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Debt Restructuring of Japanese Firms: Efficiency of Factor Allocations and the Debt-Labor Complementarity

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Debt Restructuring of Japanese Firms: Efficiency of Factor Allocations and the Debt–Labor Complementarity*

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Abstract

Using the data from the Financial Statements Statistics of Corporations by Industry (FSSCI) compiled by the Ministry of Finance, we first overview the changing capital structure of Japanese firms, emphasizing the long-term declining trend of debt financing and the acceleration of that trend in recent years. In the second half of the paper, we examine whether the rapid decrease of corporate debt subsequent to the domestic banking crisis in the late 1990s really improved the efficiency of factor allocation at the microeconomic level. While the cross-sectoral movement of capital/credit seems to have increased in the 2000s, the regression result implies that negative profit measured by return on assets (ROA) is associated with the increase of corporate debt during the period of mild recovery in the mid-2000s. These results imply that even after the banking panic and the subsequent policy measures cleaned up major nonperforming loans, some nonnegligible number of "zombie firms" must have remained, and banks began to feed them again when the Japanese economy started to grow again.

JEL classification: E22; G32; G34
Keywords: debt/equity ratio; corporate restructuring; debt restructuring; complementarity.

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1 Introduction

Since the late 1990s, Japan's private sector has financed continuing large government budget deficits, so that the economy could avoid running an external deficit. However, during the same period, the composition of the private sector saving surplus changed dramatically. As shown in Table 1, Japanese household saving (item *ii*) as a percentage of GDP declined sharply from the range 6–7% in the late 1990s to 1.0–2.5% in the second half of the 2000s. During the same period, corporate saving (item *i*) increased from 3–5% to 6–8% in 2006–2007. Although corporate saving dropped to 6% and total private sector saving (item I) dipped from 9.4% in 2007 to 7.3% in 2008, these declines can be explained readily by the sudden deterioration of business conditions prompted by the worldwide financial and economic crisis in the second half of 2008. Otherwise, total private sector saving in Japan was relatively stable at around 9% to 11% of GDP since the collapse of the bubble in the early 1990s.

[Insert Table 1 here]

As discussed in detail by Iwaisako and Okada (2010), an apparent substitution of corporate and household saving in recent years seems to be closely related with the process of corporate restructuring. The most significant increases in corporate saving and decreases in household saving were concentrated in the five-year period around the turn of the century, subsequent to the domestic financial crisis in 1997/98. Although by then the Japanese economy had already been in recession for nearly five years, further declines in household income and a surge in the unemployment rate were observed as firms started to restructure their businesses seriously around this period.

In general, the process of corporate restructuring includes restructuring of labor and financial restructuring. The first goal of this paper is to provide an overview of the debt restructuring process of Japanese nonfinancial corporations in recent years utilizing the Financial Statements Statistics of Corporations by Industry (FSSCI) data compiled by the Ministry of Finance. As the second goal of the paper, we examine whether the significant decline in aggregate corporate debt really improved the efficiency of allocation of credit at the micro level using the same industry data. It has been widely discussed that during the first phase of Japan's structural slump after the collapse of the asset bubble in the 1990s, inefficient firms that should have been shut down survived because banks made additional inefficient lending, known as forbearance or evergreening lending (Hosono and Sakuragawa 2003; Peek and Rosengren 2005; Caballero, Hoshi and Kashyap 2008). We examine whether the Japanese economy successfully rid itself of "zombie firms" by stopping forbearance lending during the 2000s, the period subsequent to the banking crisis in late 1990s. The empirical results on the determinants of the growth in debt suggest that a nonnegligible number of zombie firms must have survived the severe recession following the banking crisis, and that banks began to lend to them again when the economy began its mild recovery in the mid-2000s.

The remainder of this paper is organized as follows. In section 2, we provide an overview of the trend in Japanese nonfinancial corporations' capital structure

at semiaggregate level. Section 3 examines the changing relationship between aggregate corporate debt growth and the variability of industry debt growth. In section 4, detainments of the of debt are considered using panel data on Japanese industries. Section 4 provides the conclusions.

2 Recent trends in Japanese corporations' capital structure

Figure 1 shows the long-run trend of the debt/equity ratio of Japanese nonfinancial business corporations since the 1960s. The debt/equity ratio increased until the mid-1970s, several years after the first oil crisis and when the long-term trend of Japanese economic growth dramatically shifted downward. Since the late 1970s, the debt/equity ratio has been on a mild declining trend for about two decades. Then, following the domestic financial crisis in 1997/98, this declining trend suddenly accelerated, starting from 1999. Throughout the 2000s, the aggregate debt/equity ratio of Japanese nonfinancial corporations decreased more rapidly than from the 1960s to the 1990s.

[Insert Figure 1 here]

Figure 1 also separately exhibits the debt/equity ratios of manufacturing and nonmanufacturing industries. The debt/equity ratio of manufacturing firms has been consistently lower than that of nonmanufacturing firms. Also, that declining trend since the 1970s is steadier than the trend for that of nonmanufacturing firms and exhibits no acceleration at the turn of the century. On the other hand, the debt/equity ratio of nonmanufacturing firms exhibited only limited signs of decline until the financial crisis of 1997/98. After a small spike in 1998, the ratio began to decline sharply. Overall, the significant decline in the aggregate debt/equity ratio since the second half of the 1990s will be mostly explained by the behavior of nonmanufacturing corporations.

In Figure 2, we show debt/equity ratios by firm size group. The firms in the FSSCI data are categorized by the value of accounting capital/common stocks (*Shihonkin*). The upper panel shows two larger firm groups and the lower panel presents two smaller groups. The long-run trend of the debt/equity ratio of the biggest firm group, whose capital is more than one billion yen (eight to nine million US dollars at the exchange rate in 2010), resembles that of manufacturing firms in Figure 1. This is not surprising since the behavior of the debt/equity ratio of the largest nonmanufacturing firms is very similar to that of the largest manufacturing firms (Iwaisako 2010). The second largest group's (capital of one to ten billion yen) debt/equity ratio moves somewhat similarly to that of the aggregate data. However, the significant decline in the debt/equity ratio begins before the financial crisis around 1995/96. As shown in the lower panel, the acceleration of the aggregate debt/equity ratio is mostly the result of the behavior of firms whose capital is ten million to one billion yen.

On the other hand, the smallest group (whose capital is lower than ten million yen) actually increased their reliance on debt finance in recent years. Note however that the movement of the smallest firm group's debt/equity ratio since the 1990s also reflects important institutional changes regarding the minimum capital requirement when establishing business corporations (kabushiki-gaisha and yugen-gaisha). The hike in 2003 is conceivably the result of the change in the minimum capital requirement, which was lowered from three million yen to one yen. Because of this time-varying nature of the group, we drop the smallest firm group from the following empirical analyses.

[Insert Figure 2 here]

While Figure 1 and Figure 2 present interesting and important features of the changing capital structure of Japanese nonfinancial corporations, the composition of corporate debt is another important aspect of the problem. So we briefly digress from the main theme of the paper and examine the term-structure of debt maturity and the increase in market-based debt financing. We tabulated the ratios of long-term debt to total debt outstanding and corporate bond to total debt outstanding by firm groups, sorted by manufacturing/nonmanufacturing and firm size (ten billion and over: one to ten billion; ten million to one billion).

These numbers are shown in Figure 3. The ratio of long-term debt to total debt outstanding is shown in the left scale, and the ratio of corporate bond to total debt is shown in the right scale. The changes in corporate debt maturity structure are certainly interesting, but rather complicated. Among the largest firm group, the debt maturity of manufacturing firms remained unchanged since the mid-1970s at around the 25% level. On the other hand, the fraction of long-term debt of nonmanufacturing firms began to increase from a level similar to that of manufacturing firms in the mid-1980s. It reached a level around 40% after the collapse of the asset bubbles in the early 1990s and then stopped increasing. Mid-size firms' long-term debt ratio reached its peak of around 25–30% in the first half of the 1990s, then started to decrease to the 15–20% level in the late 2000s. Finally, the smallest firms behaved similarly to large nonmanufacturing firms. Their long-term debt ratio increased from the mid-1980s to the early 1990s, and then stabilized at the 40% level.

From the viewpoint that emphasizes bargaining in loan contracts, longer maturity implies that borrowers have stronger bargaining power. They want to avoid refinancing as much as possible, since the bargaining power of the lender is at its highest at the inception of refinancing, because lenders can threaten borrowers by suggesting that they might not roll over debts that are about to mature (Flannery 1986; Diamond 1991, 1993; Bolton and Scharfstein 1990). Another possible explanation is that the increase in long-term debt reflects the fact that the short-term interest rate was at historically low levels in this period. Even if the lender prefers short-term lending, it might not be able to obtain enough profits if such a low level of short-term rates is expected to persist. However, by either explanation, it is difficult to explain the ups and downs in the maturity structures of mid-size firms. Although these are extremely interesting problems, further investigation will be left to future research.

[Insert Figure 3 here]

The ratio of corporate debt financed by corporate bond issues of the largest firm group was around 5% in the mid-1970s. The ratio of large manufacturing firms has a hump shape, peaking in the early 1990s at around 17–18 %, then declining to less than 10%. The ratio of large nonmanufacturing firms increased in the mid-1980s, then stabilized at around 12–13%. On the other hand, medium-size firms' ratio of debt financed by corporate bonds has increased in recent years, but remains at the low level of 2% or less. Overall, corporate bond issues have not been an attractive way for Japanese corporations to finance their debt.

Finally, small firms' (ten million to one billion yen in capital) corporate debt has increased significantly in 2000s. However, this increase is perhaps the result of the increase in corporate bonds from private issues/placements (Shibo-sai, enko-sai) arranged by banks and security companies. Hence, an expansion of the corporate bond market in Japan did not necessarily occur.

3 The cross-sectional variability of corporate debt growth

Many have argued that during the first phase of Japan's structural slump after the collapse of the asset bubble in the early 1990s and prior to the domestic banking crisis in 1997/98, inefficient firms that should have been shut down survived because of banks' forbearance lending. This created a serious inefficiency in the allocation of credit and perhaps contributed to the slowdown of Japan's aggregate productivity growth. Previous studies making this argument include Hosono and Sakuragawa (2003), Peek and Rosengren (2005), and Cabarello, Hoshi, and Kashyap (2008), among others. While this argument certainly captures an important aspect of Japan's structural problem in the 1990s, time has passed and things have changed since then. In particular, the domestic banking crisis and the subsequent policy measures taken by the government in the late 1990s forced Japanese banks to deal seriously with their nonperforming loan problem. Later, with the Program for Financial Revival (Kinyu Saisei Program) in 2003–2004 under the Koizumi administration, led by Minister for Financial Services Heizo Takenaka, further steps were taken to end Japanese nonperforming loan problems. To our knowledge, serious investigations of the corporate debt restructuring/adjustment in the 2000s have been relatively scarce. For this reason, we examine whether the cross-sectional efficiency of capital allocation at the micro level in the Japanese economy really improved in recent years.

Cross-sectoral factor allocation efficiency means that labor and capital move to more productive firms/industries from less productive firms/industries. Hence, a quick way to examine the efficiency of factor (re)allocation is to view the cross-sectional variability of production activities in the economy, as argued by Saita

and Sekine (2001). Using industry data, they found that the cross-sectional variability of bank lending, measured by the so-called Lilien measure (Lilien, 1982) — the standard deviations of sectoral growth rates weighted by the size of each sector —, significantly declined during the mid-1990s. Total bank lending also stagnated during the same period. Iwaisako (2005) applied their framework to capital investments and found similar results.

In Figure 4, using annual FSSCI industry data, we calculated the weighted averages μ_t and cross-sectional standard deviations SD_t of corporate debt growth.

$$\begin{aligned} \varpi_{i,t} &\equiv debt_{i,t-1} \diagup \sum_{i=1}^{N} debt_{i,t}, \qquad \mu_t \equiv \sum_{i=1}^{N} \varpi_t \triangle debt_{i,t} \\ SD_t^2 &\equiv \sum_{i=1}^{N} \left(\triangle debt_{i,t} - \mu_t\right)^2 \diagup N, \end{aligned}$$

Firms in the FSSCI data are grouped into several size groups according to their accounting capital. Data on the largest group exhibited the most interesting results about the relationship between average and standard deviations of corporate debt growth. Up to the early 1990s, two variables moved in the same direction. This is the usual situation when the variable considered is bank lending or equipment investment. In the mid-1990s, the standard deviation declined significantly, and average debt growth almost equaled zero. The zero-growth and zero-variability period of factor movement in the mid-1990s corresponds to the situation discussed by Saita and Sekine (2001).

[Insert Figure 4 here]

Truly remarkable is the period from the late 1990s to around 2005. From the late 1990s, standard deviations began increasing. However, the growth rate of debt became negative, so that the average and the standard deviation moved in opposite directions in the first half of the 2000s. In 2006–2008, corporate debt finally started to increase. At the same time, its average and standard deviation began moving in the same direction again.

These empirical results are intuitive and straightforward. Before the collapse of the bubble in the early 1990s and the period after 2006, the economy was in a normal situation, showing that the growth rate of debt was higher when cross-sectional variability was higher. In the mid-1990s, before the banking crisis of 1997/98, the Japanese economy as a whole was in a sort of debt-overhang situation. In the first half of the 2000s, the period subsequent to the banking crisis, the companies that could restructure their debt rushed to do so, while other firms perhaps just tried to survive. Such debt restructuring processes of nonfinancial corporations at the aggregate level seem to have concluded by 2006.

It is certainly a good sign that the cross-industry movement of capital/credit significantly increased in the mid-2000s. However, the question still remains whether there remain some zombie firms/industries among those who did not decrease their debt in the restructuring period of the late 1990s to the first half of the 2000s.

Medium-size firms' average and standard deviations exhibited similar trends. Up to the early 1990s, they exhibited positive correlation. While the decline of standard deviations in the mid-1990s is not so obvious as in the case of large firms, corporate debt growth apparently slowed. From the late 1990s, standard deviations kept increasing until 2006, while the mean debt growth kept recording negative values. On the other hand, in the case of small firms, there seems to be no clear trend in the cross-sectional variability of debt growth, while the average apparently declined in the late 1990s and has been mostly negative through the 2000s.

4 Determinants of corporate debt growth

In this section, to investigate further the micro-level efficiency of debt restructuring of nonfinancial corporations, we estimate the following simple regression for corporate debt growth:

$$\begin{aligned} \triangle debt_t &= \alpha + \beta_1 \triangle Job_t + \beta_2 \triangle Job_t^- \\ &\quad + \gamma_1 ROA_t + \gamma_2 ROA_t^- + \delta \triangle debt_{t-1} \end{aligned} \tag{1}$$

where $\triangle debt$ is the industry's growth rate of debt, $\triangle Job_t$ is the industry's growth rate of employment, and ROA_t is business conditions measured by the industry's ROA.

The motivation for this regression is as follows. First, if the firm's business situation is good and it wants to expand, it is likely to increase bank borrowing or corporate bond issues. This creates a positive relationship between ROA and debt growth when ROA_t is positive. On the other hand, if the firm's business condition is bad, the firm has a choice either to start restructuring immediately or to postpone it and wait for an improvement in the external business environment. The extreme case of postponing restructuring depends on forbearance lending, and the situation observed when the number of zombie firms increased in the mid-1990s. Corporate debts grow rapidly even though the firms' profits are negative, so that the estimated coefficient of ROA_t will be negative in that case. The sign of ROA_t's coefficient when ROA is negative can be either positive or negative. However, a negative coefficient with a large absolute value implies delayed debt restructuring and micro-level inefficiency in credit allocation. For this reason, we included the term ROA_t^- in the regression, defined as follows:

$$\begin{aligned} ROA_t^- &= ROA_t \qquad \text{if } ROA_t < 0 \\ &= 0 \qquad\quad \text{if } ROA_t \geq 0 \end{aligned}$$

Second, with business cycle frequency, labor and capital are usually complementary as production inputs. In particular, labor is much more specific to firms or industries, so the adjustment of labor is typically more costly than the adjustment of capital. When the firm restructures its business, labor restructuring is more difficult and more costly than debt restructuring because of firing costs

and the loss of job/firm-specific human capital associated with labor restructuring. At the same time, if the firm decides to postpone labor restructuring under bad business conditions, this decision creates additional costs from maintaining an excessive labor force until the firm's business environment improves. So the firm has to weigh the cost of restructuring and the cost of keeping its current labor force. This implies that once the firm decides to restructure its labor force, there is no reason to withhold debt restructuring. Overall, we expect that there exists strong complementarity between labor and debt restructuring so that the growth rates of the company's debt $\triangle debt_t$ and the labor force $\triangle Job_t$ have strong positive relationships with each other.

We estimate regression (1) using the annual panel of 33 industries from FSSCI data. The full sample estimates are reported in Table 2. Panel A of Table 2 shows the specifications without ROA_t^- and Job_t^- terms. On average, the estimation results of the different firm size groups suggest that the industry's debt $\triangle debt_t$ has a clear positive relationship with its employment $\triangle Job_t$, and a negative relationship with business conditions as measured by ROA. We report the fixed-effect estimation results, but the random-effect estimation (which is available from the authors upon request) yields similar results for Table 2 and for all other empirical results reported in this section. For the medium-size firm group, we also estimate the regression including lagged corporate debt growth, since we find $\triangle debt_t$ exhibits nonnegligible negative autocorrelation in this firm group.

However, in Panel B of Table 2, the regressions with ROA_t^- and $\triangle Job_t^-$ terms, the negative relationship between $\triangle debt_t$ and ROA_t becomes unclear, except in the case of the small firm group. These results lead us to estimate equation (1) for the following subsamples: (1) 1984–1992, until the start of the post-bubble recession; (2) 1992–1997, the first phase of the post-bubble recession before the financial crisis; (3) 1998–2002, the period of the post-banking crisis recession; and (4) 2003–2007, the mild recovery period after Takenaka's Program for Financial Revival. We excluded the 2008 observation from the subsample (4), because we want to exclude the effect of the world financial and economic crisis from our main analysis.

These subsample estimation results are reported in Table 3. In Figure 5, we plot the fitted values of estimation results reported in Table 3 to visualize the relationship of $\triangle debt_t$ to $\triangle Job_t$, and to ROA_t.

First, the positive relationship between $\triangle debt_t$ and $\triangle Job_t$ in the medium- and small-size firm groups is clear. In the case of large firms, the relationship is negative in the 1993–97 sample when $\triangle Job_t$ is positive and in the 1998–2002 sample when $\triangle Job_t$ is negative. However, the relationship is not statistically significant in these cases. Overall, it is safe to say that $\triangle debt_t$ and $\triangle Job_t$ are also positively correlated in the large-size firm group.

[Insert Table 3 and Figure 5 here]

The relationship between $\triangle debt_t$ and ROA_t is more period specific. In the large firm group in the 1984–1992 sample, the relationship is clearly negative when ROA_t is positive, and there is no clear relationship when ROA_t is negative. The former result implies that the firms in the industry facing good business conditions cut their debt, which is consistent with the long-run trend of the decline in the debt–equity ratio in this group, as discussed in section 2. In the 1993–1997 sample, the relationship is clearly negative when ROA_t is negative, and no clear relationship is observed when ROA_t is positive. This is consistent with the theory that zombie firms with negative ROA are supported by forbearance lending, so that their $\triangle debt_t$ is positive. Such a relationship disappears in the 1998–2002 sample subsequent to the domestic banking crisis, suggesting that forbearance lending had ended in this period. However, the negative relationship reemerges so that the zombie firms story seems to have revived in 2003–2007, a period during which the Japanese economy was on a mild recovery path.

In Table 4, admittedly in a rather ad hoc manner, we include the contemporaneous cross-sectional variability of corporate debt growth measured by the standard deviation SD_t, defined in Section 3, to regression (1) for the large firm group. The estimated coefficients are not so different from those in the regressions without SD_t in Table 3. SD_t is positively significant in the full sample regression and in the 1984–1992 subsample. On the other hand, SD_t's coefficient is negative and significant in the 2003–2007 subsample, implying that the increase in the variability of corporate debt growth is associated with the decrease in aggregate corporate debt. These results are consistent with our observation Panel A of Figure 4, which shows that Japanese firms that could restructure their debt rushed to do so, while other firms just tried to maintain the current situation.

[Insert Table 4 here]

The empirical results for the medium-size firms are mostly the same as the large firm results, except that the negative relationship between $\triangle debt_t$ and ROA_t is clearer in the 1984–1992 sample. A strong negative relationship between $\triangle debt_t$ and ROA_t when ROA_t is positive was observed in the 1993–1997 sample. It disappeared in the 1998–2002 sample, but reemerged in the 2003–2007 sample. This makes us worry that the zombie firms perhaps had not been wiped out completely either by the recession following the banking crisis in 1997/98 or by the policy measures taken in the late 1990s and early 2000s to end Japan's nonperforming loan problem. As a result, the recovery period after 2003 shows that banks started to lend again to firms facing difficult conditions as aggressively as in the sample prior to the banking crisis.

A positive aspect of the results for the 2003–2007 sample is that the relationship between ROA and debt growth became positive when ROA was positive. This implies that some Japanese firms started to expand their businesses again. However, as a negative aspect, negative ROA strongly induced debt growth again, so that the relationship between the two variables takes a V-shape. These

results provide only indirect evidence. However, they strongly suggest that the efficiency of credit allocation in the Japanese economy must have significantly improved in the 2000s, but that the structural change still had a long way to go.

On the other hand, the time-varying pattern of the relationship between $\triangle debt_t$ and ROA_t in the small-size firm group is clearly different from that of the large- and medium-size firms. While the two variables seem to be negatively related with each other, their relationship is mostly insignificant. Exceptions are in the 1984–1992 sample when ROA_t was positive and in the 1998–2002 sample when ROA_t was negative. The former result fits perfectly into the long-run decline of debt financing before the start of the prolonged recession of the Japanese economy. However, the latter result that small firms facing bad business conditions were actually increasing their debts in the period following the banking crisis is counterintuitive and contradicts the results for large- and medium- size firms. Little is known about the situations of very small firms, and further investigation with more disaggregate data is required for a comprehensive understanding.

5 Conclusions

This paper surveys the changing capital structure of Japanese nonfinancial corporations, emphasizing the long-run decreasing trend of corporate debt, which significantly accelerated after the domestic financial crisis in 1997/98. In the second half of the paper, we investigated industry data to determine whether debt restructuring in the 2000s really improved the efficiency of factor allocations by Japanese corporations. Although the severe credit conditions subsequent to the crisis and the measures taken by the Japanese government to overcome nonperforming loan problems seemed to attain significant positive results, corporate restructuring in the Japanese economy is still far from complete. While the increase in the cross-sectional variation of debt growth rates in the mid-2000s implies improvement in credit/capital allocation, the regression results suggest that negative ROA also significantly increases the growth of debt in that industry. Hence, inefficient firms/industries still exist in the second half of the 2000s, and banks are helping them survive again.

Since financial institutions' nonperforming loans are not a binding problem for the Japanese economy today, there is little possibility that policy measures on the financial side will increase the efficiency of firm/industry factor allocations. Given the evidence for strong complementarity between labor and debt restructuring, the next important subject for our research will be the restructuring of Japanese firms' labor force.

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Table 1
Sectoral saving surpluses in Japan as fractions of GDP

	I. private sector saving surplus: *i*+*ii*					II. public	III. national
		i. corporate sector: a+b			*ii.* household		
			a. non-financial	*b.* financial			
1981–85	15.0	3.5	3.4	0.1	11.2	1.5	16.5
1986–90	12.8	3.7	3.4	0.3	8.7	4.3	17.2
1991–95	11.0	1.8	0.5	1.4	8.6	3.2	14.2
1996	10.5	3.5	1.8	1.6	6.4	0.5	11.0
1997	10.6	3.8	2.5	1.3	6.2	0.5	11.0
1998	10.5	3.1	1.8	1.3	7.0	−1.2	9.4
1999	10.6	4.1	2.8	1.3	6.2	−2.8	7.8
2000	10.6	5.2	3.6	1.6	5.2	−2.8	7.8
2001	8.3	5.2	3.1	2.1	3.0	−2.6	5.6
2002	9.9	6.8	4.3	2.5	3.0	−5.0	4.9
2003	9.9	7.6	4.4	3.2	2.3	−5.4	4.6
2004	10.4	8.2	5.0	3.2	2.1	−5.7	4.7
2005	10.5	8.2	5.0	3.2	2.2	−4.5	6.0
2006	9.0	6.8	4.0	2.9	2.2	−3.1	6.0
2007	9.4	7.9	5.3	2.6	1.4	−2.9	6.5
2008	7.3	6.0	4.2	1.8	1.3	−3.8	3.6

Annual data of net sectoral saving surpluses. The data source is the Cabinet Office's SNA (national account) Web site. Private sector saving (item I) is the sum of corporate sector saving (item *i*), household saving (item *ii*), and the savings of "private nonprofit institutions serving households" (not listed). The definition of the household sector includes "private unincorporated enterprises."

Table 2
Determinants of sectoral corporate debt growth

Corporate debt growth ($\triangle Debt_t$) is regressed on the growth rate of the number of employees ($\triangle Job_t$) and ROA (ROA_t) for the 1984–2008 sample.

$$\triangle Debt_t = \alpha + \beta_1 \triangle Job_t + \beta_2 \triangle Job_t^- + \gamma_1 ROA_t + \gamma_2 ROA_t^-$$

Fixed-effect estimation results are reported; the random effect estimations yield fairly similar results. The number of industries is 33 for large- and medium-size firm groups excluding agriculture, forestry, fishery, and information technology industries. The electricity (power supply) industry is also excluded from the small firm sample, resulting in 32 industries. Medium-size firms' $\triangle Debt_t$ exhibits significant negative autocorrelations of around -0.3 to 0.35; hence, the estimation result including the lagged $\triangle Debt_t$ term is also reported. $\triangle Debt_t$ also exhibits mild positive autocorrelation for the large firm sample and negative autocorrelation for the small firm sample. However, since including the lagged $\triangle Debt_t$ term does not significantly change the estimates of other coefficients and did not improve the explanatory power of the regression, those estimation results are not reported here. (**) and (*) indicate that estimated coefficients are statistically significant at the 1% and 5% levels.

(A) Full sample estimation results: 1984–2008

	large	**medium**	**medium (with lag)**	**small**
$\triangle Job_t$	0.878**	0.484	0.454**	0.817**
	[18.0]	[8.99]	[8.97]	[13.74]
ROA_t	−3.380**	−4.223**	−3.662**	−4.102**
	[−5.66]	[−5.29]	[−4.87]	[−5.31]
$\triangle Debt_{t-1}$			−0.321**	
			[−10.34]	
constant	4.000**	5.378**	7.709**	5.567**
	[4.69]	[4.08]	[6.13]	[5.01]
R^2	0.341	0.139	0.215	0.219

Table 2 (continued)

(B) Full sample estimation results with asymmetric effects: 1984–2008

	large	**medium**	**medium (with lag)**	**small**
$\triangle Job_t$	0.878^{**}	0.335^{**}	0.375^{**}	0.661^{**}
	[16.1]	[4.71]	[5.58]	[7.25]
$\triangle Job_t^-$	0.006	0.585^{**}	0.317	0.461^{*}
	[1.03]	[3.14]	[1.78]	[2.26]
ROA_t	−1.744	−2.528	−1.934	-4.094^{**}
	[−1.45]	[−1.83]	[−1.48]	[−5.14]
ROA_t^-	−2.830	−3.225	−3.332	0.417
	[−1.57]	[−1.43]	[−1.56]	[0.36]
$\triangle Debt_{t-1}$			$-.313^{**}$	
			[−9.98]	
constant	2.757^{*}	7.436^{**}	7.950^{**}	8.723^{**}
	[2.19]	[3.46]	[3.93]	[4.77]
R^2	0.345	0.144	0.215	0.222

Table 3
Sectoral corporate debt growth: subsample estimates

$\triangle Debt_t$ is regressed on, in addition to $\triangle Job_t$ and ROA_t for the subsamples. See the notes for Table 2 about the details of the estimated regression and the variable definitions. (**) and (*) indicate that estimated coefficients are statistically significant at the 1% and 5% levels.

A. large	(1) 1984–92	(2) 1993–97	(3) 1998–02	(4) 2003–07
$\triangle Job_t$	0.878**	−0.695	2.183**	0.808**
	[9.09]	[1.80]	[4.68]	[8.75]
$\triangle Job_t^-$	−0.304	2.433**	−2.390**	0.234
	[−0.50]	[3.46]	[−3.44]	[0.94]
ROA_t	−8.304**	0.495	−5.225	4.084
	[−2.75]	[0.21]	[−1.95]	[1.77]
ROA_t^-	7.685	−12.527**	2.713	−16.664**
	[1.80]	[−3.14]	[0.53]	[−3.15]
constant	11.345**	3.120	−4.690	−4.022
	[3.98]	[1.39]	[−1.54]	[−1.35]
R^2	0.301	0.251	0.281	0.522

Table 3 (continued)

B-1. medium	(1) 1984–92	(2) 1993–97	(3) 1998–02	(4) 2003–07
$\triangle Job_t$	0.325^{**}	0.775	0.804^{*}	0.196
	[4.54]	[2.03]	[2.09]	[0.90]
$\triangle Job_t^-$	0.657^{**}	-0.343	-0.109	0.785
	[2.82]	[-0.50]	[-0.14]	[1.32]
ROA_t	-4.782^{**}	-3.278	-7.451	3.012
	[-2.44]	[-0.60]	[-1.09]	[0.90]
ROA_t^-	-3.807	-6.630	4.639	-11.564
	[-1.12]	[-0.78]	[0.42]	[-1.79]
constant	10.818^{**}	1.109	2.804	-4.022
	[3.65]	[0.19]	[0.34]	[-1.35]
R^2	0.300	0.115	0.103	0.120

B-2. medium (with lag)	(1) 1984–92	(2) 1993–97	(3) 1998–02	(4) 2003–07
$\triangle Job_t$	0.423^{**}	0.681^{*}	0.829^{*}	0.161
	[6.39]	[1.97]	[2.28]	[0.87]
$\triangle Job_t^-$	0.270	-0.185	-0.498	-0.115
	[1.25]	[-0.30]	[-0.67]	[-0.22]
ROA_t	-3.179	0.411	-7.838	1.778
	[-1.77]	[0.08]	[-1.21]	[0.65]
ROA_t^-	-3.773	-9.661	8.289	-11.326^{*}
	[-1.22]	[-1.26]	[0.78]	[-2.08]
$\triangle Debt_{t-1}$	-0.363^{**}	-0.440^{**}	-0.614^{**}	-0.438^{**}
	[-7.58]	[-5.54]	[-4.00]	[-7.34]
constant	12.913^{**}	3.779	1.483	0.243
	[4.79]	[0.72]	[0.19]	[0.04]
R^2	0.362	0.252	0.165	0.176

Table 3 (continued)

C. small	(1) 1984–92	(2) 1993–97	(3) 1998–02	(4) 2003–07
$\triangle Job_t$	0.784^{**}	0.900^{**}	0.925^{*}	0.400^{**}
	[4.25]	[2.94]	[3.26]	[2.54]
$\triangle Job_t^-$	0.457	0.364	0.162	0.570
	[1.12]	[0.51]	[0.30]	[1.31]
ROA_t	-6.249^{**}	-2.628	-1.651	-2.781
	[−4.83]	[−0.96]	[−0.84]	[−1.63]
ROA_t^-	3.060	-0.493	-7.540^{**}	0.411
	[1.44]	[−0.11]	[−2.38]	[0.14]
con.	16.151^{**}	4.226	0.256	6.096
	[4.61]	[0.84]	[0.06]	[−1.35]
R^2	0.262	0.192	0.299	0.184

Table 4
Relationship between sectoral corporate debt growth and its cross-sectoral variability

$$\triangle debt_t = \alpha + \beta_1 \triangle Job_t + \beta_2 \triangle Job_t^- + \gamma_1 ROA_t + \gamma_2 ROA_t^- + \delta SD_t$$

$\triangle Debt_t$ is regressed on, in addition to $\triangle Job_t$ and ROA_t, the cross-sectional variability measured by the standard deviation of $\triangle Debt_t$, SD_t. Full sample and subsample fixed-effect estimation results are reported for the large-firm group. (**) and (*) indicate that estimated coefficients are statistically significant at the 1% and 5% levels.

	full sample 1984–08	(1) 1984–92	(2) 1992–97	(3) 1998–02	(4) 2003–07
$\triangle Job_t$	0.864**	0.865**	−0.758	2.151**	0.868**
	[15.89]	[9.00]	[−1.94]	[4.59]	[9.24]
$\triangle Job_t^-$	−0.009	−0.258	2.484**	−2.375**	0.121
	[−0.05]	[−0.43]	[3.52]	[−3.41]	[0.94]
ROA_t	−2.159	−9.065**	0.544	−5.204	5.343*
	[−1.79]	[−3.00]	[0.23]	[−1.94]	[2.30]
ROA_t^-	−1.836	7.951	−12.166**	1.607	−18.416*
	[−1.01]	[1.87]	[−3.04]	[0.30]	[−3.52]
SD_t	8.674**	13.790*	11.084	47.465	−37.451*
	[2.93]	[2.15]	[0.95]	[0.76]	[−2.44]
constant	−0.958	2.510	0.539	−19.344	10.334
	[−0.54]	[0.50]	[0.15]	[−0.99]	[1.57]
R^2	0.351	0.314	0.248	0.286	0.534

Figure 1
Aggregate debt–equity ratios of Japanese nonfinancial corporations in FSSCI data: 1960–2008

The natural logarithms of debt–equity ratios of all corporations as well as manufacturing and nonmanufacturing corporations in FSSCI data are shown. The debt–equity ratio here is defined as total debt outstanding over net assets. The data source is the Ministry of Finance's Web site:
http://www.mof.go.jp/english/e1c002.htm.

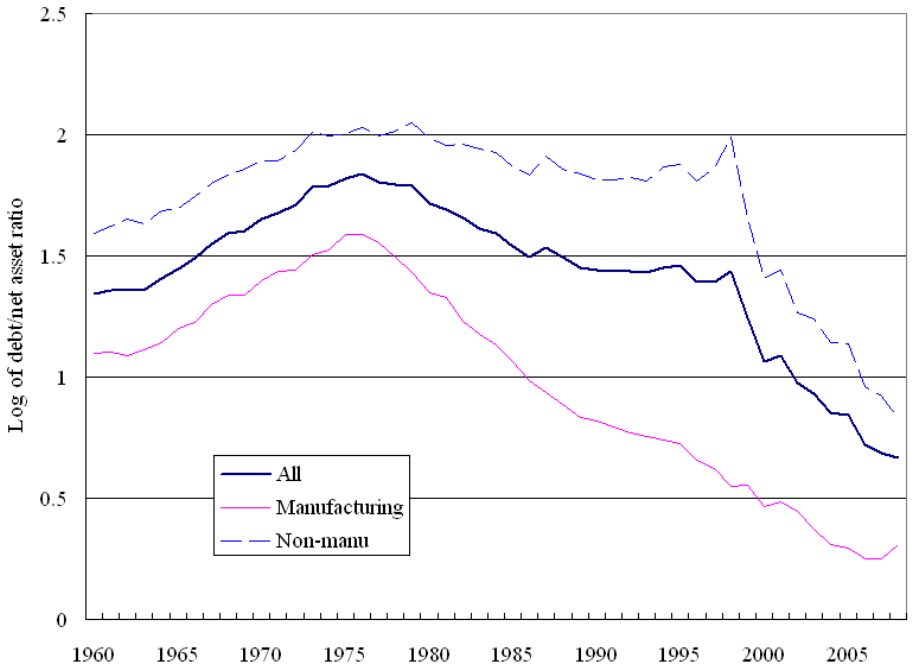
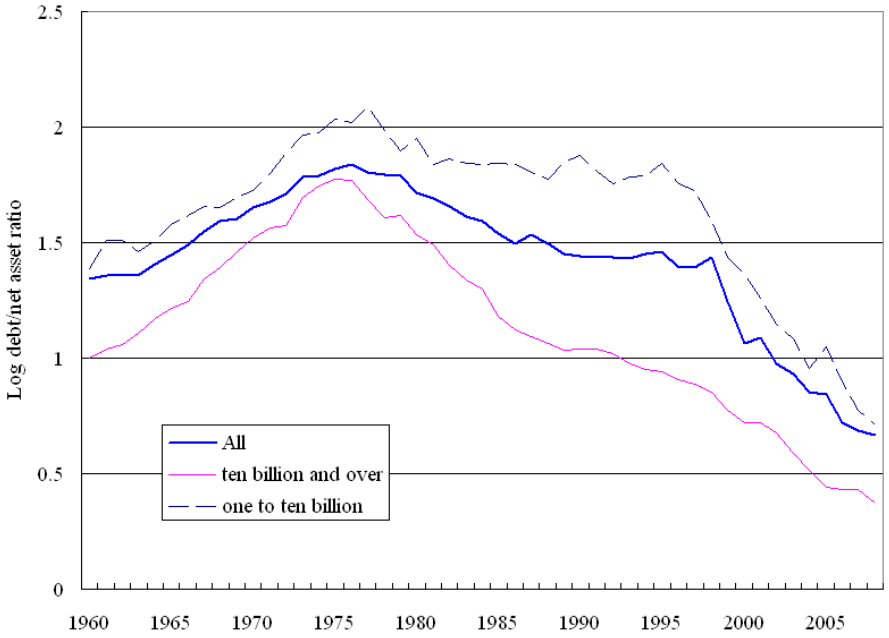


Figure 2
Debt–equity ratios by firm size groups in FSSCI data: 1960–2008



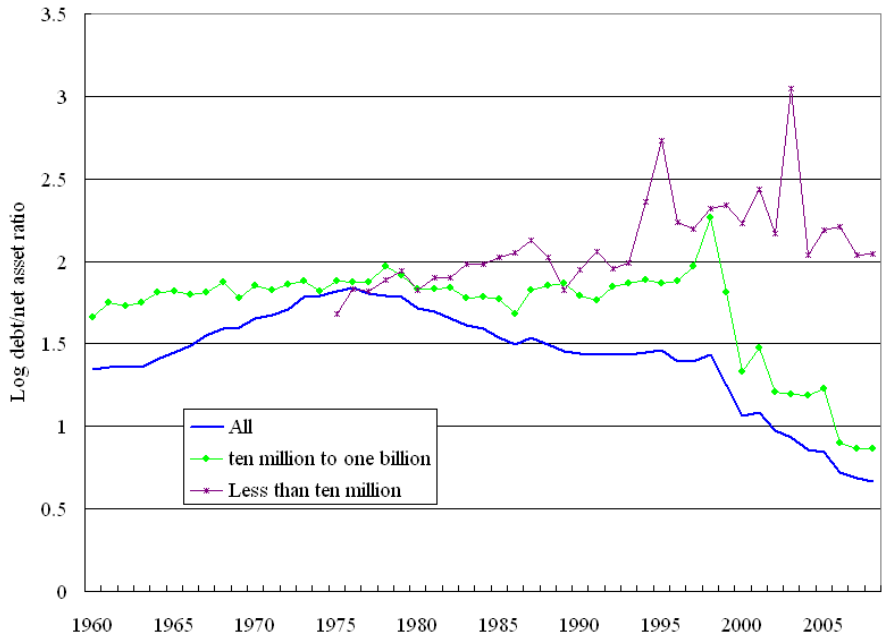


Figure 3
Ratios of long-term debt to total debt and corporate bond to total debt: 1975–2008

Ratios of long-term debt to total debt outstanding and corporate bond to total debt outstanding by firm groups divided by manufacturing/nonmanufacturing and firm size.

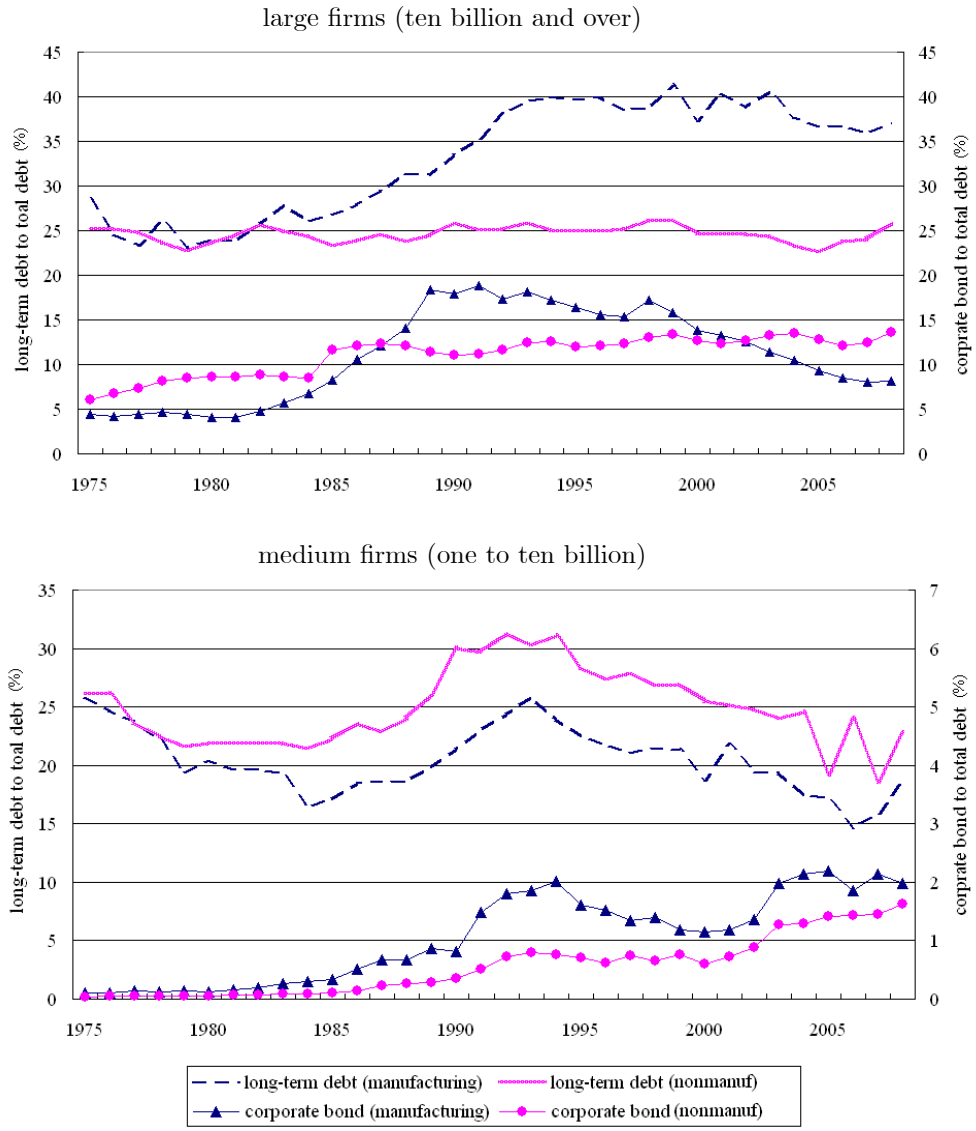


Figure 3 (continued)

small firms (ten million to one billion)

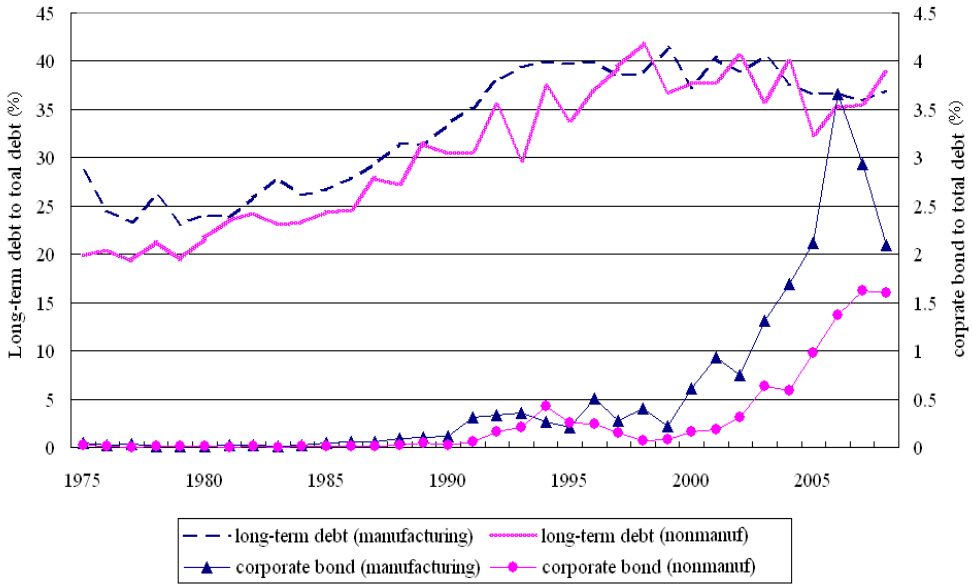
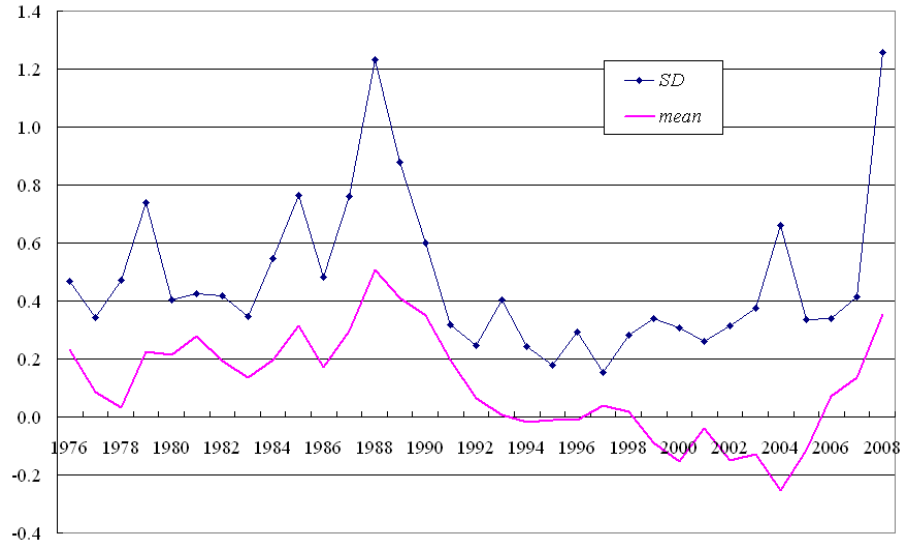


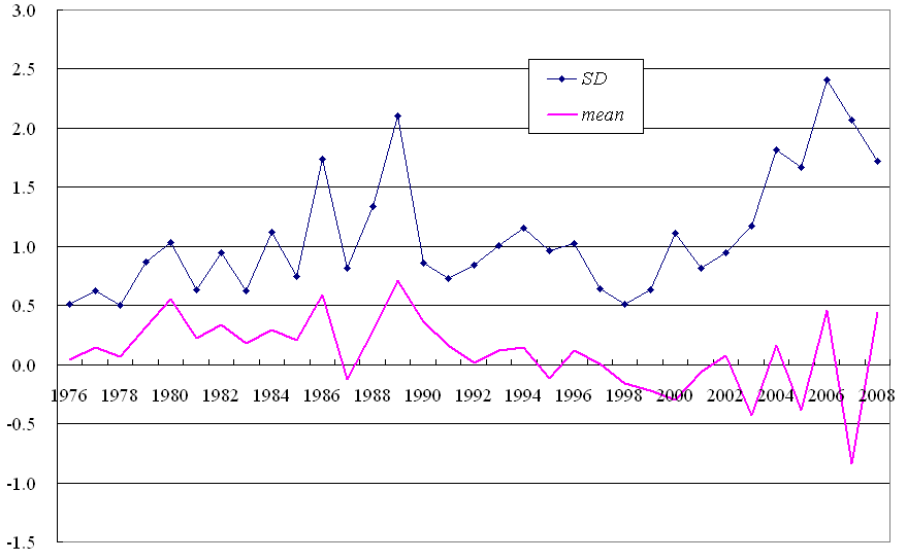
Figure 4
Average and cross-sectional variability of corporate debt growth

Average (*mean*: red smooth line) and standard deviation (*SD*: blue line with circles) of corporate debt growth in the industry data.

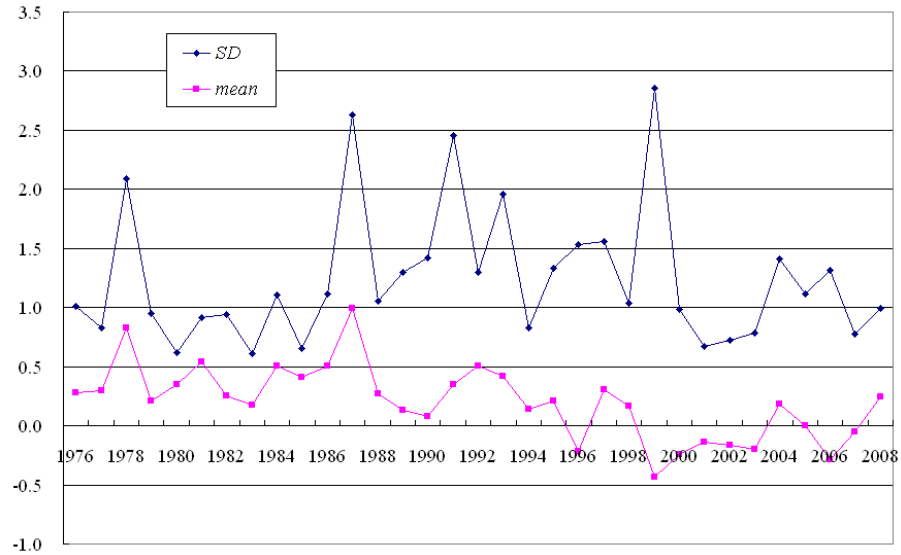


large firms: debt

Figure 4 (continued)



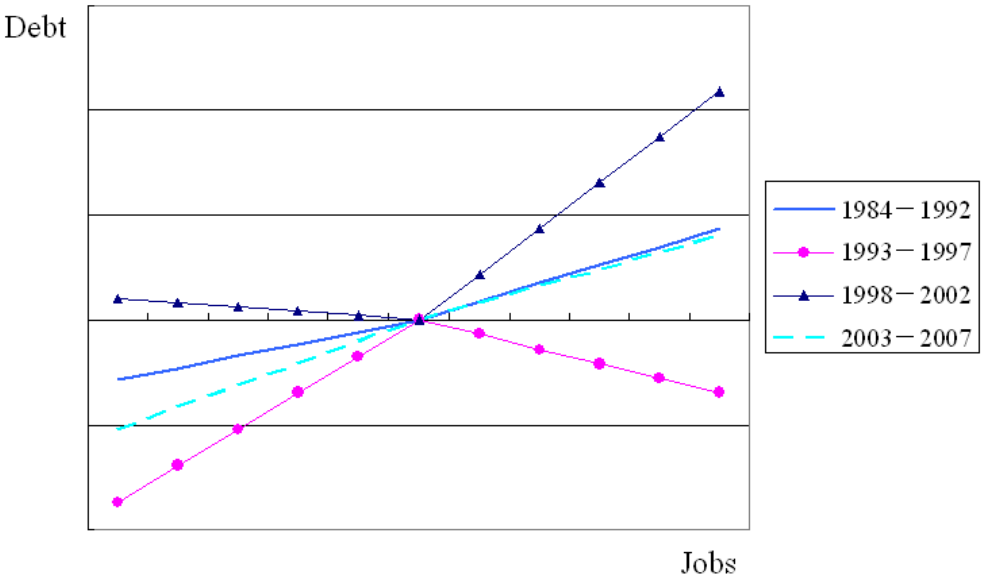
medium firms: debt



small firms: debt

Figure 5
Estimated responses of $\triangle debt$ to $\triangle Job$ and ROA

(1A) large firms: Jobs



(1B) large firms: ROA

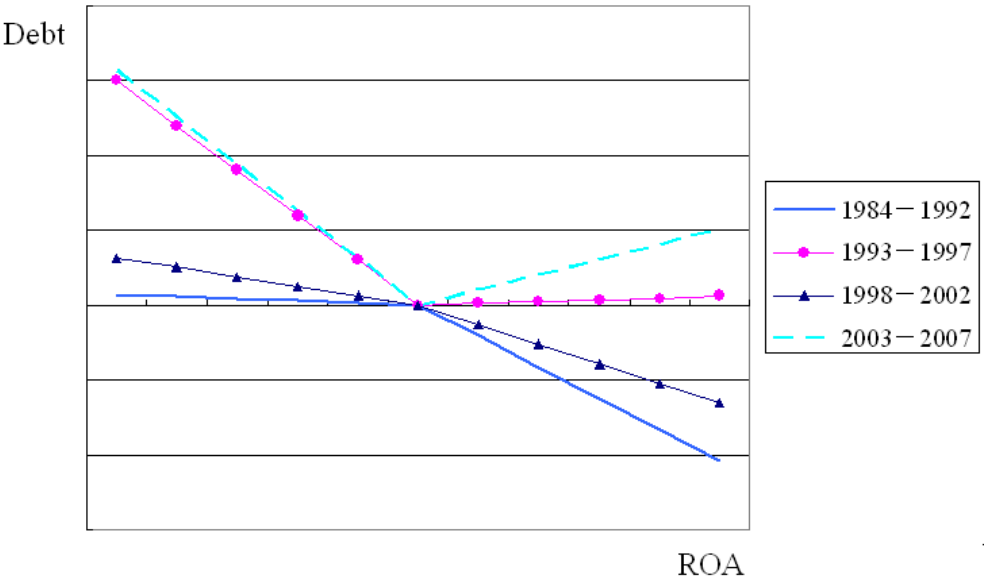
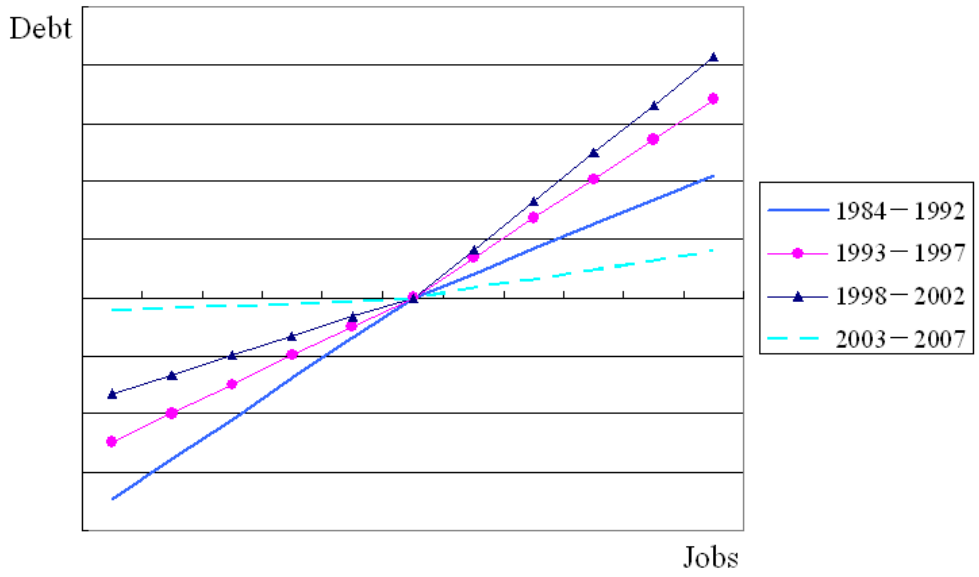


Figure 5 (continued)

(2A) medium firms : Jobs



(2B) medium firms : ROA

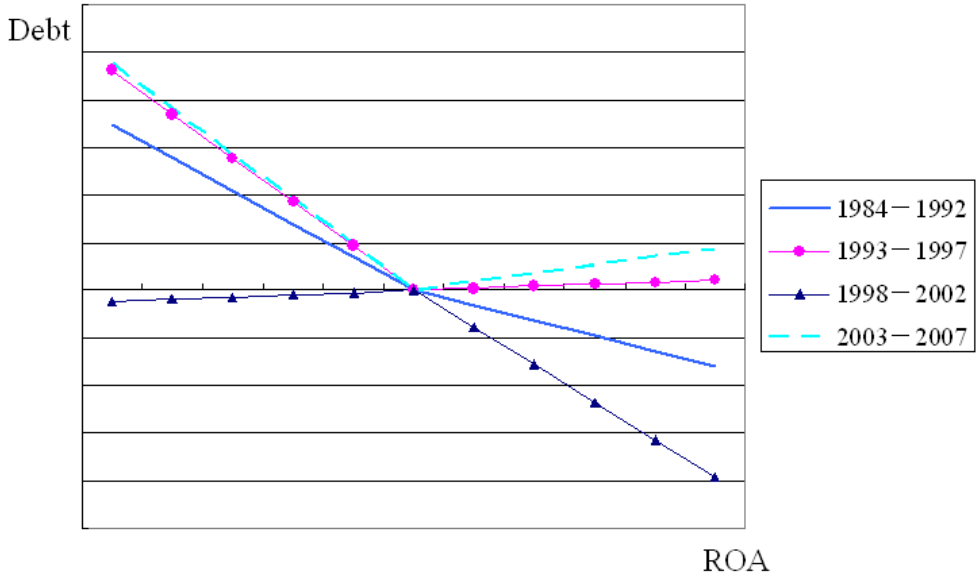
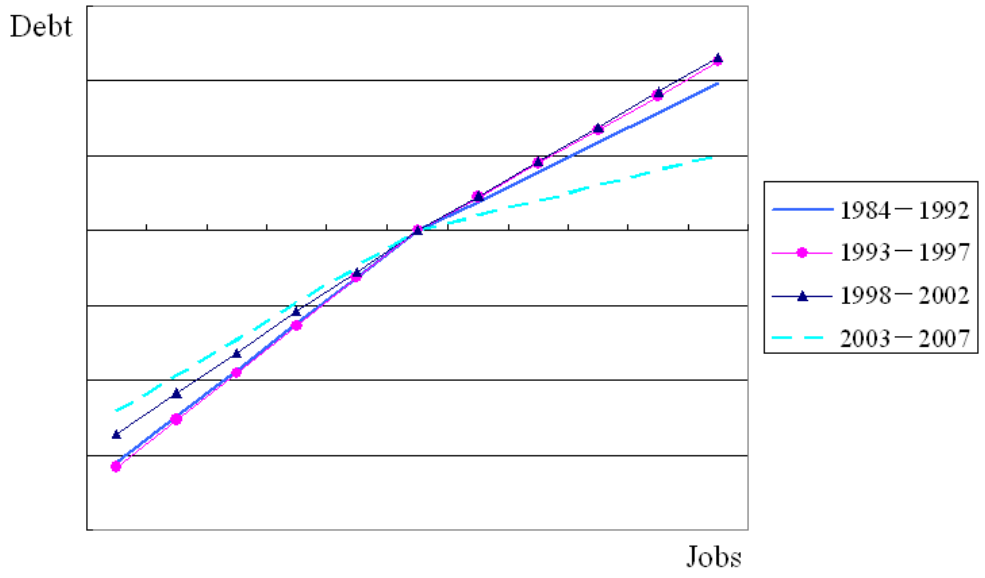


Figure 5 (continued)

(3A) small firms: Jobs



(3B) small firms: ROA