkan*, we construct a new firm-level financial data set for 174 firms in the fiscal year of 1932 to estimate cross-sectional investment functions. Section 4 summarizes the analyses presented in this paper and gives brief suggestions for future research directions.

## **2. Establishment of the system of supplementary payment in stocks and its function in Japan**

### **2.1 Establishment of the system of supplementary payment in stocks<sup>8</sup>**

When a company was established in prewar Japan, as stated above, it had to find subscribers for all shares. The subscribers were then required to pay a portion of the face value of each share. Although this payment system lacked a proper legal basis until the promulgation of the Commercial Code of Japan in 1890 (enacted in 1893 following a minor amendment), it was already in widespread use in Japan before this law. The National Bank Act of 1872, which established the first joint-stock-company system in Japan, stipulated that before a national bank could open its doors and receive a license to operate, at least one-half of the face value of its stock had to be paid. The remainder could then be paid in monthly installments of 10% of the face value, beginning the month following licensing. The full face value would be paid no later than six months following bank licensing.<sup>9</sup> Thus, while a system of installment payments did in fact exist at this time, it played a relatively minor role, since the timeframe for which shares were not paid in full was a mere six months.

Companies claiming limited liability status modeled on national banks were established afterwards, with their numbers swelling rapidly after 1886. The Tokyo

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<sup>8</sup> Except as noted otherwise, the contents here are based on Noda [1980], Imuta [1976], Miyamoto [1990], Takamura [1996], and Aochi [2006].

<sup>9</sup> Shares were forfeited by shareholders who failed to make this payment and were then auctioned. If no buyer was found, the shares were retired (Meiji Zaiseishi Hensankai [1972], pp. 41-42).

Stock Exchange (established 1878), Tokio Marine Insurance (established 1879), and Meiji Life Insurance (established 1881), all well-known among companies established before 1886, adopted share payment systems more or less identical to those for national banks. The Tokyo Stock Exchange had two-thirds of its nominal capitalization paid in as of the day before its opening, with the remainder paid in following notification by the president and directors. The shares were delivered to shareholders only after the entire amount was fully paid in. The 1878 balance sheet for the Tokyo Stock Exchange shows no unpaid capital (Hiraga [1928]). Tokio Marine Insurance had one-half of its capital paid in during the month in which the company obtained authorization from the Japanese government, another one-quarter within 60 days thereafter, and the final one-quarter within another 60 days. It also delivered share certificates following payment of the full amount. According to Tokio Marine Insurance's balance sheets, the entire amount had been paid in by the end of 1879 (Japan Business History Institute [1979]). One-fifth of Meiji Life Insurance's capitalization was paid in within five days following the first general meeting of shareholders and another one-fifth every three months thereafter; the total amount had been paid by the 13th month following the first general meeting. According to balance sheets, of 100,000 yen in capital, 40,000 yen had been paid in by the end of 1881. The entire amount had been paid in by the end of 1882 (Meiji Life Insurance [1955]). Since these three companies made every effort to have the entire amount of capital paid in within approximately one year following their establishment, the payment system used by the three companies were not entirely different from that for national banks.

These three companies belonged to the financial industry, and their primary source of funding was liabilities. With the exception of modest fixed assets (e.g., buildings), their capital was expected to serve as security for the companies' debts. In contrast, in the manufacturing and transport industries, which made use of fixed assets on a larger scale, the need for funds increased as plants and railways were constructed. Since a company's capitalization at this time tended to be determined by the funds needed to acquire fixed assets (plants or machinery), companies did not need to have their entire capitalization on hand when first established (i.e., when they first began constructing their fixed assets). For this reason, from the very early stages of their respective industries, companies appear to have chosen to forego full collection of their capital before startup, although the figure for total capital had been determined. The articles of association of Shoshi Kaisha (Oji Paper's predecessor) in November 1872 specify that of its total capitalization of 150,000 yen, 100,000 yen would be raised to

pay startup costs (for example, to buy machinery), while the remaining 50,000 yen would be collected later (Oji Paper [2001]). In 1874, Shoshi Kaisha merged with Keiteisha, issuing 2.25 new shares of stock (at 1,000 yen per share). By October 1874, its paid-in capital was 152,250 yen, received via nine separate installments. However, since this amount was less than that needed to purchase the required machinery, the company sought to increase its capitalization once again near the end of 1874. After five more payments, its paid-in capital as of June 1876 totaled 261,600 yen.<sup>10</sup> Shoshi Kaisha appears to have been one of the earliest companies in the manufacturing sector for which shares were paid in installments.

The cases of Osaka Cotton Spinning (hereafter OCS) and Japan Railway are worth examining, in part because the process of such payments for these companies is well documented. OCS was founded in 1879 by Ei-ichi Shibusawa and his partners. Shibusawa took various preparatory measures to establish the company, asking Takeo Yamanobe to seek out on-the-job training at a mill in the United Kingdom. In October 1880, the company finally set a target capitalization of 250,000 yen. Mill construction began in 1882, and part of the mill began operating in July 1883. In December 1882, the company increased its capital to 280,000 yen. The company's first semi-annual report included "various specifics of business performance, from the start of operations through July 5, 1883, and circumstances and accounts for the six-month period from that date through December 28." This suggests that the company regarded the period from its startup to the beginning of operations (about four years) as a single accounting period, perhaps due to the ambiguity of the establishment of the company. As a result, the company's balance sheets do not illustrate the process of capital inflow. However, a document entitled "Income Statement of Osaka Spinning, June 30, 1883" included in the first semi-annual report clearly shows that capital had been paid in in eight installments. Although the timing of these payments remains unclear, the company raised funds for purposes such as startup costs, equipment purchases, and mill construction over a certain period (Fig. 1). Since the first payment of capital took place in January 1881 (Takamura [1971], p. 64), subsequent payments appear to have been made over a period of approximately two years extending through 1882. The amount of paid-in capital on the company's balance sheet at the end of its first fiscal year is 265,000 yen, indicating that one-half (15,000 yen) of the amount of the capital increase

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<sup>10</sup> Shares of Shoshi Kaisha included fractions of less than one share. It appears that the concept of a single indivisible share was not universally held at this time.



of 30,000 yen had been paid in. The new shares were also paid in installments.<sup>11</sup>

The railway industry required even longer construction periods. Japan Railway, which linked Tokyo to Maebashi and Aomori, received startup authorization in November 1881, with a proposed capitalization of 20 million yen. Unable to raise this amount immediately, it sought to raise a partial amount. The application for incorporation submitted in May 1881 indicates subscriptions for 119,445 shares. While some shares were forfeited for reasons such as failure to pay, the company continued to issue shares through May 1884, changing the number of shares issued (Fig. 2). Since the company's founding predated the Commercial Code, it was possible to begin operating even before subscribers had been found for all shares. Additionally, the principle of finalizing capital amounts (i.e., clearly stating the capital figure in the articles of association) had yet to be established. Although company management had proposed a payment period of two years, the governors of the Tohoku region, who offered to sell shares to wealthy individuals living near the railway, demanded a period of seven years. A period of six years was ultimately set. The company began operating trains between Tokyo and Kumagaya in 1883 and gradually extended its line thereafter, completing the route to Aomori in 1891. Before the entire amount of the first offering of stock was to be paid in 1885, Japan Railway had doubled its capitalization, and the company had not found subscribers for all of its shares. In 1881, the entire amount of the first offering of stock was paid in in six years, as planned. Since the Japanese government provided shareholders with 8% interest, the company's semi-annual reports were issued before trains began operating. Due to the long-term payments clearly indicated by the reports, Japan Railway is the most notable company in the early stages of Japan's industrialization whose shares were paid in in installments.

A number of spinning and railway companies modeled on OSC and Japan Railway were established in the boom times between 1886 and 1890. Most shares in companies established during this period were paid in installments, establishing the convention in Japan of payment for shares by installment. At the time, none of the leading capitalist nations—the United Kingdom, United States, France, or Germany—required payment of the full face value of each share at the time of company establishment. Policymakers or businesspeople who examined Western stock systems

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<sup>11</sup> Capital of 265,000 yen was entered on the credit side of the balance sheet. The practice of entering capital of 280,000 yen on the credit side and unpaid capital of 15,000 yen on the debit side would only become accepted practice some time later.

were naturally inclined to accept installment payments. Moreover, this approach was favored by investors, since it required payment only as construction progressed. For these reasons, this system spread across Japan.

So far, our analysis has focused on the process whereby the installment payment system spread across Japan, albeit without solid legal foundations. We will now consider how the Commercial Code addressed this system. The draft version of the code, written by Karl Friedrich Hermann Roesler and published by the Ministry of Justice in 1884, stipulated installment payments for stock, based on French and German commercial laws. The part-paid stock system was incorporated into the Commercial Code of 1890. The Commercial Code required the company to find subscribers for all shares at the time the company was established and required the payment of at least one-quarter of the face value of all shares to discourage the proliferation of companies with very low ratios of paid-in capital to capital.<sup>12</sup> The minimum face value of a single share was 20 yen in general, but 50 yen for companies with capital of 100,000 yen or more. Although dividends were paid in proportion to the amount paid in per share, the voting rights corresponding to a fully-paid stock was identical to that of a part-paid stock. Articles of association were permitted to restrict the voting rights of those owning 11 or more shares. If a shareholder failed to pay in the amount called, his or her shares were forfeited and auctioned. If the auction price was less than the amount called, the shareholder whose shares were forfeited was obligated to make up the difference. Until one-half of the face value had been paid in, if the shareholder failed to make up the difference, the former shareholder was subject to security obligations for two years following his or her sale.

The new Commercial Code promulgated and established in 1899 further refined the system of payment in stock, requiring the articles of association to clearly state the amount of capital and the face value per share and requiring articles of association to be amended in general shareholders' meetings. It also required capital increases to be determined by resolution of a general meeting of shareholders. However, since supplementary installments were not legally subject to resolutions of the general meeting of shareholders, demands for payment were made in most cases by a resolution of the board of directors. When issuing stock at a price above the face value, companies were required to collect the amount in excess of the face value at the same time as the initial payment. A face value of 20 yen was permitted only if the entire

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<sup>12</sup> Under special legal conditions applying to railways, only one-tenth needed to be paid in.

amount was paid in one lump sum, and face values of less than 50 yen were prohibited in other instances. If a shareholder failed to make a payment and thereby forfeited his or her shares, a call for payment was submitted to the sellers of the shares (the former shareholders). If no party responded to this call, the shares were sold at auction. If the amount received at auction fell short of the payment amount called in, the company was entitled to seek payment from the shareholder who had forfeited the shares. If the amount could not be collected at this juncture, the company was entitled to demand payment from the sellers of the shares. The sellers of the shares bore this responsibility for a period of two years following the sale of the shares.<sup>13</sup> In addition, no capital increase was permitted unless the shares issued earlier had been fully paid in.<sup>14</sup> All these measures helped establish the installment payment system in prewar Japan, a system that survived until the 1948 amendments to the Commercial Code.

Widely accepted views tend to stress that the system of payment of stock in installments performed the following three functions: (1) It reduced the burden of payment on shares with high face values; (2) it reduced dividend burdens by collecting payments in accordance with construction status; and (3) it enabled collection of unpaid capital after a company's bankruptcy, protecting creditors and thereby easing credit (Noda [1980] p. 79, Aochi [2006]). With respect to the first function, since issuing shares with a face value of 50 yen paid in four installments (12.5 yen each) reduced the initial payment burden to roughly one-half that for shares with a face value of 20 yen paid in one lump sum, multiple stock payments broadened the shareholder base. The anticipated burden of paying the full amount for shares offered at 50 yen per share may have discouraged small-scale investors; the installment part-paid stock system was far less discouraging because shareholders were able to sell part-paid stocks when necessary. With respect to the second function, increasing capital in accordance with the progress of construction could reduce a company's dividend burdens as well. Part-paid stock system had implicit advantages which issuing several sets of smaller numbers of fully paid in shares, staggered at intervals, could not offer. For example, the part-paid stock system eliminated operating costs associated with issuing shares in multiple capital-raising efforts. Also, the requirement of a resolution of the general

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<sup>13</sup> Although this responsibility may have impeded circulation of stock with unpaid portions remaining, such stock was listed and widely traded.

<sup>14</sup> Under special legal conditions, companies in industries such as railways, electric power, and insurance were permitted to issue new shares without having the entire amount paid in. In addition, the amendment to the Commercial Code in 1938 permitted companies to issue new shares without having the entire amount paid in.

meeting of shareholders to increase capitalization made it difficult to raise funds swiftly, something the part-paid system made possible by requiring merely a resolution of the board of directors.<sup>15</sup> In addition, the installment payment system allowed collection of payments even under financial conditions in which raising capital by other means might prove difficult. Fourth, while shareholders would not always respond to demands for payment, some shareholders would pay in out of fear of forfeiture. Since the company was entitled to demand payment from the original shareholder (and from the buyer at the time of auction), if proceeds from the forfeiture and auction of the shares fell short of the payment demanded, prospects for successful fundraising were better than those through new issues. With respect to the third function, it is well-known that English joint stock banks issued part-paid stock and won the confidence of depositors.<sup>16</sup> Part-paid stocks have had the effect of supplementing company credit. However, numerous cases in which a company failed to collect sufficient funds in this manner when bankruptcies occurred have also provoked creditors' anger.

## **2.2 The roles played by supplementary installments: Six case studies drawn from the Showa depression**

In this section, we consider how companies raised funds during the Showa depression, when capital markets were very tight, by calling in unpaid capital from shareholders. Here we discuss six companies – Shirokiya, a department store; Tokyo Underground Railway (hereafter TUR); Dainihon Sugar Refinery (hereafter DSR); Oita Cement; Keio Electric Railway; and Ujigawa Electric Power – and examine the effects of such measures on investment at these companies.

In November 1930, Shirokiya collected payment of 5 yen per share on 100,000 shares for which 40 yen per share had already been paid in. These funds were used to pay for the second phase of construction of its main store, for which the first phase had begun in 1929. At the time of this fundraising, the price of a part-paid stock of Shirokiya on the markets was only 6 yen. Despite the harsh environment, investors forfeited no more than 288 shares; 99,712 shares had been paid in at the end of

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<sup>15</sup> Under the authorized-capital system adopted by amendment of the Commercial Code in 1950, capital could be increased up to the authorized capital amount, subject only to a resolution of the board of directors.

<sup>16</sup> In Japan, supplementary installments were collected to cover losses or to refund deposits in the event of bankruptcy or suspension of bank operations. See Aochi [2006] concerning the case of Jugo Bank.

January 1931. The forfeited shares were auctioned, and by March, full payment had been made for all outstanding part-paid shares. In May 1931, Shirokiya called in payment of the remaining 5 yen. The full original face value of the 50-yen shares was paid in by June.<sup>17</sup>

By the end of 1929, TUR had completed construction from Asakusa to Manseibashi and had begun work to extend its line from Manseibashi to Shinbashi (TUR [1939]). To raise the necessary funds, it launched an offering in April 1930, issuing a second round of 400,000 new shares for which it demanded initial payment of 5 yen per share. However, due to the difficulty of raising funds during the Showa depression, the company borrowed four million yen from the Industrial Bank of Japan (hereafter IBJ) in November 1930 and borrowed another 4 million yen in November 1931 from the same bank, with these loans secured by a railway foundation (TUR borrowed an additional 500,000 yen in May 1932 from the IBJ). In the second half of 1932, it successfully concluded 10.5 million yen in financing agreements with a syndicate consisting of the IBJ and four trust companies: Mitsui, Mitsubishi, Sumitomo, and Yasuda. Over this period, it called in payment of 2 million yen (in April 1931) and 4 million yen (in April 1932). In April 1930, the current price of the company's 15-yen paid-in stock stood at about 15 yen, indicating relatively health market conditions for TUR. The 1931 payment demand resulted in the collection of 1,910,000 yen by June, and the full amount had been collected by October 21. The 1932 payment demand resulted in the collection of approximately 90% of the total amount by June. Although 93,385 yen remained unpaid at the end of November, a substantial portion of the payments had been made. The 1931 capital call was a precondition for loans from the IBJ secured by the railway foundation.<sup>18</sup> TUR and Shirokiya invested in their fixed assets by raising capital from holders of part-paid shares in times when capital markets were tight. For TUR, raising capital in this way was a prerequisite for obtaining additional bank loans.

In November 1930, DSR called in payment of 12.5 yen on its first issue of new shares (170,000 shares), 5 yen on its second issue of new shares (316,000 shares), and 12.5 yen on its third issue of new shares (135,000 shares), raising a total of 5,392,500

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<sup>17</sup> *Diamond*, October 1, 1930; Semi-annual report of Shirokiya; each period. Shirokiya planned to use funds on hand to cover construction costs that could not be covered by payment for part-paid shares.

<sup>18</sup> Semi-annual report of TUR, each period. Since the company belonged to the railway industry, it was permitted to issue a second round of new shares before the full amount of the first round had been paid in.

yen.<sup>19</sup> The company had imported raw sugar from Java and refined it in Japan until the 1920s, when it ventured into the raw-sugar business in Taiwan. Despite raising the needed funds through liabilities, it announced a call for payment in August 1930, when the price of its various shares dropped below the respective paid-in amounts. Since it had not collected payment in the late 1920s on first venturing into the raw-sugar industry in Taiwan, the stock markets had not anticipated this demand for payment; and since the demand was made during a period of declining stock prices, some observers speculated the company faced dire financial conditions, with banks pressuring it to repay loans. The company's stock prices fell dramatically.<sup>20</sup> By the end of April, however, full payments had been made, although 127 shareholders forfeited their shares. These forfeited shares were auctioned in March 1931. Efforts to collect payments suffered less than one might have expected, given the focus on the rapid decline in company shares. In fact, the company issued statements to shareholders explaining that it was not being pressured by banks to repay debts and that the purpose of the payment call was "to repay long-term debts and to secure working funds" (Nishihara [1934], p. 186). The company's balance sheets back up these claims: its product inventory increased by 7,080,000 yen from the end of October 1930 through the end of April 1931, while notes payable decreased by no more than 30,000 yen. All funds raised from shareholders were in fact invested into current assets.<sup>21</sup> In this case, then, the company raised funds from holders of part-paid stock to carry inventory due to poor sales.

Finally, we examine three companies forced to raise funds from part-paid stock holders due to pressures to repay debts. We should note the difficulty of clearly distinguishing such companies from companies seeking to raise funds to make investments, since the bank loans being called in had often been used for investments. We begin with Oita Cement. Facing poor business results, it partnered with Onoda Cement and entrusted sales to Mitsui & Co., which was expected to provide financial assistance to Oita Cement. With Oita Cement needing additional funds, the IBJ demanded that Oita call in payment on shares as a precondition for a loan of 1.5 million yen secured by its plant. In June 1930, Oita Cement collected payment of 6.5

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<sup>19</sup> Due to mergers, DSR had issued three issues of part-paid stock.

<sup>20</sup> *Diamond*, September 1, 1930; *Economist*, September 15, 1930. The company's stock had the following prices on September 1: for older stock for which 50 yen had been paid in, 31.2 yen; for the first issue of new stock, for which 37.5 yen had been paid in, 15.3 yen; for the second issue of new stock for which 20 yen had been paid in, 6.5 yen; and for the third issue of new stock for which 12.5 yen had been paid in, 1.3 yen.

yen per share of part-paid stock (127,200 shares). Although the company's part-paid stock (of which 30 yen had been paid in) at that time was valued at no more than 0.2 yen per share, no more than 7,572 shares (owned by 165 shareholders) were forfeited, and payment had been completed for all shares by February 1931. The company's goal was to repay unsecured short-term debts of 2.3 million yen with the funds raised from shareholders and the IBJ.<sup>22</sup> While this capital increase may have been intended to modify its capital structure as part of restructuring efforts, the effort succeeded because business performance, with the participation of Onoda Cement and Mitsui & Co., was expected to improve.

Keio Electric Railway invested to expand and improve its existing lines, establish the Keiokaku amusement park (in 1927), and expand its power-supply business, resulting in growth in fixed assets during the latter half of the 1920s. While the company had raised most of the required funds by issuing notes payable, in September 1930, Keio Electric Railway collected 5 yen per share on its third issue of 130,000 shares of stock to repay bank loans. Although the market value of the 25-yen stock reached a low point of 19.7 yen during that September, full payment had been completed by November, with the company raising 650,000 yen (Since the 650,000 yen fell short of the amount needed to repay its debts, the company issued corporate bonds totaling 5 million yen in November 1930). Comparisons of figures for May and November 1930 show an increase of 500,000 yen in fixed assets, indicating the results of investment during a credit crunch.<sup>23</sup>

Ujigawa Electric Power serves as another example of a company that raised funds from holders of part-paid shares both to make investments and to repay debts. To repay debts and to expand its power lines and transformers in response to increased demand, the company in March 1931 collected payment of 10 yen per share on its part-paid stock (872,667 shares).<sup>24</sup> The lowest price in February 1931 for the company's part-paid stock, for which 30 yen had been paid in, was 29 yen. Perhaps because the share price was maintained largely at the paid-in amount, no more than 8,380 yen remained unpaid as of March 1931. Comparisons of figures for September 1930 and March 1931 show that while the amount in bonds had actually decreased by 560,000

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<sup>21</sup> Semi-annual report of DSR, each period.

<sup>22</sup> *Economist*, July 1, 1930; Semi-annual report of Oita Cement, each period. Also, see Kato [2004].

<sup>23</sup> *Diamond*, September 11, 1930; Semi-annual report of Keio Electric Railway, each period.

<sup>24</sup> *Toyo Keizai* (Oriental Economist), January 10, 1931; Semi-annual report of Ujigawa Electric Power, each period.

yen, other debts increased by 190,000 yen. While the decline in debts was modest, the funds raised were mainly used for facilities expansion, primarily power-line equipment.

The six cases above demonstrate how the part-paid stock and installment payment system made it possible for companies to raise funds on demand (although not immediately) from shareholders under poor financial conditions, including cases in which stock prices had fallen below the paid-in amount. The funds raised were invested into fixed assets or inventory or used to repay creditors.

What was the most common reason for such payment calls? Fig. 3 classifies the motives for payment collection as raising investment funds, debt repayment, or both, based on articles on collection of payment carried in the business magazines *Economist*, *Diamond*, and *Toyo Keizai* over the period from 1930 through 1932 (ignoring the amounts of paid-in funds). As already seen, although in some cases the magazine articles did not address the purpose of collection accurately (or the funds were used for other than their stated purpose), the figure gives a clear sense of the overall picture. Collection for investment was the most common motive (42%), followed by both investment and debt repayment (33%) and debt repayment (24%). This suggests stock supplementary installments were closely tied to both company capital investments and cash flow.

### **3. Estimates of corporate investment functions for fiscal year 1932**

#### **3.1 Earlier research and a framework for analysis**

In Section 2, we showed that when financial markets tightened in the early 1930s, many companies raised funds by calling in supplementary installments on part-paid stock, using the funds thus raised to invest or to repay loans. This section examines the effects of supplementary installments on corporate investment.

Many previous case studies have addressed the investment activities of specific firms in interwar Japan. Here, we review previous studies analyzing the relationship between the developments of aggregated corporate investments and financial conditions in the early 1930s.<sup>25</sup> Asajima [1995] totaled the balance sheets of

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<sup>25</sup> For financial and economic developments during the interwar period, see Takeda [1983] and Nakamura [1989]. As a brief summary of economic developments during the 1932 fiscal year (covered in Section 3 [Table 4]), although real GNP returned to positive territory under the Takahashi's economic policies of expanding exports and government spending, private-sector investment continued to decline from fiscal 1931, as did prices (GNP deflator). Bank lending continued to decline. Payments on bonds and stock in capital markets remained low. Although stock prices had rebounded from their 1930 lows, they remained depressed. Land prices (rice paddies) remained in a declining trend.



111 to 155 companies based on Osakaya Shoten's *Kabushiki Nenkan* and examined changes in their fixed assets and fund-raising at four points in time: in 1919, 1926, 1931, and 1936. His study indicated that growth in fixed assets slowed in many industries in 1931, with the exception of railways and electric power companies that raised funds for investment through bonds. Fujino and Teranishi [2000] used the Mitsubishi Economic Research Institute's *Honpo Jigyo-Seiseki Bunseki* to analyze the relationship between corporate fund-raising and assets during the first half of fiscal 1933. Their results indicated that companies tended to raise long-term funds in a manner proportional to changes in fixed assets. Miyajima [2004] used the Mitsubishi Economic Research Institute's *Honpo Jigyo-Seiseki Bunseki* and other sources to get balance sheets for 54 companies during the period from 1921 to 1927 and for 64 companies during the period from 1933 to 1937, estimating investment functions in each period to determine whether liquidity constraints, debt constraints, or membership in *zaibatsu* groups affected corporate investment activities.

After compiling a corporate financial database incorporating data on supplementary installments on part-paid stocks, we estimate investment functions in the form in which supplementary installments and other means of fund-raising are added to the Miyajima's [2004] estimation model as independent variables and examine the effects of supplementary installments on corporate investment. Analysis based on firm-level data makes it possible to examine more precisely the relationship between supplementary installments and corporate investment activities by controlling for the characteristics of companies other than supplementary installments. For two reasons, we focus on fiscal 1932, during the interwar period, for our estimates of cross-sectional investment functions. First, previous research has shown that supplementary installments played a significant role in corporate fund-raising, particularly in times of tight financial markets. Second, data from the Mitsubishi Economic Research Institute's *Honpo Jigyo-Seiseki Bunseki* is available only for fiscal 1931 and beyond, allowing year-on-year comparisons only from fiscal 1932.

## **3.2 Data and estimation model**

### **3.2.1 Data**

Of the data needed for estimates, data on fixed assets, liabilities, sales, net income, and depreciation, and other corporate financial data is drawn from the Mitsubishi Economic Research Institute's *Honpo Jigyo-Seiseki Bunseki*. Since the accounts on the balance sheets in corporate financial statements in prewar Japan vary from company

to company, all companies tended to define fixed asset accounts in different ways, making direct comparisons problematic. *Honpo Jigyo-Seiseki Bunseki* totals each company's accounts corresponding to fixed assets by its own standard to derive data on fixed assets.<sup>26</sup> Gross investment is used as a representative variable for investment, which is calculated by subtracting the amount of fixed assets at the end of the 1931 fiscal year from that at the end of the 1932 fiscal year and adding depreciation for the 1932 fiscal year.<sup>27</sup> Since fixed assets include land, the investment figures also encompass land investments. This is because data on fixed assets in *Honpo Jigyo-Seiseki Bunseki* cannot be divided into land and depreciable assets, and because land investments were crucial for numerous companies in their efforts to expand. For this reason, we chose to include land investment in our analyses.

Since the amount of unpaid capital on the balance sheet declines when supplementary installments are made, we consider this decline in unpaid capital to represent the amount of supplementary installment payments made.<sup>28</sup> We used this data from Toyo Keizai's *Kabushiki Gaisha Nenkan*, since *Honpo Jigyo-Seiseki Bunseki* does not provide data on unpaid capital.

Matching the data from *Honpo Jigyo-Seiseki Bunseki* and *Kabushiki Gaisha Nenkan*, we compiled a financial database for 174 companies found in both. Since unpaid capital can change for reasons apart from payment of supplementary installments (e.g., when balance sheets for multiple companies are consolidated in mergers or acquisitions), we excluded from our sample companies involved in mergers or acquisitions during fiscal 1932. We relied on Chapter Seven (a summary of company histories) of Toyo Keizai's *Kabushiki Gaisha Nenkan*, Osakaya Shoten's *Kabushiki Nenkan*, and financial statements of individual companies to determine whether such mergers or acquisitions had occurred. Our sample of 174 companies included 105 manufacturing firms and 69 non-manufacturing firms.<sup>29</sup> Although the fiscal years of

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<sup>26</sup> See Saito [2004b] concerning the characteristics of the data provided in *Honpo Jigyo-Seiseki Bunseki*. The study pointed out that "the only comprehensive database covering prewar Japanese businesses in a form that makes it possible to compare data for multiple companies is the Mitsubishi Economic Research Institute's *Honpo Jigyo-Seiseki Bunseki*, covering the year 1930 and beyond..." He went on to emphasize the difficulty of quantitative analysis for company activities before 1930.

<sup>27</sup> For depreciation of investment during the prewar Japan, see Takadera[1974] and Saito [2004a].

<sup>28</sup> In the account processing used in the prewar period, nominal capital was booked to capital accounts and unpaid capital to assets.

<sup>29</sup> A breakdown of the companies included in *Honpo Jigyo-Seiseki Bunseki* by sector shows the following companies in the manufacturing sector: two silk textile firms, nine cotton spinning firms, five cotton textile firms, four woolen firms, two hemp spinning firms, 12

the various companies started and ended in different months, in accordance with *Honpo Jigyo-Seiseki Bunseki*, we treated any fiscal year ending during the period March 1932 through February 1933 as the 1932 fiscal year.<sup>30</sup> Our sample includes the companies examined in Section 2: Shirokiya, Tokyo Underground Railway, Dai-Nippon Sugar, Oita Cement, Keio Electric Railway, and Ujigawa Electric Power.

### 3.2.2 Estimation model

The equation used for the investment function is given below.

$$I/K = \alpha + \beta_1 \Delta Y/K + \beta_2 CF/K + \beta_3 DE/AS + \beta_4 SI/K + \Sigma \gamma \text{Dummy} + \varepsilon$$

The dependent variable on the left side of the equation ( $I/K$ ) represents investment ( $I$ ) in the fiscal year of 1932 normalized to fiscal 1931 fixed assets ( $K$ ). Since estimates of the investment function in this paper are based on cross-section data at a single period and fluctuations in equipment prices are relatively insignificant, we use nominal values.<sup>31,32</sup>

The first term on the right-hand side of the equation is a constant ( $\alpha$ ); the second is year-on-year changes in sales in fiscal 1932 ( $\Delta Y$ , normalized to fixed assets as of the end of fiscal 1931); the third is cash flow ( $CF$ , net income after tax plus

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cement firms, two brick firms, two glass firms, one pharmaceuticals firm, three industrial chemicals firms, one dye firm, one paint firm, four artificial thread firms, five paper firms, three artificial fertilizer firms, three other chemical firms, three electrical machinery firms, six shipbuilding firms, nine machinery firms, five steel firms, three metalworking firms, four brewery firms, six sugar refining firms, three flour milling firms, two snack and bread firms, three petroleum firms, and two silk reeling firms. The nonmanufacturing sector includes two warehouse firms, 22 railways, six steamship firms, one shipping firm, three trade firms, four department stores, nine mining firms, four oil firms, nine electrical power firms, one fisheries firm, six land and building firms, and two printing firms.

<sup>30</sup> This category is used for companies whose accounting term is six months. For companies (e.g., those in the silk reeling industry) whose accounting term is 12 months, a fiscal year ending during the period June 1932 through May 1933 is regarded as fiscal 1932. This paper uses the definition by *Honpo Jigyo-Seiseki Bunseki*.

<sup>31</sup> Since the Commercial Code amended in 1911 required booked and assessed asset values to be below current market values, investment should have partially reflected fluctuations in equipment prices through fixed asset revaluation. See Aochi [2003] concerning the prewar corporate accounting practice of booking assets at below current market value.

<sup>32</sup> It should be noted that companies experiencing declining business performance may have revalued assets at other than their actual values. Takahashi [1930] highlighted the possibility that 21 firms that had gone bankrupt during the 1920s had engaged in account processing practices such as arbitrary booking of revaluation gains. Others pointed out that since depreciation was voluntary and booked at the company's discretion, not according to established rules, depreciation tended to decrease in times of poor business performance.

depreciation less dividend payments and directors' bonuses,<sup>33</sup> normalized to fixed assets as of the end of fiscal 1931); and the fourth is the ratio of debt to assets (DE/AS). This equation is based on a regression in Miyajima [2004] incorporating liquidity constraints and debt constraints in an investment function with the acceleration principle. When the cost of external funds exceeds that of internal funds due to information asymmetry, internal funds receive priority for funding investments, while investments beyond internal funds are constrained.<sup>34</sup> Under such liquidity constraints, the coefficient of cash flow is expected to be positive. For a company facing debt overhang, even with prospects of returns from new investment, it may become impossible to make the necessary arrangements between existing creditors and new creditors concerning distributions of returns, making it difficult for the company to engage in new fund-raising and investment efforts. Under such debt constraints, we would expect the coefficient of the ratio of debt to assets to be negative. The fifth term is supplementary installments on part-paid stock (SI, normalized to fixed assets as of the end of FY 1931). This coefficient is expected to be positive when supplementary installments have a positive impact on investment. The sixth term is a dummy variable added to control for the effects of industry type.

We use ordinary least squares (OLS) as the estimation method. In cases of cross-section data, the variance of the error terms may not be uniformly distributed. Where such heteroskedasticity is present, the statistical significance of estimated coefficients by OLS is imprecise.<sup>35</sup> In our estimate, White's test for heteroskedasticity rejects the null hypothesis that the variance of error terms is uniformly distributed.<sup>36</sup> Accordingly, we apply White's corrections to calculate standard errors for the estimated coefficients and to test significant levels of estimated coefficients by the t-statistic, based on corrected standard errors.<sup>37</sup>

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<sup>33</sup> For a discussion of how directors' bonuses were determined in the prewar Japan, see Okazaki [1999a] and Yokoyama [2001].

<sup>34</sup> For theories regarding the effects of liquidity constraint and debt constraint on investment and empirical analyses on the relation between financial crises and corporate investment activities in the 1990s Japan, see Ogawa [2007], and Fukuda, Kasuya, and Nakajima [2007].

<sup>35</sup> We use EViews statistical software. See Matsuura and Mackenzie [2005] for usage of EViews and the issue of ununiform variance.

<sup>36</sup> The null hypothesis that the variance of error term is uniformly distributed was rejected at the 1% level for both the case including intersection terms between independent variables and the case not including such intersection terms.

<sup>37</sup> A problem of instantaneity bias arises when estimating investment functions. In this paper, considering supplementary installments and cash flow affect investment, we made our estimates using these as independent variables. However, the reverse relationship, in

### 3.2.3 Descriptive statistics

Table 5 shows descriptive statistics for the sample of 174 companies. The average rate of investment is 0.033, with a minimum value of -0.358, a maximum of 0.347, and a standard deviation of 0.070. We see considerable variation from company to company and from industry to industry.<sup>38,39</sup> Investment rates are high in industries such as flour milling, rayon, oil, department stores, and machine industries, but negative in industries such as artificial fertilizers and steel, suggesting significant differences in companies' strategies on investment during the recovery from the Showa depression.

With respect to independent variables, the average rate of year-on-year changes in sales is 0.053, with a minimum value of -0.299, a maximum of 1.410, and a standard deviation of 0.174. Industries such as flour milling, metals, department stores, cotton spinning, cotton textiles, and steel had high sales growth rates, while industries such as paper, artificial fertilizer, and silk textiles had negative growth rates. The average rate of cash flow is 0.048, with a minimum value of -0.110, a maximum of 0.430, and a standard deviation of 0.063. Industries such as the flour milling, wool, cement, and cotton spinning had high cash flow rates, while industries such as shipbuilding had negative rates. The average ratio of debt to assets is 0.363, with high ratios for railways and electric power, which expanded fixed assets by bond financing. The average rate of supplementary installments is 0.007, with high rates in industries such as department stores, rayon, flour milling, electric power, railways, and sugar.

When we divide the companies in our sample into those that collected supplementary installments (22 companies, referred to hereinafter as the "supplementary installment sample") and those that did not (152 companies, referred

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which investment affects supplementary installments and cash flow, is also conceivable. Possible ways to rigorously verify the former relationship include instrumental variables or lagged independent variables. However, finding appropriate instrumental variables proved difficult, and since *Honpo Jigyo-Seiseki Bunseki* and other sources did not include data on supplementary installments and cash flow for fiscal 1931, we were unable to use lagged terms.

<sup>38</sup> The investment rate of 0.033 is for the fiscal year of 1932. Further study is needed to determine whether this rate is high or low relative to other years.

<sup>39</sup> The sample of 174 companies included 27 with negative investment. While this occurs in cases of substantial capital wastage, it may also be an artifact of account processing. In such cases, estimation results may be biased. In our analysis, estimates for the 147 companies excluding these 27 showed that all estimated coefficients for independent variables were statistically significant and at roughly the same levels as coefficients estimated based on the sample of 174 companies. This means the 27 companies did not significantly affect estimation results. Thus, the following analysis is based on estimation results for the sample of 174 companies, including those with negative investment.

to hereinafter as the “no supplementary installment sample”), the average values of variables in the supplementary installment samples are 0.067 for investments rates, 0.038 for rates of change in sales, 0.029 for cash flow rates, 0.491 for ratios of debt to assets, and 0.053 for supplementary installment rates. Average values for each variable in the no supplementary installments sample are 0.028 for investment rates, 0.055 for rates of change in sales, 0.051 for cash flow rates, and 0.346 for ratios of debt to assets. Compared to companies in the no supplementary installment sample, those in the supplementary installment sample are characterized by higher rates of investment and ratios of debt to assets but lower rates of change in sales and cash flow.

### 3.3 Regression results

#### 3.3.1 Estimates for the entire sample and subsamples

We estimate investment functions for the entire sample, the supplementary installment sample, and the no supplementary installment sample.<sup>40</sup> The results are shown in Table 6.<sup>41</sup> The results of estimates for the entire sample show that the coefficient for change in sales ( $\beta_1$ ) is positive and statistically significant, indicating that companies adjusted capital stock through investments corresponding to changes in sales. The coefficient of cash flow ( $\beta_2$ ) is positive and statistically significant, suggesting the presence of liquidity constraints arising from factors such as information asymmetry.<sup>42</sup> In addition, the coefficient for the ratio of debt to assets ( $\beta_3$ )

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<sup>40</sup> Although many companies showed zero supplementary installments, this does not mean all of these companies were in the same financial situation with regard to supplementary installments. Statistically, the variable of supplementary installments assumes a correct value when positive but is zero when the correct value is less than zero. Since OLS estimates using such variables as an independent variable can introduce bias, we performed separate estimates for the entire sample, the supplementary installment sample, and the no supplementary installment sample, then compared the results.

<sup>41</sup> Some companies, including companies belonging to three large *zaibatsu* groups, did not release data on depreciation during the interwar period. Previous studies argue that it may be inappropriate to use gross investment as an investment variable for a sample including *zaibatsu* members (Miyajima [2004], p. 234). Since companies whose depreciation data in *Honpo Jigyo-Seiseki Bunseki* is zero may represent such cases, we also estimate investment functions in which another variable is used as a proxy for depreciation. When we assume that the depreciation rates of companies with zero depreciation are average depreciation rates for their respective industries and estimate investment functions using investment and cash flow calculated from the modified depreciation rate, their estimated coefficients are nearly the same as those for the original data, with comparable statistical significance. This result suggests that nondisclosure of depreciation does not significantly affect the estimation in this paper.

<sup>42</sup> In prewar Japan, many shareholders borrowed funds from banks by equity-collateral financing and used the funds to pay for stocks. These investors had a strong preference for dividends, given the obligation to pay interest on such debts (Shimura [1969]). Under these

is negative and statistically significant, suggesting that investments are constrained by excessive debt. These results are generally consistent with those of Miyajima's [2004] estimation.

The coefficient of supplementary installments on part-paid stocks is positive and statistically significant, indicating a positive correlation between supplementary installments and investments.<sup>43,44</sup> Furthermore, the estimated coefficient for supplementary installments ( $\beta_4$ ) is 0.666, indicating a relationship wherein an increase of one unit in stock supplementary installments corresponds to an increase in investment of 0.666 units. This means the effect of supplementary installments on inducing investment exceeds that of cash flow (coefficient  $\beta_2 = 0.305$ ). In Section 2 (Table 3), we showed that more than 70% of the 33 companies mentioned in magazine articles as collecting supplementary installments intended to use the funds for investment (14 companies) or investment and debt repayment (11 companies). These results are consistent with the case studies.<sup>45,46</sup>

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circumstances, a company can accumulate internal reserves for cases involving concrete investment projects, potentially strengthening the link between investment and cash flow.

<sup>43</sup> We also examine means of fund-raising other than supplementary installments. For fund-raising by the 174 companies in the sample (on a stock basis, as of the end of the fiscal year of 1931), stocks had the highest weight (43.7% of total assets as of the end of the fiscal year of 1931), followed by bonds (22.1%). Thus, we estimate investment functions using the balance of bonds issued as an independent variable. However, the results were statistically insignificant. While we find no positive correlation between the balance of bonds issued and investment, we confirm a positive correlation between supplementary installments on part-paid stock and investment, suggesting the importance of the part-paid stock system in corporate finance as of fiscal 1932. Stock finance consists of capital increases (initial payments) and supplementary installments. Given the difficulty in fiscal 1932 of carrying through a capital increase requiring approval at a shareholders' meeting, only two firms in the sample made the attempt. Given the very small number of companies conducting a capital increase, we omit the corresponding analysis. We do not focus on bank loans for the following reasons: First, data on bank loans is not necessarily available for the sample. *Honpo Jigyo-Seiseki Bunseki* and *Kabushiki Gaisha Nenkan* do not differentiate bank loans from other liabilities. Second, in the prewar period, notes payable, which originally represented inter-company credit, included bank loans (i.e., notes payable issued to banks) to an extent that cannot be disregarded (Fujino and Teranishi [2000]).

<sup>44</sup> Research on the relationship between fund-raising methods and corporate investment in the present Japanese firms includes Suzuki [2001] and Ogawa [2003].

<sup>45</sup> What funding source shareholders used to pay supplementary installments remains open to question. Although shareholders in prewar Japan are known to have borrowed funds from banks using equity-collateral financing—that is, borrowing against the same stocks on which a company called for supplementary installments and other stocks—the relative significance of such borrowings in each period remains unclear (Kataoka and Teranishi [1996]). Here, we address the possibility that in certain cases covered in Section 2, shareholders may have borrowed from banks against the very stocks on which a company called for supplementary installments, using those funds to pay supplementary installments. As seen in Section 2, the price of Dai-Nippon Sugar's third issue of shares, on

While estimates for the supplementary installment sample indicate that the coefficient for change in sales and the coefficient for stock supplementary installments are positive and statistically significant, we are unable to obtain statistically significant results for the coefficients of cash flow and the ratio of debt to total assets. Although a wide range of reasons may explain these results, one possible interpretation is that supplementary installments eased liquidity constraints and debt constraints on corporate fund-raising. The estimate for the no supplementary installment sample shows that the coefficient of change in sales is positive and statistically significant; the coefficient of cash flow is positive and statistically significant; and the coefficient of the ratio of debt to total assets is negative and statistically significant. (The estimate excludes supplementary installments, since the sample consists of companies that did not collect supplementary installments.) Based on the results of estimates for the entire sample, the supplementary installment sample, and the no supplementary installment sample, the capital investment function

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which the company called for a 12.5-yen supplementary installment, was 1.3 yen, while that of Oita Cement's shares on which the company called for a 6.5-yen supplementary installment was 0.20 yen. Both stocks at that time were valued significantly below the amount of their supplementary installments. In addition, the price of Shirokiya's new shares, on which the company called for a 5-yen supplementary installment, were approximately six yen. Since a collateral weight over market price was not 80% or more for stocks in principal (see Hattori [1914], Kasuga [1925], Ikeda and Oyachi [1929]), it appears likely that the collateral value of Shirokiya's new shares was less than the supplementary installment amount. In these cases, we can conclude that shareholders would have encountered difficulty raising funds for payment via equity-collateral financing using as collateral the stocks on which the companies called for supplementary installments; and that they instead paid supplementary installments by drawing on their own private funds or by other means (including borrowing from banks using other stock holdings as collateral).

<sup>46</sup> Numerous previous studies showed that banks during the Meiji Era did not lend to joint-stock companies or to other firms directly, but to merchants, landowners, and other individuals through equity-collateral financing. These individuals in turn provided funds to joint-stock companies in the form of subscriptions for shares or in other forms (for some recent studies, see Teranishi [2007], Ishii [2007], Institute for Monetary and Economic Studies, Bank of Japan [2006]). Teranishi [1982] argued that given the crude state of bank credit investigations and accumulated information on borrowers during the Meiji Era, economic agents in positions superior to those of banks with respect to information on the creditworthiness of borrowers often served as intermediaries between banks and borrowers. He defined such financial intermediation as "duplicated intermediation" and gave examples of *toiyasei maegashi kinyu* ("advance-payment financing system by wholesalers") used in the thread-making industry, trading-company finance in the spinning industry, and finance by rice merchants, landowners, and others in agriculture, in addition to equity-collateral financing. Such mechanisms may have continued to function into the early 1930s, and it is possible bank funds invested in companies via shareholders, who could more effectively monitor companies when business conditions declined. This issue requires further study.



based on the entire sample appears to incorporate the relationship seen for the supplementary installment sample (in which part-paid stock increases capital investment) and the relationship in the no supplementary installment sample (whereby cash flow increases and the ratio of debt to total assets constrains capital investment).

### 3.3.2 Effects of supplementary installments on liquidity constraints: An analysis using an intersection term

Now we consider the relationship between corporate investment, supplementary installments, and liquidity constraints. We estimate investment functions by adding the intersection term for supplementary installments and cash flow ( $SI/K \cdot CF/K$ ) to our independent variables.<sup>47</sup>

$$I/K = \alpha + \beta_1 \Delta Y/K + (\beta_2 + \beta_c SI/K) CF/K + \beta_3 DE/AS + \beta_4 SI/K + \Delta \gamma \text{Dummy} + \varepsilon$$

At a company collecting supplementary installments, we would expect a decline in the effects of cash flow with relaxed liquidity constraints. That is, the coefficient of cash flow ( $\beta_2 + \beta_c SI/K$ ) would be smaller for such companies than for companies not collecting supplementary installments (coefficient:  $\beta_2$ ), meaning  $\beta_c$  should be negative. The expected signs for coefficients  $\beta_1$ ,  $\beta_2$ ,  $\beta_3$ , and  $\beta_4$  are the same as in the preceding investment function.

Table 7 shows the results of regression.  $\beta_c$  is negative and statistically significant, while the estimated values for the other coefficients have the expected signs and are statistically significant, suggesting that supplementary installments ease liquidity constraints. The extent to which the intersection term reduces the cash flow coefficient depends on the scale of the supplementary installments ( $SI/K$ ). For example, while the coefficient of cash flow is 0.342 ( $= \beta_2$ ), if supplementary installments ( $SI/K$ ) are zero, it declines to 0.301 if the level is the average value for the entire sample (0.007) and to 0.035 if the level is the average value for the supplementary installment sample (0.053).

These results are consistent with the case study in Section 2, suggesting that

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<sup>47</sup> Miyajima [2004] examined the effects of the type of corporate governance, including the corporate governance typical of the firms affiliated with three large *zaibatsu*, based on an analysis of the intersection term between variables representing the structure of corporate governance and cash flow.

in the early 1930s, under the capital system of joint-stock companies with part-paid stock, supplementary installments eased liquidity constraints on companies and increased corporate investment. Still, certain precautions are in order when interpreting these results. First, the estimated investment function is for a single point in time: fiscal 1932. Since adjustment costs accompany investment, adjustments to the optimal capital stock would not occur immediately due to investment in a single period, but gradually through investments over multiple periods. In addition, the function of supplementary installments may vary over time. For example, it is unclear what effects supplementary installments would have on a company's cash management and investment if financial markets eased.<sup>48</sup> Future research needs to address these points by extending the sample periods. Furthermore, while supplementary installments appear to promote investment in times of increasing demand, it remains unclear whether they increased company value or productivity.<sup>49</sup> Another topic requiring further study is why so many shareholders complied with requests for supplementary installments and where they obtained the funds to do so.

#### **4. Concluding remarks**

Supplementary installments on part-paid stocks under prewar Japan's capital stock system of joint-stock companies represented a fund-raising tool with which companies could determine the amount and timing of payments. Since the Commercial Code and articles of association specified sanctions if shareholders failed to comply with calls for payment, the system functioned as an effective fund-raising last resort. This paper considered the effects of supplementary installments on corporate finance and investments in the early 1930s. We first outlined how part-paid stocks and multiple installments on stocks in joint-stock company were introduced and legislated. The system was initially adopted by companies such as national banks and insurers, playing a major role in the spinning and railway industries. The system was

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<sup>48</sup> A comparison of corporate fund-raising methods in fiscal 1932 and fiscal 1936 shows that the weight of supplementary installments in 1936, when financial markets were less constrained than in 1932, was lower. Based on a common sample of 160 companies for which information is available at both points in time, the ratio of supplementary installments to total funds raised—with the latter representing the sum of capital increases (first payments), supplementary installments, bonds, and other long-term debts (including bank loans)—was 62.5% in 1932, compared to 49.0% in 1936. This suggests that supplementary installments played a more important role in 1932, when financial markets were tight.

<sup>49</sup> For example, in bubble periods, such as the boom following World War I, supplementary installments may have led to excessive investment.

incorporated into the Commercial Code of Japan, following inclusion in Roesler’s draft of the Commercial Code. Historical materials, including financial statements and company histories, indicate that companies during the interwar period across a wide range of industries, including Tokyo Underground Railway, Dai-Nippon Sugar, Oita Cement, Keio Electric Railway, and Ujigawa Electric Power, called for supplementary installments and used the funds thus raised for investments and debt repayment.

In addition, we constructed a new company financial data set incorporating data on supplementary installments from *Honpo Jigyo-Seiseki Bunseki* and *Kabushiki Gaisha Nenkan*, estimating cross-sectional investment functions for fiscal 1932. The regression results suggest that while liquidity constraints and debt constraints hurt corporate investment, supplementary installments helped offset these conditions, improving liquidity and promoting investment. Although financial markets tightened and corporate investment activities were relatively inactive in the early 1930s, supplementary installments helped stem further declines in investment.

In considering economic development and corporate behavior in prewar Japan, one must keep in mind that these events and trends occurred under institutional frameworks and financial structures that differ from those in place today. Some business and economic historians emphasize the role of Takahashi’s economic policies in the recovery from the Showa depression – namely, allowing exchange rates to fall without interference, high public expenditures, and low interest rates.<sup>50</sup> Others argue that the economy and financial systems of interwar Japan had the efficiency and flexibility to adjust to and overcome external shocks, including the worldwide economic depression (Great Depression).<sup>51</sup> From the latter perspective, we examined the relationship between supplementary installments and corporate finance and investment, concluding that the part-paid stock system helped stabilize corporate cash management and encouraged investment. We believe future research should address a broader range of aspects of financial and corporate systems during interwar Japan.

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<sup>50</sup> A significant body of literature examines Takahashi’s economic policies. See, for example, Nakamura [1971], Miwa [1982], Ito [1989], and Cha [2003].

<sup>51</sup> Representative research includes Hashimoto [1984], who argued that productivity, backed by flexible labor markets, improved during the Showa depression. He referred to the high potential of the Japanese economy to respond to shocks as “strong Japanese capitalism.” Nanjo [2002] argued that despite the rise in nonperforming loans attributable to falling land prices, the banking system in Japan retained its overall soundness due to high shareholder equity ratios, which served as a buffer against losses.

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Table 1

## Payment for stock of Osaka Cotton Spinning

(Units: yen)

Payment amount collected	Amount collected per share	Use of funds
12,500.00	5	Startup costs
47,850.00	19.14	First machinery expenditures
41,167.50	16.467	Second machinery expenditures
35,805.00	14.322	Third machinery expenditures
30,000.00	12	First mill construction expenditures
30,000.00	12	Second mill construction expenditures
27,677.50	11.071	Remaining balance of machinery and construction expenditures
25,000.00	10	Plant construction and operating capital
250,000.00	100	Total

Source: Osaka Cotton Spinning, *Income Statement of Osaka Cotton Spinning, June 30, 1883*

Table 2

## Number of shares and amount paid-in on Japan Railway's first offering of shares (1882–1886)

(Units: shares, yen)

	Number of shares	Amount paid-in	Amount paid in per share
June 30, 1882	116,330	557,798	4.79
December 31, 1882	115,491	685,867	5.94
June 30, 1883	119,500	1,243,278	10.4
December 31, 1883	119,500	2,442,103	20.44
July 1, 1884	119,314	3,821,872	32.03
December 31, 1884	119,314	4,058,386	34.01
June 30, 1885	119,314	4,582,348	38.41
December 31, 1885	119,314	4,784,692	40.1
June 30, 1886	119,314	5,006,288	41.96
December 31, 1886	119,314	5,241,772	43.93

## Notes:

(1) The subsequent paid-in amounts after December 31, 1886 are unclear. Payment was completed over the period from April 1 through September 30, 1888.

(2) As of June 30, 1885, the second offering of shares was for 117,276 shares, with a paid-in amount of 580,300 yen.

Source: *Financial Report of Japan Railway*

Table 3

Purpose of collection of payment

(Units: cases)

Year	Period	Investment	Both	Repayment	Total
1930	January–June	1	3	0	4
	July–December	2	1	3	6
1931	January–June	5	4	2	11
	July–December	0	1	2	3
1932	January–June	0	2	0	2
	July–December	6	0	1	7
Total		14	11	8	33

Notes:

(1) Categorized by purpose of collecting payment, as reported in journals.

(2) Categorized by month of payment collection.

Source: Articles over the period from 1930 through 1932 in *Economist*, *Diamond*, and *Toyo Keizai Shimpo*

Table 4

Financial and economic developments in the early 1930s

	1929	1930	1931	1932	1933	1934
Real GNP (year-on-year percentage change)	0.5	1.1	0.4	4.4	10.1	8.7
Personal consumption	-0.7	0.4	2.2	-1.4	6.8	6.3
Private-sector capital investment	7.0	4.5	-22.7	-14.2	31.0	39.6
Residential investment	10.5	-11.0	4.3	3.7	0.0	3.2
Government expenditures	-2.2	-4.3	15.7	13.3	6.5	-4.3
Exports	10.1	1.2	5.4	19.4	5.8	28.6
Imports	4.1	-6.0	13.7	-2.8	-2.8	12.9
GNP deflator (year-on-year percentage change)	-1.7	-10.9	-9.6	-1.8	2.1	1.7
Interest rate on bills (June, average, %)	8.4	8.0	8.1	8.4	8.0	7.4
Lending balances of ordinary banks (year-on-year percentage change)	-4.0	-5.9	-3.3	-4.7	-3.1	-2.5
Payments on company bonds (millions yen)	577	149	184	243	911	1,458
Payments on stock (millions yen)	399	197	185	149	448	577
Stock price index (June; Jan. 1924 = 100)	104.1	74.0	73.5	69.9	98.9	116.6
Land prices (rice paddies; yen/tan)	480	447	372	353	351	361

Sources: *Estimates of long-term economic statistics*, *Annual Report of the Banking Bureau*, *Statistics of Capital paid for loans and stocks*, *Statistics of bonds, notes and shares*

Table 5

## Descriptive statistics on sample data

## (1) Entire sample (174 companies)

	Average	Standard deviation	Minimum	Maximum
Capital investment rate (I/K)	0.033	0.070	-0.358	0.347
Increase/decrease rate of sales (DY/K)	0.053	0.174	-0.299	1.410
Cash flow rate (CF/K)	0.048	0.063	-0.110	0.430
Debt/total assets (DE/AS)	0.363	0.197	0.005	0.895
Stock supplementary installment rate (SI/K)	0.007	0.027	0.000	0.208

## (2) Supplementary installment sample (22 companies)

	Average	Standard deviation	Minimum	Maximum
Capital investment rate (I/K)	0.067	0.080	-0.027	0.250
Increase/decrease rate of sales (DY/K)	0.038	0.084	-0.023	0.343
Cash flow rate (CF/K)	0.029	0.052	-0.033	0.197
Debt/total assets (DE/AS)	0.491	0.135	0.128	0.790
Stock supplementary installment rate (SI/K)	0.053	0.058	0.000	0.208

## (3) No supplementary installment sample (152 companies)

	Average	Standard deviation	Minimum	Maximum
Capital investment rate (I/K)	0.028	0.068	-0.358	0.347
Increase/decrease rate of sales (DY/K)	0.055	0.183	-0.299	1.410
Cash flow rate (CF/K)	0.051	0.066	-0.110	0.430
Debt/total assets (DE/AS)	0.346	0.197	0.005	0.895
Stock supplementary installment rate (SI/K)	—	—	—	—

Sources: *Honpo Jigyo-Seiseki Bunseki, Kabushiki Gaisha Nenkan*

Table 6

Estimation results of capital investment function (FY 1932)

	Entire sample (174 companies)		Supplementary installment sample (22 companies)		No supplementary installment sample (152 companies)	
	Estimated value	t-statistic	Estimated value	t-statistic	Estimated value	t-statistic
Constant (a)	0.020 **	2.21	-0.028 *	-1.79	0.017 *	1.77
Increase/decrease in sales (b1)	0.083 ***	2.75	0.294 *	1.84	0.080 ***	2.62
Cash flow (b2)	0.305 ***	2.97	—	—	0.343 ***	3.22
Debt/total assets (b3)	-0.070 **	-2.52	—	—	-0.064 **	-2.18
Stock supplementary installment (b4)	0.666 ***	2.64	0.921 **	2.76	—	—
adjusted R2	0.359		0.719		0.323	

Notes:

1. Estimated by ordinary least squares (OLS) and applied White correction.
2. The symbols \*\*\*, \*\*, and \* denote the statistical significance at the 1 percent, 5 percent, and 10 percent levels, respectively.
3. Industry dummy variables omitted.

Table 7

Estimation results for the model including the intersection term  
(FY 1932, 174 companies)

	Estimated value	t- statistic
Constant (a)	0.017 *	1.91
Increase/decrease in sales (b1)	0.079 ***	2.63
Cash flow (b2)	0.342 ***	3.32
Cash-flow x stock supplementary installment (bc)	-5.795 ***	-4.97
Debt/total assets (b3)	-0.067 **	-2.42
Stock supplementary installment (b4)	1.128 ***	6.36
adjusted R2	0.385	

Notes:

1. Estimated by ordinary least squares (OLS) and applied White correction.
2. The symbols \*\*\*, \*\*, and \* indicate statistical significance at the 1%, 5%, and 10% level, respectively.
3. Sector dummy variable omitted.