NBER WORKING PAPER SERIES

FINANCIAL DISTRESS AND EMPLOYMENT: THE JAPANESE CASE IN THE 90s

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Working Paper 9646
http://www.nber.org/papers/w9646

NATIONAL BUREAU OF ECONOMIC RESEARCH
1050 Massachusetts Avenue
Cambridge, MA 02138
April 2003

This paper is part of the research project where the author was a chief research economist at Research Office, Director-General's Secretariat of Small and Medium Enterprise Agency. The author was permitted by Statistical Bureau of Ministry of Public Management, Home Affairs, Posts and Telecommunications to use the micro-data of the Annual Report of Financial Statements of Incorporated Business for the purpose not originally intended when the data was collected. The author thanks Hidehiko Ichimura, Anil Kashyap, Fumio Ohtake, the participants of the NBER/CEPR/CIRJE/EIJS Japan project meeting and the research stuff at Research Office, Director-General's Secretariat of Small and Medium Enterprise Agency for useful suggestions and comments. This research was partially supported by Grants-in-Aid for Scientific Research 12124207 of the Ministry of Education. Any remaining errors are the sole responsibility of the author. The views expressed herein are those of the authors and not necessarily those of the National Bureau of Economic Research.

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NBER Working Paper No. 9646
April 2003
JEL No. E5, J2

ABSTRACT

We examine quantitatively the extent to which financial distress in the 1990s affected employment behavior in Japan. Based on the firm-level panel data that include small firms, we estimate dynamic labor demand function, taking the impact of financial distress on employment into consideration. We find that the firm's ratio of debt to total asset exerts a significantly negative effect on employment of small firms. We also find that employment of small firms is sensitively affected by lending attitude of financial institutions.

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1.Introduction

It is often argued that massive debt outstanding in the corporate sector and the associated bad loan problems in the banking sector are the main cause of long stagnancy of the Japanese economy in the 1990s. Theoretically, financial distress exerts a negative effect on the real economy through a variety of channels.

First of all, it is well known that the balance sheet conditions of debtors affects the cost of external funds when there is asymmetric information between debtors and creditors. The cost of external finance is higher than that of internal finance, reflecting several factors including the creditor's cost of collecting the debtor's information and monitoring the debtor's behavior, and the costs arising from lemon problems or moral hazard. It can be shown that the external finance premium, the wedge between the cost of external finance and internal finance, is an increasing function of the loans outstanding relative to the collateralizable net worth. Thus, the higher the debt burden is on firms, the higher the cost of external finance is, thereby leading to cut back of economic activities of the debtor.[1]

Secondly, under asymmetric information, managers' interests can diverge from the shareholders' interests and managers might pursue their own interests. An increase of debt to net worth raises external finance premium due to the associated increase in the probability of bankruptcy. Managers are more concerned with bankruptcy than shareholders, since it is quite likely in the case of bankruptcy that the managers are fired. Therefore, faced with increasing debt, managers will make every effort to cut back labor and investment to raise efficiency. This is a disciplinary role of debt.

Thirdly, corporate debt can affect investment by creating debt overhang. Debt overhang is defined as deterrence of new investment due to the presence of debt outstanding. It occurs when the face value of debt outstanding is greater than its market value. In this case some of the benefits from new investment will go to the existing creditors rather than to the new investors.[2]

Fourthly, bad loans can also cause problems. An increase of bad loans impairs the bank's balance sheet. It raises the cost of external finance *for the bank* for the same reasons as were discussed above and thereby restrains the bank's lending activity. It will

in turn exert a negative effect on the real activities of the bank-dependent borrowers.

Based upon the theoretical developments on the relations between financial distress and the real economy, some studies examined empirically how the financial distress affected the Japanese economy. However, all of them are mainly concerned with the impact of financial distress on fixed investment.[3] It should be noted that the arguments held for fixed investment are perfectly applicable to employment since both fixed capital and labor are quasi-fixed in nature.[4]

The purpose of this paper is to examine the impact of financial distress in 1990s on employment of Japanese firms quantitatively. Specifically, using firm-level micro data we estimate the extent to which firms' employment is affected by high leverage in the corporate sector and bad loan problems in the banking sector.

There are two novel features of this study. First of all, we analyze a rich panel data set that is constructed from the Annual Report of Financial Statements of Incorporated Business or *Hojin Kigyo Tokei Nenpo* of the Ministry of Finance(abbreviated as ARFS). It includes not only large firms listed in stock exchange but also unlisted small firms. The sample period covers the period of 1993 to 1998 that includes the financial turmoil that is often described as a "credit crunch" in Japan. There are no previous studies that investigate the impact of financial distress on employment 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. Lingering bad loans on the banks' balance sheet might lead to a reduction of bank loans, which might directly affect employment of bank-dependent firms. In general, it is quite difficult to estimate the effect of loan supply on employment 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 serve as 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 employment varies across

firms with different size.

We preview our main findings of this study. First the firm's ratio of debt to total asset exerts a significantly negative effect on employment of small firms. It is consistent with capital market imperfections story that suggests that the external finance premium is inversely associated with the collateralized net worth relative to loan size. Second, the lending attitude of financial institutions has significant effect on employment of small firms. It implies that bank health is important for employment of small firms that are bank-dependent. Therefore, mounting debt outstanding in the corporate sector as well as bad loans in the banking sector is partially responsible for cut back of employment of small firms in the 1990s.

This paper is organized as follows. The next section sketches a derivation of dynamic labor demand function to be estimated from the intertemporal profit maximization of firms. Section 3 explains the procedure for constructing the panel data set along with the major characteristics of the obtained data set. Section 4 explains the estimation results and discusses the implications derived from them. Section 5 gives concluding remarks.

2. Formulation of Employment Equation in an Intertemporal Optimization Framework

The basic model of labor demand we rely upon is a dynamic model originally developed by Nickell(1986). The virtue of the model is that it has solid micro-foundations. Employment decisions are made in such a manner that the firm maximizes the present value of its earnings net of quadratic adjustment cost of hiring/firing labor. Then it can be shown that the actual employment is written, via a log approximation and the certainty equivalence results, as

$$\log N_t = \mu \log N_{t-1} + (1-\mu)(1-\alpha\mu)\sum_{s=0}^{\infty}(\alpha\mu)^s \log N^*_{t+s} \qquad (1)$$

where N_t :actual employment in period t

N^*_t : short-run equilibrium employment in period t

μ :stable root of the Euler equation of employment

$$\alpha = \frac{1}{1+r}$$ and r is a real interest rate in terms of wages

$$0 < \alpha < 1$$

Note that the speed of adjustment, $1-\mu$, decreases as the convexity of adjustment cost rises and that it is also affected by the discount factor α.

Eq.(1) is modified in several ways to obtain the employment equation to be estimated. First, we incorporate the existence of different types of labor with different adjustment costs. Then it can be shown that the aggregated employment equation has at least two lags on the dependent variable. Furthermore, the coefficient structure in the distributed lead term is much more complex than a simple geometric recursion. [5]

Second, we specify the short-term equilibrium level of employment under the CES production function. When the production function is written as

$$Y_t = A\left[\gamma N_t^{*-\rho} + (1-\gamma)K_t^{-\rho}\right]^{-1/\rho}, \qquad (2)$$

where K_t:capital stock at the beginning of period t

Y_t: real output in period t

then the equilibrium employment level that maximizes the short-run profit for a competitive firm is given by

$$\log N_t^* = \log Y_t + \frac{1}{1+\rho}\log\left(A^{-\rho}\gamma\right) - \frac{1}{1+\rho}\log\left(\frac{w}{p}\right)_t \qquad (3)$$

where w_t: nominal wage rate in period t

p_t:output price in period t

Third, we assume that the variables determining the short-run equilibrium employment have the following stochastic structures.

$$\log Y_t = a_{0y} + a_{1y}\log Y_{t-1} + \varepsilon_{yt}$$

$$\log\left(\frac{w}{p}\right)_t = a_{0w} + a_{1w}\log\left(\frac{w}{p}\right)_{t-1} + a_{2w}\log\left(\frac{w}{p}\right)_{t-2} + \varepsilon_{wt} \qquad (4)$$

where $\varepsilon_{yt}, \varepsilon_{wt}$ iid stochastic disturbances

Fourth, we approximate the degree of financial distress by two variables. One corresponds to the leverage of the firms and the other to the proxy of bad loan burden on banks. The former is represented by the ratio of debt to total assets ($DEBT_t$) and the latter by the lending attitude of commercial banks ($LEND_t$). It is expected that the harder the bad loan problem hits the bank, the more severe the bank's lending attitude becomes. The degree of financial distress has an impact on employment through two channels. One is by changing the external finance premium facing the firm. High debt outstanding relative to total assets and/or severe lending attitude of banks raises the external finance premium under asymmetric information between lenders and borrowers, which in turn leads to an increase of effective interest rate or a decrease of discount factor α. Note that the speed of adjustment is affected by the discount factor.

The other is a disciplinary role of debt. Firm managers have more incentive to cut employment when the debt asset ratio is high. In other words, faced with increasing debt, managers realize the adjustment cost of labor to be less convex. It implies that managers can adjust employment less costly.

Substituting eqs.(3) and (4) into eq.(1) and taking an additional lag of the dependent variable and financial factors into consideration, we obtain the employment equation to be estimated as:

$$\begin{aligned}\log N_t = {} & \beta_0 + \beta_1 \log N_{t-1} + \beta_2 \log N_{t-2} + \beta_3 \log N_{t-1} \times DEBT_{t-1} \\ & + \beta_4 \log N_{t-1} \times LEND_{t-1} + \beta_5 \log N_{t-2} \times DEBT_{t-2} + \beta_6 \log N_{t-2} \times LEND_{t-2} \\ & + \beta_7 \log\left(\frac{w}{p}\right)_t + \beta_8 \log\left(\frac{w}{p}\right)_{t-1} + \beta_9 \log Y_t + \beta_{10} DEBT_t + \beta_{11} LEND_t + \varepsilon_{Nt}\end{aligned} \qquad (5)$$

where ε_{Nt}: disturbance term

Note that the financial distress variables affect not only the employment level but also the adjustment process of employment.

3. Data Set Construction and its Characteristics

The panel data set we use is constructed from the Annual Report of Financial Statements of Incorporated Business or *Hojin Kigyo Tokei Nenpo* (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 covers the fiscal year of 1993 to 1998 including 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 in the period of 1993 to 1998, respectively. The ARFS is basically a cross-section data and the sampled firms whose equity capital are less than one billion yen are chosen randomly at the beginning of fiscal year and fixed for a year, although the sample includes all the firms whose equity capital are more than one billion yen. Fortunately, the ARFS has major items of firms' balance sheet at the beginning of period as well as at the end of period. This overlapping nature of data series enables us to obtain a panel data set by comparing the beginning-of-period asset in the current period with the end-of-period asset in the previous year. When they coincide, it is inferred that they are generated from the same firm. Specifically, comparison is made between the beginning-of-period value in the current period and the end-of-period value in the previous year for three items of firm's balance sheet: total assets, tangible fixed assets excluding land, and total borrowings.

The total number of firms consistently available during the whole sample period is 3044. The industry classification of the sampled firms is shown in Table 1.[6] The number of manufacturing firms is 1463(48.1%) and the rest belong to non-manufacturing industries (51.9%). The price we have to pay for obtaining the panel data set is to discard the firms discontinuously sampled, most of which are small firms. Figure 1 and 2 show histograms of equity capital and number of employees of the constructed panel data set in 1993, respectively. The proportion of firms whose equity

capital is less than 1 billion yen is 30.9 % for our sample, while it is 82.8 % for the original data set. As for the distribution of employees, the proportion of firms with employees less than 100 is 14.4 % for our sample, while it is 62.7 % for the original data set.[7] This suggests that the histogram of equity capital as well as the number of employees is much more skewed to the right for the constructed data set than for the original one. In fact the median of equity capital and the number of employees is 1664 million yen and 529 for the constructed data set, while they are 99 million yen and 42 for the original data set.

Now we describe the procedure to construct the variables used in estimation. The employment variable (N_t) is measured by the number of employees excluding directors. Real output is measured by real value-added, which is the sum of current profits, salaries for staffs, welfare expenses, interest and discounting expenses, rental fees of tangible assets and land, taxes, and depreciation allowance. The nominal value-added is deflated by the industry value-added deflator. The wage rate is computed as the sum of salaries for employees and welfare expenses divided by the number of employees. We obtain the real wage rate by dividing the nominal figure by the industry value-added deflator. The debt-asset ratio is defined as the ratio of borrowings and bonds payable to total assets at the beginning of period. The lending attitude of financial institutions 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.

Table 2 shows the median and mean values of real value-added, number of employees, real wage rate, and the ratio of debt to total assets over the whole sample period for manufacturing and non-manufacturing industries. The mean value is much higher than the median value especially for real value-added and number of employees, implying that the distribution of these variables is skewed to the right. The mean and median values of real value-added, number of employees, and real wage rate are larger

for manufacturing industries than for non-manufacturing industries. On the contrary, the debt-asset ratio is higher for non-manufacturing industries.

Figure 3 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 exceeded that of " accommodative" respondents starting in the first quarter of 1998.

4. Impact of Financial Distress on Employment: Quantitative Evaluation

Eq.(5) is estimated in a first-differenced form by the two-step GMM estimation proposed by Arellano and Bond(1991). The instruments we use are logarithm of thrice and fourth lagged employment, twice to fourth lagged logarithm of real value-added and real wages, once to fourth lagged debt-asset ratio and lending attitude of financial institutions and the cross terms of logarithm of thrice and fourth lagged employment with the corresponding lagged debt-asset ratio and lending attitude of financial institutions. Estimation is conducted for four cases classified by industry (manufacturing and non-manufacturing) and firm size (small to medium-sized firms and large firms). The large firms are defined as those whose equity capital in 1993 are larger than 1 billion yen.

Basic Results

Table 3 shows the estimation results. Real value-added has a significantly positive effect on employment, irrespective of industry and firm size. Real wage rate also exerts a significantly negative effect on employment for all firm groups in manufacturing as well as non-manufacturing industries. As for the effect of financial distress on employment, the debt-asset ratio has a significantly negative effect on employment for small firms in manufacturing and non-manufacturing industries. However, the manner in which debt-asset ratio affects employment differs between these two sectors. For manufacturing industries debt-asset ratio exerts a negative effect

on the adjustment process of labor. That is to say, higher debt-asset ratio increases the speed of adjusting employment toward equilibrium level. On the other hand, the debt-asset ratio directly affects the current level of employment negatively for non-manufacturing industries.

Lending attitude has a statistically positive effect on employment for all firm groups, irrespective of industry. The response pattern of employment to lending attitude is somewhat similar to that of employment to debt-asset ratio. Severe lending attitude raises the adjustment speed of employment for all firm groups in manufacturing industries and large firms in non-manufacturing industries, while severe lending attitude leads to direct reduction of current employment for small firm group in non-manufacturing industries. We will discuss later why small firms, in particular for non-manufacturing industries, responds quickly to financial distress.

Quantitative Evaluation of the Impact of Financial Distress on Employment

Now we evaluate quantitatively the impact of financial distress on employment by comparing the employment pattern across firms with different debt structure and facing different lending attitudes of financial institutions. Our empirical strategy to accomplish this purpose is to conduct the following four numerical exercises. The first exercise we make is to compute how much current employment is reduced when the debt-asset ratio increases. Table 4 shows the percentage change in current employment by firm size for selected industries when the debt-asset ratio rises from the 1st quartile to the 3rd quartile in 1998. Employment is substantially reduced for small firms in non-manufacturing industries. For instance, employment is reduced by 36.6 percent for small real estate firms. The percentage change in employment of small firms in manufacturing industries is second largest, hovering around 1-2 percent, although it is by far smaller than that of counterparts in non-manufacturing industries. The change in employment of large firm groups is much smaller than that of small firm groups.

In the second exercise, we compute how much current employment changes when lending attitude becomes severe. Table 5 shows the percentage change in current employment by firm size for selected industries when lending attitude changes from

1996 that is a relatively accommodative year to 1998 when credit contracted severely. Employment is reduced by between 1.3 and 2.6 percent for small firms.

The third exercise is to compare the adjustment process of employment across firms with different debt structure when a temporary shock hits the firm. Specifically we compare the future adjustment paths of employment generated by a one-standard-error increase in the employment equation residual between a firm with the 1st quartile debt-asset ratio in 1998 and a firm with the 3rd quartile debt-asset ratio in 1998. The exercise is conducted by firm size for four manufacturing industries (chemicals, machinery, electrical machinery and transport equipment) and four non-manufacturing industries (construction, wholesale trade, retail trade and real estate). The results reveal that the higher the debt-asset ratio is, the quicker the adjustment of employment toward equilibrium, but the difference is not large quantitatively. In fact, for manufacturing industries the difference is at most 7 basis points (1st to 2nd year after the shock in electrical machinery) for small firms and 4 basis points (2nd year after the shock in electrical machinery). As for non-manufacturing industries, the difference is at most 8 basis points (2nd year after the shock in real estate) and 3 basis points (1st to 2nd year after the shock in real estate).[8]

The last exercise is to compare the adjustment process of employment across firms facing different lending attitudes when a temporary shock hits the firm. We compare the dynamic path of employment generated by a one-standard-error increase in the employment equation residual between a firm facing severe lending attitude and a firm facing accommodative lending attitude.[9] The exercise is conducted by firm size for the same industries in the third exercise. The results indicate that the more severe the lending attitude is, the quicker the firm adjusts employment toward equilibrium, but the difference is by no means large. For manufacturing industries the difference is at most 6 basis points (1st year after the shock in chemicals) for small firms and 3 basis points (2nd year after the shock in machinery). For non-manufacturing industries, the difference is at most 3 basis points for small firms (2nd year after the shock in construction, wholesale trade and real estate) and large firms (1st year after the shock in construction, wholesale trade and real estate).

To sum up, increase in debt-asset ratio reduces the current level of employment for small firms substantially, but not for large firms. Higher debt-asset ratio raises the adjustment speed of employment irrespective of firm size and industry, but it is not quantitatively large. The same holds true for the impact of lending attitude on employment.

Interpretations of Our Findings

Our findings are consistent with the theoretical prediction that financial distress might exert a negative effect on employment. Moreover, the finding that the impact of financial distress on employment is much stronger for small firms is reasonably interpreted as follows. First, the external finance premium might be raised higher by the debt-asset ratio for small firms since large firms have large collateralizable net worth that helps to diversify unobservable idiosyncratic risk, while small firms do not.[10] Moreover, 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, while small firms have relatively loose ties with main banks. Aoki(1994) argues that main bank system is institutionally complementary with the Japanese employment system where employees embodying firm-specific training are kept within a firm over quite the long term. Moreover, large firms tend to retain a higher proportion of employees with firm-specific training, which is confirmed by the following table. Table 6 shows the average length of service of employees by firm size for selected industries. The average length of service is used as a proxy of the extent to which firm-specific training is prevalent in an industry. We can see from the table that the average length of service is shorter for small firms, irrespective of industry. The upshot is that labor resources of large firms that embody firm-specific training fluctuate less by the temporary adverse shock since the main banks support the troubled firms financially.[11] We can give direct empirical evidence to support this line of argument. Figure 4 shows the dynamic response of employment to a temporary fall of sales by 10 percent for small and large firm groups in electrical machinery and real estate industries.[12] It is clear from the figure that the adjustment is much smoother and slower

for large firm groups.

Second, disciplinary role of debt might be more potent for small firms since the managers of small firms on the verge of bankruptcy feel threatened by the cut of bank loans and/or are easily fired by their parent firms. Therefore the managers of small firms have good reasons for making every effort to reduce employment to improve efficiency of production. Third, small firms are more bank-dependent, so that lending attitude of banks has much stronger effect on employment.

Robustness of Our Findings

Now we examine in two different ways the robustness of our findings that financial distress has an adverse effect on employment. First we re-estimate the employment equation by respecifying the short-run equilibrium employment level. In general the employment level maximizing the short-run profit is expressed as a function of real wage rate and capital stock at the beginning of period (K_t). In other words, it is written in a logarithmic form as

$$\log N_t^* = \gamma_0 + \gamma_1 \log K_t + \gamma_2 \log\left(\frac{w}{p}\right)_t \tag{6}$$

We assume that the capital stock has the following stochastic structure.

$$\log K_t = a_{0K} + a_{1K} \log K_{t-1} + \varepsilon_{Kt} \tag{7}$$

Then we obtain the following employment equation to be estimated.[13]

$$\begin{aligned}\log N_t = {} & \beta_0 + \beta_1 \log N_{t-1} + \beta_2 \log N_{t-2} + \beta_3 \log N_{t-1} \times DEBT_{t-1} \\ & + \beta_4 \log N_{t-1} \times LEND_{t-1} + \beta_5 \log N_{t-2} \times DEBT_{t-2} + \beta_6 \log N_{t-2} \times LEND_{t-2} \\ & + \beta_7 \log\left(\frac{w}{p}\right)_t + \beta_8 \log\left(\frac{w}{p}\right)_{t-1} + \beta_9 \log K_t + \beta_{10} DEBT_t + \beta_{11} LEND_t + \varepsilon_{Nt}\end{aligned} \tag{8}$$

Capital stock 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. Table 7 shows the estimation results of eq.(8). The results are essentially unaltered. The debt-asset ratio exerts a negative effect on employment for small firms in both manufacturing and non-manufacturing industries. For manufacturing industries the debt-asset ratio affects employment in the course of adjusting employment toward equilibrium, while it has a direct effect on the current level of employment for non-manufacturing industries. Lending attitude of financial institutions exerts a positive effect on employment irrespective of firm size and industry. Lending attitude affects the current level of employment for small firms in both manufacturing and non-manufacturing industries.[14] On the other hand, lending attitude has a positive effect on employment through altering the adjustment process for large firms in manufacturing as well as non-manufacturing industries.

Secondly we employ an alternative measure of financial leverage of firms. We define a flow version of firms' leverage ($DEBTF_t$) as the interest and discount paid divided by the sum of operating profit and depreciation allowances. Note that this variable is inversely related to the interest coverage ratio. Estimation results with new leverage variable instead of the stock leverage variable are shown in Table 8. The impact of lending attitude on employment remains positive for all firm groups in manufacturing as well as non-manufacturing industries, but it is only for small firm group in manufacturing industries that firm's leverage exerts a significantly negative effect on employment. It appears that the flow leverage variable is a poor proxy for the firm's true debt structure. In fact, the correlation coefficient between the flow variable of firm's leverage and the stock counterpart is only 0.1534.

5.Concluding Remarks

This study examined empirically the impact of financial distress in 1990s on employment using the panel data of Japanese firms. We confirmed that financial distress

had an adverse effect on employment of small firms. In a companion paper (Ogawa(2001)), we also found that financial distress affected fixed investment of small firms negatively. Putting these findings together, it is clear that financial distress in the corporate sector as well as the banking sector led to a reduction of demand for quasi-fixed inputs. It should be noted that quasi-fixed factors embody a new technology that raises efficiency of production. To attain the sustained long-run growth, reducing the corporate debt and wiping out the banks' bad loans is an urgent agenda for the Japanese economy.

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

[3] Ogawa et al. (1996), Suzuki and Ogawa (1997) and Ogawa and Suzuki (1998) examine empirically the effects of collateralizable net worth or land on corporate investment. As for the effects of the bank's balance sheet conditions on corporate investment, 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 1990s. 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. Based upon the firm-level data, Ogawa(2001) found that the ratio of debt to total assets exerted a negative effect on fixed investment for small firms and that lending attitude of financial institutions affected fixed investment, irrespective of firm size.

[4] Lange et al.(1996) and Nickell and Nicolitsas(1999) find a negative relation between leverage and employment for the U.S. and U.K., respectively. Cantor(1990) and Sharpe(1994) find that employment growth at highly leveraged firms is more sensitive to demand and financial market conditions for the U.S. For Japan, as far as the author knows, Tomiyama(2001) is the only study that examines empirically a relation between leverage and speed of adjusting labor, using the panel data of firms.

[5] See Nickell(1986) pp.509-510 for more detailed discussions.

[6] 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.

[7] It should be noted that even if the proportion of small firms in our sample is lower than that in the original data set, it is much higher than the other studies. For example, the proportion of firms with employees less than 100 is only 1 % in Tomiyama(2001).

[8] The one-standard-error increase in the employment equation residual corresponds to 0.0841, 0.0896, 0.1859, and 0.1375 for small and large firms in manufacturing

industries and small and large firms in non-manufacturing industries, respectively.

[9] The severe lending attitude is represented by the cross terms of lagged lending attitude in 1998 and 1997 with lagged employment, while the accommodative lending attitude is represented by the cross terms of lagged lending attitude in 1996 and 1995 with lagged employment.

[10] Gertler and Gilchrist (1993) emphasize that asymmetric information problems are more severe for small firms than for large firms. See Berger and Udell (1998) for a comprehensive survey of small business finance.

[11] Abe(1999). Tomiyama(2001) and Urasaka and Noda(2001) examine empirically whether employment fluctuations are mitigated for the firms with strong ties with main banks. Their findings are generally in the affirmative.

[12] In computing the dynamic response of employment, we use the lagged lending attitude and industry-median debt-asset ratios in 1998 and 1997.

[13] This equation corresponds to the basic employment specification adopted by Nickell and Nicolitsas(1999).

[14] Note that in the previous specification lending attitude affects employment via adjustment process for small firm group in manufacturing industries.

Table 1 Number of Firms in Our Sample

	Number of firms
Manufacturing	
Food and beverages	142
Textiles	41
Wearing apparels and clothing accessaries	8
Wood and wooden products	8
Pulp, paper and paper products	27
Publishing and printing	19
Chemicals	241
Petroleum and coal products	25
Non-metallic mineral products	53
Iron and steel	59
Non-ferrous metals	61
Fabricated metal products	76
Machinery	165
Electrical machinery, equipment and supplies	245
Transport equipment	116
Precision instruments	44
Shipbuilding and repairs	20
Other manufacturings	113
Non-manufacturing	
Construction	212
Wholesale trade	315
Retail trade	244
Real estate	168
Land transportation	108
Marine transportation	45
Other transportation and communications	124
Services for business activities	115
Hotels and lodging	64
Personal service activities	10
Movies and entertainments	52
Broadcasting	70
Other services	54
Total	3044

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

Table 2 Descriptive Statistics of Major Variable in Our Sample

	Sample means	
	Manufacturing	Non-manufacturing
Real value-added	27027.3	20019.5
	(7158.2)	(5207.8)
Number of employees	1678	1340
	(610)	(402)
Real wage rate	7.4	6.4
	(6.9)	(5.2)
Ratio of debt to total assets	0.2876	0.3705
	(0.2581)	(0.3124)

Notes: Real value-added and real wage rate are obtained by dividing the corresponding nominal figures by the industry valu-added deflator (1990=1.0) (Unit: million yen).
The wage rate is per annum.
The figures in parentheses are sample medians.

Table 3 Estimation Results of Dynamic Labor Demand (1):
Basic Case

	Lagged dependent variable						Debt-asset ratio	Lending attitude of financial institutions
	One-period lagged	Two-period lagged	One-period lagged x debt-asset ratio	Two-period lagged x debt-asset ratio	One-period lagged x lending attitude	Two-period lagged x lending attitude		
Manufacturing								
Small firms	0.1178	0.1252	-0.0150	-0.0135	0.0182	-0.0116	-0.0039	0.0690
	(1.54)	(4.57)	(-2.48)	(-2.49)	(2.13)	(-1.25)	(-0.10)	(1.19)
Large firms	0.4229	0.0579	-0.0087	-0.0057	-0.0027	0.0158	0.0366	-0.0098
	(5.83)	(1.48)	(-1.49)	(-0.97)	(-0.64)	(2.79)	(0.23)	(-0.24)
Non-manufacturing								
Small firms	-0.0313	0.1668	0.0003	-0.0082	0.0009	0.0079	-0.6801	0.0518
	(-0.24)	(2.36)	(0.02)	(-0.77)	(0.23)	(0.89)	(-5.37)	(3.66)
Large firms	0.3990	0.0438	-0.0040	-0.0004	0.0033	-0.0009	-0.0040	0.0058
	(6.33)	(1.05)	(-0.51)	(-0.06)	(2.11)	(-0.20)	(-0.08)	(0.34)

	Real wage rate		Real value-added	J-statistics
	Current	One-period lagged		p-value
Manufacturing				
Small firms	-0.3829	0.0064	0.2990	30.2561
	(-4.97)	(0.19)	(4.40)	(0.78)
Large firms	-0.2052	0.1271	0.0934	48.3142
	(-2.55)	(2.09)	(1.83)	(0.10)
Non-manufacturing				
Small firms	-0.0557	-0.0801	0.2604	32.9297
	(-1.90)	(-1.35)	(2.70)	(0.66)
Large firms	-0.3190	0.0049	0.1753	29.9524
	(-3.21)	(0.11)	(2.76)	(0.79)

Notes: The figures in parentheses are the ratio of coefficient estimate to its standard error.

Table 4

Change in Current Employment by an Increase of Debt-asset Ratio from the 1st to the 3rd Quartile in 1998

(%)

	Small firms	Large firms
Manufacturing		
Chemicals	-1.28	1.09
Machinery	-1.65	0.95
Electrical machinery	-1.89	1.10
Transport equipment	-1.12	0.90
Non-manufacturing		
Construction	-18.53	-0.13
Wholesale trade	-19.70	-0.13
Retail trade	-24.85	-0.15
Real Estate	-36.55	-0.22

Table 5

Change in Current Employment When Lending Attitude Changes from 1996 to 1998

(%)

	Small firms	Large firms
Manufacturing		
Chemicals	-2.62	0.48
Machinery	-2.06	0.49
Electrical machinery	-2.20	0.35
Transport equipment	-2.16	0.58
Non-manufacturing		
Construction	-1.76	-0.35
Wholesale trade	-1.78	-0.39
Retail trade	-1.27	-0.31
Real Estate	-2.56	-0.41

Table 6

Average Length of Service of Employees

(year)

	Number of Employees		
	10-99	100-999	1000-
Manufacturing	10.9	12.9	17.0
Construction	10.1	12.4	16.4
Wholesale trade and retail trade	9.8	10.9	13.2
Real estate	7.4	8.9	10.1

Data Source: Basic Survey on Wage Structure 1998, Ministry of Labour

Table 7 Estimation Results of Dynamic Labor Demand (2):
Alternative Specification of Short-run Equilibrium Employment

	Lagged dependent variable						Debt-asset ratio	Lending attitude of financial institutions
	One-period lagged	Two-period lagged	One-period lagged x debt-asset ratio	Two-period lagged x debt-asset ratio	One-period lagged x lending attitude	Two-period lagged x lending attitude		
Manufacturing								
Small firms	0.2214	0.0459	-0.0188	-0.0149	0.0148	0.0063	-0.0440	0.1109
	(2.51)	(0.90)	(-2.97)	(-1.90)	(1.34)	(0.55)	(-0.87)	(1.81)
Large firms	0.2469	0.0344	-0.0115	-0.0002	0.0029	0.0098	-0.0858	-0.0248
	(4.08)	(0.91)	(-2.08)	(-0.04)	(0.77)	(1.81)	(-0.61)	(-0.65)
Non-manufacturing								
Small firms	0.1535	0.2352	0.0028	-0.0133	0.0003	0.0060	-0.5076	0.0336
	(1.27)	(3.11)	(0.26)	(-1.24)	(0.08)	(0.69)	(-4.35)	(1.96)
Large firms	0.2992	0.1795	-0.0103	0.0004	0.0034	-0.0034	0.0210	0.0061
	(4.41)	(2.89)	(-0.99)	(0.06)	(2.19)	(-0.71)	(0.49)	(0.34)

	Real wage rate		Capital stock	J-statistics
	Current	One-period lagged		p-value
Manufacturing				
Small firms	-0.2599	0.0493	-0.0589	48.2933
	(-3.96)	(1.35)	(-1.41)	(0.15)
Large firms	-0.1246	0.0521	0.1729	42.4706
	(-2.15)	(0.96)	(2.71)	(0.32)
Non-manufacturing				
Small firms	-0.0986	-0.0455	0.0460	30.0471
	(-1.60)	(-0.84)	(1.05)	(0.85)
Large firms	-0.1411	-0.0886	0.0494	37.1049
	(-1.26)	(-1.85)	(1.39)	(0.56)

Notes: The figures in parentheses are the ratio of coefficient estimate to its standard error.

Table 8 Estimation Results of Dynamic Labor Demand (3):
Flow measure of leverage ratio

	Lagged dependent variable							
	One-period lagged	Two-period lagged	One-period lagged x debt-asset ratio	Two-period lagged x debt-asset ratio	One-period lagged x lending attitude	Two-period lagged x lending attitude	Interest and discounts paid/ operating profits plus depreciation	Lending attitude of financial institutions
Manufacturing								
Small firms	0.1397	0.0959	0.0287	-0.0190	0.0191	-0.0030	0.1686	0.0511
	(2.00)	(3.75)	(1.26)	(-1.78)	(2.13)	(-0.33)	(0.75)	(0.90)
Large firms	0.4225	0.0273	0.0487	0.0013	-0.0022	0.0192	-0.4135	-0.0331
	(4.69)	(0.67)	(2.52)	(0.17)	(-0.48)	(2.88)	(-1.39)	(-0.78)
Non-manufacturing								
Small firms	0.3146	0.1383	0.0411	-0.0067	0.0079	0.0148	0.3644	0.0199
	(2.77)	(1.78)	(1.14)	(-0.49)	(1.70)	(1.23)	(1.27)	(1.03)
Large firms	0.4196	0.0543	0.0056	0.0053	0.0048	0.0033	0.7015	0.0161
	(5.97)	(1.10)	(0.28)	(0.70)	(2.42)	(0.66)	(2.46)	(0.81)

	Real wage rate		Capital stock	J-statistics
	Current	One-period lagged		p-value
Manufacturing				
Small firms	-0.3863	0.0094	0.3101	35.4400
	(-4.71)	(0.28)	(4.40)	(0.45)
Large firms	-0.0767	0.1114	0.0244	36.4920
	(-0.86)	(1.79)	(0.45)	(0.40)
Non-manufacturing				
Small firms	-0.1508	-0.0218	0.4071	28.5001
	(-1.90)	(-0.37)	(3.45)	(0.77)
Large firms	-0.3930	0.0291	0.2023	30.7458
	(-3.76)	(0.50)	(2.98)	(0.67)

Notes: The figures in parentheses are the ratio of coefficient estimate to its standard error.

Figure 1 Histogram of Equity Capital in 1993

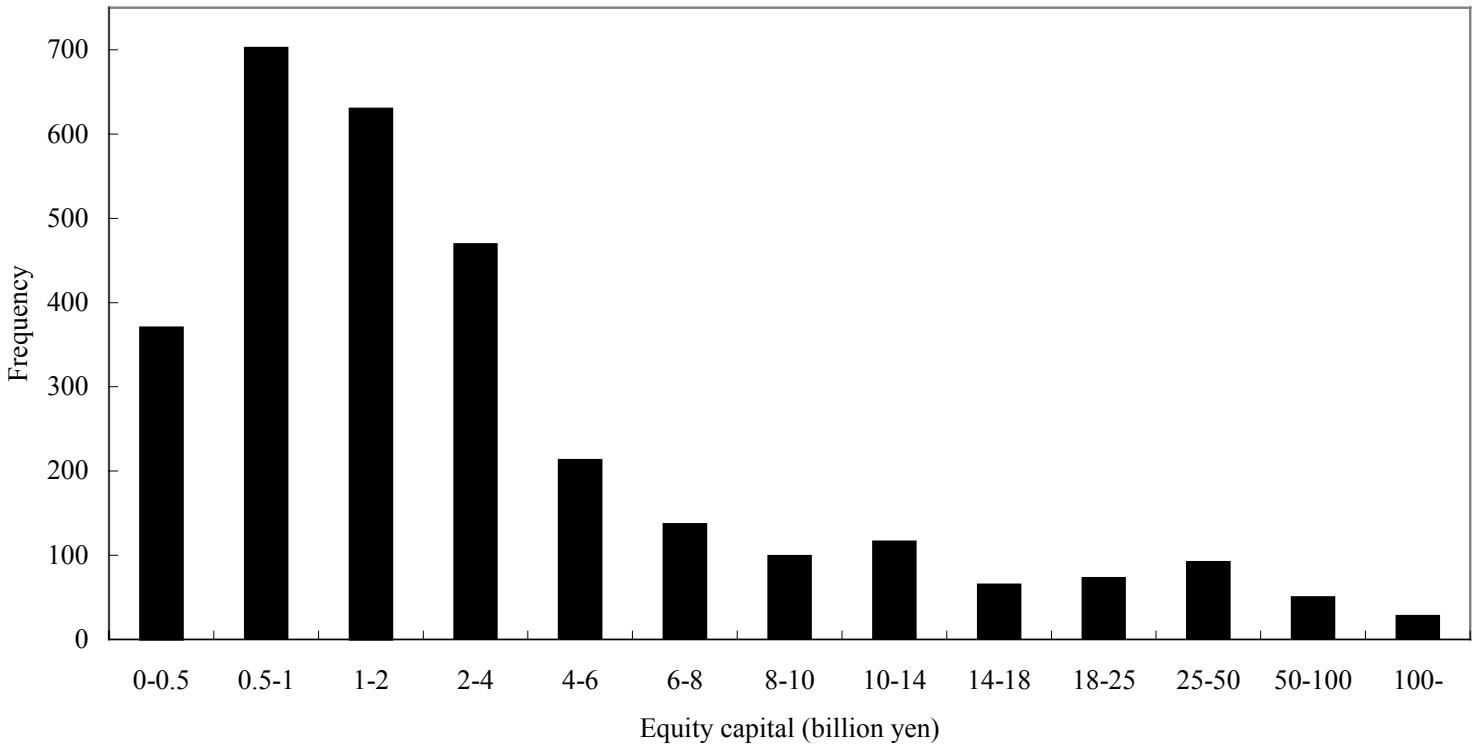


Figure 2 Histogram of Number of Employees in 1993

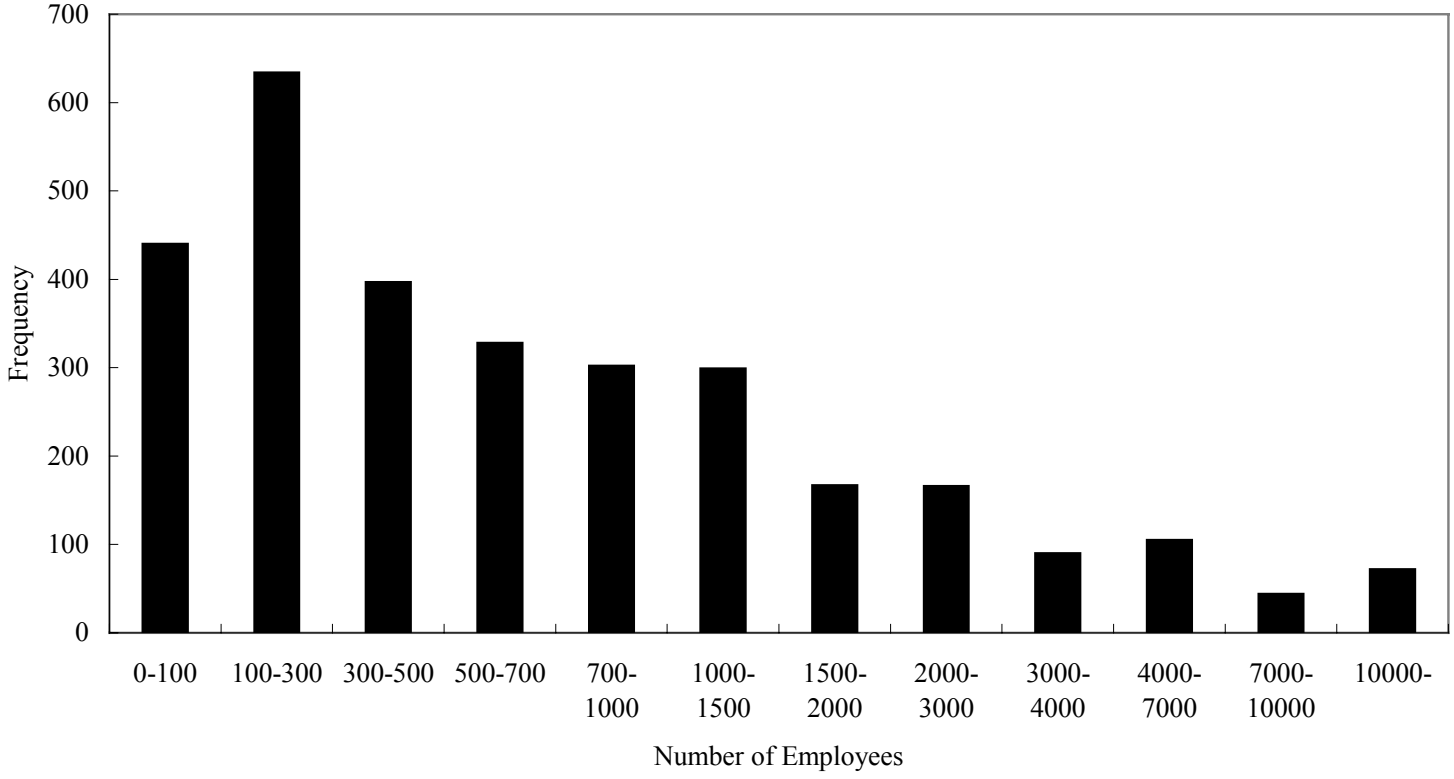
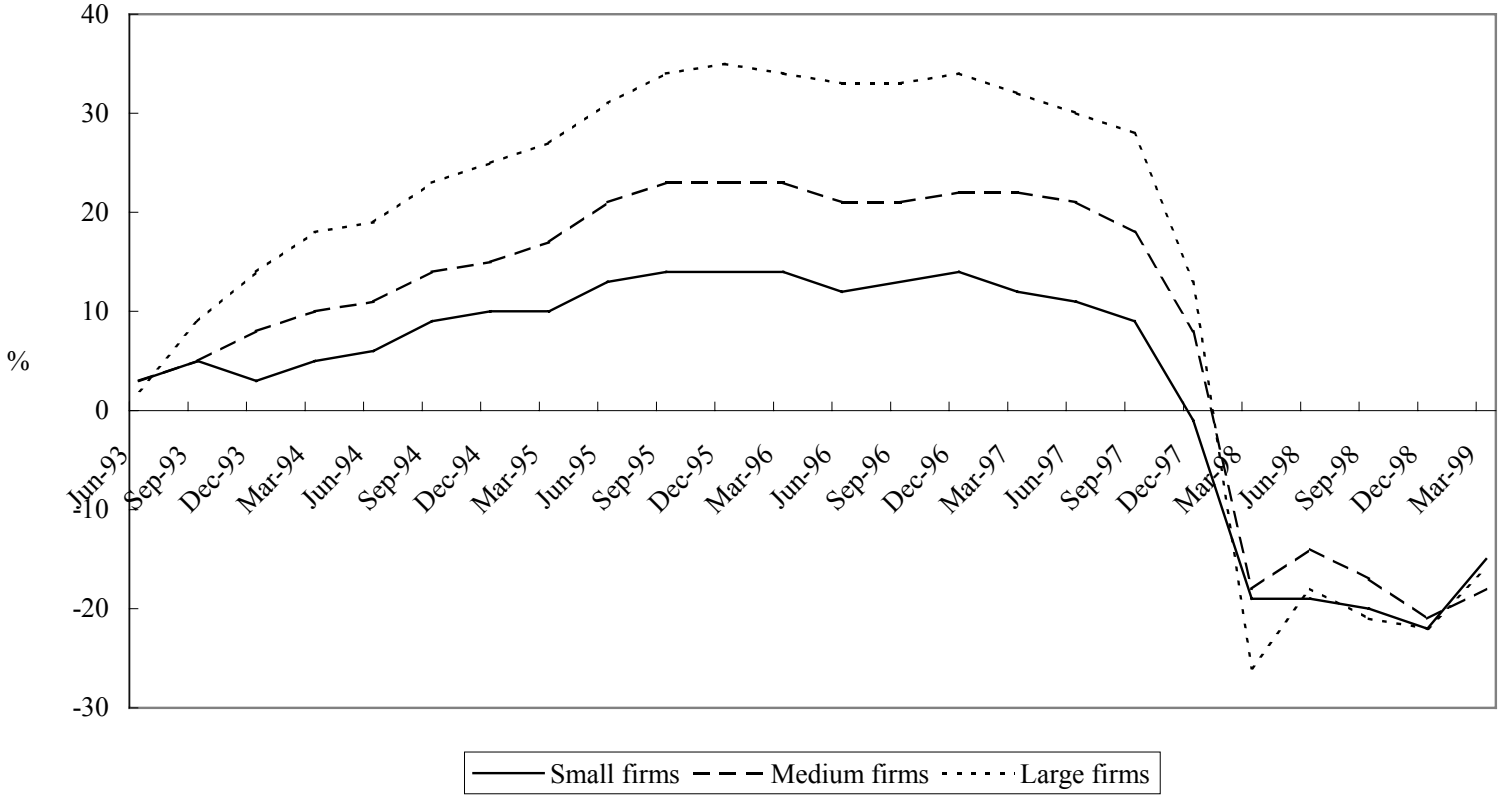


Figure 3 Diffusion Index: Lending Attitude of Financial Institutions



Source: Bank of Japan : Short-term Economic Survey of Enterprises (Tankan)

Figure 4-1 Adjustment Process of Employment to Sales Shock:
Electrical Industry

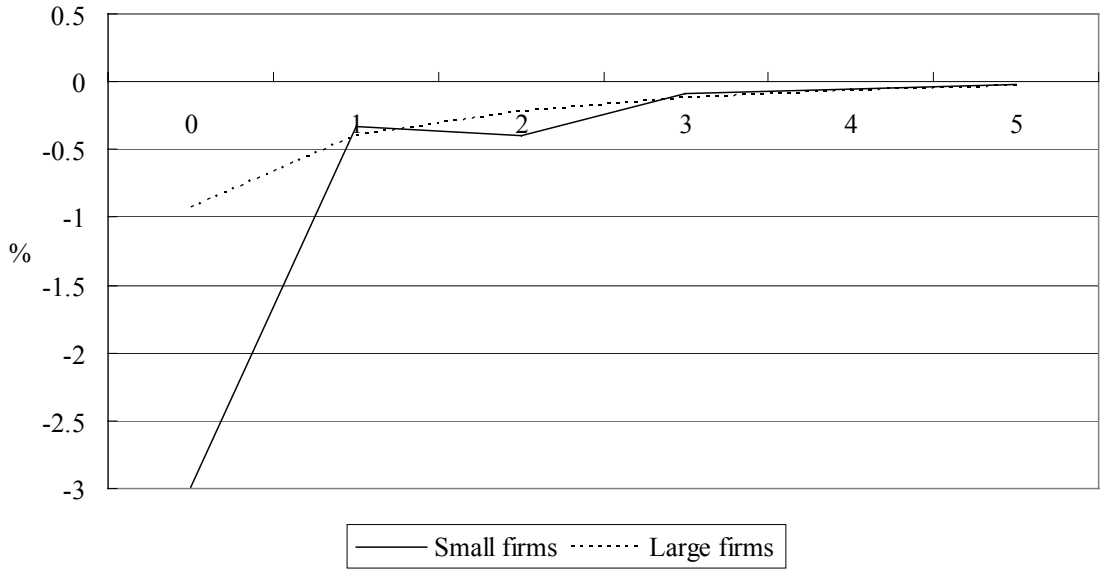
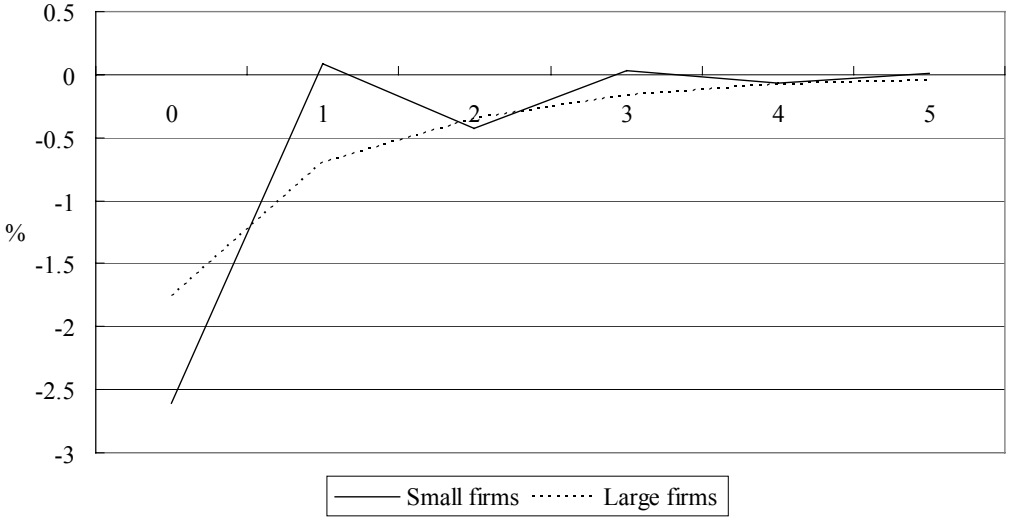


Figure 4-2 Adjustment Process of Employment to Sales Shock:
Real Estate Industry



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