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Corporate financing and product market competition: evidence from firm-level data in Japan

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Abstract

This paper investigates the link between external financing and product market competition by focusing on different maturity structures. Using firm-level data for Japanese manufacturing firms over the period 1990-1995, we find that long-term loans enable firms to compete aggressively at a level below profit maximization. By contrast, short-term loans are not related to product market competition. Our results suggest that long-term loans play an important role in investment in market share for long-term profits through lowering prices.

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1. Introduction

Analysis of the link between credit market imperfection and pricing strategy occupies an important role in macroeconomics, industrial organization, corporate finance, and other fields (e.g., Phillips (1995), Chevalier (1995a), Chevalier (1995b), Chevalier and Scharfstein (1996), and Asplund *et al*. (2005)). Asymmetric information between lenders and borrowers create a gap between the costs of external and internal financing. Costly external financing restricts the ability of firms to raise external finance. Firms that have the difficulty in raising external finance need to boost current profits to meet their liabilities and to finance their operations. This leads the firms to gain short-term profits by raising prices. In particular, a formal model presented in Chevalier and Scharfstein (1996) suggests that if price level maximizing the present value of future profits is below the short-term profit maximization price level, liquidity-constrained firms could increase their profits in the short run by raising prices in markets with switching costs.

In this paper, we investigate the link between external financing and product market competition. Firms facing the difficulty in obtaining external finance are likely to place greater importance on current profits relative to future profits to avoid the risk of bankruptcy. However, obtaining external finance enables the firms to avoid imminent bankruptcy. Firms receiving external funds need not put greater emphasis on current cash flows than previously, and attempt to reap long-term profits from investment in future market share if the firms have strong incentives to increase market share. This leads firms to maintain prices at a lower level than firms without such funds. Thus, our prediction is that firms receiving external funds maintain smaller price-cost margins than other firms by cutting prices. In particular, we focus on different maturity structures of external funds because these could have different effects on product market competition.

We examine the prediction by using panel data on Japanese firms.[1] There is main reason why Japanese firms are suitable to testing our hypothesis. Our hypothesis is consistent with the notion that Japanese firms aim to maximize market share rather than profits.[2] Abegglen and Stalk (1985), for example, present survey results showing that Japanese managers consider acquisition of market share to be the most important objective of the firm. Blinder (1991) argues that Japanese managers are concerned with growth, not profits, because of the lack of disciplinary pressure by shareholders. Abe (1997) finds that long-term performance

[1] See Porter and Sakakibara (2004) for the review of the literatures on market competition in Japan.
[2] Kaplan (1994) is skeptical about this view. He presents evidence that the response of executive turnover to performance variables in Japan is similar to that in the United States, and concludes that this is inconsistent with the view that Japanese managers ignore profits to pursue increases in market share or sales growth.

measures are more sensitive to executive turnover in Japan than short-term measures. Thus, using data on Japanese firm allows us to examine whether external funds affect product market competition.

Our empirical results show that when firms receive long-term loans, the firms compete more fiercely at a level below the profit maximizing level. By contrast, short-term loans do not affect product market competition. Consequently, our findings suggest that long-term loans play an important role in investment in market share for long-term profits through lowering prices.

Our study is related to Weinstein and Yafeh (1995) that find that keiretsu group firms are induced to have lower price-cost margins by main bank pressures to use capital and raise output more, but is different from this previous study in two ways. First, we explicitly attempt to shed light on the impact of change in loans on product market competition, with special attention to different maturity structures. Second, in contrast to the cross-section analyses in Weinstein and Yafeh (1995), we use panel data of individual firms. Using panel dataset is well suited to examining determinants of price-cost margins. Moreover, our study is strongly associated with those of Erol (2003, 2005) that present evidence that while short-term debt increases output price, long-term debt has a negative impact. However, our study differs from two previous studies in two ways. First, while the two studies use industry-level data from Turkey, developing country, our analyses are based on firm-level data for Japanese firms in an advanced economy. Second, the two studies use the ratio of bank loans to total assets by focusing on the role of loans as debt. By contrast, we concentrate on the role of overall loans, including bank loans, loans from other financial institutions and affiliated firms and so on, and use the change rate of loans over the previous year in empirical analyses. Using the change rate of loans over the previous year is essential to examining our prediction.

The rest of the paper is organized as follows. Section 2 describes the empirical framework and variables. Section 3 reports the empirical results. Section 4 concludes the paper.

2. Empirical Framework

Our purpose is to examine whether external funds allows firms to compete more fiercely. Then we test directly at the firm-level for the effects of change in loans on product market competition. In what follows, we derive price-cost margins based on firm's profit maximization behaviors, and add loan and control variables to the structural equation for our purpose.

To derive the structural equation, we follow earlier work by Weinstein and Yafeh (1995). Although they propose several models to examine whether firms belonging to keiretsu groups

collude or compete aggressively among the same group, our structural equation corresponds to their simple type of Cournot competition. The model reflects well the fact that most Japanese firms operate in many markets.

Assuming that each firm with Cobb-Douglas technology maximizes total profits in each market on the basis of Cournot competition, we obtain the following equation:

$$\mathrm{PCM_i} = \sum_j \beta_j \sigma_{ij} \mathrm{SHR_{ij}}$$

where $\mathrm{PCM_i}$ is firm i's production-weighted price-cost margin, σ_{ij} is the share of firm i's total sales in industry j, $\mathrm{SHR_{ij}}$ is firm i's market share in industry j, and β_j is a constant for each industry j.

Allowing for the impact of loan and control variables on the price-cost margin, the equation to be estimated is then written as

$$\mathrm{PCM_{it}} = \sum_j \beta_j \sigma_{ijt} \mathrm{SHR_{ijt}} + \gamma_1 \mathrm{LOAN_{it-1}} + \gamma_2 \mathrm{CONTROL_{it-1}} + \varepsilon_{it}$$

where $\mathrm{PCM_{it}}$ is firm i's production-weighted price-cost margin in year t, σ_{ijt} is the share of firm i's total sales in industry j in year t, $\mathrm{SHR_{ijt}}$ is firm i's market share in industry j in year t, β_j, γ_1, γ_2 are a set of estimated parameters, $\mathrm{LOAN_{it}}$ is a set of loan variables for firm i in year t, $\mathrm{CONTROL_{it}}$ is a set of control variables for firm i, i is the firm subscript, j is the industry subscript, t is the year subscript, and ε_{it} is the error term that reflects all other shocks to the firm's price-cost margin.

Our data is obtained from the Nikkei NEEDS dataset. This dataset includes unconsolidated data on income statements and balance sheets for non-financial firms traded on the stock exchange. We employ a sample limited to manufacturing firms with fiscal years ending in March over the period 1990-1995. We do not include firms that drop from our sample during the sample period because of mergers, and acquisitions (M&A) or bankruptcy. As a result, our sample includes 1014 Japanese manufacturing firms. This study is based on the sample period because the market for M&A has increased since the late 1990s, and Japanese managers are forced to emphasize stock price rather than market share. Thus, using data in the early 1990s is suitable for an examination of our hypothesis.

To calculate the variable for price-cost margin, we need to know the marginal cost for each firm, but such data are not available. Instead, we follow previous work by Weinstein and Yafeh (1995), and approximate marginal cost by using the cost of sales for each firm. Then our price-cost margin is defined as follows:

$$\text{Price} - \text{cost margin} = \frac{\text{Sales} - \text{Cost of Sales}}{\text{Sales}}$$

where cost of sales is labor costs plus raw material costs plus the processing costs of outsourcing plus depreciation allowance plus inventory value at the beginning of the period minus inventory value at the end of the period.

We use data from *Toyo Keizai Shimpo Sha's Japan Company Handbook* to calculate the share of firm's sales in each industry (σ_{ijt}). Although Weinstein and Yafeh (1995) use *Nihon Keizai Shimbun Sha's Japan Company Handbook*, there is no difference in the share of firm's sales in each industry between these alternative sources of information. The data are based on three-digit industry classifications, but we aggregate at the two-digit level to avoid the excessively large number of coefficients to be estimated at the three-digit level.[3] Using data on aggregate sales at the two-digit level from the Census of Manufacturing enables us to construct the market share for every firm in each industry (SHR_{ijt}).

LOAN contains a set of variables that are intended to capture the effects of change in loans as external funds. We calculate the change rate of loans over the previous year to examine the effects of loans on the price-cost margin. Total loan growth is the change rate of total loans outstanding over the previous year. The effects of loans on price-cost margin could vary depending on different maturity structures of the loans. Then, we classify total loans into long- and short-term loans, and construct separate variables for them. Long-term loan growth is the change rate of long-term loans outstanding over the previous year. Short-term loan growth is the change rate of short-term loans outstanding over the previous year.[4]

CONTROL contains a set of variables that are intended to capture other characteristics, including internal funds, keiretsu group membership, firm size, capital intensity, dependence on loans. Cash flow ratio is intended to capture the extent of internal funds. This is defined as after-tax income plus depreciation allowance less dividends, divided by total assets. Following Weinstein and Yafeh (1995), we include keiretsu group membership that has a value of 1 if the firm is in one of the eight bank-centered keiretsu groups (Mitsubishi, Mitsui, Sumitomo, Fuyo, Dai-ichi Kangyo, Sanwa, IBJ, and Tokai), and 0 otherwise. Our sample includes 362 keiretsu group firms. Identification of keiretsu group membership comes from *Industrial Groupings in Japan*. Firm size is measured by the logarithm of total assets. As in Domowitz *et al*. (1986) and Fisher (1987), we include the variable for capital intensity. This variable is defined as depreciable assets, divided by sales. We include variables that control for the degree of dependence on three types of loans. Total loan ratio is defined as total loans outstanding, divided by total assets. Long-term loan ratio is defined as long-term loans outstanding, divided by total assets. Short-term loan ratio is defined as short-term loans outstanding, divided by total assets. While Long-term loan growth and Short-term loan

[3] Weinstein and Yafeh (1995) also use market share variables at the two-digit industry level because of more than 200 coefficients required for their specifications at the three-digit industry level.

[4] Our sample includes several firms without loans outstanding in the years. In particular, we could not calculate the change rate of loans outstanding for firms with no loans outstanding in the previous year but with loans outstanding in the current year. Then we assume that the change rate for such firms is 0. Our results hold even when we make no such assumption, or set the change rate to other value, for example, 1.

growth are intended to capture the effects of loans as flow variables, Long-term loan ratio and Short-term loan ratio are intended to control for the degrees of dependence on loans. Because the effects of the change rate of loans on price-cost margin should vary with the degrees of dependence on loans, inclusion of *both* two variables in our specification is important for examination of our prediction.

Table 1 reports the means, medians, and standard deviations for variables except for market share variables. Note that observations with extreme values for continuous variables are removed from our sample to ensure the robustness of our results.[5]

3. Empirical Results

In the empirical analyses, we examine the impact of change in loans on product market competition, using data on Japanese manufacturing firms over the period 1990-1995. Our sample includes 16 manufacturing industries according to two-digit industry classifications.

As mentioned above, we use cost of sales instead of marginal cost data. Unfortunately, the difference between accounting cost and true marginal cost could cause errors in the estimation. Indeed, Fisher (1987) demonstrates that the difference is highly correlated with several independent variables, including firm- and industry-specific attributes.[6] To overcome this problem, Weinstein and Yafeh (1995) add the share of firm's sales in each industry (σ_{ijt}) to their specifications. However, they argue that a high degree of multicollinearity between σ_{ijt} and $\sigma_{ijt} \cdot SHR_{ijt}$ make it difficult to estimate the coefficients on β_j. For this reason, we employ industry dummy variables.[7] As in Weinstein and Yafeh (1995), these variables help control for industry-specific effects, such as degree of market concentration, industry growth rate, import penetration and so on.

As suggested by Weinstein and Yafeh (1995), when costs are imperfectly measured, market share variables could be correlated with the error term, resulting in biased coefficients. Then, we follow Weinstein and Yafeh (1995), and treat the firm's market share (SHR_{ijt}) as endogenous. The instrumental variable for market share is the ratio of each firm's employment in the sector to total employment of the sector. To treat the firm's market share as endogenous, we estimate the equation, using two-stage least squares. In the examination of the determinants of mark-up, several studies use panel data models that focus on the

[5] Extreme observations here are defined as those for which any one of the variables has a value that is more than four standard deviations from its mean value.

[6] Salinger (1990) disputes Fisher's (1987) claim that accounting measures of return on sales are flawed because of mismeasurement of economic depreciation. He argues that errors in measuring depreciation adversely affect only the numerator in return on sales, and the impact is weak.

[7] We obtain similar results when σ_{ijt} is included in our specifications.

heterogeneity across firms (e.g., Domowitz *et al*. (1986) and Campello (2003)). However, using panel data analyses, in particular fixed effects model as estimation method in our analyses generates difficult problems. If the fixed effects model is employed as estimation method, the effects captured by market share and keiretsu group membership are cancelled out because these variables remain stable during our sample periods. Given that firm sales in each industry reflect differences in production costs for each firm, we believe that firm-specific effects are captured by market share for each firm.

Table 2 provides evidence for the link between change in loans and product market competition. To avoid endogeneity problems, one period lagged values of independent variables excluding market share variables are included in our equations. All equations include industry dummy variables and year dummy variables. Because observations with extreme values are removed from our sample, the number of observation varies with specifications. Because there are 22 coefficients for β_j, we do not report the coefficients in order to conserve the space. In all regressions, nearly half coefficients for β_j are positive, but few of them are statistically significant. Column 1 contains the results for the specification with total loan growth. The coefficient on total loan growth is negative, but not statistically significant. Significant and negative coefficient on cash flow ratio indicates that firms with lower internal funds increase profit margins by raising prices. Consistent with the findings reported by bank influence model in Weinstein and Yafeh (1995), the coefficient on keiretsu group membership is negative and statistically significant, suggesting that keiretsu group firms are compelled to have lower price-cost margins from main bank pressures. Significant and positive coefficient on firm size indicates that larger firms have higher price-cost margins. The coefficient on capital intensity is negative and statistically significant, suggesting that firms with higher capital intensity have lower profit margins. The coefficient on total loan ratio is positive, but not statistically significant.

By focusing on different maturity structures of the loans, Column 2 contains the results for the specification with long-term loan growth and short-term loan growth. Long-term loan growth has a statistically significant and negative coefficient.[8] Long-term loans enable firms to compete fiercely below the profit maximizing level by lowering their prices. Such aggressive competition leads to an increase in market share as long-term profits. By contrast,

[8] If the error term is serially correlated, Long-term loan growth and Short-term loan growth are correlated with the error term, thereby generating endogeneity problems. Unfortunately, we have no instrumental variables available for examination of the robustness check of our results. However, our error term could contain the effect of business fixed investment. If the firms try to invest, they need to raise long-term loans from other institutions. Information about business fixed investment in the error term are *positively* correlated with Long-term loan growth, suggesting that the estimated coefficient suffers from *upward* bias. Consequently, we are not able to control for endogeneity problems fully, but our results remain unchanged even if the problems occur.

the coefficient on short-term loan growth is negative, but statistically insignificant. We infer from these results that in column 1, the change rate of total loans over the previous year does not affect price-cost margins because different effects of long- and short-term loans on price-cost margins offset each other. Long-term loan ratio has a positive, but statistically insignificant coefficient. Short-term loan ratio has a negative, but statistically insignificant coefficient. Results for other variables remain virtually unchanged.

The different effects of long-term loan growth and short-term loan growth indicate that the maturity periods of the loans are important for product market competition. If additional profits generated by increased market share are required to cover debt, whether the profits during the short-term periods are sufficient to meet liabilities is a difficult problem. In addition, firms receiving short-term loans may require creditors to roll over short-term loans subsequently, but are likely to face the credit crunch. Alternatively, provision of long-term loans allows firms to avoid such risk. Thus, long-term loans play an important role in aggressive competition that is intended to increase long-term profits.

The results in Table 2 indicate that long-term loans allow firms to have lower price-cost margins, or to compete fiercely below the profit maximizing level. This indicates that long-term loans as external finance play an essential role in aggressive competition by lowering prices, or increasing output. Taking account of the fact that Japanese firms operate in many industries, firms receiving long-term loans may lower prices in industries with high price elasticity of demand.

4. Conclusion

In this paper, we examine the link between external funds and product market competition. In particular, we focus attention on different maturity structures of the loans. Using data on Japanese manufacturing firms over the period 1990-1995, we investigate the impact of loan financing on product market competition.

We find that firms receiving long-term loans compete more aggressively at a level beyond that warranted by profit maximization. Alternatively, short-term loans do not have such impact on product market competition. As a result, we conclude that long-term loans play an essential role in aggressive product market competition by cutting prices.

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Table 1. Descriptive statistics

Variable	Mean	Median	Std. dev.
Price-cost margin	0.4218	0.3906	0.2056
Total loan growth	0.2094	0	3.3516
Long-term loan growth	0.3147	0	3.7455
Short-term loan growth	0.1359	0	2.2241
Cash flow ratio	0.0433	0.0424	0.0340
Keiretsu group membership	0.3631		
Firm size	10.8509	10.6941	1.3346
Capital intensity	0.2287	0.1977	0.1349
Total loan ratio	0.1808	0.1416	0.1673
Long-term loan ratio	0.0799	0.0459	0.0955
Short-term loan ratio	0.0977	0.0714	0.0991

Notes

The table reports the means, medians and standard deviations of the variables for 1014 Japanese manufacturing firms over the period 1990-1995. Price-cost margin is sales less cost of sales, divided by sales. Total loan growth is the change rate of total loans outstanding over the previous year. Long-term loan growth is the change rate of long-term loans outstanding over the previous year. Short-term loan growth is the change rate of short-term loans outstanding over the previous year. Cash flow ratio is after-tax income plus depreciation allowance less dividends, divided by total assets. Keiretsu group membership has a value of 1 if the firm is in one of bank-centered keiretsu groups, and 0 otherwise. Firm size is the logarithm of total assets. Capital intensity is depreciable assets, divided by sales. Total loan ratio is the ratio of total loans outstanding to total assets. Long-term loan ratio is the ratio of long-term loans outstanding to total assets. Short-term loan ratio is the ratio of short-term loans outstanding to total assets.

Table 2. Corporate financing and product market competition

	Dependent variable: Price-cost margin	
Independent variable	1	2
Total loan growth$_{t-1}$	−0.0003	
	(0.0017)	
Long − term loan growth$_{t-1}$		−0.0014**
		(0.0006)
Short − term loan growth$_{t-1}$		−0.0002
		(0.0007)
Cash flow ratio$_{t-1}$	−0.1563*	−0.1731*
	(0.0850)	(0.0846)
Keiretsu group membership$_{t-1}$	−0.0194***	−0.0183***
	(0.0052)	(0.0052)
Firm size$_{t-1}$	0.0213***	0.0215***
	(0.0032)	(0.0032)
Capital intensity$_{t-1}$	−0.2321***	−0.2352***
	(0.0222)	(0.0223)
Total loan ratio$_{t-1}$	0.0074	
	(0.0195)	
Long − term loan ratio$_{t-1}$		0.0485
		(0.0331)
Short − term loan ratio$_{t-1}$		−0.0333
		(0.0323)
No. of observations	4824	4796
R^2	0.3632	0.3649

Notes

The table reports regression estimates for 1014 Japanese manufacturing firms over the period 1990-1995. All equations include a constant, market share variables, industry dummy variables, and year dummy variables. The coefficients are estimated, using two-stage least squares. Standard errors reported in parentheses are robust to heteroskedasticity. ***Significant at the 1% level; **Significant at the 5% level; *Significant at the 10% level.