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Financial Distress and Industry Structure: An Inter-industry Approach to the "Lost Decade" in Japan*

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Abstract

This paper proposes a novel approach to investigating the propagation mechanism of balance sheet deterioration in financial institutions and firms, by extending the input-output analysis. First, we use input-output tables classified by firm size. Second, we link the input-output table with the balance sheet conditions of financial institutions and firms.

Based on Japanese input-output tables, we find that the lending attitude of financial institutions affected firms' input decision in the late 1990s and the early 2000s. Simulation exercises are conducted to evaluate the effects of changes in the lending attitude toward small firms, as favorable as toward large firms, on sectoral allocations. We find that output was increased for small firms and reduced for large firms. The change in output was non-negligible, about 5.5% of the initial output of each sector. In particular it exceeded 20% in textile, iron and steel and fabricated metal products.

Keywords: Input-output analysis, Trade credit, Balance sheet, Multiplier

JEL classification: C67, E23, E44, and L14

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1 Introduction

In Japan, the period of the 1990s and the early 2000s is called the "Lost Decade," and in it the balance sheets of financial institutions and firms deteriorated greatly. Many studies report that this had perverse effects on firms' activities.[1] This paper investigates the effects of the balance sheet deterioration of financial institutions and firms on the inter-industry structure. Input-output analysis is a powerful tool for examining the inter-industry relationship from the general equilibrium viewpoint. Employing this input-output technique, this paper investigates how the balance sheet deterioration of financial institutions and firms are propagated across sectors, and then evaluates quantitatively the extent to which the sectoral distribution is affected by balance sheet deterioration.[2]

Our study is related to the two strands of the literature. First, there is a growing literature of multisectoral general equilibrium models that are intended to explain the transmission of sectoral shocks through input-output linkages. This literature includes Long and Plosser (1983), Basu (1995), Hornstein and Praschnik (1997), Horvath (1998, 2000), Dupor (1999), Bergin and Feenstra (2000), Huang and Liu (2001) and Shea (2002).

Secondly there are studies shedding light on the transmission mechanism of sectoral shocks through credit chains. To illustrate in this framework how a deterioration in the balance sheet of one firm is transmitted to other firms through inter-industry credit chains, suppose that customer A is hit by liquidity shock. The supplier B will withhold completion of goods ordered from the customer A. Thus

[1]For example, see Nishimura et al. (2005), Caballero el al. (2008), and Ogawa (2003a,b) for the effects of balance sheet deterioration on firms ' entry and exit, and investment and employment, decisions.

[2]Kobayashi and Inaba (2002) analyze the propagation mechanism of coordination failure in one sector triggered by non-performing loans in the banking sector, but this approach does not take full advantage of input-output tables, whereas ours does. Tsuruta (2007) investigates whether credit contagion leads to a decrease of trade credit supply for small businesses, using the micro data of the Credit Risk Database. Tsuruta's study does not take full interplays among sectors into consideration.

the supplier B will also run into liquidity problems, which in turn will affect the suppliers that provide the supplier B with intermediate goods. In this manner, an output reduction in one industry resulting from balance sheet deterioration may be propagated into other industries, and thus eventually affect aggregate production. Kiyotaki and Moore (1997, 2002) are pioneering studies, which show that a small, temporary shock to the liquidity of some firms generates a large, persistent fall in aggregate activity. Boissay (2006) and Raddatz(2008) are studies along this line.

The discussions above illustrate the importance of taking the inter-industry linkages into consideration when investigating the propagation of financial distress in one sector across sectors.[3] Our study is on the same track with the two strands of the literature in the sense that we investigate the propagation mechanism of balance sheet shocks in one sector into the other sectors based on the input-output tables.

We extend the conventional input-output analysis in two directions. First, we use input-output tables classified by firm size for the manufacturing sector.[4] Specifically, the input structure of the *j*-th industry from the i-th industry is described by four input-output coefficients, rather than one, as in the conventional input-output table, because the input and output sectors are each divided into large and small firms. Thus we obtain much richer information on the inter-industry relationship than a conventional input-output table provides. The information in input-output tables classified by firm size is very useful in analyzing the inter-industry structure of the lost decade in Japan, because it is often argued that the balance sheet deterioration of financial institutions forced small firms to rely more on trade credit from large firms, in order to meet their financial needs.

It is a tacit assumption underlying the credit chain argument that the firms

[3]In a slightly different context, Lang and Stulz (1992) and Hertzel et al. (2008), using bankruptcy filings data, examine the extent to which distress and bankruptcy filing have valuation consequences for suppliers and customers of filing firms. However, they are silent on the macroeconomic consequence of financial distress.

[4]Shimoda et al. (2005) is the only study that analyzes the industrial structure in Japan based on input-output tables classified by firm size.

hit by liquidity shocks are credit-constrained. It is true that small-sized firms are liquidity-constrained, but large firms have ample liquid assets to absorb the liquidity shocks coming from default of their customers. The upshot is that credit contagion might be cushioned to some extent by the existence of large suppliers in a network of firms. We can examine this possibility, using the input-output tables classified by firm size.

Second, we specify the coefficients of the input-output table as a function of the balance sheet conditions of suppliers and buyers. When a firm inputs certain goods into the production process, it makes a decision about how much to purchase from large suppliers and small suppliers. It is often argued that large firms with easy access to bank credit can distribute their credit to their small customers by way of trade credit. This is the so-called redistributional view of trade credit.[5] Furthermore, the buyer may prefer a supplier with a healthy balance sheet, to ensure the delivery of intermediate goods. We can test these conjectures in our framework.

To preview our findings, we find that the lending attitude of financial institutions toward suppliers, a proxy for the balance sheet conditions of the financial sector, affected buyers' input decisions in the late 1990s and the early 2000s, when Japanese financial institutions suffered from excessive non-performing loans. Specifically, in the lost decade the customer, irrespective of its size, preferred to purchase intermediate inputs from those suppliers that faced an easier lending attitude, rather than from those facing a more severe lending attitude. We also find that customers, irrespective of their size, increased purchase of intermediate inputs from large suppliers when liquidiy of small suppliers was reduced, small suppliers became increasingly dependent on debt and/or sales growth of large suppliers in-

[5] See Meltzer (1960), Jaffee (1971), Ramey (1992), Petersen and Rajan (1997), McMillan and Woodruff (1999), Nilsen (2002), De Haan and Sterken (2006), and Love et al. (2007) for evidence on the validity of the redistributional view of trade credit in the U.S. and other countries. For the Japanese evidence, see Takehiro and Ohkusa (1995), Ono (2001), Ogawa (2003c), Uesugi and Yamashiro (2004), Uesugi (2005), Fukuda et al. (2006), Taketa and Udel (2006), Uchida et al. (2006), Tsuruta (2008), and Ogawa et al. (2009).

creased in the lost decade. To gauge the quantitative importance of our findings, we conduct simulation exercises to establish the extent to which change in lending attitude affects the output of each industry, via change in inter-industry transactions. We find that an easier lending attitude toward small suppliers increased the output in the small firm sector, and reduced the output in the large firm sector. This suggests that differential changes in lending attitude toward the large firm sector and the small firm sector bring about distributional changes in intermediate inputs across sectors with different firm size, which in turns leads to non-negligible changes in the sectoral outputs.

The paper is organized as follows. In Section 2 we discuss the determinants of input-output structure theoretically. Section 3 derives the basic equation to be estimated, and describes the data set we use. Section 4 interprets the estimation results we obtained, and Section 5 presents the results of the simulation exercises. Section 6 concludes this study.

2 Determinants of the Input-Output Structure: Theoretical Discussions

In traditional input-output analysis, the input-output coefficient is technically determined. Suppose that a firm has the following constant-returns-to-scale Cobb-Douglas production technology.

$$Y = AL^{\alpha_L} K^{\alpha_K} M_1^{\alpha_{M_1}} \cdots M_N^{\alpha_{M_N}}, \tag{1}$$

where

Y : gross output,

L : labor,

K : capital,

M_i : intermediary input from the i-th industry $(i = 1, \ldots, N)$, and

$\alpha_L, \alpha_K, \alpha_{m_1}, \ldots, \alpha_{m_N}$: technology parameters with

$\alpha_L + \alpha_K + \sum_{i=1}^{N} \alpha_{M_i} = 1.$

The firm determines the optimal ratio of intermediary inputs to gross output that maximizes its profit(π) , defined as follows:

$$\pi = pY - wL - rK - \sum_{i=1}^{N} p_{M_i} M_i, \tag{2}$$

where

p : output price,

w : wage rate,

r : rental price of capital, and

P_{M_i} : price of the i-th intermediary input.

The first-order conditions yield the following input demand function for intermediary goods:

$$\frac{p_{M_i} M_i}{pY} = \alpha_{M_i} \ (i = 1, 2, \ldots, N). \tag{3}$$

This equation shows that the input-output coefficients on value terms are simply the technology parameters of the production function.

When a firm has the option to purchase the i-th intermediary input from two suppliers, a large firm and a small firm, then we have to specify how the customer determines the proportion of intermediary goods purchased from each supplier. Three determinants affect the customer's decision to purchase from large or small suppliers. First, the firm can reduce the risk that the order placed for the intermediary inputs is not delivered as scheduled, by diversifying the orders from large and small suppliers. The total amount of the i-th intermediary input necessary to attain optimal production is rewritten from eq.(3) as

$$M_i^* = \frac{\alpha_{M_i} pY}{p_{M_i}}. \tag{4}$$

Given the optimal amount of the i-th intermediary input given by eq.(4), the firm determines the proportion of intermediary goods that it orders from large and small suppliers in a way that minimizes the expected loss from failing to attain the profit-maximizing level of intermediary input. Formally, the objective function of the customer is written as:

$$\mathrm{E}\left[M_i^* - \tilde{a}_{iL} M_{iL} - \tilde{a}_{iS} M_{iS}\right]^2. \tag{5}$$

where

M_{iL} : amount ordered from large suppliers,

M_{iS} : amount ordered from small suppliers,

$\tilde{a}_{iL}$: stochastic factor that affects realization of the order from large firms, and

$\tilde{a}_{iS}$: stochastic factor that affects realization of the order from small firms.

The idea underlying our formulation is as follows. The firm knows the optimal total amount of intermediary goods and places orders with large and small suppliers. However, it takes some time for the ordered goods to be delivered to the customer, and there is always some possibility that the goods delivered will fall short of those ordered, due to stochastic shocks. Therefore the customer has an incentive to lessen the risk by diversifying the orders between large and small suppliers. Formally the firm minimizes eq.(5) subject to the following constraint:

$$M_{iL} + M_{iS} = M_i^*. \tag{6}$$

The first condition yields the following demand function for the i-th intermediary input of large suppliers.

$$\frac{M_{iL}}{M_i^*} = \frac{\mathrm{E}\left[\tilde{a}_{iL}\right] - \mathrm{E}\left[\tilde{a}_{iS}\right] + \mathrm{E}\left[\tilde{a}_{iS}^2\right] - \mathrm{E}\left[\tilde{a}_{iL}\tilde{a}_{iS}\right]}{\mathrm{E}\left[(\tilde{a}_{iL} - \tilde{a}_{iS})^2\right]}. \tag{7}$$

The term $\mathrm{E}\left[\tilde{a}_{iL}\right] - \mathrm{E}\left[\tilde{a}_{iS}\right]$ measures the difference in the mean of the stochastic factors. Here we assume that $\mathrm{E}\left[\tilde{\alpha}_{iL}\right] = \mathrm{E}\left[\tilde{\alpha}_{iS}\right]$. Then eq.(7) is written simply as

$$m_{iL} = \frac{M_{iL}}{M_i^*} = \frac{\sigma_{iS}^2 - \sigma_{iSL}}{\sigma_{iS}^2 + \sigma_{iL}^2 - 2\sigma_{iSL}}, \tag{8}$$

where

σ_{iS}^2 : variance of $\tilde{a}_{iS}$

σ_{iL}^2 : variance of $\tilde{a}_{iL}$, and

σ_{iSL} : covariance between $\tilde{a}_{iS}$ and $\tilde{a}_{iL}$.

Similarly, the demand function for the i-th intermediary input of small suppliers is given by[6]

$$m_{iS} = \frac{M_{iS}}{M_i^*} = \frac{\sigma_{iL}^2 - \sigma_{iSL}}{\sigma_{iS}^2 + \sigma_{iL}^2 - 2\sigma_{iSL}}. \tag{9}$$

We can show that when $\sigma_{iS}^2 > \sigma_{iL}^2$ then $m_{iL} > m_{iS}$. In other words, if the delivery uncertainty of a small supplier is larger than that of a large supplier, the proportion purchased from the large supplier is larger than that from the small supplier.[7]

Comparative statics also enable us to obtain the following results:

$$\frac{\partial m_{iL}}{\partial \sigma_{iL}^2} < 0, \quad \frac{\partial m_{iL}}{\partial \sigma_{iS}^2} > 0, \quad \frac{\partial m_{iS}}{\partial \sigma_{iS}^2} < 0, \quad \frac{\partial m_{iS}}{\partial \sigma_{iL}^2} > 0. \tag{10}$$

[6]It can be shown that, if the correlation coefficient between $\tilde{a}_{iS}$ and $\tilde{a}_{iL}$ (ρ_i) satisfies the condition $\rho_i < \min\left(\frac{\sigma_{iS}}{\sigma_{iL}}, \frac{\sigma_{iL}}{\sigma_{iS}}\right)$, then $0 < m_{iL}, m_{iS} < 1$.

[7]This proposition and the subsequent comparative statics results remain essentially valid without the constraint (6).

A rise in the delivery uncertainty of one supplier, measured by the variance of $\tilde{a}_{iS}$ or $\tilde{a}_{iL}$, will reduce the proportion of purchase from that supplier, and will instead increase the proportion purchased from the other supplier. These results suggest that the degree of uncertainty about delivery is very important in determining the degree of diversification of intermediate inputs between large and small suppliers. Note that the degree of uncertainty about delivery depends crucially on the balance sheet conditions of the suppliers. When one supplier's balance sheet deteriorates, then it is quite likely that the supplier will be forced to reduce production, perhaps due to the unavailability of working capital, and thus cannot deliver the contracted amount to its customers. Therefore, the customer has an incentive to increase its purchases from the supplier with a healthier balance sheet.

Second, the customer may prefer purchase from large firms, since large suppliers have better access to credit, and hence can redistribute the credit they receive to their customers by way of trade credit. This is the redistributional aspect of trade credit. Note that the redistributional role of trade credit depends on the balance sheet conditions of financial institutions, since credit availability, for both large and small firms, is very much affected by the health of financial institutions.

Finally, the market structure of intermediate goods is an important factor in determining the purchase pattern of intermediate inputs from large and small suppliers. When a market for intermediate goods is oligopolistic, purchase will be heavily dependent on large suppliers. On the other hand, dependence on large suppliers will be lower in a competitive intermediate goods market. It should be noted that the input-output coefficient in our context is no longer the parameter determined purely by production technologies. The input-output coefficient, say from a large supplier in the i-th industry, is defined as

$$\frac{p_{M_i} M_{iL}}{pY} = \frac{p_{M_i} M_i}{pY} \cdot \frac{M_{iL}}{M_i} = \alpha_{M_i} \cdot \frac{M_{iL}}{M_i}. \tag{11}$$

The first term of the right hand side of eq.(11) is the conventional input-output coefficient, which is technologically given, but the second term of the right hand side of eq.(11) depends upon economic factors, such as the balance sheet conditions of suppliers and financial institutions, and the market structure of intermediate goods.

3 Model Specification and the Data Set Description

3.1 Model Specification

In our model the input-output coefficient has four dimensions: buyer, supplier, firm size of buyer and firm size of supplier. We assume that the economy consists of N industries. Consider the production structure of the small firm in the j-th industry $(j = 1, 2, \ldots, N)$. Suppose that the small firm in the j-th industry buys $M_{iL,jS}$ units of input from the large firm in the i-th industry when it produces Y_{jS} units of output. Then the input-output coefficient ($a_{iL,jS}$) in value terms is defined as

$$a_{iL,jS} \equiv \frac{p_{M_i} M_{iL,jS}}{p_j Y_{jS}}. \tag{12}$$

The coefficient $a_{iL,jS}$ is a product of the input-output coefficient $p_{Mi}M_{i,jS}/p_jY_{jS}$, where $M_{i,jS}$ is the total input from the i-th industry to the small firm of the j-th industry, and the proportion of inputs purchased from the large supplier of the i-th industry $m_{iL,jS} \equiv p_{M_i}M_{iL,jS}/p_{M_i}M_{i,jS}$. The former is an exogenous parameter of the Cobb-Douglas production technology, while the latter depends on economic factors, as described in the previous section.

Now we make an econometric specification of the determinants of $m_{iL,jS}$. First, it will be affected by the balance sheet conditions of the suppliers. Deterioration in the balance sheet of the supplier may prevent the order placed from being delivered as scheduled. This effect can be captured by the debt outstanding relative to real activities of the large supplier and the small supplier of the i-th industry, which we denote by $DEBT_{iL}$ and $DEBT_{iS}$, respectively. A fall (rise) in $DEBT_{iL}$ ($DEBT_{iS}$) will increase $m_{iL,jS}$.

Liquidity is another balance sheet variable of the supplier that we consider. When the supplier has abundant liquidity, production activities will be executed smoothly and thus the order placed will be delivered without delay. We denote the liquidity of the large supplier and the small supplier of the i-th industry by LIQ_{iL} and LIQ_{iS}, respectively. An increase (decrease) in LIQ_{iL} (LIQ_{iS}) will increase $m_{iL,jS}$.

The redistributional view of trade credit implies that the bank credit that suppliers receive may be redistributed to their customers via trade credit. Therefore the necessary condition for the redistributional view to hold is that the supplier receives sufficient credit from financial institutions. We use the lending attitude of financial institutions toward the supplier as a proxy for the availability of bank credit. The lending attitude of financial institutions to large suppliers and small suppliers of the i-th industry is denoted by $LEND_{iL}$ and $LEND_{iS}$, respectively. An increase (decrease) in $LEND_{iL}$ ($LEND_{iS}$) will increase $m_{iL,jS}$.

Sales growth might also affect the purchase pattern of intermediate inputs between large and small suppliers. Higher sales growth will warrant stable supply of intermediate goods to customers. We denote the growth rate of sales of the large suppliers and the small suppliers of the i-th industry by $SGROWTH_{iL}$ and $SGROWTH_{iS}$, respectively. A rise (fall) in $SGROWTH_{iL}$ ($SGROWTH_{iS}$) will increase $m_{iL,jS}$.

The market structure of the supplier is an important factor in determining the pattern of purchases from large and small suppliers. Market structure is captured in this study by the dummy variables, as follows. In specifying the $m_{iL,jS}$ equation, we add the dummy variable $DUM_{iL,jS}$ to represent individual effects ($i, j = 1, 2, \ldots, N$). The variable $DUM_{iL,jS}$ takes unity for the pair of large supplier in the i-th industry and small customer in the j-th industry, and zero elsewhere. Then the average industry effect of supplier is calculated simply as $(1/N)\sum_{j=1}^{N}\gamma_{iL,jS}$, where

$\gamma_{iL,jS}$ is the coefficient estimate of $DUM_{iL,jS}$.

Lastly, we take the balance sheet conditions of the buyer into consideration. The balance sheet variables are debt outstanding relative to real activities ($DEBT_{jS}$), liquidity (LIQ_{jS}) and sales growth rate ($SGROWTH_{jS}$). We also add the lending attitude of financial institutions toward the small customer of the j-th industry ($LEND_{jS}$) to the list of explanatory variables.

To sum up, the equation to be estimated is written as[8]

$$\begin{aligned} m_{iL,jS} &= \gamma_0 + \gamma_1 LIQ_{iL} + \gamma_2 LIQ_{iS} + \gamma_3 DEBT_{iL} + \gamma_4 DEBT_{iS} \\ &+\gamma_5 LEND_{iL} + \gamma_6 LEND_{iS} + \gamma_7 SGROWTH_{iL} + \gamma_8 SGROWTH_{iS} \\ &+\gamma_9 LIQ_{jS} + \gamma_{10} DEBT_{jS} + \gamma_{11} LEND_{jS} + \gamma_{12} SGROWTH_{jS} \\ &+ \sum_{i=1}^{N} \sum_{j=1}^{N} \gamma_{iL,jS} DUM_{iL,jS} + \sum_{t=1}^{T} \lambda_t D_t + \epsilon_{iL,jS} \quad (i, j = 1, 2, \ldots, N), \quad (13) \end{aligned}$$

where

D_t : time dummy, and

$\epsilon_{iL,jS}$: disturbance term.

The proportion of inputs purchased from the small supplier of the i-th industry ($m_{iS,jS}$) does not give any additional information, since $m_{iS,jS}$ is linearly related to $m_{iL,jS}$ as $1 - m_{iL,jS}$. Therefore we use only the input information from large suppliers. As for the input customer, small customers and large customers may respond differently to changes in the balance sheet conditions, and in the lending attitude of financial institutions. Therefore eq.(13) is estimated separately for large

[8]Time dummies are also added to the equation to account for the effects of the macro shocks common to each industry, since we pool different panels of input-output tables.

customers. The equation to be estimated for large customers is written as

$$
\begin{aligned}
m_{iL,jL} = & \eta_0 + \eta_1 LIQ_{iL} + \eta_2 LIQ_{iS} + \eta_3 DEBT_{iL} + \eta_4 DEBT_{iS} \\
& + \eta_5 LEND_{iL} + \eta_6 LEND_{iS} + \eta_7 SGROWTH_{iL} + \eta_8 SGROWTH_{iS} \\
& + \eta_9 LIQ_{jL} + \eta_{10} DEBT_{jL} + \eta_{11} LEND_{jL} + \eta_{12} SGROWTH_{jL} \\
& + \sum_{i=1}^{N} \sum_{j=1}^{N} \eta_{iL,jL} DUM_{iL,jL} + \sum_{t=1}^{T} \mu_t D_t + \epsilon_{iL,jL} \quad (i, j = 1, 2, \ldots, N), \quad (14)
\end{aligned}
$$

3.2 Data Set Description

The proportion of inputs purchased from either large suppliers or small suppliers, $(m_{ik,jl}; k, l = S, L)$, is directly estimated by the scale-wise input-output tables compiled by the *Applied Research Institute Japan*. We use the input-output tables of 1980, 1985, 1990, 1995 and 2000. In these tables, the sectors in the manufacturing industry are further divided into two sectors by firm size. In the original tables, the number of sectors in manufacturing industry is 23, which are aggregated into 14 sectors in accordance with the sector classification in *Financial Statements Statistics of Corporations* (abbreviated as FSSC), compiled by the Ministry of Finance.[9] Since we restrict the analysis to manufacturing industry, the total number of input coefficients used in our analysis is 1,960 (=(14 suppliers)×(14 customers)×(5 years)×(2 firm sizes)).[10] In the estimation, we discard observations that report no input from a certain industry, or negative values in the input-output tables. Also, some sectors have negative input coefficients, mainly due to the treatment of waste or by-products. We also eliminated these observations from the sample.

The distribution of the input coefficients $(m_{iL,jl}; l = S, L)$ and the related de-

[9]The sector concordance between the Input-output tables and the Financial Statement Statistics of Corporations is presented in Table A1 of the Data Appendix.

[10]The total number of input coefficients is 3,920 (=1,960×2) but, as discussed above, the proportion of input purchased from small suppliers is linearly related to that from large suppliers. Therefore the number of input coefficients used in our analysis is 1960.

scriptive statistics are presented in Table 1.[11] The mean of $m_{iL,jl}$ has remained relatively stable since 1985, irrespective of firm size. It ranges from 0.401 to 0.436. The mode of distribution also remains unaltered over time, and is in the interval of 0.1 to 0.2, irrespective of firm size. The shape of the distribution is bimodal.

All the balance sheet variables are taken from FSSC.[12] The FSSC data are on a fiscal year basis, and we have the values at the beginning of period and at the end of the period available for stock variables. To maintain the consistency of the data frequency with the input-output tables, we use the stock variable at the beginning of the period. The debt outstanding relative to real activities is measured in two ways. One is the ratio of debt to sales ($DEBT1$), and the other is the ratio of total borrowings to sales ($DEBT2$). The liquidity variable (LIQ) is defined as the ratio of cash, deposits and securities in current assets to sales. The sales variable is deflated by the output deflator of each industry reported in the *Annual Report of National Account* (Cabinet Office of the Government of Japan).

The lending attitude of financial institutions comes from *The Short-term Economic Survey of Enterprises or Tankan Survey*, released by the Bank of Japan. The original series is available quarterly, so we use annual averages.

Table A3 summarizes the balance sheet variables and the lending attitude thus constructed, by firm size and industry for each year. It should be noted that the variation in these variables over the whole sample is small relative to those of the input coefficients. That is to say, the balance sheet variables of the *i*-th supplier take the same value irrespective of its customers, and those of the *j*-th customer takes the same value irrespective of its suppliers.

[11]The original distribution of the input coefficients is shown in Table A2 in the Data Appendix. Comparison of Table 1 and Table A2 reveals how many observations have been eliminated from the sample, due to zero or negative inputs.

[12]In the input-output tables, small firms are defined as those whose number of employees is less than 300, while in the FSSC we define small firms as those whose equity capital is less than 100 million yen.

4 Estimation Results and their Implications

Table 2 shows the estimation results when $DEBT1$ is used as the $DEBT$ variable. The estimation is conducted for the whole period, the period from 1980 to 1990 and the period of the lost decade (1995 and 2000). First we examine the estimation results for small customers. When the estimation is conducted for the whole period, the debt-sales ratio of large suppliers has a significantly negative effect on the proportion of purchases from large suppliers. An increase in the debt burden on large suppliers prompts small customers to rely more on small suppliers, due to increasing uncertainty about the delivery of intermediate inputs from large suppliers with a shaky balance sheet. In the lost decade period the debt-sales ratio of small suppliers exerts a significantly positive effect on the proportion of purchase from large suppliers. In other words, a rise in the debt-sales ratio of small suppliers induces small customers to depend more on large suppliers. We also find that liquidity of small suppliers has negative effects on the proportion of purchase from large suppliers, implying that fall of liquidity of small suppliers prompts small customers to rely more on large suppliers more abundant in liquidity. Furthermore, in the lost decade period, the lending attitude of financial institutions toward large (small) suppliers has a significantly positive (negative) effect on the proportion of purchases from large suppliers. This result indicates that easing the lending attitude toward large suppliers and / or tightening the lending attitude toward small suppliers raises the proportion of purchases from large suppliers by small customers. This result is consistent with the redistributional view of trade credit. Lastly, we find that higher sales growth of large suppliers, which warrants stable supply of intermediate goods to customers, makes small customers more dependent on large suppliers.[13]

[13]Significantly positive coefficient of sales growth of small suppliers is a bit puzzling result to interpret. It might suggest that purchase from small and large suppliers are complements rather than substitutes.

Now we turn to the estimation results for large customers. When the estimation is conducted for the whole period, the debt-sales ratio of large suppliers has a significantly negative effect on the proportion of purchases from large suppliers. In the latter period we find that higher sales growth of large suppliers, lower liquidity of small suppliers and higher debt-sales ratio of small suppliers significantly increase dependence on large suppliers. We also find that easier lending attitude toward large suppliers and/or tighter lending attitude toward small suppliers increase dependence on large suppliers significantly. This result indicates that the redistributional view of trade credit is valid, even for large firms in the lost decade.

It should be noted that the market structure of suppliers, shown in the bottom panel of the table, is important, irrespective of the sample period and the type of customer. The figures in the table measure the magnitude of the industry effect, relative to the food products and beverages industry. Almost all the parameter estimates are significantly positive. We observe large values for the petroleum and coal products, electrical machinery and transport equipment industries.

Table 3 shows the estimation results when $DEBT2$ is used as the $DEBT$ variable. The results remain essentially unaltered. In the lost decade, the coefficient estimate of the debt-sales ratio of small suppliers is significantly positive for small customers . We find significantly positive (negative) effects of lending attitude toward large (small) suppliers on the proportion of purchases from large suppliers, for both large and small customers. We also find that higher sales growth of large suppliers and lower liquidity of small suppliers significantly increase dependence on large suppliers, for both large and small customers. The market structure of suppliers is also important for customers' purchase behavior, irrespective of the sample period and the type of customer.

5 The Impact of Balance Sheet Contagion on Sectoral Output by Inter-Industry Linkage: Simulation Analysis

The virtue of input-output analysis is that it enables us to evaluate quantitatively to what extent an initial increase in final demand in one sector is propagated into output in other sectors, and eventually in aggregate output. This is well known as the multiplier effect. The inverse matrix of identity matrix minus input-coefficient matrix plays a vital role in determining the magnitude of multipliers. In the previous sections, we showed that when firm size is taken into consideration in the inter-industry transactions, the input-output coefficients are not technically determined constant, but depend on the balance sheet conditions of firms and financial institutions. The upshot is that the multiplier effects are also affected by the balance sheet conditions of firms and financial institutions. Furthermore, change in the balance sheet conditions also brings about sectoral reallocation of outputs through substitution of intermediate inputs between large and small firm sector.

In this section we quantitatively evaluate to what extent sectoral outputs are affected by change in the balance sheet conditions. Specifically, we conduct the following simulation exercise. It has been often argued that small firms suffered most in the credit crunch in the late 1990s in Japan. Figure 1 shows the difference of the lending attitude toward large firms and small firms in 1995 by industry. Note that the lending attitude is much easier toward large firms except for petroleum and coal products. In particular the lending attitude is easier toward large firms by more than 20 percentage points for textiles, fabricated metal products and precision instruments.

We quantitatively evaluate the situation where the lending attitude toward small firms gets easier. Specifically, we assume that the lending attitude of financial institutions toward small firms in 1995 gets as easy as toward large firms across all manufacturing industries, keeping the lending attitude toward large firms intact. [14]

In this simulation, we adopt the estimated equations for the period 1995-2000 in Table 2, where $DEBT1$ (Debt / Sales ratio) is used as the $DEBT$ variable. The impact of this scenario on sectoral output in 1995 is calculated in the following steps. First we compute the input-output coefficient matrix of the base case in 1995, using the predicted values of $m_{iL,jS}$ and $m_{iL,jL}$, from eqs.(13) and (14), by substituting the historical values in 1995 into each explanatory variable.[15] In other words,

$$\begin{aligned} \hat{a}_{iL,jS} &= b_{i,jS}\hat{m}_{iL,jS}, \\ \hat{a}_{iS,jS} &= b_{i,jS}(1-\hat{m}_{iL,jS}), \\ \hat{a}_{iL,jL} &= b_{i,jL}\hat{m}_{iL,jL}, \text{ and} \\ \hat{a}_{iS,jL} &= b_{i,jL}(1-\hat{m}_{iL,jL}), \end{aligned} \tag{15}$$

where

$\hat{m}_{iL,jS}$: predicted values of $m_{iL,jS}$ in 1995 computed from eq.(13),

$\hat{m}_{iL,jL}$: predicted values of $m_{iL,jL}$ in 1995 computed from eq.(14),

$b_{i,jS} = \dfrac{p_{M_i}M_{i,jS}}{p_jY_{jS}}$: actual ratio of input from the i-th industry to output of small firms in the j-th industry in 1995, and

$b_{i,jL} = \dfrac{p_{M_i}M_{i,jL}}{p_jY_{jL}}$: actual ratio of input from the i-th industry to output of large firms in the j-th industry in 1995.

Then we calculate the inverse matrix of $\mathbf{I}-(\mathbf{I}-\mathbf{V})\hat{\mathbf{A}}$, where the elements of $\hat{\mathbf{A}}$ matrix are given by eq.(15) and $\mathbf{V}$ is a diagonal matrix where the diagonal elements are the ratios of import to the domestic demand for the corresponding industries.[16]

[14]Note that in this scenario the lending attitude of financial institutions toward small firms tightens in petroleum and coal products.

[15]For the predicted year, 1995, the mean absolute error of $\hat{m}_{iL,jl}$ is 0.0206 for small firms ($l = S$) and 0.0171 for large firms ($l = L$). In terms of the original input coefficients, $\hat{a}_{iL,jl} = b_{i,jl}\hat{m}_{iL,jl}$ used for the simulation, the mean absolute errors are negligibly small: 0.00064 for small firms and 0.00049 for large firms.

[16]The predicted $\hat{m}_{iL,jl}$ ($l = S, L$) can exceed unity or take a negative value. This case is quite likely

In the next step we compute the input-output coefficient matrix under this scenario, by substituting the newly assumed values of the lending attitude variable into $\hat{m}_{iL,jS}$ and $\hat{m}_{iL,jL}$ equation, with the other variables taking the same values as before. We denote the input-output coefficient matrix thus calculated by $\tilde{\mathbf{A}}$. Change in sectoral outputs induced by the domestic final demand are the elements of $\left[\mathbf{I} - (\mathbf{I} - \mathbf{V})\tilde{\mathbf{A}}\right]^{-1} (\mathbf{I} - \mathbf{V})$.

Change in sectoral outputs is composed of two parts. One is the change in sectoral outputs due to the change in the input-output coefficient matrix. This part is calculated as

$$\left[\left[\mathbf{I} - (\mathbf{I} - \mathbf{V})\tilde{\mathbf{A}}\right]^{-1} - \left[\mathbf{I} - (\mathbf{I} - \mathbf{V})\hat{\mathbf{A}}\right]^{-1}\right]\left[(\mathbf{I} - \mathbf{V})\mathbf{f^d} + \mathbf{e}\right], \tag{16}$$

where $\mathbf{f^d}$ is the domestic final demand vector, including private consumption, private investment, inventory change, and government expenditure, and $\mathbf{e}$ is the vector of export in 1995. This term reflects substitution of intermediate inputs between small firms and large firms.

The other part is the change in sectoral output induced by a change in final demand. Note that change in the balance sheet conditions of firms and financial institutions might affect investment, important component of domestic final demand.[17] This part is written as

$$\left[\mathbf{I} - (\mathbf{I} - \mathbf{V})\tilde{\mathbf{A}}\right]^{-1} (\mathbf{I} - \mathbf{V})\Delta\mathbf{f^d}, \tag{17}$$

where $\Delta\mathbf{f^d}$ is the change in domestic final demand in 1995 arising from the change in balance sheet conditions.

Now we turn to quantitative evaluation of the scenario. The first column of Table 4 shows the sectoral output before the change in the lending attitude of fi-

when actual $m_{iL,jl}$ is very close to unity or zero, since our prediction is based on OLS with a fixed effect model. Actually, we have 10 ($\hat{m}_{iL,jS} > 1$) and 1 ($\hat{m}_{iL,jS} < 0$) cases out of 179 observations for small firms, and 10 ($\hat{m}_{iL,jL} > 1$) and 2 ($\hat{m}_{iL,jL} < 0$) cases out of 182 observations for large firms. In these cases we replace them with 1 or 0.

[17]For example, see Ogawa(2003b) for the effects of balance sheet conditions of firms and financial institutions on corporate investment.

nancial institutions, calculated as $\left[\mathbf{I} - (\mathbf{I} - \mathbf{V})\hat{\mathbf{A}}\right]^{-1}\left[(\mathbf{I} - \mathbf{V})\mathbf{f^d} + \mathbf{e}\right]$. The second column shows the sectoral output after the change in the lending attitude, calculated as $\left[\mathbf{I} - (\mathbf{I} - \mathbf{V})\tilde{\mathbf{A}}\right]^{-1}\left[(\mathbf{I} - \mathbf{V})\mathbf{f^d} + \mathbf{e}\right]$. The third column is the difference between the second column and the first one. The figures in the third column represent how much the output of a certain industry changes when the lending attitude toward small firms gets as easy as toward large firms, with the final demand being fixed.

As for the change in final demand, based on the investment function estimated in Ogawa(2003b), easing lending attitude toward small firms in this scenario increases corporate investment of small firms by 682.6 billion yen. This increase of investment is then allocated across industries, using the weights of the private gross fixed capital formation by industry in 1995. The fourth column shows the increase of sectoral outputs brought about by this increment of final demand. The fifth column is the total change in sectoral output, sum of the third and the fourth column. The sixth column shows the rate of change in sectoral output.

The table also shows the grand total of the figures over large firms in manufacturing industries, and that over small firms in manufacturing industries. The former corresponds to the total increase in the output of large firms in all manufacturing industries, while the latter corresponds to that of the output of small firms in all manufacturing industries.

The third column of Table 4 shows that the output of small manufacturing firms increases by 8,310.5 billion yen and that of large manufacturing firms decreases by 8,986.6 billion yen. The output of the manufacturing firms as a whole decreases by 676.1 billion yen. This indicates that intermediate inputs purchased from large manufacturing firms is substituted by those from small manufacturing firms that now face lending attitude as favorable as large firms.

Induced by increase of final demand, the output of small and large manufacturing firms is raised by 281.6 billion yen and 280.4 billion yen, respectively. Comparison of the third column with the fourth column shows that substitution effects dominate the multiplier effects. Consequently the output of small manufacturing firms increases by 8,592.1 billion yen, while that of large manufacturing firms decreases by 8,706.2 billion yen. Change in the output varies across industries. In large manufacturing firms the change is notably large for textile (-86.9%) and fabricated metal products (-20.6%). On the other hand, in small manufacturing firms the change is large for iron and steel (20.8%), non-ferrous metals (17.9%), transport equipment (14.8%) and textile (14.3%).

Figure 2 shows the scatter diagram of the rate of change in output of small manufacturing firms and the change in lending attitude of financial institutions toward small firms across industries. We observe positive correlation of the rate of change in lending attitude with the rate of change in output. In fact the correlation coefficient is 0.41.

Our approach is contrasted with the conventional one. In the conventional approach favorable change in lending attitude toward small firms is analyzed as follows. As is shown above, favorable change in lending attitude toward small firms creates 682.6 billion yen increase of corporate investment, which is allocated across industries as additional final demand, using the weights of the private gross fixed capital formation by industry in 1995. Then the multiplier is calculated based on the input-output coefficient matrix without taking account of the effects of change in lending attitude. Change in output thus calculated is shown in the seventh column of Table 4. Comparison of the fifth column and the seventh column shows that the change in output is overestimated for large manufacturing firms and underestimated for small manufacturing firms in the conventional approach. This is due to omission of substitution effects of intermediate inputs from large manufacturing firms to small manufacturing firms in the conventional approach. The total multiplier is also quite different between the two approaches. The multiplier in our approach is 0.926 (= 632.1 / 682.6), while it is 1.894 (= 1,292.9 / 682.6) in the conventional case.

The simulation results above indicate quantitative importance of substitution effects of intermediate inputs between large and small manufacturing firms. It also hints that output of small firm sector increases to a large extent simply by easing lending attitude toward them without any increase in final demand.

6 Concluding Remarks

This paper proposed a novel approach to investigating the propagation mechanism of balance sheet deterioration in financial institutions and firms, by extending the conventional input-output analysis. The direction of extension is twofold. One is the use of input-output tables that are classified by firm size for the manufacturing sector. This adds another dimension to the inter-industry structure: the transactional relationship between firms of different sizes. The other links the input-output tables with the balance sheet conditions of financial institutions and firms, and this enables us to analyze customers' decision making in allocating input purchases between large and small suppliers.

By pooling the Japanese input-output tables, classified by firms, for 1980, 1885, 1990, 1995 and 2000, we explored the determinants of the purchase of intermediate goods from large and small suppliers. We found that the lending attitude of financial institutions affected customers' input decisions from the late 1990s to the early 2000s.

Based on the estimation results, we conducted simulation exercises to evaluate quantitatively the extent to which the change in the balance sheet conditions of financial institutions that was favorable to small firms affected the sectoral outputs. We found that the output increased for small firms and declined for large firms. The change in output is non-negligible, about 5.5% of the initial output of each sector. In particular it exceeded 20% in textile, iron and steel and fabricated metal products. This suggests that a change in the balance sheet conditions of financial institutions generates a non-negligible distributional change in output among firms of different sizes.

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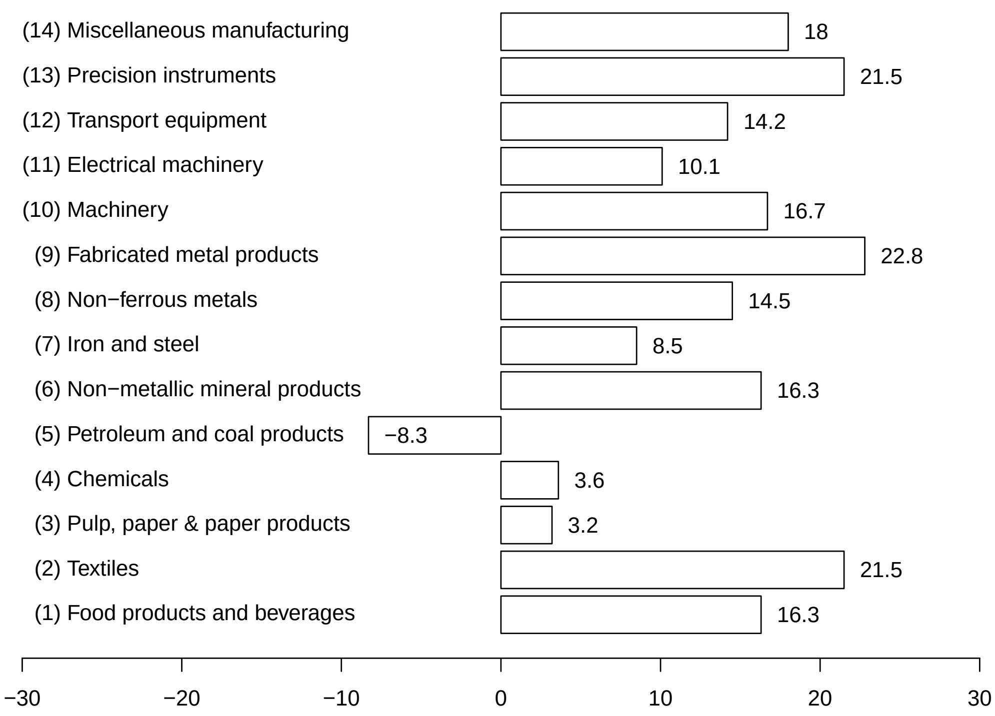

Figure 1: Difference in Lending Attitude of Financial Institutions between Large Firms and Small Firms: 1995

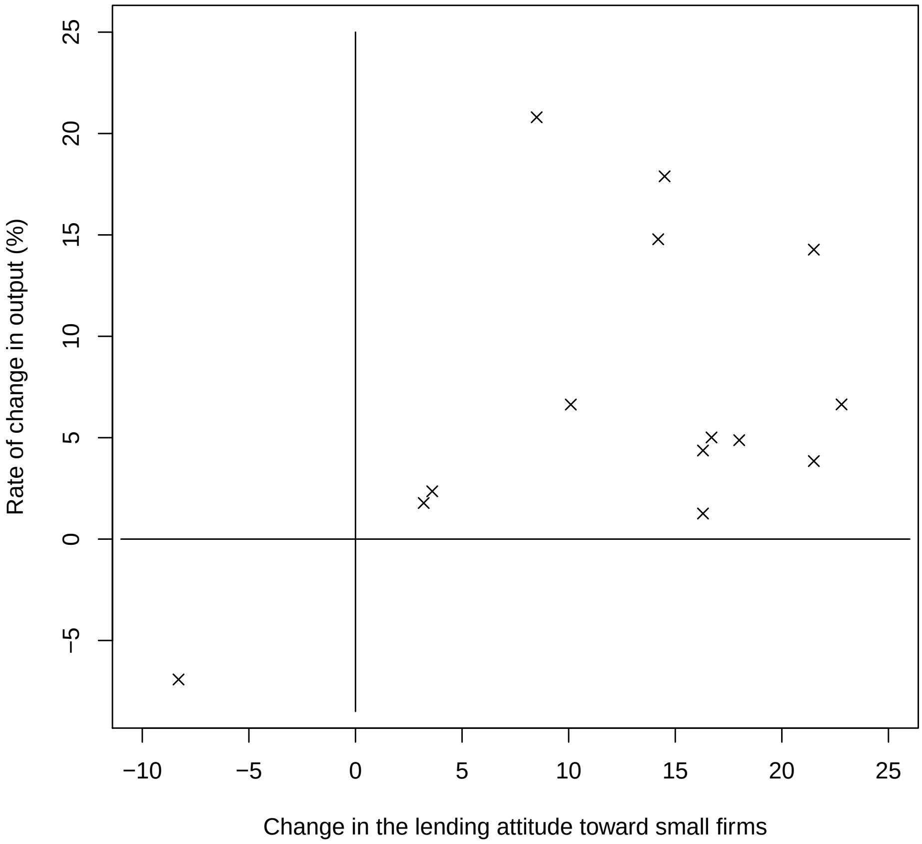

Figure 2: Relationship between the Rate of Change in Output and the Change in Lending Attitude across Industries: Small Manufacturing Firms

Table 1: Distribution of Normalized Input Coefficients by Year

	(1) 1980	(2) 1985	(3) 1990	(4) 1995	(5) 2000	(6) Total
			Small firms			
$m_{iL,jS} = 0.0$	5	5	2	2	2	16
$0.0 < m_{iL,jS} \leq 0.1$	12	15	20	16	27	90
$0.1 < m_{iL,jS} \leq 0.2$	26	31	34	35	30	156
$0.2 < m_{iL,jS} \leq 0.3$	16	22	16	20	19	93
$0.3 < m_{iL,jS} \leq 0.4$	25	17	18	18	14	92
$0.4 < m_{iL,jS} \leq 0.5$	16	14	16	18	21	85
$0.5 < m_{iL,jS} \leq 0.6$	12	18	21	27	17	95
$0.6 < m_{iL,jS} \leq 0.7$	7	14	11	17	15	64
$0.7 < m_{iL,jS} \leq 0.8$	17	7	10	8	10	52
$0.8 < m_{iL,jS} \leq 0.9$	3	2	4	1	6	16
$0.9 < m_{iL,jS} < 1.0$	8	1	13	15	15	52
$m_{iL,jS} = 1.0$	18	16	1	2	4	41
Total	165	162	166	179	180	852
Fraction of 0 or 1 coefficients	0.139	0.130	0.018	0.022	0.033	0.067
Mean	0.463	0.406	0.401	0.416	0.414	0.420
Standard deviation	0.315	0.294	0.284	0.278	0.302	0.295
			Large firms			
$m_{iL,jL} = 0.0$	5	5	4	4	4	22
$0.0 < m_{iL,jL} \leq 0.1$	12	14	18	17	26	87
$0.1 < m_{iL,jL} \leq 0.2$	25	27	29	29	24	134
$0.2 < m_{iL,jL} \leq 0.3$	15	23	17	19	13	87
$0.3 < m_{iL,jL} \leq 0.4$	14	14	18	18	20	84
$0.4 < m_{iL,jL} \leq 0.5$	19	17	18	20	22	96
$0.5 < m_{iL,jL} \leq 0.6$	16	14	21	24	20	95
$0.6 < m_{iL,jL} \leq 0.7$	8	22	15	18	14	77
$0.7 < m_{iL,jL} \leq 0.8$	23	11	10	13	12	69
$0.8 < m_{iL,jL} \leq 0.9$	3	3	4	3	7	20
$0.9 < m_{iL,jL} < 1.0$	6	1	13	13	15	48
$m_{iL,jL} = 1.0$	20	17	2	4	4	47
Total	166	168	169	182	181	866
Fraction of 0 or 1 coefficients	0.151	0.131	0.036	0.044	0.044	0.080
Mean	0.488	0.435	0.416	0.436	0.428	0.440
Standard deviation	0.317	0.299	0.283	0.283	0.303	0.297

Table 2: Estimated Results for Small Customers: $DEBT1$

	(1) 1980 - 2000		(2) 1980 - 1990		(3) 1995 - 2000	
LIQ_{iL}	0.2534	(1.34)	0.6207	(1.81)*	-0.6270	(1.21)
LIQ_{iS}	-0.0832	(0.77)	-0.1496	(0.42)	-0.3456	(3.36)***
$DEBT1_{iL}$	-0.1476	(2.63)***	0.0184	(0.19)	-0.0203	(0.11)
$DEBT1_{iS}$	0.0224	(0.36)	-0.4412	(2.88)***	0.3112	(3.41)***
$LEND_{iL}$	0.0004	(0.50)	0.0002	(0.14)	0.0047	(4.00)***
$LEND_{iS}$	-0.0008	(1.07)	0.0006	(0.44)	-0.0084	(4.95)***
$SGROWTH_{iL}$	0.1482	(2.41)**	0.0283	(0.38)	0.3626	(2.52)**
$SGROWTH_{iS}$	0.0266	(1.37)*	0.0401	(1.11)	0.1349	(5.20)***
LIQ_{jS}	0.0393	(0.38)	-0.0683	(0.22)	-0.0259	(0.33)
$DEBT1_{jS}$	-0.0612	(0.96)	0.0563	(0.39)	0.0353	(0.65)
$LEND_{jS}$	-0.0007	(1.48)	-0.0009	(0.98)	0.0002	(0.15)
$SGROWTH_{jS}$	0.0012	(0.06)	-0.0352	(0.99)	0.0007	(0.03)
$D1985$	-0.0175	(0.51)				
$D1990$	-0.0311	(1.33)				
$D1995$	-0.0232	(0.64)	-0.0200	(0.36)		
$D2000$	-0.0402	(1.48)	-0.0202	(0.49)	-0.0358	(1.58)
Constant term	0.1566	(3.06)***	0.2151	(2.50)**	-0.0296	(0.28)
Textiles	0.1178	(3.62)***	0.1051	(2.46)**	-0.0062	(0.06)
Pulp and paper products	0.1761	(4.51)***	0.0821	(1.34)	0.1116	(1.01)
Chemicals	0.4336	(14.7)***	0.3770	(8.35)***	0.6229	(11.4)***
Petroleum and coal	0.9799	(26.1)***	0.9318	(17.6)***	1.1744	(15.6)***
Non-metallic mineral	0.2963	(9.92)***	0.2584	(5.77)***	0.2453	(3.48)***
Iron and steel	0.5384	(15.3)***	0.4612	(8.66)***	0.4396	(4.69)***
Non-ferrous metals	0.5016	(16.5)***	0.4404	(9.63)***	0.4093	(4.46)***
Fabricated metal products	0.1074	(4.41)***	0.0662	(1.94)*	0.0533	(1.37)
Machinery	0.2292	(10.8)***	0.1767	(5.53)***	0.2548	(8.33)***
Electrical machinery	0.5986	(24.6)***	0.3727	(11.0)***	0.6116	(19.8)***
Transport equipment	0.6044	(27.4)***	0.4809	(19.0)***	0.5711	(24.6)***
Precision instruments	0.4721	(19.5)***	0.4338	(11.3)***	0.3942	(12.7)***
Miscellaneous	0.1247	(5.60)***	0.0875	(2.92)***	0.1289	(4.75)***
$\bar{R}^2$ / Se	0.9232	0.0817	0.9263	0.0810	0.9636	0.0472
N	852		493		359	

The figures in parentheses are the t-values in absolute value. Asterisks *, **, and *** indicate that the corresponding coefficients are significant at the 10%, 5% and 1% level, respectively. $\bar{R}^2$, Se, and N are the coefficients of determination adjusted for the degree of freedom, standard error of the regression, and the number of observations, respectively.

Table 2: (continued) Estimated Results for Large Customers: $DEBT1$

	(1) 1980 - 2000		(2) 1980 - 1990		(3) 1995 - 2000	
LIQ_{iL}	0.0358	(0.18)	0.0846	(0.24)	-0.6151	(1.57)
LIQ_{iS}	-0.0874	(0.79)	-0.0629	(0.17)	-0.1808	(2.35)**
$DEBT1_{iL}$	-0.1271	(2.20)**	-0.1285	(1.30)	0.1334	(0.95)
$DEBT1_{iS}$	0.0164	(0.25)	-0.2111	(1.31)	0.1940	(2.80)***
$LEND_{iL}$	-0.0003	(0.43)	-0.0005	(0.45)	0.0038	(4.31)***
$LEND_{iS}$	-0.0001	(0.10)	0.0005	(0.32)	-0.0047	(3.61)***
$SGROWTH_{iL}$	0.1735	(2.73)***	0.0731	(0.94)	0.2870	(2.62)***
$SGROWTH_{iS}$	0.0072	(0.36)	0.0255	(0.67)	0.0513	(2.61)***
LIQ_{jL}	0.1067	(0.57)	0.3514	(1.11)	0.1400	(0.64)
$DEBT1_{jL}$	-0.0530	(0.96)	0.0589	(0.63)	-0.0486	(0.63)
$LEND_{jL}$	-0.0004	(0.92)	-0.0001	(0.09)	0.0001	(0.20)
$SGROWTH_{jL}$	-0.1539	(2.39)**	-0.1792	(2.35)**	0.0156	(0.17)
$D1985$	0.0105	(0.25)	0.0000	(0.00)		
$D1990$	-0.0438	(1.85)*	-0.0347	(0.88)		
$D1995$	-0.0112	(0.28)				
$D2000$	-0.0232	(0.79)			-0.0109	(0.67)
Constant term	0.2241	(4.08)***	0.2732	(3.23)***	-0.0434	(0.49)
Food and beverages	-		-		-	
Textiles	0.0830	(2.48)**	0.0782	(1.79)*	-0.0627	(0.81)
Pulp and paper products	0.1920	(5.16)***	0.1604	(2.72)***	0.0759	(0.97)
Chemicals	0.4225	(13.8)***	0.3985	(8.50)***	0.4950	(12.0)***
Petroleum and coal	0.9220	(23.5)***	0.8763	(15.7)***	1.0213	(17.9)***
Non-metallic mineral	0.3582	(11.6)***	0.3508	(7.57)***	0.2690	(5.06)***
Iron and steel	0.4147	(12.4)***	0.4026	(7.80)***	0.2923	(4.54)***
Non-ferrous metals	0.5053	(14.6)***	0.4748	(9.15)***	0.3664	(4.91)***
Fabricated metal products	0.0912	(3.62)***	0.0692	(1.95)*	0.0377	(1.29)
Machinery	0.2574	(10.8)***	0.2405	(6.67)***	0.2479	(9.88)***
Electrical machinery	0.5994	(24.2)***	0.4582	(11.9)***	0.6328	(27.4)***
Transport equipment	0.6231	(27.6)***	0.5767	(20.7)***	0.5841	(35.1)***
Precision instruments	0.4837	(19.4)***	0.4666	(11.7)***	0.4341	(18.6)***
Miscellaneous	0.1299	(5.63)***	0.1014	(3.27)***	0.1260	(6.27)***
$\bar{R}^2$/ Se	0.9173	0.0855	0.9191	0.0856	0.9849	0.0360
N	866		503		363	

The figures in parentheses are the t-values in absolute value. Asterisks *, **, and *** indicate that the corresponding coefficients are significant at the 10%, 5% and 1% level, respectively. $\bar{R}^2$, Se, and N are the coefficients of determination adjusted for the degree of freedom, standard error of the regression, and the number of observations, respectively.

Table 3: Estimated Results for Small Customers: $DEBT2$

	(1) 1980 - 2000		(2) 1980 - 1990		(3) 1995 - 2000	
LIQ_{iL}	0.1985	(1.05)	0.6293	(1.80)*	-0.3026	(0.75)
LIQ_{iS}	-0.0606	(0.57)	-0.3024	(0.89)	-0.3149	(3.23)***
$DEBT2_{iL}$	-0.1377	(1.82)*	0.0298	(0.27)	-0.2586	(1.65)
$DEBT2_{iS}$	-0.0307	(0.44)	-0.5082	(2.51)**	0.1793	(1.93)**
$LEND_{iL}$	0.0003	(0.46)	0.0000	(0.03)	0.0041	(3.90)***
$LEND_{iS}$	-0.0009	(1.13)	0.0003	(0.24)	-0.0076	(4.52)***
$SGROWTH_{iL}$	0.1311	(2.15)**	0.0567	(0.78)	0.3623	(2.81)***
$SGROWTH_{iS}$	0.0335	(1.73)*	0.0361	(1.01)	0.1123	(4.61)***
LIQ_{jS}	0.0428	(0.42)	0.0033	(0.01)	-0.0231	(0.29)
$DEBT2_{jS}$	-0.0794	(1.14)	-0.0354	(0.19)	0.0439	(0.80)
$LEND_{jS}$	-0.0007	(1.49)	-0.0009	(1.00)	0.0002	(0.24)
$SGROWTH_{jS}$	0.0023	(0.12)	-0.0314	(0.88)	-0.0020	(0.09)
$D1985$	-0.0112	(0.32)				
$D1990$	-0.0282	(1.17)				
$D1995$	-0.0149	(0.40)	0.0016	(0.03)		
$D2000$	-0.0364	(1.26)	0.0075	(0.16)	-0.0313	(1.37)*
Constant term	0.1315	(2.94)***	0.1946	(2.58)***	0.0602	(0.86)
Food and beverages	-		-		-	
Textiles	0.1016	(3.27)**	0.0573	(1.41)	0.1166	(2.11)**
Pulp and paper products	0.1525	(4.01)***	0.0312	(0.51)	0.2253	(3.26)***
Chemicals	0.4127	(14.7)***	0.3328	(7.19)***	0.6138	(11.1)***
Petroleum and coal	0.9741	(23.3)***	0.8894	(14.1)***	1.2139	(18.0)***
Non-metallic mineral	0.2786	(10.4)***	0.2050	(4.89)***	0.3256	(9.41)***
Iron and steel	0.4976	(17.8)***	0.4222	(10.1)***	0.5103	(13.6)***
Non-ferrous metals	0.4835	(15.7)***	0.4062	(8.46)***	0.5038	(9.04)***
Fabricated metal products	0.0899	(3.92)***	0.0294	(0.87)	0.0982	(3.87)***
Machinery	0.2120	(10.8)***	0.1370	(4.44)***	0.2779	(9.58)***
Electrical machinery	0.5795	(22.7)***	0.3504	(9.44)***	0.6073	(15.6)***
Transport equipment	0.5895	(27.2)***	0.4553	(18.4)***	0.5800	(25.6)***
Precision instruments	0.4604	(19.2)***	0.4059	(10.2)***	0.4201	(12.6)***
Miscellaneous	0.1118	(5.07)***	0.0498	(1.57)	0.1543	(5.90)***
$\bar{R}^2/Se$	0.9228	0.0819	0.9258	0.0814	0.9728	0.0478
N	852		493		359	

The figures in parentheses are the t-values in absolute value. Asterisks *, **, and *** indicate that the corresponding coefficients are significant at the 10%, 5% and 1% level, respectively. $\bar{R}^2$, Se, and N are the coefficients of determination adjusted for the degree of freedom, standard error of the regression, and the number of observations, respectively.

Table 3: (continued) Estimated Results for Large Customers: $DEBT2$

	(1) 1980 - 2000		(2) 1980 - 1990		(3) 1995 - 2000	
LIQ_{iL}	-0.0245	(0.13)	0.0885	(0.24)	-0.1108	(0.36)
LIQ_{iS}	-0.0687	(0.63)	-0.2802	(0.79)	-0.1875	(2.58)**
$DEBT2_{iL}$	-0.1064	(1.37)	-0.0824	(0.73)	-0.1111	(0.94)
$DEBT2_{iS}$	-0.0244	(0.34)	-0.1678	(0.79)	0.0711	(1.00)
$LEND_{iL}$	-0.0004	(0.54)	-0.0006	(0.46)	0.0031	(3.79)***
$LEND_{iS}$	-0.0001	(0.08)	0.0004	(0.26)	-0.0043	(3.35)***
$SGROWTH_{iL}$	0.1583	(2.52)**	0.0717	(0.95)	0.3434	(3.48)***
$SGROWTH_{iS}$	0.0127	(0.63)	0.0315	(0.84)	0.0361	(1.95)*
LIQ_{jL}	0.0776	(0.42)	0.3420	(1.09)	0.0570	(0.30)
$DEBT2_{jL}$	-0.0284	(0.39)	0.0894	(0.77)	-0.0010	(0.01)
$LEND_{jL}$	-0.0004	(0.91)	-0.0001	(0.10)	0.0003	(0.65)
$SGROWTH_{jL}$	-0.1611	(2.51)**	-0.1738	(2.31)**	0.0009	(0.01)
$D1985$	0.0165	(0.39)	0.0025	(0.04)		
$D1990$	-0.0433	(1.76)*	-0.0308	(0.68)		
$D1995$	-0.0103	(0.25)				
$D2000$	-0.0273	(0.90)			-0.0088	(0.54)
Constant term	0.1936	(3.94)***	0.2203	(2.90)***	0.0436	(0.71)
Food and beverages	-		-		-	
Textiles	0.0644	(2.03)**	0.0385	(0.93)	0.0683	(1.53)
Pulp and paper products	0.1679	(4.64)***	0.1194	(2.03)**	0.1973	(4.11)***
Chemicals	0.4005	(13.9)***	0.3668	(7.62)***	0.4959	(12.0)***
Petroleum and coal	0.9114	(21.1)***	0.8646	(13.2)***	1.0730	(21.3)***
Non-metallic mineral	0.3396	(12.3)***	0.3078	(7.14)***	0.3525	(13.9)***
Iron and steel	0.3798	(14.3)***	0.3535	(8.58)***	0.3852	(15.1)***
Non-ferrous metals	0.4835	(13.9)***	0.4477	(8.22)***	0.4822	(10.7)***
Fabricated metal products	0.0745	(3.16)***	0.0424	(1.21)	0.0773	(4.22)***
Machinery	0.2416	(10.9)***	0.2069	(5.88)***	0.2710	(11.4)***
Electrical machinery	0.5831	(22.5)***	0.4408	(10.4)***	0.6186	(21.2)***
Transport equipment	0.6101	(27.5)***	0.5559	(20.2)***	0.5945	(36.7)***
Precision instruments	0.4733	(19.1)***	0.4498	(10.9)***	0.4441	(18.0)***
Miscellaneous	0.1180	(5.19)***	0.0793	(2.43)**	0.1418	(7.45)***
$\bar{R}^2/Se$	0.9169	0.0857	0.9182	0.0860	0.9844	0.0365
N	866		503		363	

The figures in parentheses are the t-values in absolute value. Asterisks *, **, and *** indicate that the corresponding coefficients are significant at the 10%, 5% and 1% level, respectively. $\bar{R}^2$, Se, and N are the coefficients of determination adjusted for the degree of freedom, standard error of the regression, and the number of observations, respectively.

Table 4: Effect on Sectoral Output

			(1) †1	(2) †2	(3) (2)−(1)	(4) †3	(5) (3)+(4)	(6) (5) / (1)	(7) †4
(1)	Agriculture		15,808.3	15,913.1	104.9	6.2	111.0	0.7	6.1
(2)	Mining		1,660.7	1,653.3	-7.4	2.6	-4.8	-0.3	2.6
(3)	Food and beverages	Large	8,460.0	8,068.0	-392.1	1.0	-391.1	-4.6	1.0
(4)		Small	30,395.6	30,773.7	378.2	5.1	383.3	1.3	5.1
(5)	Textile	Large	423.7	55.5	-368.2	0.0	-368.2	-86.9	0.5
(6)		Small	3,626.0	4,138.0	511.9	5.7	517.6	14.3	4.9
(7)	Pulp and paper	Large	2,920.5	2,735.6	-184.9	3.1	-181.8	-6.2	3.4
(8)		Small	6,498.4	6,606.6	108.2	7.4	115.6	1.8	7.3
(9)	Chemicals	Large	13,385.1	13,036.2	-348.9	8.2	-340.7	-2.5	8.6
(10)		Small	12,405.1	12,688.0	282.9	9.4	292.3	2.4	9.1
(11)	Petroleum and coal	Large	9,921.9	9,937.6	15.7	9.5	25.1	0.3	9.5
(12)		Small	566.8	525.8	-40.9	1.7	-39.2	-6.9	1.8
(13)	Non-metallic mineral	Large	1,787.5	1,480.2	-307.3	3.0	-304.3	-17.0	3.7
(14)		Small	7,908.2	8,229.6	321.4	24.0	345.4	4.4	23.3
(15)	Iron and steel	Large	15,350.1	14,390.2	-959.8	35.9	-923.9	-6.0	38.5
(16)		Small	4,769.3	5,746.1	976.9	15.3	992.1	20.8	12.6
(17)	Non-ferrous metals	Large	3,705.8	3,227.7	-478.1	7.6	-470.5	-12.7	8.7
(18)		Small	2,643.2	3,109.9	466.7	6.1	472.8	17.9	5.0
(19)	Fabricated metal	Large	3,669.2	2,902.5	-766.7	9.4	-757.3	-20.6	11.1
(20)		Small	12,042.9	12,807.2	764.2	35.6	799.8	6.6	33.9
(21)	Machinery	Large	13,820.6	13,134.7	-685.8	51.6	-634.3	-4.6	54.1
(22)		Small	14,657.0	15,329.2	672.2	62.4	734.6	5.0	60.0
(23)	Electrical machinery	Large	36,428.4	35,421.7	-1,006.6	78.4	-928.2	-2.5	80.8
(24)		Small	13,949.2	14,839.4	890.2	35.2	925.4	6.6	33.1
(25)	Transport equipment	Large	33,616.1	32,096.8	-1,519.4	59.1	-1,460.2	-4.3	61.9
(26)		Small	8,171.9	9,363.4	1,191.5	16.7	1,208.2	14.8	14.5
(27)	Precision instruments	Large	1,786.8	1,713.2	-73.6	3.1	-70.5	-3.9	3.3
(28)		Small	2,023.8	2,096.8	73.0	4.9	77.9	3.8	4.7
(29)	Miscellaneous	Large	11,390.8	9,480.0	-1,910.7	10.5	-1,900.3	-16.7	13.5
(30)		Small	36,211.3	37,925.4	1,714.1	52.1	1,766.2	4.9	49.4
(31)	Construction		88,149.9	88,150.9	1.0	323.9	324.9	0.4	323.9
(32)	Electricity		26,462.5	26,439.5	-23.0	20.4	-2.6	0.0	20.4
(33)	Wholesales and retails	Large	52,112.4	52,126.0	13.6	64.6	78.1	0.1	64.6
(34)		Small	50,212.3	50,250.1	37.8	62.6	100.4	0.2	62.5
(35)	Finance		100,521.3	100,526.4	5.1	44.1	49.2	0.0	44.1
(36)	Transportation		55,666.3	55,669.6	3.2	49.4	52.6	0.1	49.4
(37)	Service	Large	37,647.7	37,613.5	-34.2	56.0	21.8	0.1	56.1
(38)		Small	79,222.4	79,192.6	-29.9	68.9	39.0	0.0	68.9
(39)	Public administration		100,351.7	100,293.3	-58.3	21.6	-36.8	0.0	21.7
(40)	Unclassified		7,555.7	7,559.8	4.1	9.3	13.3	0.2	9.2
(41)	Large manufacturing		156,666.5	147,679.9	-8,986.6	280.4	-8,706.2	-5.6	298.5
(42)	Small manufacturing		155,868.6	164,179.1	8,310.5	281.6	8,592.1	5.5	264.8
(43)	Manufacturing total		312,535.1	311,859.1	-676.1	562.0	-114.1	0.0	563.3
(44)	Industry total		927,906.4	927,247.1	-659.3	1,291.3	632.1	0.1	1,292.9

(unit: billions of yen for columns (1) to (5), and (7); % for column (6))

†1 $\left[\mathbf{I}-(\mathbf{I}-\mathbf{V})\hat{\mathbf{A}}\right]^{-1}\left[(\mathbf{I}-\mathbf{V})\mathbf{f^d}+\mathbf{e}\right]$

†2 $\left[\mathbf{I}-(\mathbf{I}-\mathbf{V})\tilde{\mathbf{A}}\right]^{-1}\left[(\mathbf{I}-\mathbf{V})\mathbf{f^d}+\mathbf{e}\right]$

†3 $\left[\mathbf{I}-(\mathbf{I}-\mathbf{V})\tilde{\mathbf{A}}\right]^{-1}(\mathbf{I}-\mathbf{V})\Delta\mathbf{f^d}$

†4 $\left[\mathbf{I}-(\mathbf{I}-\mathbf{V})\hat{\mathbf{A}}\right]^{-1}(\mathbf{I}-\mathbf{V})\Delta\mathbf{f^d}$

Table A1. Sector Classification

	Aggregated sectors in this study	Original sectors in input-output table
1	Food products and beverages	Food products Beverages, tobacco and feeds
2	Textiles	Textiles
3	Pulp, paper and paper products	Pulp, paper and paper products
4	Chemicals	Chemicals
5	Petroleum and coal products	Petoleum products Coal products
6	Non-metallic mineral products	Non-metalic mineral products
7	Iron and steel	Iron and steel
8	Non-ferrous metals	Non-ferrous metal
9	Fabricated metal products	Fabricated metal products
10	Machinery	Machinery
11	Electrical machinery, equipment and supplies	Electrical machinery, equipment and supplies
12	Transport equipment	Transport equipment
13	Precision instruments	Precision instruments
14	Miscellaneous manufacturing	Wearing apparel and clothing accessories Wood and of wooden products Furniture Publishing and printing Plastics products Rubber products Leather, fur products and miscellaneous leather products Others

Table A2. Distribution of Input Coefficients by Year: Small Firms

	(1) 1980	(2) 1985	(3) 1990	(4) 1995	(5) 2000	(6) Total
$a_{iL,jS} + a_{iS,jS} < 0.0$	0	1	1	0	0	2
$a_{iL,jS} + a_{iS,jS} = 0.0$	31	33	29	17	16	126
$0.0 < a_{iL,jS} + a_{iS,jS} \leq 0.1$	149	144	150	164	167	774
$0.1 < a_{iL,jS} + a_{iS,jS} \leq 0.2$	8	10	7	6	6	37
$0.2 < a_{iL,jS} + a_{iS,jS} \leq 0.3$	3	2	5	6	5	21
$0.3 < a_{iL,jS} + a_{iS,jS} \leq 0.4$	2	4	3	2	2	13
$0.4 < a_{iL,jS} + a_{iS,jS} \leq 0.5$	3	1	1	1	0	6
$0.5 < a_{iL,jS} + a_{iS,jS} \leq 0.6$	0	1	0	0	0	1
$0.6 < a_{iL,jS} + a_{iS,jS} \leq 0.7$	0	0	0	0	0	0
$0.7 < a_{iL,jS} + a_{iS,jS} \leq 0.8$	0	0	0	0	0	0
$0.8 < a_{iL,jS} + a_{iS,jS} \leq 0.9$	0	0	0	0	0	0
$0.9 < a_{iL,jS} + a_{iS,jS} < 1.0$	0	0	0	0	0	0
$a_{iL,jS} + a_{iS,jS} = 1.0$	0	0	0	0	0	0
Total	196	196	196	196	196	980
$a_{iS,jS} < 0$	0	1	1	0	0	2
$a_{iS,jS} = 0$	49	49	30	19	20	167
$0 < a_{iS,jS} \leq 0.1$	140	138	156	169	168	771
$0.1 < a_{iS,jS} \leq 0.2$	5	6	6	6	7	30
$0.2 < a_{iS,jS} \leq 0.3$	2	2	3	2	1	10
$0.3 < a_{iS,jS} \leq 0.4$	0	0	0	0	0	0
$0.4 < a_{iS,jS} \leq 0.5$	0	0	0	0	0	0
$0.5 < a_{iS,jS} \leq 0.6$	0	0	0	0	0	0
$0.6 < a_{iS,jS} \leq 0.7$	0	0	0	0	0	0
$0.7 < a_{iS,jS} \leq 0.8$	0	0	0	0	0	0
$0.8 < a_{iS,jS} \leq 0.9$	0	0	0	0	0	0
$0.9 < a_{iS,jS} < 1.0$	0	0	0	0	0	0
$a_{iS,jS} = 1.0$	0	0	0	0	0	0
Total	196	196	196	196	196	980
$a_{iL,jS} < 0$	0	1	0	0	0	1
$a_{iL,jS} = 0$	36	38	32	19	18	143
$0 < a_{iL,jS} \leq 0.1$	153	150	156	169	172	800
$0.1 < a_{iL,jS} \leq 0.2$	3	4	6	6	5	24
$0.2 < a_{iL,jS} \leq 0.3$	2	1	1	1	0	5
$0.3 < a_{iL,jS} \leq 0.4$	1	1	0	1	1	4
$0.4 < a_{iL,jS} \leq 0.5$	1	1	1	0	0	3
$0.5 < a_{iL,jS} \leq 0.6$	0	0	0	0	0	0
$0.6 < a_{iL,jS} \leq 0.7$	0	0	0	0	0	0
$0.7 < a_{iL,jS} \leq 0.8$	0	0	0	0	0	0
$0.8 < a_{iL,jS} \leq 0.9$	0	0	0	0	0	0
$0.9 < a_{iL,jS} < 1.0$	0	0	0	0	0	0
$a_{iL,jS} = 1.0$	0	0	0	0	0	0
Total	196	196	196	196	196	980

Table A2. (continued) Distribution of Input Coefficients by Year: Large Firms

	(1) 1980	(2) 1985	(3) 1990	(4) 1995	(5) 2000	(6) Total
$a_{iL,jL} + a_{iS,jL} < 0.0$	0	0	0	0	0	0
$a_{iL,jL} + a_{iS,jL} = 0.0$	29	28	27	14	15	113
$0 < a_{iL,jL} + a_{iS,jL} \leq 0.1$	150	153	154	168	167	792
$0.1 < a_{iL,jL} + a_{iS,jL} \leq 0.2$	8	5	7	6	7	33
$0.2 < a_{iL,jL} + a_{iS,jL} \leq 0.3$	5	5	3	4	3	20
$0.3 < a_{iL,jL} + a_{iS,jL} \leq 0.4$	3	2	2	2	2	11
$0.4 < a_{iL,jL} + a_{iS,jL} \leq 0.5$	0	2	2	2	2	8
$0.5 < a_{iL,jL} + a_{iS,jL} \leq 0.6$	1	1	1	0	0	3
$0.6 < a_{iL,jL} + a_{iS,jL} \leq 0.7$	0	0	0	0	0	0
$0.7 < a_{iL,jL} + a_{iS,jL} \leq 0.8$	0	0	0	0	0	0
$0.8 < a_{iL,jL} + a_{iS,jL} \leq 0.9$	0	0	0	0	0	0
$0.9 < a_{iL,jL} + a_{iS,jL} < 1.0$	0	0	0	0	0	0
$a_{iL,jL} + a_{iS,jL} = 1.0$	0	0	0	0	0	0
Total	196	196	196	196	196	980
$a_{iS,jL} < 0.0$	0	0	0	0	0	0
$a_{iS,jL} = 0.0$	49	45	29	18	19	160
$0 < a_{iS,jL} \leq 0.1$	140	141	157	169	169	776
$0.1 < a_{iS,jL} \leq 0.2$	7	10	10	9	8	44
$0.2 < a_{iS,jL} \leq 0.3$	0	0	0	0	0	0
$0.3 < a_{iS,jL} \leq 0.4$	0	0	0	0	0	0
$0.4 < a_{iS,jL} \leq 0.5$	0	0	0	0	0	0
$0.5 < a_{iS,jL} \leq 0.6$	0	0	0	0	0	0
$0.6 < a_{iS,jL} \leq 0.7$	0	0	0	0	0	0
$0.7 < a_{iS,jL} \leq 0.8$	0	0	0	0	0	0
$0.8 < a_{iS,jL} \leq 0.9$	0	0	0	0	0	0
$0.9 < a_{iS,jL} < 1.0$	0	0	0	0	0	0
$a_{iS,jL} = 1.0$	0	0	0	0	0	0
Total	196	196	196	196	196	980
$a_{iL,jL} < 0.0$	1	0	0	0	0	1
$a_{iL,jL} = 0.0$	34	33	31	18	19	135
$0 < a_{iL,jL} \leq 0.1$	149	154	157	170	170	800
$0.1 < a_{iL,jL} \leq 0.2$	8	5	5	5	4	27
$0.2 < a_{iL,jL} \leq 0.3$	3	2	1	1	1	8
$0.3 < a_{iL,jL} \leq 0.4$	0	1	1	1	1	4
$0.4 < a_{iL,jL} \leq 0.5$	0	0	1	1	1	3
$0.5 < a_{iL,jL} \leq 0.6$	1	1	0	0	0	2
$0.6 < a_{iL,jL} \leq 0.7$	0	0	0	0	0	0
$0.7 < a_{iL,jL} \leq 0.8$	0	0	0	0	0	0
$0.8 < a_{iL,jL} \leq 0.9$	0	0	0	0	0	0
$0.9 < a_{iL,jL} < 1.0$	0	0	0	0	0	0
$a_{iL,jL} = 1.0$	0	0	0	0	0	0
Total	196	196	196	196	196	980

Table A3. Annual Data Used in Regression: Small firms

		(1) Cash / Sales ratio	(2) Debt / Sales ratio	(3) Borrowing / Sales ratio	(4) Growth Rate of Sales	(5) Lending Attitude of banks
		LIQ	*DEBT*1	*DEBT*2	*SGROWTH*	*LEND*
Food and beverages	1980	0.0870	0.3786	0.2239	0.1194	-15.5
	1985	0.0922	0.4090	0.2610	0.1128	20.0
	1990	0.1228	0.5195	0.3556	-0.0289	9.5
	1995	0.1160	0.5720	0.4084	0.2745	17.5
	2000	0.1125	0.4814	0.3417	0.0961	3.3
Textiles	1980	0.1117	0.5292	0.2731	-0.1088	-17.0
	1985	0.1297	0.5473	0.2839	0.1182	20.8
	1990	0.1366	0.6298	0.3521	-0.1581	5.0
	1995	0.2378	0.8965	0.5907	-0.1376	1.5
	2000	0.2256	0.7704	0.5396	0.0179	-17.0
Pulp ,paper and paper products	1980	0.0781	0.3703	0.1141	-0.2269	1.8
	1985	0.1240	0.5069	0.2207	0.2363	33.3
	1990	0.1168	0.5163	0.2599	-0.2106	17.8
	1995	0.1505	0.6955	0.4369	0.0523	20.8
	2000	0.1279	0.7088	0.4459	-0.2704	10.3
Chemicals	1980	0.1062	0.4014	0.1449	-0.0507	-10.5
	1985	0.1096	0.4748	0.1978	0.0602	39.5
	1990	0.2039	0.5363	0.2714	-0.1692	15.8
	1995	0.1398	0.5292	0.2709	-0.3425	27.8
	2000	0.2837	0.5949	0.3780	0.2420	26.5
Petroleum and coal products	1980	0.0916	0.4063	0.1540	-0.3220	-6.5
	1985	0.1186	0.4160	0.1851	-0.2653	25.8
	1990	0.1205	0.4563	0.2478	0.0259	5.0
	1995	0.1142	0.4316	0.2252	-0.0316	33.8
	2000	0.1695	0.5063	0.2475	-0.1544	31.5
Non-metallic mineral products	1980	0.1006	0.4525	0.1856	0.0609	-11.3
	1985	0.1285	0.6370	0.3404	-0.0815	18.3
	1990	0.1415	0.5855	0.2994	-0.1180	10.3
	1995	0.1665	0.8474	0.5343	-0.0796	13.8
	2000	0.1521	0.6980	0.4494	0.1192	-1.5
Iron and steel	1980	0.1107	0.4663	0.2056	0.4174	-13.3
	1985	0.1592	0.5288	0.2224	0.1925	23.0
	1990	0.1200	0.5490	0.3014	0.0620	12.5
	1995	0.1326	0.7359	0.4527	0.1893	19.3
	2000	0.1397	0.5512	0.3184	-0.3035	-8.0

Table A3. (continued) Annual Data Used in Regression: Small firms

		(1) Cash / Sales ratio	(2) Debt / Sales ratio	(3) Borrowing / Sales ratio	(4) Growth Rate of Sales	(5) Lending Attitude of banks
		LIQ	*DEBT*1	*DEBT*2	*SGROWTH*	*LEND*
Non-ferrous Metals	1980	0.1018	0.3484	0.1448	-0.0981	-16.8
	1985	0.0998	0.4440	0.1949	0.0123	33.0
	1990	0.1178	0.4977	0.2614	0.0830	21.8
	1995	0.1429	0.6239	0.3910	0.4033	23.3
	2000	0.1248	0.5775	0.3368	-0.4266	-2.3
Fabricated metal Products	1980	0.1039	0.4403	0.1893	-0.0152	-6.0
	1985	0.1243	0.4740	0.2333	0.0610	17.5
	1990	0.1442	0.5343	0.2847	-0.1141	16.8
	1995	0.1435	0.6238	0.3744	0.1395	10.0
	2000	0.1433	0.6766	0.4379	0.3582	-0.5
Machinery	1980	0.1373	0.5068	0.2118	0.0228	-9.8
	1985	0.1486	0.5484	0.2583	0.2339	19.8
	1990	0.1344	0.5120	0.2564	-0.0894	18.0
	1995	0.1258	0.7249	0.4598	-0.0859	8.8
	2000	0.3575	0.7164	0.4577	0.0428	-6.5
Electrical machinery, equipment and Supplies	1980	0.0733	0.3465	0.1345	0.1834	-1.5
	1985	0.0924	0.3271	0.1390	0.0289	30.5
	1990	0.0868	0.3915	0.2002	0.1623	13.5
	1995	0.1191	0.5750	0.3414	0.0292	12.3
	2000	0.1026	0.4856	0.2457	0.0604	-1.5
Transport Equipment	1980	0.1013	0.4421	0.1947	0.3986	-3.5
	1985	0.1260	0.4843	0.2281	0.0935	22.0
	1990	0.1171	0.4664	0.2272	-0.0038	17.5
	1995	0.1209	0.5125	0.2572	0.0699	19.8
	2000	0.1362	0.6148	0.3900	0.0779	-1.3
Precision Instruments	1980	0.0984	0.3578	0.1518	0.0769	10.5
	1985	0.1290	0.4778	0.2398	0.0715	26.0
	1990	0.1745	0.5725	0.3255	0.0675	14.8
	1995	0.1268	0.7689	0.5300	0.0842	4.8
	2000	0.2070	0.5296	0.2862	0.3888	-3.8
Miscellaneous Manufacturing	1980	0.0960	0.4169	0.1825	-0.0534	-12.5
	1985	0.1200	0.4758	0.2197	0.2241	19.7
	1990	0.1212	0.5084	0.2760	0.0016	13.7
	1995	0.1432	0.6396	0.3852	-0.1014	8.4
	2000	0.1738	0.5759	0.3485	0.1565	-3.6

Table A3. (continued) Annual Data Used in Regression: Large firms

		(1) Cash / Sales ratio	(2) Debt / Sales ratio	(3) Borrowing / Sales ratio	(4) Growth Rate of Sales	(5) Lending Attitude of banks
		LIQ	*DEBT*1	*DEBT*2	*SGROWTH*	*LEND*
Food and beverages	1980	0.0935	0.3946	0.1452	0.0101	-14.3
	1985	0.1208	0.3908	0.1155	0.2072	46.2
	1990	0.1668	0.4094	0.1120	0.0514	8.6
	1995	0.1484	0.4369	0.1374	0.0172	33.8
	2000	0.1100	0.4579	0.1654	0.0390	18.4
Textiles	1980	0.1474	0.6750	0.3385	0.0322	-23.9
	1985	0.1403	0.6555	0.3306	0.0401	42.1
	1990	0.1511	0.8717	0.4223	0.1771	-3.3
	1995	0.1567	0.8833	0.4171	0.0149	23.0
	2000	0.1933	1.1075	0.6309	-0.0288	2.0
Pulp ,paper and paper products	1980	0.1315	0.7454	0.3710	-0.0947	-28.4
	1985	0.1410	0.8036	0.4246	-0.0282	35.5
	1990	0.1485	0.8454	0.3662	0.0390	-12.8
	1995	0.1006	0.9218	0.4663	0.0653	24.0
	2000	0.0909	0.8848	0.4609	0.0401	24.2
Chemicals	1980	0.1304	0.6274	0.2526	-0.0680	-21.1
	1985	0.1497	0.6450	0.2607	0.0386	43.7
	1990	0.2259	0.6848	0.1940	0.0780	0.3
	1995	0.2183	0.7298	0.2662	0.0198	31.4
	2000	0.2143	0.6721	0.2236	0.0173	25.1
Petroleum and coal products	1980	0.0662	0.5544	0.3322	-0.1624	-38.1
	1985	0.0634	0.5883	0.3502	0.1450	29.0
	1990	0.1000	0.5786	0.3353	0.0643	-27.2
	1995	0.0951	0.6775	0.3674	-0.0203	25.5
	2000	0.0486	0.5522	0.2813	0.0134	16.2
Non-metallic mineral products	1980	0.1665	0.6860	0.3297	0.0017	-22.3
	1985	0.1909	0.7344	0.3608	-0.0036	30.1
	1990	0.1974	0.6571	0.2173	-0.0381	-3.9
	1995	0.1706	0.7470	0.3061	-0.0537	30.1
	2000	0.1661	0.8666	0.3639	0.0297	11.7
Iron and steel	1980	0.1391	0.9181	0.4247	-0.0044	-26.3
	1985	0.1721	1.0922	0.5165	-0.0263	40.9
	1990	0.1820	0.8499	0.2730	0.0503	-6.2
	1995	0.1805	1.1203	0.4447	-0.0090	27.8
	2000	0.1260	1.1380	0.5056	0.0163	1.7

Table A3. (continued) Annual Data Used in Regression: Large firms

		(1) Cash / Sales ratio	(2) Debt / Sales ratio	(3) Borrowing / Sales ratio	(4) Growth Rate of Sales	(5) Lending Attitude of banks
		LIQ	*DEBT*1	*DEBT*2	*SGROWTH*	*LEND*
	1980	0.1179	0.6936	0.3689	0.0149	-35.9
Non-ferrous	1985	0.1418	0.7261	0.4039	-0.0297	38.0
Metals	1990	0.1250	0.6077	0.2198	0.0200	-6.1
	1995	0.1147	0.8492	0.4530	0.0538	37.8
	2000	0.0918	0.9431	0.4819	0.0587	12.0
	1980	0.1316	0.6155	0.2487	0.0294	-2.5
Fabricated metal	1985	0.1413	0.6005	0.2429	-0.0193	37.6
Products	1990	0.1751	0.5925	0.1928	0.0080	11.3
	1995	0.1783	0.6652	0.2467	0.0612	32.8
	2000	0.1679	0.6850	0.2576	-0.0116	11.9
	1980	0.1741	0.6613	0.2280	0.1224	-15.4
	1985	0.2091	0.6659	0.2092	0.0599	42.4
Machinery	1990	0.2167	0.6209	0.1584	0.0788	7.1
	1995	0.2235	0.7088	0.2188	0.0357	25.5
	2000	0.1926	0.7060	0.2370	0.1126	5.9
Electrical	1980	0.1242	0.4881	0.1202	0.1728	-7.2
machinery,	1985	0.1487	0.4972	0.0898	0.0669	40.8
equipment and	1990	0.2030	0.5091	0.0901	0.1610	10.0
Supplies	1995	0.1750	0.5308	0.1162	0.1462	22.4
	2000	0.1257	0.4985	0.0952	0.1698	19.2
	1980	0.1224	0.5552	0.1927	0.1194	-10.7
Transport	1985	0.1146	0.4757	0.1501	0.0848	45.6
Equipment	1990	0.1365	0.4471	0.0953	0.1033	4.7
	1995	0.1306	0.5079	0.1259	0.0216	34.0
	2000	0.1250	0.5265	0.1216	0.0678	9.0
	1980	0.1345	0.4806	0.1334	0.1855	4.0
Precision	1985	0.1823	0.4840	0.1354	0.1371	45.8
Instruments	1990	0.2361	0.5698	0.1487	0.0871	3.4
	1995	0.2097	0.5833	0.1646	0.0542	26.3
	2000	0.1441	0.5176	0.1652	0.1090	19.8
	1980	0.1201	0.4764	0.1568	-0.0273	-8.7
Miscellaneous	1985	0.1420	0.5035	0.1573	0.1217	34.5
Manufacturing	1990	0.1760	0.5390	0.1548	-0.0018	7.1
	1995	0.1514	0.5616	0.1973	0.0594	26.4
	2000	0.1728	0.5733	0.2007	-0.0463	12.0