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FINANCIAL DISTRESS AND CORPORATE INVESTMENT: THE JAPANESE CASE IN THE 90s

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Abstract

We examine quantitatively the extent to which financial distress in the 90s affected Japanese corporate investment. Based on the firm-level data that includes small, unlisted firms, we estimate investment function to measure the impact of financial distress on investment. We find that the firm's ratio of debt to total asset exerts a significantly negative effect on investment of small firms. We also find that lending attitude of financial institutions did affect investment behavior irrespective of firm size. The impact of lending attitude on investment is notably large for 1998 labeled "credit crunch."

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1. Introduction

Financial liberalization in the 80s prompted Japanese large firms in manufacturing industries to shift from bank borrowing to direct financing in capital market. On the other hand, small firms, especially in nonmanufacturing industries, increased borrowings enormously, mostly collateralized by land. However, land price kept on falling in the 90s, which plunged a number of firms into insolvency. Looking at the problem from the lender's side, the loans they made became non-performing and caused severe damage to the bank's balance sheet.

It is often argued that massive debt outstanding in the corporate sector and the associated bad loan problems are the main cause of long stagnancy of the Japanese economy in the 90s. The purpose of this paper is to examine the impact of financial distress on the real economy quantitatively. Specifically we estimate the extent to which firm's investment is affected by high leverage in the corporate sector and bad loan problems in the banking sector.

There are three features in this study. First of all, we analyze the relationship between debt accumulation and investment using the firm-level data. The micro data set we utilize is taken from the Annual Report of Financial Statements of Incorporated Business or *Hojin Kigyo Tokei Nenpo* of the Ministry of Finance. It includes not only large firms listed in stock exchange but also unlisted small firms. Since small firms are more bank-dependent, investment of small firms might be affected more sensitively by debt outstanding of their own and bad loan problem of banking sector. The sample period covers the period of 1993 to 1998 that includes the financial turmoil labeled "credit crunch" in Japan. There are none that investigate investment behavior by utilizing firm-level data including small firms.

Secondly, we deal with not only financial leverage in the corporate sector but also bad loan problems in the banking sector. Debt accumulation in the corporate sector might raise the firm's borrowing cost, while lingering bad loans in the bank's balance sheet might lead to a reduction of bank loans, which might directly affect the investment expenditure of bank-dependent firms. Investigation into these two problems simultaneously has important policy implications. If high leverage is found to be a

significant factor to affect investment, policy prescriptions to speed up the restructuring of firm's balance sheet will be needed. On the other hand, if bad loan problems turn out to affect investment expenditure, wipeout of bad loans will be an urgent agenda for policymakers.

Thirdly, it is quite difficult to estimate the effect of loan supply on investment from observed data of bank loans due to the identification problem of supply and demand conditions. Therefore it is necessary to select the variable purely representing the supply condition of loans. Fortunately the Bank of Japan *Tankan* (Short-term Economic Survey of Corporations) records the diffusion index of 'banks' willingness to lend' that can be a good proxy of the supply condition of loans. The data is available by industry and firm size, so that it is possible to test whether the impact of supply conditions of loans on investment varies across firms with different size. Motonishi and Yoshikawa (1999) is the first to estimate the investment function with this diffusion index as one of the explanatory variables to estimate the effect of credit crunch on investment. They use the aggregated data and this study is the first attempt to use the same approach to firm-level data.

We preview the main findings of this study. First the firm's ratio of debt to total asset exerts a significantly negative effect on investment for small firms. Furthermore the effect of debt on investment is statistically smaller for large firms. This finding lends support to the debt overhang argument that lingering debt chokes off new investment. It is also consistent with the asymmetric information literature that external finance premium is inversely associated with the collateralized net worth relative to loan size. Secondly, the lending attitude of financial institutions has significant effect on investment irrespective of firm size. It implies that bank health is important for investment activities of large firms as well as small firms that are bank-dependent. This finding is consistent with the work of Gibson(1995 and 1997) and Kang and Stulz(2000) that are based on micro data of large listed companies. The effect of lending attitude of financial institutions on investment is notably large for 1998 often identified as the year of credit crunch.

This paper is organized as follows. The next section reviews the theoretical and

empirical literature on the impact of financial distress on investment. Section 3 specifies investment function to be estimated and explains the data set used for empirical analysis. Section 4 explains the estimation results of investment function and discusses the implications derived from the estimation results. Section 5 gives concluding remarks.

2. Financial Distress and Investment: Theory and Evidence

Before proceeding to the formal analysis, we review the theoretical arguments and empirical evidence in Japan how the balance sheet conditions of banks as well as firms affect corporate investment. It is well known that the balance sheet conditions of debtor affect the cost of raising external funds under capital market imperfections. When there exists asymmetric information between debtors and creditors, it will drive a wedge between the cost of external finance and internal finance, called *external finance premium*. External finance premium reflects the creditor's cost of collecting the debtor's information and monitoring the debtor's behavior and the cost arising from lemon problem or moral hazard problem. The premium for external funds influences the cost of external funds and thereby affects economic activities of the debtor.

The importance of this view has been frequently stressed in investment literature since it cast serious doubt on the celebrated Modigliani-Miller theorem that the financial policy is irrelevant in investment decision. Contrary to the verdict of the theorem, the cost of internal fund is lower than that of external fund and thus investment is influenced by the availability of internal fund.[1] Furthermore, the external finance premium is inversely associated with the borrower's collateralizable net worth relative to the loan. An adverse shock to the borrower's net worth increases the external finance premium and reduces borrowings as well as investment.[2] Note that the external finance premium is not equally imposed on borrowers. The external finance premium might be higher for small borrowers for several reasons. First, large borrowers have large collateralizable net worth that helps to diversify unobservable idiosyncratic risk, while small borrowers do not. [3] Secondly, as is discussed below, a number of large firms in Japan belong to industry groups known as *keiretsu*, where main bank plays a central role in mitigating the informational asymmetry between lenders and borrowers.

Another channel through which corporate debt affects investment is by creating debt overhang. Debt overhang is defined as deterrence of new investment by debt outstanding. It occurs when the debt outstanding is greater than the net present value of investment project since the benefits from new investment will go to the existing creditors rather than to the new investors. [4]

It is often pointed out that the damaged balance sheet of borrowers is one of the factors to explain the long stagnancy of investment by Japanese firms in the 90s. The story goes as follows. The borrowing of Japanese firms increased enormously in the late 80s secured by land. Land used to be perfect for collateral in Japan under the expectation that the land price would never fall. In other words land can be a very useful device to reduce the external finance premium. In fact, based upon the aggregated time-series data, Ogawa et al. (1996) finds that the external finance premium is reduced by appreciation of land value in the late 80s for non-manufacturing industries that are composed of a number of small firms.[5] Contrary to the expectations, land price fell sharply in the 90s, which eroded the firm's collateralizable net worth with the loan outstanding almost intact, which raised the external finance premium considerably and thereby decreased investment. Moreover the debt overhang argument above lends further support to the stagnancy of new investment due to excessive debt outstanding in the corporate sector.

Recently attention has been also paid to the balance sheet of banks as one of the important determinants to affect the real activities of firms. [6] Banks play an intermediary role in mitigating asymmetric information between lenders and borrowers. Banks examine the request for loans by borrowers by collecting the information of borrowers and monitor the borrowers so that the contract may be fulfilled. However, if there are a large number of lenders, free-rider problem discourages individual banks from monitoring the borrowers. Thus a single "delegated monitor" can conserve on aggregate monitoring costs.[7] In particular the saving of monitoring cost is large for small and medium-sized firms for which there are few alternative ways of raising external funds.

It is also noted that in Japan institutional device called *main bank system* is potent

in narrowing the informational asymmetry between lenders and borrowers. Information of borrowers is accumulated in main banks through long-term, stable relationships of firms with their main banks. Moreover, bank employees often hold management positions in the financially troubled firms for the purpose of direct monitoring.[8]

However, note that accumulation of borrower's information into a single bank creates an informational monopoly with respect to its client. This lock-in effect makes it difficult for borrowers to switch lenders.[9]

If a shock to the bank's balance sheet affects lending, it will influence the real activities of bank-dependent borrowers. Suppose that an adverse shock hits the bank's balance sheet. It raises the cost of external finance for the bank for the same reason as was discussed in the case of non-financial firm and thereby restrains the bank's lending activity. Then it will lead to aggravation of the real activities of the bank-dependent borrowers.

Empirical studies on the effects of balance sheet shock on bank lending have mainly examined two types shocks on the bank's balance sheet. One type of shock is monetary policy shock. Kashyap and Stein(1995,2000) examine how the monetary policy change affects the bank's lending. They find that the response of lending to the monetary policy change varies across banks with different attributes. The impact of monetary policy on lending activities is more pronounced for smaller banks with less liquid balance sheets.

Another strand of research examines the causes of contraction of bank lending in the period labeled "credit crunch." It is not hard to identify the period of credit crunch in several countries. For instance, the early 90s in the US has been labeled credit crunch and a number of hypotheses on the decline in bank credit have been advocated and tested. Among them include the shocks that affect bank capital, such as implementation of the Basel-Accord risk-based capital standards, depletion of bank capital from loan loss experiences in the late 80s. [10]

As for Japan, there are also similar studies that examine whether the shocks to bank capital affect lending behavior of banks. In Japan the late 90s is often identified as the period of credit crunch when large financial institutions went into bankruptcy due to

severe bad loan problems. Yoshikawa et al. (1994) tests whether the bad loan problem led to contraction of bank credit to small firms and found no correlation between the level of bad loan and bank lending. Peek and Rosengren(1997) showed that contraction of bank lending by Japanese banks in the US resulted from the binding risk-based capital requirements associated with the Japanese market decline. Honda (1996), Ito and Sasaki (1998), and Ogawa and Kitasaka (2000) analyze the effect of risk-based capital requirements on bank lending. They found that the introduction of risk-based capital requirements affects bank lending of city banks. Woo(1999) found a positive and statistically significant correlation between bank capital and lending growth in 1997 and concludes that the shortage of bank capital is mainly responsible for contraction of bank lending.

Combining the evidence that the shocks to bank's balance sheet affects lending behavior with the existence of bank-dependent borrowers, it follows that the balance sheet conditions of banks influence the real activities of firms.

Gibson(1995 and 1997) and Kang and Stulz(2000) conduct direct tests of the impact of bank health on investment activities. The former studies found that the impact of bank health on investment was small, while the latter found that more bank-dependent firms invested less in early 90s. Note that these two studies are likely to underestimate the impact of bank health on investment since they use individual firm data listed in Tokyo Stock Exchange. Those firms are relatively large and not necessarily bank-dependent borrowers.

Motonishi and Yoshikawa (1999) and Ogawa and Kitasaka (2000) show that bank lending exerts a significant effect on investment. Using the Bank of Japan diffusion index of 'banks' willingness to lend,' Motonishi and Yoshikawa obtain the evidence that bank lending is a significant determinant of business investment of small firms, but not large firms. Ogawa and Kitasaka also show that expenditures on fixed investment are sensitively affected by bank loans for small firms that do not have close substitutes of bank loans. Note that the empirical evidence of these two studies is based on the aggregated data.

3. Specification of Investment Function and Data Set Description

Specification of Investment Function

The basic investment function to be estimated is a q-type investment function with the variables representing the degree of financial distress. The main driving force of investment is marginal q (Mq), present discounted value of maximized profit rate divided by the investment goods price. In other words, the marginal q is defined as:

$$Mq_t = \frac{1}{p_t^I} E_t\left[\sum_{j=0}^{\infty} \beta_{t+j}(1-\delta)^j \pi_{t+j}\right] \qquad (1)$$

where p_t^I : price of investment goods in period t

$$\beta_{t+j} = \prod_{i=1}^{j}(1+r_{t+i})^{-1}, \quad (j = 1,2,\cdots), \quad \beta_t \equiv 1$$

r_{t+i} : discount rate in period t+i

δ : depreciation rate

π_{t+j} : profit rate, defined as the maximized profit divided by the capital stock at the end of t+j-1 period

$E_t[\ ]$: expectation operator conditional on the information set available for the firm in period t

We also add the cash flow variable (CFLOW) to measure the availability of internal funds to the explanatory variables. Under asymmetric information between lenders and borrowers, it is expected that cash flow will exert a positive effect on investment.[11]

There are two explanatory variables regarding the severity of financial distress. One is related to the firm's balance sheet condition and is represented by the debt size relative to total asset (DEBT). Higher debt-asset ratio implies a higher cost of external finance. It might also create debt overhang. Both will decrease investment. The other is bank's willingness to lend (LEND). The adverse shock such as bad loan withers the bank's willingness to lend and hence will reduce investment expenditure of bank-dependent borrowers.

As was discussed in the previous section, it is quite plausible that the asymmetric

information problem is more severe for small and medium-sized firms than for large firms. Therefore it might be the case that investment of small and medium-sized firms is more sensitive to the degree of financial distress. To account for the differential impact of financial distress on investment, we introduce two dummy variables on the firm size. One dummy (DUMMY1) takes unity when the firm's equity capital is between one hundred million yen and one billion yen and zero otherwise. The other dummy (DUMMY2) takes unity when the firm's equity capital is above one billion yen and zero otherwise. Then we add the cross terms of two dummy variables with each explanatory variable. This specification takes into consideration the possibility that the coefficient estimates vary across three different firm groups, each of which corresponds to small, medium, and large firm group, respectively. The basic investment function to be estimated is written as follows:

$$\begin{aligned}\frac{I_t}{K_{t-1}} &= \alpha_0 + \alpha_1 Mq_t + \alpha_2 Mq_t \times DUMMY1_t + \alpha_3 Mq_t \times DUMMY2_t \\ &+ \alpha_4 \frac{CFLOW_t}{K_{t-1}} + \alpha_5 \frac{CFLOW_t}{K_{t-1}} \times DUMMY1_t + \alpha_6 \frac{CFLOW_t}{K_{t-1}} \times DUMMY2_t \\ &+ \alpha_7 DEBT_{t-1} + \alpha_8 DEBT_{t-1} \times DUMMY1_t + \alpha_9 DEBT_{t-1} \times DUMMY2_t \\ &+ \alpha_{10} LEND_t + \alpha_{11} LEND_t \times DUMMY1_t + \alpha_{12} LEND_t \times DUMMY2_t + u_t\end{aligned} \quad (2)$$

where I_t : gross investment in period t

K_{t-1} : capital stock at the end of t-1 period

u_t : disturbance term in period t

Data Set Description

The firm data set we use is taken from the Annual Report of Financial Statements of Incorporated Business or *Hojin Kigyo Tokei Nenpo* (abbreviated as ARFS) of the Ministry of Finance. It records individual items of firms' balance sheet as well as profit and loss statement. The virtue of this data set is an extensive coverage of corporations with a variety of firm size for all the industries except financial and insurance industries. The coverage of firms is much wider than the firm database provided by NIKKEI and

Development Bank of Japan, both of which include only the listed large firms.

The sample period is from the fiscal year of 1993 to 1998 and covers the period of financial turbulence in 1997 and 1998. The number of observations in the original data set is 26040, 26218, 26594, 25691, 25394, and 25505 from 1993 to 1998, respectively. Unfortunately there is no identifying the sampled firms, so that the data set cannot be utilized as a panel data set. However the end-of-period value as well as the beginning-of-period value of each balance sheet item is available for each firm. Therefore we can compute the flow values from the stock values for individual firms.

Now we describe the procedure to construct the variables used in estimation. Gross investment (I_t) is defined as the increment of tangible fixed asset excluding land, with depreciation allowance added, divided by investment goods deflator. Capital stock (K_t) is defined as the tangible fixed asset excluding land divided by the investment goods deflator in the year when the capital stock was installed. The installation year of the capital stock is identified by the information of the average years elapsed since installation, which is taken from the 1998 White Paper on the Japanese Economy. Cash flow $(CFLOW_t)$ is defined as net income plus depreciation allowance minus bonus to directors, and dividends including interim dividends. The real cash flow is obtained by dividing the cash flow by the value-added deflator of the industry the firm belongs to. The debt-asset ratio $(DEBT_{t-1})$ is defined as the ratio of borrowings and bonds payable to total assets at the end of period t-1. The lending attitude of financial institutions $(LEND_t)$ is taken from the Short-term Economic Survey of All Enterprises called *Tankan*, conducted by the Bank of Japan. It is the diffusion index and represents the proportion of entrepreneurs feeling the present lending attitude of financial institutions to be "accommodative" minus those feeling the present lending attitude of financial institutions to be "severe". The data are available by industries and three firm-size groups (small, medium and large firm group) classified by regular employees.[12]

In constructing the marginal q (Mq_t) series special attention should be paid to the stochastic property of the two underlying factors: discount rate (r_t) and profit rate (π_t). The discount rate is computed as the interest and discount paid divided by the sum

of discount of notes receivable, short-term loans payable, long-term loans payable and bonds payable. The profit rate is defined as the ratio of operating profit to the beginning-of-period capital stock. It is assumed that the discount rate and the profit rate follow random walk independently. In other words,

$$r_{t+1} = r_t + u_{t+1} \qquad (3)$$

$$\pi_{t+1} = \pi_t + v_{t+1} \qquad (4)$$

where u_{t+1}, v_{t+1} : stationary white noise

Then it can be shown that the marginal q is simply written as

$$Mq_t = \frac{\pi_t}{p_t^I} \frac{1 + r_t}{r_t + \delta} \qquad (5)$$

The depreciation rate δ is assumed to be 7.72 % per annum. [13]

We cannot utilize all the observations mainly due to unavailability of balance sheet items. Therefore we choose the observations for estimation based on the following three criteria. First, we exclude the firms in agriculture, forestry, fishery and mining industries since the data of lending attitude of financial institution are not available for these industries. We also exclude the firms in electric power and gas industries due to regulatory nature of these industries. Secondly, some of the balance sheet items are unreported for a number of firms, notably small firms. Therefore we choose only the firms that report the following balance sheet items: tangible fixed asset excluding land and construction in progress, total assets, equity capital, sales, depreciation allowance, and number of employees. Thirdly, we retain the observations that satisfy all of the following conditions: 1) absolute value of the ratio of investment to the beginning-of-period capital stock is less than unity 2) absolute value of the ratio of cash flow to the beginning-of-period capital stock is less than 5 3) the ratio of sales to the beginning-of-period capital stock is less than 50 4) marginal q is less than 10 5) the ratio of borrowings and bonds to total assets is less than unity 6) the sum of

interest and discount paid is positive.

The information of the sample finally chosen is shown in Table 1. The figures in parentheses at the bottom row show the proportion of the observations used for estimation out of total observations. It is the lowest for small firm group, varying from 34%(1998) to 41.7%(1993), while it is the highest for large firm group, from 68.2%(1996) to 72.6%(1993). It is in between for medium firm group. The distributional information of the sampled firms across industries is also shown in the table. The proportion of manufacturing firms hovers around 40% for small and medium firm groups. On the other hand it is much higher for large firm group, varying from 51.1%(1998) to 55.8%(1993). The proportion of firms in construction industry is notably high around 16% for small firm group, while it is at most 6% for medium and large firm groups. In the medium firm group the proportion of firms in service industries is second highest (around 15%) to that in manufacturing industries.

Table 2 shows the median and mean values of gross investment, capital stock and total assets for the sample firms. The mean value is much higher than the median value for all the variables, implying that the distribution of firms is skewed to the right. The median of capital stock and total assets of large (medium) firms is 80 to 100 (17 to 20) times larger than that of small firms. As for the median of gross investment of large (medium) firms, it is 180 to 240 (24 to 32) times larger than that of small firms.

Figure 1 to 4 depicts the median values of gross investment rate, ratio of cash flow to the beginning-of-period capital stock, marginal q, and debt-asset ratio for each firm group from 1993 to 1998. The gross investment rate is always highest for large firm group, followed by medium firm group. The trend of the gross investment rate is common to all the firm groups. The gross investment rate increases gradually up to 1997 and declines in 1998. The ratio of cash flow to capital stock is highest for small firm group, though it declines gradually over time. This ratio is rather stable for medium and large firm groups. We observe the common declining trend of marginal q from 1996 to 1998 for every firm group. From 1993 to 1996 the marginal q exhibits an increasing trend for large firm group, although it is rather stable for small and medium firm groups. The debt-asset ratio is highest for small firm group, ranging from 0.47 (1993) to

0.51(1996,1998), followed by medium firm group hovering around 0.42 to 0.43. It is by far lowest for large firm group from 0.31(1997) to 0.33(1994). The debt-asset ratio exhibits a gradual declining trend for large firm group, while it increases slightly over time for small and medium firm groups.

Figure 5 shows the diffusion index of lending attitude of financial institutions for three firm groups in the period of 1993 to 1999. It is clear that the lending attitude becomes very severe in the last quarter of 1997. Note that large financial institutions such as Yamaichi Securities and The Hokkaido Takushoku Bank went into bankruptcy on November in 1997. The proportion of "severe" respondents has by far exceeded that of " accommodative" respondents since the first quarter of 1998.

4. Estimation Results of Investment Function and Their Implications

Estimation Results of Basic Investment Function

Equation 2 is estimated separately for each year since the lending attitude of financial institutions changed drastically across years, as was seen in the previous section, and the response of investment to lending attitude might change accordingly. Dummy variables to represent individual industry effect are added to the explanatory variables in estimation. Estimation results of q-type investment function are shown in Table 3. It is found that the investment behavior is quite different across different size group. In none of the sample years the marginal q exerts a significantly positive effect on investment for small firm group. On the other hand, the effect of marginal q on investment for large firm group is statistically larger than that for small firm group for all the sample years. The total effect of marginal q on investment for large firm group as well as medium firm group is computed by adding the coefficient estimate of the cross term of marginal q with firm group dummy to that of marginal q. They are shown in Table 4. Note that the effect of marginal q on investment for large firm group is positive for all the sample years. This is quite contrasted with the negative marginal q coefficients of small firm group for all the sample years. The effect of marginal q on investment for medium firm group is also significantly larger than that for small firm group for 1993, 1994, 1996 and 1997. The total effect of marginal q on investment for

medium firm group is also positive for all the sample years.

Contrary to the role of marginal q in investment behavior, cash flow exerts a significantly positive effect on investment for small firm group for all the sample years. The effect of cash flow on investment for large firm group is significantly lower than that for small firm group for all the sample years. Table 5 shows the total effect of cash flow on investment. The size of cash flow coefficients varies from 0.1354 (1998) to 0.2279 (1993) for small firm group, while it is only from 0.0073 (1998) to 0.0890 (1996) for large firm group.

As for the effect of debt-asset ratio on investment, it is significantly negative for small firm group for all the sample years. It is consistent with debt overhang hypothesis and the theoretical verdict from asymmetric information literature that higher debt-asset ratio raises the cost of external finance and hence decreases investment. Note that the effect of debt-asset ratio on investment is significantly smaller for large firm group for 1993, 1994, 1995 and 1997. The total effect of debt-asset ratio on investment, shown in Table 6, varies from –0.1069(1997) to –0.0668(1998) for small firm group, while it is –0.0878 (1998) to –0.0240 (1993). Our findings indicate that the agency problem is particularly severe for small firms that have few alternative ways other than bank loans to finance investment.

Lending attitude of financial institutions has significantly positive effects on investment of small firm group for all the sample years. Furthermore, the cross terms of the firm size dummy with the lending attitude variable are insignificant for most of the cases. In fact no systematic difference can be detected from total effects of lending attitude on investment for three firm groups classified by firm size, shown in Table 7, except for 1997 and 1998. It implies that lending attitude of financial institutions does influence firm's investment activities irrespective of firm size. Small and medium firms are mostly bank-dependent, so that it is quite plausible that lending attitude of financial institutions has significant effect on investment. However, our results show that it is also the case with large firm group. This finding supports the evidence by Gibson(1995 and 1997) and Kang and Stulz(2000) that bank health is important for investment of listed firms. As was shown in Figure 5, the lending attitude of financial institutions was

accommodative during 1993 to 1996. Even under such accommodative circumstances, lending attitude of financial institutions did matter for investment. Then it is expected that lending attitude of financial institutions would be all the more important for investment activities for the period of 1997 and 1998 labeled "credit crunch" when the bank health was impaired by mounting non-performing loans and the steep drop in Japanese stock prices, which turned lending attitude of financial institutions very severe. In fact our evidence shows that this is the case. The effect of lending attitude on investment of small firm group jumped to 0.2285 in 1998 from 0.0842 in 1997. However, the cross terms of firm size dummy with lending attitude in 1998 are significantly negative for medium and large firm groups, indicating that the effect of lending attitude on investment was somewhat mitigated for larger firm groups.

Robustness of Findings

We obtained the findings that firm's debt-asset ratio as well as lending attitude of financial institutions did affect the firm's investment activities. We will show that these findings are quite robust with respect to specification of investment function. Investment function is re-estimated under two different specifications to reexamine the effects of debt-asset ratio and lending attitude of financial institutions on investment.

First of all, we estimate the accelerator-type investment function where the marginal q variable is replaced by the sales variable. The estimation results are shown in Table 8. The debt-asset ratio exerts a significantly negative effect on investment for small firm group in all the sample years. Moreover, the effect of debt-asset ratio on investment is significantly less for large firm group in 1993, 1994, 1995 and 1997. The lending attitude of financial institutions also affects investment of small firm group in a significantly negative manner for all the sample years. The magnitude of the effect of lending attitude on investment is not discernibly different between small firm group and larger firm groups except for a few years. In 1998 the effect of lending attitude on investment becomes notably large for small firm group, while it is significantly less for medium and large firm groups.

In the second specification of investment function, we specify the coefficient of

each variable as a function of firm size, represented by the logarithm of total asset. In the previous specifications we incorporated into the analysis the possibility that the coefficients varied discontinuously depending on the firm's equity capital. Here it is assumed that the coefficients change continuously as a function of the logarithm of firm's total asset. Specifically investment function is written as follows:

$$\begin{aligned}\frac{I_t}{K_{t-1}} &= \alpha_0 + \alpha_1 Mq_t + \alpha_2 Mq_t \times \log(TASSET)_{t-1} + \alpha_3 \frac{CFLOW_t}{K_{t-1}} \\ &+ \alpha_4 \frac{CFLOW_t}{K_{t-1}} \times \log(TASSET)_{t-1} + \alpha_5 DEBT_{t-1} + \alpha_6 DEBT_{t-1} \times \log(TASSET)_{t-1} \\ &+ \alpha_7 LEND_t + \alpha_8 LEND_t \times \log(TASSET)_{t-1} + u_t\end{aligned} \quad (6)$$

where $TASSET_{t-1}$: total asset of firm at the end of period t-1

The estimation results of equation 6 are shown in Table 9. It is found that the cross term of firm size with debt-asset ratio is significantly positive in all the sample years but 1998. It implies that the effect of debt-asset ratio on investment decreases as the firm becomes larger. To put it differently, the impact of debt burden on investment would be significantly less for larger firms. On the other hand, the effect of lending attitude of financial institutions on investment depends inversely on firm size in a significant manner only in half of the sample years or 1993, 1995 and 1998.

To evaluate the impact of debt-asset ratio and lending attitude of financial institutions on investment quantitatively under three different specifications of investment function, we make comparison of the marginal effect of debt-asset ratio and lending attitude of financial institutions on investment for small, medium and large firm groups, respectively. Under the last specification of investment function, the marginal effect depends on the firm's total asset, so that we compute the average of the marginal effects for each firm group classified by firm's equity capital. The marginal coefficients under three different specifications are shown in Table 10 and 11. Table 10 shows the marginal effects of debt-asset ratio on investment. They are quite alike in terms of magnitude across different specifications of investment function. They are the largest

for small firm group and the smallest for large firm group. Common to each specification is an increasing trend in absolute value of the effect of debt-asset on investment for large firm group, indicating that the impact of debt burden on investment is increasing for large firm group over the sample period.

The marginal effects of lending attitude of financial institutions on investment are shown in Table 11. Here we also observe that the magnitude of the marginal effects is quite alike across different specifications of investment function for small and medium firm groups. The spike of the coefficient estimate in 1998 is commonly observed for small firm group. For large firm group, the size of marginal effects is similar under the two specifications where the size effect is captured by the dummy variables for firm's equity capital. However, when the size effect is specified as a function of the logarithm of firm's total asset, the marginal effects become less than those under the other specifications.

To sum up, our findings that debt-asset ratio as well as lending attitude of financial institutions does affect firm's investment behavior is quite robust irrespective of the specification of investment function.

Impact of "Credit Crunch" on Investment: Quantitative Evaluation

It is frequently asserted that the "credit crunch" in the late 90s, triggered by the bankruptcy of large financial institutions, is mainly responsible for the stagnancy of corporate investment. We evaluate this assertion based on the coefficient estimates of investment function obtained above in two different ways.

Firstly, we compute to what extent investment is increased when the proportion of accommodative respondents rises by 10 percentage points. Table 12 shows annually by how much investment will increase for each firm group in percentage terms. The figures are based on the specification of marginal q-type investment function where firm size effect is represented by the dummy variables for firm's equity capital. They are aggregated values of all the sample firms. Investment of small firm group increases by 23.45% in 1998, which is far larger than any other year. Percentage increase of investment is also largest in 1998 for medium firm group (7.41%). On the other hand,

the percentage increase of investment for large firm group is only 3.52% in 1998, which is the second smallest in the sample years.

The second exercise computes by how much investment would have been increased if the financial institutions in 1998 had made loans under the lending attitude in 1996. The results are shown in Table 13. The table shows the increment of investment by industry and firm size in percentage terms. The investment of small firm group would have increased by as much as 84.9%. It should be noted that the pattern of investment increment is not uniform across industries. The percentage increase of investment is notably high for real estate (270.1%), transportation and communication (185.9%) and wholesale trade (129.9%), while it is lowest for manufacturing industry (59.8%). The investment of medium firm group would have increased by 34.5%. The percentage increase of investment is high for real estate (84.7%), construction (65.1%) and wholesale trade (63.7%), while it is the second lowest for manufacturing industry (36.3%). For large firm group the percentage increase of investment is lowest (18.8%) among three firm groups. The percentage increase of investment is high for real estate (50.7%) and construction (47.0%). Large increase of investment in real estate and construction industries is common to all the firm groups. It is shown that investment in total would have increased by 21.3% in 1998 under accommodative attitude of financial institutions in 1996. If the aggregate investment had increased by this proportion, the increment of investment in 1998 would amount to 16361.4 billion yen. Then the GDP growth rate in 1998 would have been 1.4% instead of –1.9%. Therefore it is concluded that the impact of "credit crunch" in the late 90s on corporate investment was substantial.

5.Concluding Remarks

Mounting debt in the corporate sector and related bad loan problems of the financial sector had been a big concern for the domestic economists as well as abroad. It is frequently asserted that this is the main cause of the stagnancy of the Japanese economy. We made an attempt to evaluate this assertion rigorously by estimating the investment function. The novelty of this study is an empirical examination of the

association of investment with financial distress based on the firm-level data in the 90s including unlisted small firms. This point is very important since it is often argued that what suffers most from financial distress is small firms rather than large firms. However existing empirical literature along this line failed to shed light on this aspect due to the accessibility to the micro data of small firms.

Our main findings are that financial distress seriously hurt firm's investment behavior in the 90s. Lingering debt on the corporate sector exerted a negative effect on investment of small firms on the one hand, and severe lending attitude of financial institutions also deterred investment of small firms on the other hand. Furthermore, we also find that the impact of "credit crunch" in the late 90s had non-negligible effect on aggregate investment. A number of policy prescriptions have been proposed to boost up the Japanese economy. Our evidence indicates that serious tackle of mounting debt in the corporate sector and non-performing loans in the financial sector deserves first priority in policy agenda.

Footnotes

[1] There is a growing body of literature on this issue. See Hubbard (1998) for a survey of investment behavior under capital market imperfections.

[2] Empirical support for negative effect of firm leverage on investment is shown in Lang et al.(1996). Cantor(1990) and Calomiris et al.(1997) show in a slightly different context that investment of leverage firm is more responsive to sales and cash flow.

[3] Gertler and Gilchrist (1993) emphasizes that asymmetric information problem is more severe for small firms than for large firms. See Berger and Udell (1998) for a comprehensive survey of small business finance.

[4] See Myers(1977) and Hart(1995) for more detailed discussion on debt overhang.

[5] Suzuki and Ogawa (1997) and Ogawa and Suzuki (1998) also confirm the positive dependence of corporate investment on land asset for large, listed corporations by firm-level panel data.

[6] Kashyap and Stein (1994) survey theoretical and empirical studies that relate to the propagation mechanism of monetary policy shock to bank lending. See also Hubbard(1995), Bernanke and Gertler(1995) and Mishkin(1996) for comprehensive survey of monetary transmission mechanism.

[7] See Diamond (1984) and Boyd and Prescott (1986) for more details on delegated monitoring.

[8] Hoshi et al. (1991) obtains the evidence that the firms affiliated with main bank enjoy lower external finance premium than independent firms using the micro data of firms.

[9] See Sharpe(1990) and Rajan(1992) for the theoretical analysis of the association of banking relationship with information monopoly.

[10] To mention a few, Bernanke and Lown(1991), Berger and Udell(1994), Peek and Rosengren (1995) , and Hancock and Wilcox(1998) analyze the effect of credit crunch on bank lending.

[11] There is a caveat on the interpretation of cash flow coefficient. Kaplan and Zingales(1997) argue that positive correlation of cash flow with investment is not the evidence of liquidity constrain, but simply reflects the future investment opportunities not covered by marginal q.

[12] The diffusion index of lending attitude of financial institutions is available on a quarterly basis. In estimating investment functions, we average out the quarterly data into the annual base.

[13] The depreciation rate is taken from TableA-2 in Ogawa et al. (1994).

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Table 1 Number of Sampled Firms

Industries	1993 Small firms	1993 Medium firms	1993 Large firms	1994 Small firms	1994 Medium firms	1994 Large firms	1995 Small firms	1995 Medium firms	1995 Large firms	1996 Small firms	1996 Medium firms	1996 Large firms	1997 Small firms	1997 Medium firms	1997 Large firms	1998 Small firms	1998 Medium firms	1998 Large firms
Manufacturing	2390	1993	1682	2252	2004	1699	2038	1936	1708	2010	1655	1697	1940	1625	1717	1862	1672	1708
Construction	927	204	114	906	230	143	851	241	153	807	211	165	772	224	183	725	249	188
Wholesale trade	561	523	242	522	518	231	504	500	237	452	426	249	406	410	234	411	443	248
Reatil trade	713	559	276	691	533	284	622	548	286	556	472	282	529	491	291	568	512	297
Real estate	258	451	164	236	447	188	208	452	206	216	391	214	203	387	228	197	381	222
Services	589	749	314	528	733	346	577	750	372	515	610	369	559	605	410	489	630	432
Transportation and communication	376	400	223	364	426	238	353	406	240	328	360	242	296	356	253	312	352	250
Total	5814	4879	3015	5499	4891	3129	5153	4833	3202	4884	4125	3218	4705	4098	3316	4564	4239	3345
	(41.7)	(61.4)	(72.6)	(40.0)	(60.4)	(71.7)	(37.3)	(58.5)	(70.6)	(35.3)	(57.7)	(68.2)	(35.0)	(57.3)	(68.9)	(34.0)	(58.7)	(68.9)

Data Source: Ministry of Finance, *Annual Report of Financial Statements of Incorporated Business*

Notes: The figures in parentheses are the proportion of observations used for estimation in percentage terms.

Table 2 Descriptive Statistics of Sampled Firms

(100 million yen)

Items	1993 Small firms	1993 Medium firms	1993 Large firms	1994 Small firms	1994 Medium firms	1994 Large firms	1995 Small firms	1995 Medium firms	1995 Large firms	1996 Small firms	1996 Medium firms	1996 Large firms	1997 Small firms	1997 Medium firms	1997 Large firms	1998 Small firms	1998 Medium firms	1998 Large firms
Gross investmnet	0.04	1.03	8.41	0.04	0.97	7.45	0.04	1.02	7.61	0.04	1.22	8.73	0.04	1.27	8.73	0.03	0.97	7.24
	(0.36)	(5.17)	(57.05)	(0.41)	(4.94)	(51.13)	(0.39)	(5.86)	(53.21)	(0.54)	(7.17)	(60.57)	(0.67)	(7.21)	(60.70)	(0.35)	(6.68)	(58.19)
Capital stock	0.73	14.10	73.31	0.77	14.57	71.48	0.82	14.31	69.46	0.88	15.12	69.64	0.83	15.36	69.77	0.86	15.25	69.65
	(3.39)	(32.17)	(346.04)	(3.57)	(34.46)	(337.63)	(3.77)	(34.30)	(330.10)	(3.94)	(37.42)	(333.35)	(3.99)	(37.29)	(334.72)	(3.62)	(38.51)	(340.21)
Total asset	3.23	60.36	339.79	3.23	63.28	334.92	3.51	62.96	332.53	3.70	64.90	350.20	3.51	65.78	347.58	3.48	67.35	339.24
	(13.06)	(120.11)	(1289.25)	(13.83)	(122.42)	(1279.57)	(14.51)	(124.01)	(1284.56)	(14.68)	(135.82)	(1328.08)	(14.80)	(134.75)	(1321.71)	(13.85)	(132.52)	(1327.48)

Data Source: Ministry of Finance, *Annual Report of Financial Statements of Incorporated Business*

Notes: The Figures of capital stock and total asset are those at the beginning of the period.

The numbers in parentheses are sample means.

Table 3 Estimation Results of q-type Investment Functions

Variables	1993	1994	1995	1996	1997	1998
Marginal q	-0.0063***	-0.0034*	-0.0005	-0.0009	-0.0049***	-0.0003
	(-3.95)	(-1.82)	(-0.26)	(-0.44)	(-2.60)	(-0.13)
Dummy for medium firms x Marginal q	0.0133***	0.0065***	0.0040	0.0051*	0.0057**	0.0036
	(6.39)	(2.73)	(1.56)	(1.78)	(2.28)	(1.30)
Dummy for large firms x Marginal q	0.0156***	0.0125***	0.0082***	0.0054*	0.0133***	0.0096***
	(6.83)	(5.02)	(3.16)	(1.91)	(5.23)	(3.50)
Cash flow	0.2279***	0.2030***	0.1887***	0.1590***	0.1552***	0.1354***
	(10.99)	(8.67)	(7.67)	(5.22)	(5.88)	(3.63)
Dummy for medium firms x Cash flow	-0.1708***	-0.0516	-0.0446	-0.0123	-0.0632*	-0.0741*
	(-6.38)	(-1.61)	(-1.19)	(-0.28)	(-1.72)	(-1.65)
Dummy for large firms x Cash flow	-0.2121***	-0.1448***	-0.1435***	-0.0700*	-0.1150***	-0.1281***
	(-6.88)	(-4.38)	(-3.81)	(-1.65)	(-3.24)	(-3.30)
Debt ratio	-0.0941***	-0.0862***	-0.1042***	-0.0805***	-0.1069***	-0.0668***
	(-10.34)	(-9.09)	(-10.28)	(-7.81)	(-10.59)	(-6.30)
Dummy for medium firms x Debt ratio	0.0303***	0.0091	0.0155	-0.0050	0.0203*	-0.0136
	(2.98)	(0.88)	(1.38)	(-0.43)	(1.77)	(-1.04)
Dummy for large firms x Debt ratio	0.0701***	0.0317**	0.0433***	0.0076	0.0264**	-0.0210
	(5.42)	(2.39)	(3.11)	(0.57)	(2.07)	(-1.38)
Lending attitude	0.1167**	0.0814**	0.1579***	0.1743***	0.0842**	0.2285***
	(2.28)	(2.43)	(4.75)	(5.33)	(2.27)	(5.81)
Dummy for medium firms x Lending attitude	-0.0066	-0.0370	-0.0604**	-0.0432	-0.0670*	-0.1001***
	(-0.16)	(-1.17)	(-2.02)	(-1.46)	(-1.82)	(-3.07)
Dummy for large firms x Lending attitude	-0.0298	0.0142	-0.0385	0.0024	-0.0593	-0.1683***
	(-0.0298)	(0.39)	(-1.20)	(0.07)	(-1.44)	(-4.80)
Adjusted R-squared	0.0637	0.0911	0.0890	0.0947	0.0809	0.0726
Standard error	0.1909	0.1823	0.1877	0.1889	0.1885	0.1774

Notes: The figures in parentheses are t-values.
The coefficient estimates of constant term as well as industry dummy variables are suppressed.
* significant at the 10% level
** significant at the 5% level
*** significant at the 1% level

Table 4 Coefficient Estimates of Marginal q

	Small firms	Medium firms	Large firms
1993	-0.0063	0.0070	0.0093
1994	-0.0034	0.0031	0.0091
1995	-0.0005	0.0035	0.0077
1996	-0.0009	0.0042	0.0045
1997	-0.0049	0.0008	0.0084
1998	-0.0003	0.0033	0.0093
Average	-0.0027	0.0037	0.0081

Table 5 Coefficient Estimates of Cash Flow

	Small firms	Medium firms	Large firms
1993	0.2279	0.0571	0.0158
1994	0.2030	0.1514	0.0582
1995	0.1887	0.1441	0.0452
1996	0.1590	0.1467	0.0890
1997	0.1552	0.0920	0.0402
1998	0.1354	0.0613	0.0073
Average	0.1782	0.1088	0.0426

Table 6 Coefficient Estimates of Debt-Asset Ratio

	Small firms	Medium firms	Large firms
1993	-0.0941	-0.0638	-0.0240
1994	-0.0862	-0.0771	-0.0545
1995	-0.1042	-0.0887	-0.0609
1996	-0.0805	-0.0855	-0.0729
1997	-0.1069	-0.0866	-0.0805
1998	-0.0668	-0.0804	-0.0878
Average	-0.0898	-0.0804	-0.0634

Table 7 Coefficient Estimates of Lending Attitude

	Small firms	Medium firms	Large firms
1993	0.1167	0.1101	0.0869
1994	0.0814	0.0444	0.0956
1995	0.1579	0.0975	0.1194
1996	0.1743	0.1311	0.1767
1997	0.0842	0.0172	0.0249
1998	0.2285	0.1284	0.0602
Average	0.1405	0.0881	0.0940

Table 8 Estimation Results of Accelerator-type Investment Functions

Variables	1993	1994	1995	1996	1997	1998
Sales	0.00003	0.0013***	0.0017***	0.0009**	0.0015***	0.0014***
	(0.09)	(2.93)	(3.84)	(2.01)	(3.31)	(2.74)
Dummy for medium firms x Sales	0.0021***	-0.0002	-0.0009	0.0002	-0.0001	0.00001
	(3.99)	(-0.38)	(-1.61)	(0.36)	(-0.23)	(0.05)
Dummy for large firms x Sales	0.0027***	0.0006	-0.0001	-0.0001	0.0006	0.0009
	(4.01)	(0.92)	(-0.13)	(-0.19)	(0.83)	(1.33)
Cash flow	0.1950***	0.1732***	0.1625***	0.1438***	0.1103***	0.1165***
	(10.98)	(9.13)	(7.89)	(5.63)	(5.43)	(3.79)
Dummy for medium firms x Cash flow	-0.1307***	-0.0132	-0.0059	0.0120	-0.0250	-0.0540
	(-5.36)	(-0.49)	(-0.18)	(0.31)	(-0.81)	(-1.39)
Dummy for large firms x Cash flow	-0.1565***	-0.0839***	-0.0989***	-0.0419	-0.0489	-0.0948***
	(-5.62)	(-2.79)	(-2.83)	(-1.09)	(-1.55)	(-2.89)
Debt ratio	-0.0975***	-0.0867***	-0.1016***	-0.0801***	-0.1111***	-0.0643***
	(-10.45)	(-9.00)	(-9.72)	(-7.52)	(-10.91)	(-6.01)
Dummy for medium firms x Debt ratio	0.0421***	0.0155	0.0172	-0.0017	0.0282**	-0.0140
	(4.09)	(1.47)	(1.52)	(-0.14)	(2.46)	(-1.06)
Dummy for large firms x Debt ratio	0.0796***	0.0375***	0.0437***	0.0081	0.0443***	-0.0239
	(5.99)	(2.78)	(3.08)	(0.59)	(3.40)	(-1.56)
Lending attitude	0.1025**	0.0568*	0.1379***	0.1644***	0.0812**	0.2445***
	(2.02)	(1.71)	(4.13)	(5.02)	(2.19)	(6.29)
Dummy for medium firms x Lending attitude	-0.0108	-0.0074	-0.0239	-0.0275	-0.0645*	-0.1170***
	(-0.26)	(-0.23)	(-0.76)	(-0.90)	(-1.75)	(-3.61)
Dummy for large firms x Lending attitude	-0.0203	0.0689*	0.0099	0.0332	-0.0388	-0.2094***
	(-0.44)	(1.87)	(0.28)	(1.01)	(-0.94)	(-6.00)
Adjusted R-squared	0.0614	0.0899	0.0895	0.0945	0.0798	0.0721
Standard error	0.1911	0.1824	0.1876	0.1889	0.1890	0.1774

Notes: See the notes in Table 3.

Table 9 Estimation Results of q-type Investment Functions
with Coefficients Specified as a Function of Firm Size

Variables	1993	1994	1995	1996	1997	1998
Marginal q	-0.0384***	-0.0221***	-0.0124	-0.0087	-0.0198***	-0.0086
	(-6.66)	(-3.22)	(-1.56)	(-1.09)	(-2.87)	(-1.38)
Firm size x Marginal q	0.0028***	0.0221***	0.0011**	0.0007	0.0014***	0.0009**
	(7.39)	(3.72)	(2.06)	(1.44)	(3.21)	(2.19)
Cash flow	0.5121***	0.3323***	0.3167***	0.1780	0.2182***	0.2385***
	(7.46)	(4.23)	(2.96)	(1.59)	(2.67)	(3.18)
Firm size x Cash flow	-0.0272***	-0.0123**	-0.0127*	-0.0028	-0.0081	-0.0116***
	(-5.92)	(-2.31)	(-1.66)	(-0.36)	(-1.54)	(-2.69)
Debt ratio	-0.2183***	-0.1994***	-0.2418***	-0.1374***	-0.1937***	0.0140
	(-7.07)	(-6.36)	(-6.49)	(-3.87)	(-5.85)	(0.37)
Firm size x Debt ratio	0.0101***	0.0083***	0.0103***	0.0039*	0.0068***	-0.0063**
	(4.98)	(4.12)	(4.29)	(1.69)	(3.15)	(-2.49)
Lending attitude	0.3028**	0.1909**	0.4161***	0.2004**	0.1339	0.7465***
	(2.32)	(2.02)	(4.65)	(2.35)	(1.19)	(7.76)
Firm size x Lending attitude	-0.0142*	-0.0093	-0.0197***	-0.0046	-0.0074	-0.0391***
	(-1.91)	(-1.61)	(-3.84)	(-0.92)	(-1.07)	(-7.18)
Adjusted R-squared	0.0601	0.0897	0.0874	0.0940	0.0793	0.0724
Standard error	0.1912	0.1824	0.1878	0.1889	0.1890	0.1774

Notes: See the notes in Table 3.

Table 10 Comparison of Coefficients of Debt-Asset Ratio

	Small firms			Medium firms			Large firms		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1993	-0.0941	-0.0975	-0.0901	-0.0638	-0.0554	-0.0608	-0.0240	-0.0179	-0.0416
1994	-0.0862	-0.0867	-0.0941	-0.0771	-0.0712	-0.0703	-0.0545	-0.0492	-0.0548
1995	-0.1042	-0.1016	-0.1100	-0.0887	-0.0844	-0.0808	-0.0609	-0.0579	-0.0617
1996	-0.0805	-0.0801	-0.0878	-0.0855	-0.0818	-0.0767	-0.0729	-0.0720	-0.0697
1997	-0.1069	-0.1111	-0.1065	-0.0866	-0.0829	-0.0868	-0.0805	-0.0668	-0.0744
1998	-0.0668	-0.0643	-0.0659	-0.0804	-0.0783	-0.0840	-0.0878	-0.0882	-0.0951
Average	-0.0898	-0.0902	-0.0924	-0.0804	-0.0757	-0.0766	-0.0634	-0.0587	-0.0662

Notes: (1) Q-type investment function with dummy variables for firm size
(2) Accelerator-type investment function with dummy variables for firm size
(3) Q-type investment function with coefficients as a function of firm size

Table 11 Comparison of Coefficients of Lending Attitude

	Small firms			Medium firms			Large firms		
	(1)	(2)	(3)	(1)	(2)	(3)	(1)	(2)	(3)
1993	0.1167	0.1025	0.1234	0.1101	0.0917	0.0823	0.0869	0.0822	0.0555
1994	0.0814	0.0568	0.0733	0.0444	0.0494	0.0467	0.0956	0.1257	0.0294
1995	0.1579	0.1379	0.1648	0.0975	0.1140	0.1092	0.1194	0.1478	0.0728
1996	0.1743	0.1644	0.1421	0.1311	0.1369	0.1290	0.1767	0.1976	0.1208
1997	0.0842	0.0812	0.0395	0.0172	0.0167	0.0181	0.0249	0.0424	0.0048
1998	0.2285	0.2445	0.2471	0.1284	0.1275	0.1336	0.0602	0.0351	0.0644
Average	0.1405	0.1312	0.1317	0.0881	0.0894	0.0865	0.0940	0.1051	0.0580

Notes: (1) Q-type investment function with dummy variables for firm size
(2) Accelerator-type investment function with dummy variables for firm size
(3) Q-type investment function with coefficients as a function of firm size

Table 12 Increase of Investment When the Accommodative Respondents Increase by 10 Percentage Points

(%)

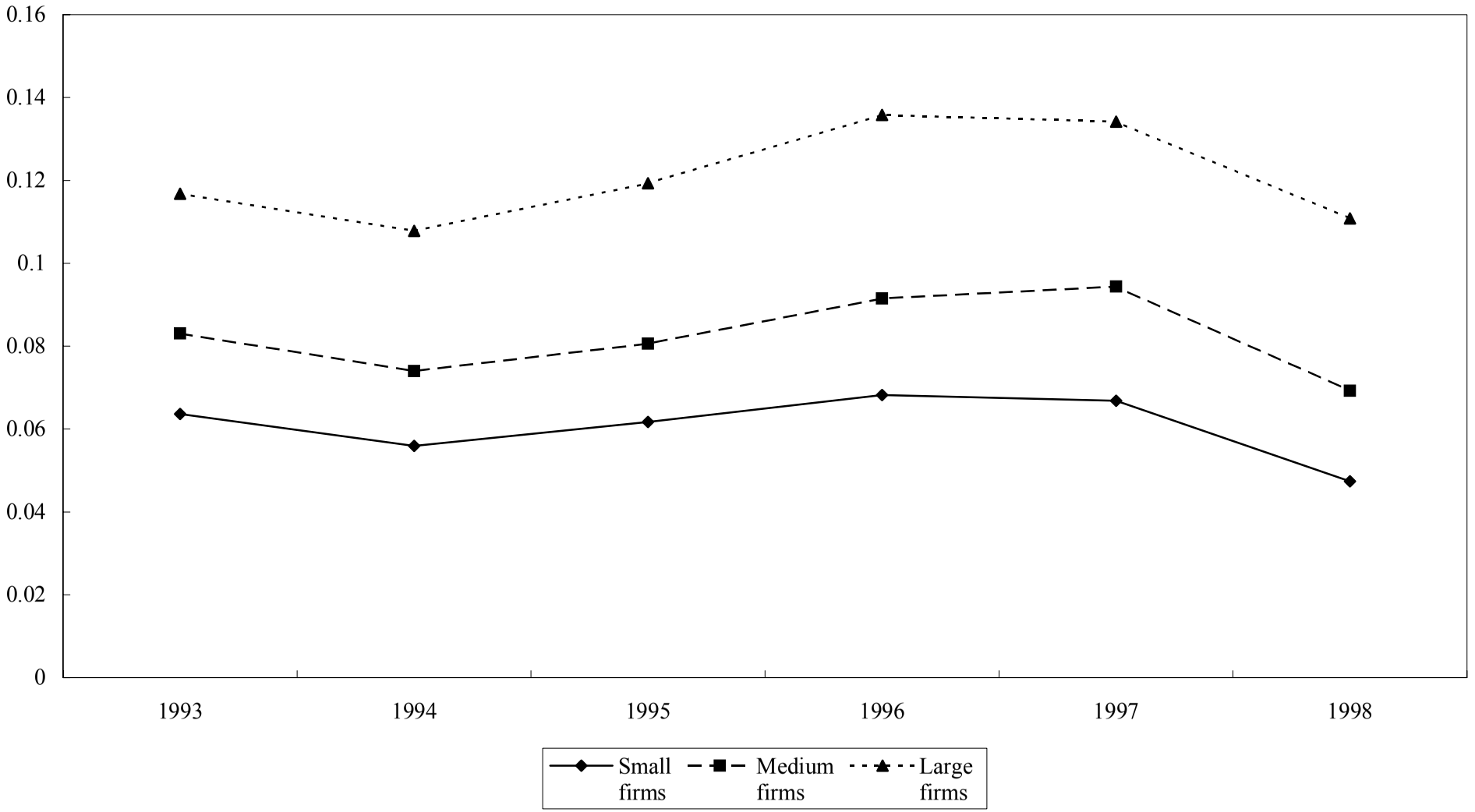
	Small firms	Medium firms	Large firms
1993	11.07	6.85	5.27
1994	7.03	3.09	6.31
1995	15.44	5.70	7.40
1996	12.77	6.84	9.72
1997	4.99	0.89	1.37
1998	23.45	7.41	3.52

Table 13 Effect of Credit Crunch in 1997-98 on Investment

(%)

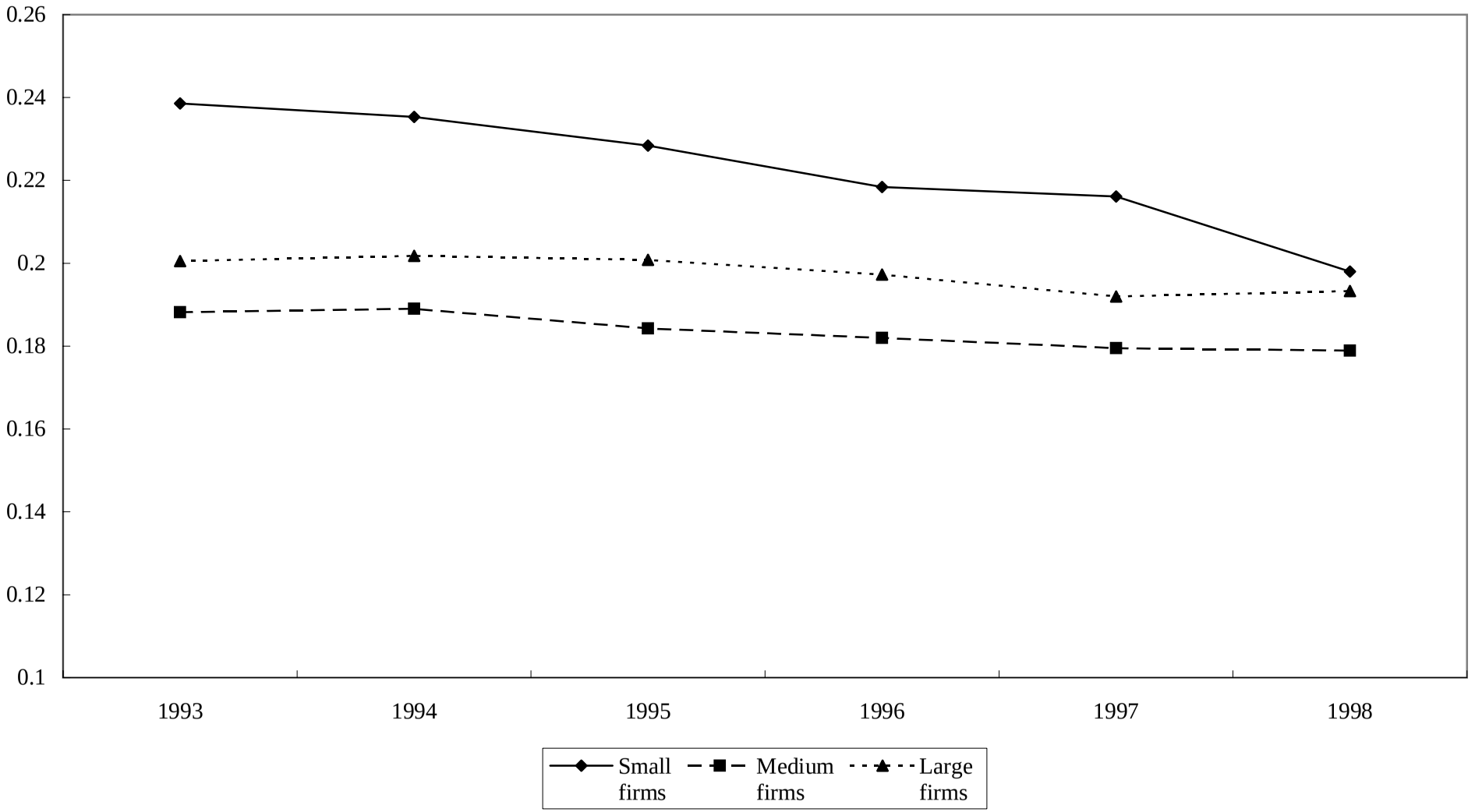
	Small firms	Medium firms	Large firms
Manufacturing	59.8	36.3	17.7
Construction	88.9	65.1	47.0
Wholesale trade	129.9	63.7	29.3
Reatil trade	74.4	38.2	21.4
Real estate	270.1	84.7	50.7
Services	97.0	15.1	7.2
Transportation and communication	185.9	51.3	26.0
Total	84.9	34.5	18.8

Figure 1 Gross Investment Rate by Firm Size (1993-1998)



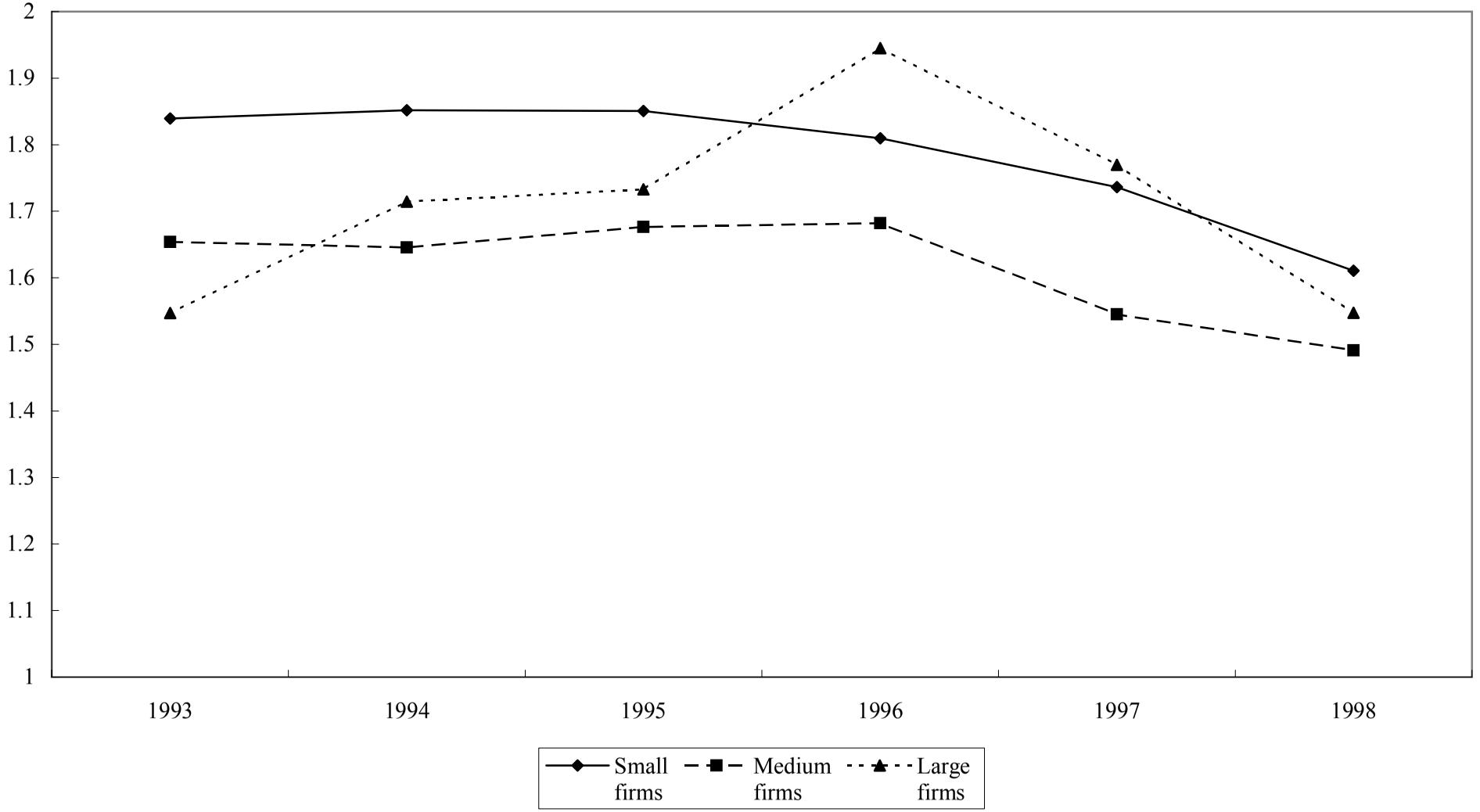
Data Source: Ministry of Finance, Annual Report of Financial Statements of Incorporated Business

Figure 2 Ratio of Cash Flow to Capital Stcok by Firm Size (1993-1998)



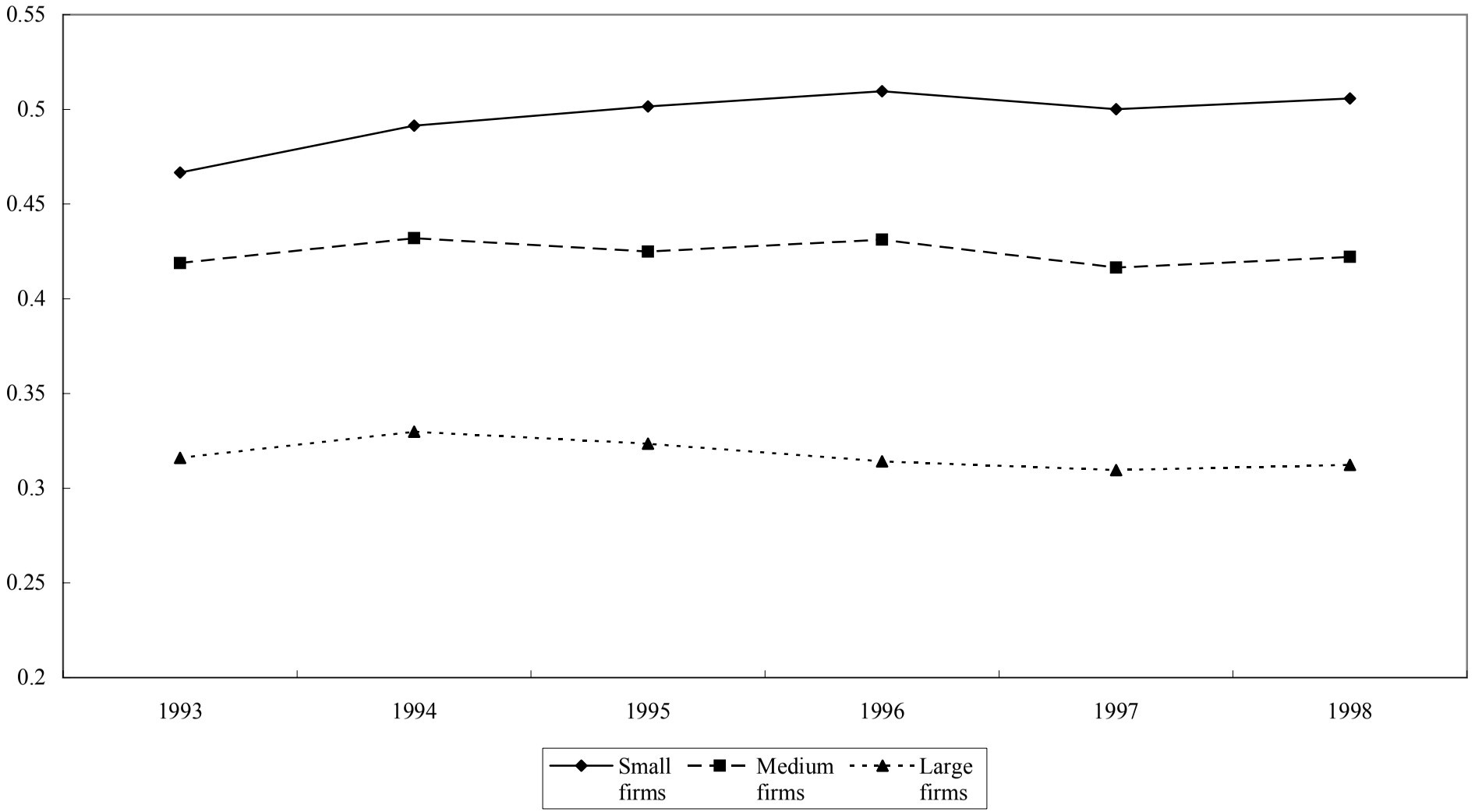
Data Source: Ministry of Finance, Annual Report of Financial Statements of Incorporated Business

Figure 3 Marginal q by Firm Size (1993-1998)



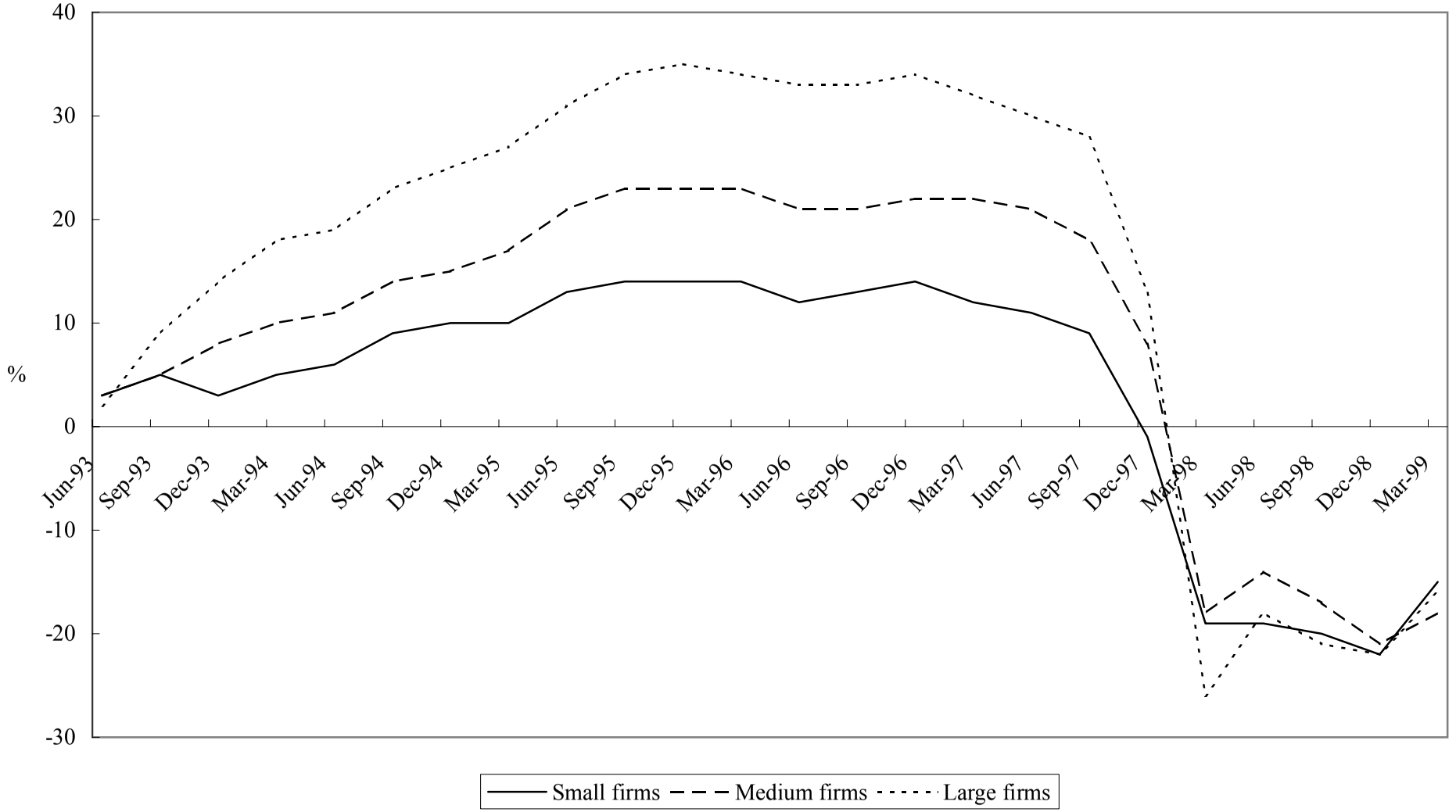
Data Source: Ministry of Finance, Annual Report of Financial Statements of Incorporated Business

Figure 4 Ratio of Debt to Total Assets by Firm Size (1993-1998)



Data Source: Ministry of Finance, Annual Report of Financial Statements of Incorporated Business

Figure 5 Diffusion Index: Lending Attitude of Financial Institutions



Data Source: Bank of Japan, Short-term Economic Survey of All Enterprises