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Impact of the Debt Ratio on Firm Investment: A case study of listed companies in China*

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Abstract

In this paper, we analyze whether the total debt ratios and bank loan ratios of Chinese listed companies had any impact on their fixed investment in 2001-2006, and whether this impact, if it existed, differed among companies with differing investment opportunities. Our results are as follows. First, our analysis reveals that the total debt ratio (bank loan ratio) did have a negative impact on fixed investment among Chinese listed companies. Secondly, the total debt ratio (bank loan ratio) had a stronger negative impact on low-growth companies than on high-growth companies, implying that the total debt ratio (bank loan ratio) actually restrained companies from overinvestment. Finally, the analysis led to the interesting result that the bank loan ratio had a stronger impact on fixed investment than the total debt ratio, and actually had the strong effect of restraining investment particularly by low-growth companies, implying that in China, banks supervise the investment activities of companies more strongly than other creditors.

Keywords: Investment; Debt; China; Bank
JEL: G31, G32, D92

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1. Introduction

China has reformed its financial system as part of its market mechanism-driven economic reforms. Particularly important among these reforms was the enactment of the Commercial Bank Law ("Shang Ye Yin Hang Fa" in Chinese) in 1995, which allowed major state-owned banks to commercialize their lending operations. Until that time, Chinese banks were seen as institutions that provided funding to state-owned enterprises under administrative directives. Consequently, the problem of moral hazard due to soft budget constraints came into the open at state-owned companies that had received funding from state-owned banks, leaving many such loans as bad debt (Ke 2007). In addition, while China's state-owned banks are now engaged in the lending business as commercial operations, it has been pointed out that they are not performing the role of financial intermediaries satisfactorily due to their lack of capacity to examine the creditworthiness of borrowers. Based on an analysis of financing activities of Chinese listed companies in 1994-2000, Shirai (2002) found that Chinese banks provided greater amounts of loans to companies with a relatively poor earnings performance.

On the other hand, however, it has been argued that the function of financial intermediation among Chinese banks has been improving gradually as a consequence of financial system reforms, including the enactment of the Commercial Bank Law and interest rate liberalization. Yuan (2006) used the Panzar-Rosse H-statistic to measure the degree of competition in the Chinese banking industry in 1996-2001, and found the competition to be much higher than in other countries, finding in particular that joint-stock commercial banks were in a state of perfect competition. Furthermore, Yuan and Gunji (2007) found that the entry of foreign banks into the Chinese banking market helped improve the efficiency of Chinese banks. Sakashita and Nakayama (2006) also pointed out that compared with the 1992-1996 period Chinese banks in 2002-2004 were paying greater attention to the financial indicators and business activities of borrowing companies.

As mentioned above, there are both negative and positive perceptions of China's financial system reforms. Which of the conflicting views most accurately reflects the reality of the state of affairs? This paper attempts to contribute to the debate over the financial system reform in China by analyzing the relationship between bank loans and fixed investment with the use of latest financial data of listed companies.

First, we look at whether the total debt ratio or the bank loan ratio has effect over Chinese listed companies, and then focus on whether the impact of the total debt ratio (bank loan ratio) on fixed investment is any different among listed companies with differing investment opportunities. We find first that the rise in the total debt ratio (bank loan ratio) had the effect of causing underinvestment among high-growth companies with investment opportunities. Secondly, we find that through the investment-restraining effect of the total debt ratio (bank loan ratio), liabilities had the effect of

restraining overinvestment, which allowed a reduction in overall liabilities and/or unprofitable operations of companies.

Our method of analysis is described below. First, we add the total debt ratio (bank loan ratio) to an investment equation to examine whether debt sensitivity exists in the fixed investment activities of Chinese listed companies. Then, similar to Lang et al. (1996), Ahn et al. (2006) and Arikawa et al. (2003), we use the ratio of the market value to the replacement cost of assets (Tobin's Q), to distinguish corporate growth potential, and add the cross term between them and the debt ratio to the investment equation. Further, to ensure that the results are robust, we use the price-earnings ratio (PER) to distinguish between companies with high growth potential and those with low growth potential in line with McConnell and Servaes (1995). Since high-growth companies have promising investment opportunities, they are believed to be prone to underinvestment due to liabilities. On the other hand, as low-growth companies lack promising investment opportunities, their liabilities are believed to keep them from overinvestment.[1]

The key results of the estimation in this paper are summarized below. First of all, we find that the effect of the total debt ratio (bank loan ratio) does exist in China as well. In other words, we find that the total debt ratio (bank loan ratio) has a significant negative impact on fixed investment. Next, we find that companies with a higher Tobin's Q have larger amounts of investments. These two sets of estimation results suggest that the general investment theory that liabilities have a negative effect on corporate investment is applicable to listed companies in China. Next, we find that the effect of the total debt ratio (bank loan ratio) works more strongly on low-growth companies (companies with a low Tobin's Q [PER]) than on high-growth companies (companies with a high Tobin's Q [PER]). As our analysis uses the bank loan ratio in the prior accounting year as an explanatory variable, the estimation results suggest that banks in China, through their lending activities, are restraining overinvestment by companies that lack promising investment opportunities. A comparison of the overinvestment-restraining effect between the total debt ratio and the bank loan ratio shows that the bank loan ratio has a stronger effect than the total debt ratio. This result suggests that in China, banks have a greater effect than other creditors in supervising investment activities by companies. Finally, we find that companies with a larger cash flow tend to make greater investments.

This paper is structured as follows. We survey previous studies on the debt ratios and corporate investment in Section 2 and explain our method of empirical analysis in Section 3. In Section 4, we explain the data used in this paper. We attempt an interpretation of the estimation results in Section 5, followed by some conclusions in Section 6.

2. Previous Studies

[1] Lang et al. (1996), Ahn et al. (2006), Aivazian et al. (2005) and Arikawa et al. (2003) define high-growth companies and low-growth companies according to the level of Tobin's q.

In the area of corporate finance, the impact of liabilities on investment decisions by companies has drawn keen attention. According to the Modigliani-Miller Theorem (MM Theorem), the level of liabilities does not affect corporate investment behaviors in a perfect market. In other words, given simple assumptions, it is noted that there is no connection between fund procurement and the debt ratio. Regarding the negative effects of liabilities on corporate management, however, it is noted that liabilities can influence corporate behaviors through the following three channels. Firstly, as increased liabilities raise bankruptcy risks, corporate managers who fret over the possibility of shareholders holding them accountable tend to move to curb borrowings and/or reduce investments, potentially raising the prospect of underinvestment. Secondly, as larger interest payment burdens resulting from higher debts reduce funds in hand, so debt has a negative impact on the investment activities of companies with promising investment opportunities. This is called the "debt overhang hypothesis" (Myers [1977], Hart [1995]). Thirdly, managers of companies with declining equity ratios have an incentive to make investments with a high expected rate of return even at the risk of sacrificing creditors. Therefore, as liabilities increase, creditors become increasingly reluctant to provide more funds, a development that can lead to underinvestment (Jensen and Meckling [1976]).

Meanwhile, in contrast to the negative effect of liabilities on corporate management, Jensen (1986) points out that liabilities can help avoid overinvestment by reducing the cash flow left up to corporate managers' own discretion and constraining investments in investment projects that might be desirable for corporate mangers but not desirable for companies' future profitability. Jensen argues that whether liabilities restrain overinvestment depends largely on whether companies have growth opportunities. In short, Jensen points out that liabilities have (not only the negative effect of causing underinvestment by high-growth companies but also) the potentially positive effect of restraining overinvestment by low-growth companies. Like Jensen (1986), Stulz (1990) and Hart and Moore (1995) argue that liabilities effectively restrain overinvestment. They reason that increased liabilities, by enlarging repayment obligations, not only curtail free cash flow but also raise the possibility of corporate bankruptcies, thus prompting corporate managers to reduce investments and sell off unprofitable business divisions.

In empirical studies, sample companies are classified based on whether or not they have investment opportunities in order to differentiate the positive effect of liabilities in restraining overinvestment from their negative effect of causing underinvestment. Previous studies have used Tobin's Q or PER to classify companies into those with and without investment opportunities. The low value of these indicators of investment opportunities suggests a lack of investment opportunities, often resulting in overinvestment. At companies with fewer investment opportunities, the negative effect of liabilities on investment activities is interpreted as having an investment restraining effect. On the other hand, at companies with abundant investment opportunities, the negative effect of

liabilities on investment activities is thought to lead to underinvestment. McConnell and Servaes (1995) use cross-sectional data to analyze U.S. listed companies in 1976, 1986 and 1988, and finds "two faces of debt," meaning that enterprise value was negatively correlated with the debt ratio of companies with high growth opportunities and positively correlated with the debt ratio of companies with few growth opportunities. Lang et al. (1996), based on an analysis of the relationship between the debt ratio and the rate of growth of companies, point out that for companies with fewer investment opportunities (i.e. companies with a low Tobin's Q), there is a negative correlation between the debt ratio and the investment. The estimation results from their studies do not find a negative correlation between the debt ratio and the growth rate for companies with abundant growth opportunities. In other words, for companies with excellent investment opportunities, increased liabilities do not necessarily hamper growth. Lang et al. interpret this analysis outcome as reflecting the disciplinary role of liabilities.

Looking at more recent studies, Aivazian et al. (2005) analyze the impact of liabilities on fixed investment using Canadian corporate-level data, and demonstrate that companies with fewer investment opportunities are more vulnerable to the impact of liabilities than companies with many investment opportunities. Further, according to Ahn et al. (2006), diversified companies tend to have higher debt ratios than focused counterparts and diversified companies make larger investments (net cost of capital/sales) than focused counterparts. They also point out that debt ratios influence management decisions on investment and that diversified companies can overcome the constraints of debt ratios through the distribution of liabilities by corporate managers.

There are numerous previous studies on Japan as well. For example, Arikawa et al. (2003) adopt the method of estimation used by Lang et al. (1996) and point out that the main bank system in Japan helped amplify the disciplinary function of liabilities, particularly for low-growth companies. Meanwhile, Muramatsu (2002), based on the theory of Jensen (1986), assumes that overinvestment occurred in Japan during the bubble period and argues that the disciplinary role of liabilities or monitoring by main banks was not significant.

Thus, the previous studies have verified the impact of liabilities on investment in industrial countries as well as the effects of liabilities in restraining overinvestment and facilitating underinvestment. These studies suggest that liabilities restrain overinvestment but likely cause underinvestment. However, there are few studies on corporate liabilities in developing countries.[2] Thus, in this paper, we attempt to more clearly grasp the lending behaviors of Chinese banks by examining the impacts of banks on fixed investment by companies with different growth potentials.

3. Empirical Analysis

[2] Saito (2006) finds that among Philippine listed firms, overinvestment among corporate group companies with insufficient investment opportunities is constrained through the discipline due to liabilities.

As with previous studies (Lang, Ofek and Stulz [1996], Aivazian et al. [2005] and Arikawa et al. [2003]), the analysis in this paper uses Tobin's Q as a key explanatory variable of the investment equation and we conduct an estimation by adding the debt ratio to it. A high Tobin's Q indicates a high market value relative to total assets, suggesting that a company has ample business opportunities. Thus, with the addition of Tobin's Q to the investment equation, it is possible to verify the impact of the debt ratio on fixed investment while controlling companies' business opportunities (Arikawa et al. [2003]). As corporate investments are found to be influenced by the availability of internal funds in Fazzari et al. (1988) and Hoshi et al. (1991), the analysis in this paper adds the free cash flow ratio to the estimate equation as a control variable.

$$Investment_{i,t} = \alpha + \lambda_t + \beta Q_{i,t-1} + \delta Debt_{i,t-1} + \eta Cashflow_{i,t-1} + \vartheta Yeardummy + \mu_i + \varepsilon_{i,t} \quad (1)$$

$Investment_{i,t}$: Fixed investment ratio (fixed investment/fixed assets) of Company *i* at time *t*

$Q_{i,t-1}$: Tobin's Q[3] of Company *i* at time *t-1*

$Debt_{i,t-1}$: Total debt ratio (total liabilities/total assets or bank loans/total assets) of Company *i* at time *t-1*

$Cashflow_{i,t-1}$: Cash flow of Company *i* at time *t-1*

Our approach differs from previous studies in that our analysis covers the estimation that uses the bank loan ratio instead of the debt ratio, in order to focus not only on the impact of debt on corporate fixed investment but also on the impact of bank loans on fixed investment. More specifically, one is the total debt ratio without any regard to the source of funds and the other is the bank loan ratio that involves only borrowings from banks. And lastly, we add the yeardummy to the estimate equation to take macro factors into consideration.

In previous studies, the debt ratio was found to influence investment by companies with a high value of Q and investment by companies with a low value of Q differently, apparently because the value of Q represents the extent of easiness toward access to funds on the capital market. In other words, since companies with greater investment opportunities (a high Tobin's Q) find it relatively easy to finance on the capital market, their investments are less sensitive to the level of debt. On the other hand, since companies with few investment opportunities find it relatively difficult to raise

[3] Lindenberg and Ross (1981) calculate Tobin's Q as the market value of a company divided by the replacement value of its assets. However, as data available in this study is limited, it is difficult to calculate the replacement value of assets. Since Perfect and Wiles (1994) use the book value of total assets, rather than the replacement value of total assets, as the denominator of Simple Q, we calculate Tobin's Q in this study according to the definition of Simple Q in Perfect and Wiles (1994). Thus, Tobin's Q in this study is (market value + liabilities)/book value of total assets.

funds on the market, they appear to be more sensitive to the level of debt in their investment decisions. Lang et al. (1996), Aivazian et al. (2005) and Arikawa et al. (2003) differentiate the investment opportunities of companies with the value of Tobin's Q and demonstrate that companies with few investment opportunities respond more strongly to the level of debt than companies with greater investment opportunities. In this paper we also define high-growth companies and low-growth companies with the use of Tobin's Q, and examine differences in the impact of the level of debt on fixed investment by high-growth companies and low-growth companies. Here, to look into the impact of the debt ratio on companies with differing investment opportunities, the upper one-third and lower one-third of companies in terms of the value of Tobin's Q are defined as high-growth companies and low-growth companies, respectively. Therefore, on the basis of equation (1), we also estimate the following equation (2), with the addition of the cross terms of the debt ratio with the high-growth company dummy and low growth company dummy, respectively.

$$Investment_{i,t} = \alpha + \lambda_t + \beta Q_{i,t-1} + \delta Debt_{i,t-1} + \varsigma HQ_{i,t-1} * Debt_{i,t-1} + \xi LQ_{i,t-1} * Debt_{i,t-1} + \varphi Cashflow_{i,t-1} + \vartheta Yeardummy_t + \mu_i + \varepsilon_{i,t} \quad (2)$$

HQ : 1 when Tobin's Q for Company *i* at time *t*-1 is in the upper one-third, otherwise 0
LQ : 1 when Tobin's Q for Company *i* at time *t*-1 is in the lower one-third, otherwise 0

McConnell and Servaes (1995) analyze the impact of debt on corporate performance by using PER to distinguish the investment opportunities of companies. In order to ensure the robustness of results, the analysis in this paper also uses PER[4] to distinguish investment opportunities of companies in accordance with McConnell and Servaes (1995).

$$Investment_{i,t} = \alpha + \lambda_t + \beta Q_{i,t-1} + \delta Debt_{i,t-1} + \varsigma Hper_{i,t-1} * Debt_{i,t-1} + \xi Lper_{i,t-1} * Debt_{i,t-1} + \varphi Cashflow_{i,t-1} + \vartheta Yeardummy_t + \mu_i + \varepsilon_{i,t} \quad (3)$$

$Hper$: 1 when PER for Company *i* at time *t*-1is in the upper one-third, otherwise 0
$Lper$: 1 when PER for Company *i* at time *t*-1is in the lower one-third, otherwise 0

4. Data

For this study we use 2001-2006 financial data of non-financial companies listed on the Shanghai

[4] PER=stock price/earnings per share

and Shenzhen stock exchanges.[5] The database includes financial data for a total of 1,418 listed companies as of the end of 2006. However, we actually used the data for less than 1,418 of the companies, because some data are missing from some of the samples used for the estimation and because we excluded outliers more than 1% above or below for the fixed investment, total debt ratio and bank loan ratio. We use unbalanced panel data, with a maximum of 6,949 samples and 1,366 companies. A breakdown of the number of listed companies in 2006 by industry (Table 1) shows that the manufacturing industry accounted for the largest share, 885 firms, followed by 126 for utilities, 114 for conglomerate, 100 for commerce and 66 for real estate. This means that nearly 70% of companies covered by the analysis in this paper are in the manufacturing sector.

China's financial markets, including the stock and bond markets, are not as fully developed as those of other developed countries. The Shanghai Stock Exchange was established in 1990 and the Shenzhen Stock Exchange in 1991. Yet, the most important financing methods for listed companies, other than their own funds in hand, remain trade credit and borrowings from banks. Table 2 shows changes in the total debt ratio and bank loan ratio of Chinese listed companies during the period of 1991-2006. The total debt ratio stood at around 60% in 1991 and declined to around 40% by 1994. After hovering between 40% and 50%, it rose above 50% in 2006 for the first time in 14 years. The bank loan ratio, meanwhile, has moved between 20% and 25% since 1994. The table indicates that both the total debt ratio and bank loan ratio have tended to increase.

Figure 1 gives the breakdown of total liabilities of listed companies in 2006. Borrowings from banks accounted for nearly half of total liabilities, while the sum of trade accounts payable, bills payable and advances received accounted for 38%. The figure shows the high ratio of bank loans to total liabilities, with the ratio of corporate bonds being extremely low, indicating that financial institutions are the most important creditors for Chinese listed companies, and have a high degree of influence over their investment activities.

Table 3 lists the definitions of the variables used for the models in the preceding section, while Table 4 shows the descriptive statistics of these variables. The mean of the fixed investment ratio (fixed investment/fixed assets: Investment) is 0.223 for all companies. The mean for high-growth companies is 0.248, higher than the mean of 0.197 for low-growth companies, and high-growth companies also have a higher standard deviation. For debt ratios, low-growth companies have higher ratios than high-growth companies in terms of both the total debt ratio and bank loan ratio. For both the entire sample and the breakdown between high-growth and low-growth companies, bank loans account for about 50% of total company liabilities, a confirmation of Chinese listed companies' heavy dependence on bank loans in financing during the sample period for the analysis in this paper. The average value of Tobin's Q is 2.5 for all samples. The factors behind the high value of Tobin's Q

[5] This study makes use of China Stock Market Financial Database "Annual Report" and "China Listed Firm's Corporate Governance Research Database," both provided by GTA Information Technology Co., Ltd.

for listed companies in China apparently include the market's high expectations for growth opportunities of Chinese companies due to the high growth of the Chinese economy in recent years.[6] It is also shown that high-growth companies have a higher cash flow ratio than low-growth ones.

Table 5 shows the correlations between the variables used in the analysis in this paper. The total debt ratio and bank loan ratio, the two focal points of this paper, are both negatively correlated with fixed investment. The table also shows a low correlation among explanatory variables.

5. Estimation Results[7]

5.1 Response of Investment to the Debt Ratio

Table 6 shows the basic estimation results. The first and second columns of Table 6 show the estimation results of the impact of the total debt ratio on fixed investment using the basic model of the investment equation. The impact of the total debt ratio on investment is significantly negative at the 1% level. Since the addition of the control variable, there is no significant change in the impact of the total debt ratio on fixed investment; the sensitivity of fixed investment to the total debt ratio is around -0.2. The estimation results indicate that the level of debt does have a negative impact on fixed investment by Chinese listed companies. In addition, as Tobin's Q, an indication of available investment opportunities, is significantly positive at the 1% level, the estimation results show that companies with a high value of Q have easy market access to funds and make large investments. These findings are similar to those of previous studies. Since cash flow, the control variable, has a significantly positive correlation to fixed investment, companies with ample internal funds tend to make large amounts of investment. The estimation results shown in the first and second columns of Table 6 confirm the strong negative impact of the total debt ratio (total liabilities/total assets) on fixed investment.

The third and fourth columns of Table 6 present the results of our analysis of the impact on fixed investment of bank loans, the most important means of financing for Chinese companies. Since the impact of the bank loan ratio on investment is significantly negative at the 1% level, the bank loan ratio is found to have a significantly negative impact on fixed investment by companies. The result is similar even when the control variable is added to the equation. Tobin's Q, which controls investment opportunities for companies, is significantly positive at the 1% level. Regarding the cash flow, the control variable, the estimation results of columns third and forth are consistent with the first and second columns. A comparison between the impact of the total debt ratio on fixed investment (-0.21) and the impact of the bank loan ratio on fixed investment (-0.35) indicates that

[6] Chen et al. (forthcoming) also analyze Tobin's Q for listed companies and come up with a high value of over 2.
[7] This analysis uses both the fixed-effects model and the random-effects model to estimate the disciplinary effect of debt. The results of the Hausman test support the fixed-effects model.

the bank loan ratio has a stronger negative impact on fixed investment.[8] This means that the effect of the bank loan ratio is larger than that of the total debt ratio.

The estimation results in this section confirm that the total debt ratio (bank loan ratio) has a negative impact on fixed investment and that the bank loan ratio has a stronger negative impact than the total debt ratio on fixed investment. However, the negative impact of the total debt ratio (bank loan ratio) on fixed investment does not differentiate between underinvestment due to the high total debt ratio (bank loan ratio) and the restraint of overinvestment due to the disciplinary effect of the total debt ratio (bank loan ratio). We will examine that in the next section.

5.2 Differences in Response of Investment to Debt between High-growth and Low-growth Companies

To examine differences in the impact of debt on investment of high-growth companies and low-growth companies, we analyze the estimate equations (2) and (3), which add the debt ratios and the respective cross terms for high-growth company dummy and low-growth company dummy. Table 7 shows the estimation results of the differences in the impact of the debt ratios on investment between high-growth and low-growth companies. The fifth through eighth columns show the impact of the total debt ratio on fixed investment. The fifth and sixth columns give the estimation results when Tobin's Q is used to distinguish investment opportunities. It is confirmed anew that the total debt ratio has a significantly negative impact at the 1% level. It is also reaffirmed that Tobin's Q is significantly positive for investment. The cross term of the high-growth company dummy and the total debt ratio is not significant, but still tends to be positive. On the other hand, the cross term of the low-growth company dummy and total debt ratio is significantly negative at the 1% level. In other words, we find that the sensitivity of low-growth companies to the total debt ratio (-0.2-0.051) is higher than that of average companies (-0.2) [9]. The estimation results suggest that low-growth companies, which do not have highly profitable investment opportunities, tend to respond more strongly to the disciplinary effect of debt and restrain overinvestment. On the other hand, it shows that the negative impact of the total debt ratio on investment tends to be smaller at high-growth companies with ample investment opportunities than at average companies. These estimation results are consistent with the results on U.S. companies of Lang, Ofek and Stulz (1996) as well as the estimation results concerning Japanese companies of Arikawa et al. (2003). For control variables, it is again evident that cash flow has a significantly positive impact on investment by companies. The seventh and eighth columns, which show the estimation results when companies' investment opportunities are distinguished by PER, produce similar results to the fifth and sixth columns,

[8] In the one-sided t-test, the impacts differ at the 1% significance level.
[9] Here, the absolute value of coefficient is defined as the sensitivity.

indicating a strong negative impact of the total debt ratio on fixed investment by low-growth companies, significant at the 13% level.

The ninth through 12th columns of Table 7 show the results of the analysis of differences in the impact of the bank loan ratio, the subject of greatest interest in this paper's analysis, on investment by high-growth and low-growth companies. The ninth and 10th columns show the estimation results when investment opportunities are distinguished by Tobin's Q, while the 11th and 12th columns show the estimation results when investment opportunities are differentiated with the use of PER. It is again confirmed that the bank loan ratio has a significantly negative impact on fixed investment at the 1% level. The impact of Tobin's Q on investment is significantly positive, as with other estimations. The cross term for the high-growth company dummy and the bank loan ratio is not significant, but still tends to be positive. On the other hand, the cross term for the low-growth company dummy and bank loan ratio is significantly negative at the 1% level. In other words, the sensitivity of low-growth companies to the bank loan ratio (-0.32-0.097) is higher than that of average companies (-0.32). These estimation results indicate that the disciplinary effect of the bank loan ratio restrains overinvestment by companies. On the other hand, it also indicates that high-growth companies with ample investment opportunities are less responsive than average companies to the bank loan ratio. The estimation results shown in the 11th and 12th columns for the PER-based differentiation of investment opportunities of companies are consistent with the estimation results shown in the ninth and 10th columns, indicating that the bank loan ratio has a strong negative effect on fixed investment by low-growth companies. Generally speaking, low-growth companies show a tendency toward overinvestment. Thus, the bank loan ratio appears to restrain overinvestment by curbing investment by low-growth companies, which have a tendency toward overinvestment. Thus, the estimation results discussed above show that Chinese banks are restraining overinvestment by companies through their lending operations.

Though the bank loan ratio used in our analysis is based on figures in the prior accounting year, it is thought that Chinese companies set the level of investment in the current year on the basis of the composition of capital at the beginning of the year. Thus, using the investment equation, we find that Chinese banks are restraining overinvestment by companies through their lending operations. Furthermore, we find the interesting result that the bank loan ratio's effect in restraining overinvestment is stronger than that of the total debt ratio.[10] Hence, it can be assumed that in China, banks are supervising the investment activities of companies more strongly than other creditors.

6. Conclusions

In this paper, we first examined whether the effect of debt on fixed investment exists in China. We

[10] In the one-side t-test, the impacts differ at the 1% level of significance.

then focused our attention on whether the impact of the total debt ratio (bank loan ratio) on fixed investment differs among listed companies with differing investment opportunities. The key estimation results are summarized below. Firstly, we found that the total debt ratio (bank loan ratio) does have a negative impact on fixed investment by companies, an indication that the effect of debt on fixed investment exists for Chinese listed companies as well. We also found that companies with a higher Tobin's Q and a larger cash flow make larger amounts of investment. Secondly, we found that the total debt ratio (bank loan ratio) has a stronger negative impact on investment by low-growth companies than on that by high-growth companies. These results are consistent with those on U.S. companies from Lang, Ofek and Stulz (1996) as well as the results about Japanese companies from Arikawa et al. (2003). The results of our analysis suggest that in China, the total debt ratio (bank loan ratio) works as a factor that restrains excessive fixed investment by companies. Thirdly, as the most important finding in our analysis, we found that the restraining effect of the bank loan ratio on overinvestment is larger than that of the total debt ratio. This difference in the impact suggests that banks, which are large-lot creditors of listed companies in China, supervise the investment activities of companies more strongly than other creditors. If we are to make an assessment of what has been achieved in financial reforms carried out by the Chinese government since the 1980s on the strength of the estimation results of this paper's analysis, we can perhaps point out that banks' financial intermediation function has been gradually improving and that Chinese banks are beginning to show business behaviors driven more by market principles.

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Table 1. Industrial Attributes of Samples (20

Industry	No. of Observations	%
Commerce	100	7.75
Manufacturing	885	68.55
Real estate	66	5.11
Utilities	126	9.76
Conglomerate	114	8.83
Total	1,291	100

Table 2. Total liabilitites Ratio and bank loan ratio of Chinese listed companies

Year	Total debt/Total assets					Bank loan/Total assets				
	Obs.	Mean	St.dev.	Min	Max	Obs.	Mean	St.dev.	Min	Max
1991	7	0.602	0.163	0.306	0.779	2	0.513	0.114	0.432	0.594
1992	10	0.536	0.251	0.139	0.837	8	0.393	0.143	0.197	0.548
1993	52	0.474	0.204	0.135	0.814	48	0.265	0.137	0.049	0.507
1994	166	0.402	0.161	0.078	0.785	165	0.201	0.130	0.003	0.660
1995	274	0.410	0.163	0.083	0.859	272	0.216	0.129	0.004	0.651
1996	304	0.461	0.159	0.096	0.863	300	0.227	0.132	0.001	0.707
1997	508	0.441	0.160	0.076	0.927	496	0.224	0.129	0.003	0.729
1998	702	0.422	0.165	0.074	0.994	684	0.213	0.127	0.000	0.723
1999	809	0.425	0.180	0.074	1.404	778	0.214	0.130	0.000	0.734
2000	902	0.433	0.186	0.073	1.404	873	0.224	0.136	0.000	0.675
2001	1037	0.432	0.180	0.074	1.287	994	0.220	0.132	0.001	0.652
2002	1107	0.445	0.185	0.078	1.345	1063	0.235	0.134	0.001	0.695
2003	1172	0.466	0.191	0.074	1.518	1120	0.238	0.139	0.000	0.714
2004	1218	0.482	0.191	0.073	1.448	1160	0.253	0.142	0.000	0.736
2005	1307	0.500	0.195	0.073	1.455	1247	0.254	0.143	0.000	0.715
2006	1301	0.526	0.208	0.074	1.473	1226	0.254	0.145	0.000	0.722

Source: Prepared from "China Stock Market Financial Database (Annual Report)" provided by GTA Information Technology Co., Ltd.

Table 3. Definition of Variables

$Investment_{i,t}$	Fixed investment ratio for Company i at time t-1	Cash paid to acquire fixed assets, etc./fixed assets
$Debt_{i,t-1}$	Total debt ratio for Company i at time t-1	Total debt/total assets
	Bank loan ratio for Company i at time t-1	(Long-term bank loan + short-term bank loan)/total assets
$Cashflow_{i,t-1}$	Cash flow for Company i at time t-1	(Net profit + depreciation of fixed assets)/fixed assets
$Q_{i,t-1}$	Tobin's Q for Company i at time t-1	(Number of shares x average stock price + total debt)/total assets
$HQ(Hper)_{i,t-1}$	Dummy for Tobin's Q (PER) for Company i at time t-1 being in the upper one-third	Dummy for high-growth companies
$LQ(Lper)_{i,t-1}$	Dummy for Tobin's Q (PER) for Company i at time t-1 being in the lower one-third	Dummy for low-growth companies
Yeardummy	Yeardummy	

Table 4. Descriptive Statistics

	Overall			LQ (Low Q) Firms			HQ (High Q) Firms		
Variables	Obs	Mean	Std.dev.	Obs	Mean	Std.dev.	Obs	Mean	Std.dev.
Investment	6598	0.223	0.254	2289	0.197	0.218	2112	0.248	0.289
Debt (bank loan ratio)	6598	0.242	0.138	2289	0.268	0.134	2112	0.218	0.135
Debt (total debt ratio)	6598	0.484	0.181	2289	0.535	0.158	2112	0.433	0.191
Q	6596	2.537	1.573	2289	1.331	0.216	2112	4.251	1.709
Cashflow	6597	0.324	2.528	2289	0.284	1.498	2111	0.473	3.991

Table 5. Correlations between Variables

	Investment	Debt (total debt ratio)	Debt (bank loan ratio)	Q	Cashflow
Investment	1				
Debt (total debt ratio)	-0.155	1			
Debt (bank loan ratio)	-0.121	0.681	1		
Q	0.066	-0.161	-0.119	1	
Cashflow	0.080	-0.012	-0.045	0.020	1

Table 6. Basic Results of Estimation

	Total debt ratio		Bank loan ratio	
	1	2	3	4
$Debt_{i,t-1}$	**-0.213*** **	**-0.208*** **	**-0.355*** **	**-0.351*** **
	0.03	0.03	0.037	0.037
$Q_{i,t-1}$	0.008***	0.008***	0.014***	0.014***
	0.003	0.003	0.003	0.003
$Cashflow_{i,t-1}$		0.002*		0.003*
		0.001		0.002
Constant	0.345***	0.278***	0.248***	0.247***
	0.019	0.018	0.013	0.013
Yeardummy	Yes	Yes	Yes	Yes
Obs.	6949	6948	6620	6618
R^2Adj.	0.04	0.04	0.05	0.05

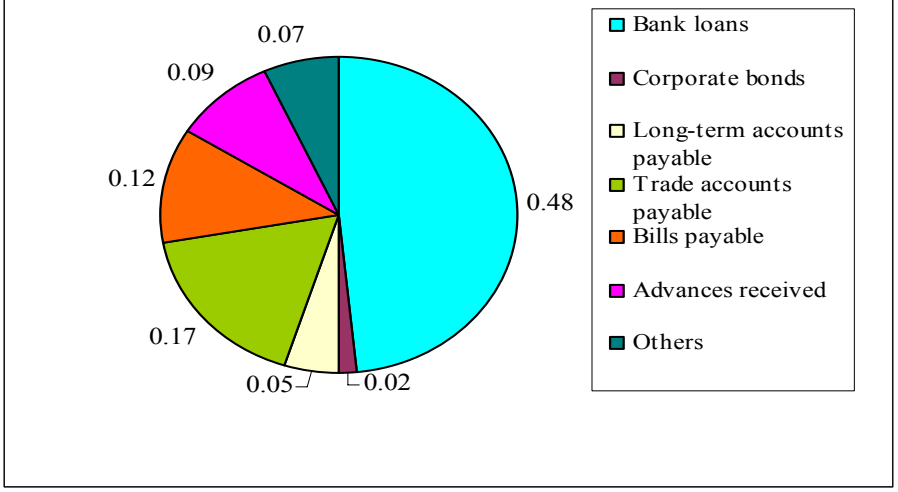
Note: The upper columns of the table show coefficients, while the lower columns show standard deviation. ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively.

Table 7. Differences between High-growth companies and Low-growth companies

	Total debt ratio				Bank loan ratio			
	Q		per		Q		per	
	5	6	7	8	9	10	11	12
$Debt_{i,t-1}$	**-0.201*** **	**-0.196*** **	**-0.191*** **	**-0.187*** **	**-0.324*** **	**-0.320*** **	**-0.322*** **	**-0.320*** **
	0.031	0.031	0.033	0.033	0.041	0.041	0.044	0.044
$Q_{i,t-1}$	0.007**	0.007**	0.008***	0.009***	0.013***	0.013***	0.014***	0.014***
	0.003	0.003	0.003	0.003	0.004	0.004	0.003	0.003
$LQ(Lper) * Debt_{i,t-1}$	**-0.051*** **	**-0.051*** **	**-0.025**	**-0.023**	**-0.097*** **	**-0.097*** **	**-0.058***	**-0.055***
	0.017	0.017	0.016	0.016	0.03	0.03	0.03	0.03
$HQ(Hper) * Debt_{i,t-1}$	**0.025**	**0.024**	**-0.006**	**-0.007**	**0.033**	**0.034**	**0.003**	**0.002**
	0.02	0.02	0.016	0.016	0.035	0.035	0.03	0.03
$Cashflow_{i,t-1}$		0.002*		0.002*		0.003*		0.003
		0.001		-0.001		0.002		0.002
Constant	0.337***	0.294***	0.277***	0.274***	0.262***	0.261***	0.248***	0.246***
	0.019	0.019	0.018	0.018	0.014	0.014	0.013	0.013
Yeardummy	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Obs.	6949	6948	6948	6948	6620	6618	6619	6618
Adj.R^2	0.05	0.05	0.04	0.04	0.05	0.06	0.05	0.05

Note: The upper columns of the table show coefficients, while the lower columns show standard deviation. ***, **, * indicate statistical significance at the level of 1%, 5% and 10%, respectively.

Figure 1. Debt Composition of Listed Companies (2006) (%)



Source: Prepared using China Stock Market Financial Database "Annual Report" provided by GTA Information Technology Co., Ltd.