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Bank's Market Power and Firm Access to Capital Markets in Asia

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ABSTRACT

We investigate the effect of bank's market power on financing constraints of non-financial firms in 11 Asian countries between 1995 and 2009. Using firm-level data we analyze financial constraints with the Euler equation derived from the dynamic investment model. We find that with a highly concentrated banking sector firms which have high market power are less financially constrained. These results are consistent with an information-based hypothesis that more market power increases bank's advantage to produce information on potential borrowers.

Keywords: Firm-Level Investment, Bank's Market Power, Financial Constraint, GMM-IV, Bootstrap Simulation

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1. INTRODUCTION

The linking between financial development and real economic activities recently garnered significant research interests to academic and policy makers around the world. In particular, the debate over the relationship between competitiveness of banking sectors and firm's access to credit has become important policy issue because of rapid consolidation process in global banking system. Theoretical model suggests that the availability of bank credit for non-financial firms crucially depends on the structural change in banking sectors. However, we content these findings solely depend on empirical work.

Much of recent empirical studies focusing on the non-financial firm's availabilities of credit created by banking sectors offer mixed results. In particular, recent works find support for information hypothesis that higher concentration can produce more credit to potential borrowers, enhancing real economic activities and favorable economic outcome. Dick (2006) finds that higher market power in regional banking in U.S. creates better welfare for U.S. consumers. Cetorelli and Gambera (2001) find more concentration in banking sectors is associated with higher growth in industries that are more dependent on external finance using cross-country industry-level data. Some papers examined the effect of banking structure on firm-level activities. Laeven (2003) and Love (2003) find the evidence that more competitive banking sector creates better credit environment for firm's investment. Ratti *et al*. (2008) find that higher concentration in banking sector is associated with better environment for assessing capital for European firms.

Asian countries are the natural laboratory since these countries have been not only showed sustained higher economic growth but also wide-ranging change in banking structure after Asian financial crisis. Compared to major developed countries such as U.S., U.K., and Germany, Asian non-financial firms also have a higher reliance on bank finance.

This paper examines the effect of bank's market power on access to external finance through firm' investment decisions in 11 Asian countries between 1995 and 2009. We estimate a dynamic model of investment based on the Euler equation approach. Development in the banking sector is linked to real activity by firms through influencing firm's stochastic discount factor.

The estimation results show that with a highly concentrated banking sector firms are less financially constrained. The estimated coefficients on cash stock suggest that low concentration in the banking sector creates more information costs and from the coefficient of the interaction of size and cash is negative indicating that larger firms are less credit constrained than smaller firms.

These results are consistent with information hypothesis that more market power increases bank's advantage to produce information on potential borrowers, since the effect is greater in those situations (i.e. for bigger firms and during expansions) when asymmetric information problems are less severe.

2. MODEL AND ESTIMATION

2.1 Investment Model

It is a dynamic model of investment based on the Euler equation approach introduced by Abel (1980) with financial frictions modeled as in Gilchrist and Himmelberg (1998). The dynamic model for firm value optimization under an imperfect capital market presented in this section is similar to the models in Laeven (2003) and Love (2003). We assume that it is costly to adjust capital, the only input in production, and that there is debt finance. To maximize the present value of dividends subject to capital accumulation and external financing constraints, we consider managers or shareholders, who choose investment and debt. The objective function (1) is given by:

$$V_t(K_t, B_t, \upsilon_t) = MaxD_t + E_t\left[\sum_{s=1}\beta^s D_{t+s}\right] \tag{1}$$

subject to

$$D_t = \Pi(K_t, \upsilon_t) - C(I_t, K_t) - I_t + B_{t+1} - (1+r_t)(1+\kappa(B_t, K_t, \upsilon_t))B_t \tag{2}$$

$$K_{t+1} = (1-\delta)K_t + I_t,\ D_t \geq 0 \tag{3}$$

where $E_t[\cdot]$ is the expectations operator conditional on information available at time t, D_t is non-negative dividend payment to shareholders at time t, and β is the firm's discount factor. In equation (2), net predetermined profits is $\Pi(K_t, \upsilon_t)$, where K_t is capital stock at time t and υ_t is a productivity shock, $C(I_t, K_t)$ is the convex adjustment cost function for investment I_t, r_t is the risk free rate of return, and $\kappa(B_t, K_t, \upsilon_t)$ is an external finance premium that is an increasing function of the firm's debt at time t, B_t. The equation (3) is capital accumulation constraint, where δ is the capital depreciation rate. The gross required rate of return on debt is expressed as $(1+r_t)(1+\kappa(B_t, K_t, \upsilon_t))B_t$.

By following forward iteration and Taylor series approximation on the first order condition, the Euler equation for investment with an imperfect capital market can be shown below:

$$1 + \frac{\partial C(I_t, K_t)}{\partial I_t} = c + E_t[\sum_{s=1}^{\infty}\beta^s(1-\delta)^{s-1}MPK_{t+s}] \equiv \gamma E_t[\sum_{s=1}^{\infty}\beta^s(1-\delta)^{s-1}\Phi_{t,t+s}] \tag{4}$$

where MPK_{t+s} denotes $\frac{\partial \Pi(K_{t+s}, \upsilon_{t+s})}{\partial K_{t+s}}$,

$$\Phi_{t,t+s} \equiv \frac{(1+\lambda_{t+s})}{(1+\lambda_t)} \tag{5}$$

$\Phi_{t,t+s}$ is the time varying stochastic discount factor for the relative cost of external finance in periods t+s and t, and λ_t denotes the Lagrangian multiplier that debt is non-negative.

As in Love (2003) and Ratti *et al*. (2008), it is assumed that the stochastic discount factor for a firm may be approximated by the stock of liquid assets relative to total assets. The basic idea is that an external finance premium suggests a positive correlation between cash stock and investment. We combine the influence of bank market power, MP_t, on the relationship between the firm's cash and the firm's stochastic discount factor and as follows:

$$\Phi_{t,t+s} \cong \sigma_0 + \sum_{k=1}^{s}(\sigma_1 + \sigma_2 MP_t)Cash_{t+k-1} \tag{6}$$

We assume a standard convex adjustment cost function that includes lagged investment to capture strong persistence observed in the data. The cost function is given by:

$$C(I_{it}, K_{it}) = \frac{\alpha}{2}(\frac{I_{it}}{K_{it}} - \rho\frac{I_{ik-1}}{K_{it-1}} - \upsilon_i)^2 K_{it} \tag{7}$$

where α is the cost of capital, υ_i is a firm-specific effect, and ρ is a measure of persistence.

In equation (4), if the suffix *i* is introduced to indicate firm *i*, MPK_{it} is parameterized using a sales-based measure derived from the profit maximization problem with a Cobb-Douglas production function, so that $MPK_{it} = \theta_i\frac{S_{it}}{K_{it}}$, where θ_i is the ratio of capital share to markup. If it is assumed that MPK_{it} and $Cash_{it}$ are vector autoregressive process of order one and that expectations are rational it can be shown, as in Laeven (2003), that equations (5), (6) and (7) imply the empirical model:

$$\frac{I}{K_{it}} = \beta_1\frac{I}{K_{it-1}} + \beta_2\frac{S}{K_{it}} + \beta_3 Cash_{it} + \beta_4 Cash_{it}MP_{ct} + f_i + d_{ct} + u_{it}, \tag{8}$$

where f_i is an unobserved firm-specific effect, d_{ct} is a country-time dummy, and u_{it} is an error term orthogonal to any available information at time t. The interaction term in equation (8) captures the effect of bank market power on the sensitivity of internal funds to investment. The main testing hypothesis is that firm level financial constraint decreases with higher bank market power.

$$H_0 = \beta_3 \geq \ \& \ \beta_4 < 0 \tag{9}$$

2.2 Econometric Issues

Several difficulties arise in estimating firm level investment to the change in banking structure for each country. To obtain consistent estimators, the main empirical concerns are the treatment of fixed effects and possible endogeneity problems as obstacles. The individual effect can be eliminated by a standard within group estimator, but this creates a correlation between the transformed dependent variable and transformed error due to the lagged variables on the right-hand side. To avoid this dynamic panel bias, we use orthogonal deviation transformation which implies forward mean differences proposed by Arellano and Bover (1995). The investment equation (8) is estimated after forward-mean differences and country-time differences are eliminated from the data to eradicate unobserved firm-specific effect, f_i, and d_{ct} country-time dummies,

The GMM-IV estimator with an optimal weight matrix can solve efficiency and possible simultaneity issues. We provide Hansen statistics to check the validity of used instruments. Since the properties of the sample distribution for the weighting regression are unknown we apply the GMM bootstrap method proposed by Hall and Horowitz (1996). The GMM bootstrap methodology will provide a check of the large sample properties of the Hansen test for the over-identification of instrumental variables in the dynamic panel data and also provide the p-value of the Hansen test for the weighting regressions.

3. DATA

Our sample contains data on bank concentration for bank market power and non-financial firms from 11 Asian countries: China, Hong Kong, India, Indonesia, Japan, Korea, Malaysia, Philippines, Singapore, Taiwan, and Thailand. We describe the firm-level data and bank concentration index for bank market power.

Regarding firm-level data, we retrieve from the OSIRIS database from 1995 to 2009, which provides financial and income statements for publicly traded companies. Our total observations are 29,714 and focus on total assets, sales, capital expenditures, cash stock and debt. All financial variables are converted to US dollar values by the appropriate exchange rates. Our sample is selected by some rules. More details on the note of Table 1.

Table 1. Firm-Level Data Across Countries: 1995~2009

Country	# of obs.	# of firms	cash	IKB	SKB	CFKB	MP
CHINA	4,694	729	0.144	0.208	2.672	0.197	0.664
HONG KONG	306	50	0.180	0.187	3.418	0.359	0.734
INDIA	2,346	132	0.053	0.242	3.572	0.300	0.337
INDONE-SIA	777	367	0.099	0.163	3.413	0.236	0.536
JAPAN	9,609	1,587	0.128	0.134	3.973	0.200	0.420
KOREA	6,063	373	0.077	0.218	3.948	0.171	0.427
MALAY-SIA	2,329	376	0.099	0.132	2.808	0.209	0.442
PHILIP-PINES	310	53	0.100	0.135	2.332	0.206	0.609
SINGA-PORE	1,131	184	0.141	0.193	3.735	0.293	0.934
TAIWAN	840	204	0.155	0.221	3.411	0.330	0.273
THAI-LAND	1,309	131	0.087	0.172	3.515	0.299	0.474
Total	29,714	4,186	0.111	0.179	3.557	0.216	
Mean		381	0.115	0.182	3.363	0.251	0.481

Note) Data comes from the ORISIS. Cash-ratio of cash stock to total assets; IKB-ratio of investment to capital stock; SKB-ratio of sales to capital stock; CFKB-ratio of cash flow to capital stock; General rules with regard to the data are the following. We focus on non-financial firms (with SIC less than 6000). Firm-level data is eliminated if a firm has three or less years of coverage, if there are missing values for investment, capital stock, sales, cash stock, and cash flow, and if there are observations with negative values for assets, sales, or capital stock. In addition, we follow Gilchrist and Himmelberg (1998) and Love (2003) in excluding observations with IK > 2.5, SK > 20, Cash > 0.6, and outliers in the top and bottom 1% of the variable values.

Table 1 shows basic statistics with the number of observations and firms across 11 Asian countries. In Table 1, the number of observations and the distribution of firm size in terms of total assets vary widely across countries. Total number of firm are 4,186 and the average number of firm across 11 countries are 381 firms, and average of main variables are also shown. The average of cash is 0.111, and the average of ratio of investment to capital stock is 0.179. And that for ratio of sales to capital stock is 3.557 and that for cash flow is 0.216. In the last column, the average of bank concentration index is 0.481 across 11 countries and Singapore is the highest one, 0.934.

Bank's market power is traditionally represented by bank concentration index. Bank concentration index is defined as the share of the assets of the three largest banks in total banking sector assets in each country from Bank Scope database. We use data for this index over 1995 to 2009. Bank concentration by this measure tends

to decrease with fluctuations. A business cycle effect on investment will be identified by real GDP growth.

4. EMPIRICAL RESULTS

4.1 Bank's Market Power Effects in Asian Countries

Our main empirical model for panel is followed by equation (8). The model is the objective for the assessments of the effect of structural change in the banking sector on relaxing firm use of internal funds. The slope coefficient, β_4, for the effect on investment of the product of cash stock and bank's market power represents the joint effect of within-country and cross-country variation in market power.

Table 2. Main Empirical Results

Model:	Baseline Model	Extended Model	
	Total	Size Effect	Business Cycle
I/K_{it-1}	0.214***	0.223***	0.225***
	(0.020)	(0.020)	(0.021)
S/K_{it}	0.044***	0.037***	0.042***
	(0.007)	(0.007)	(0.008)
$Cash_{it}$	1.484***	1.474*	3.042***
	(0.419)	(0.815)	(0.776)
$Cash_{it} \times MP_{it}$	-4.748***	-0.143***	-5.180***
	(0.846)	(0.065)	(0.982)
$Cash_{it} \times Size_{ct}$		-1.432***	
		(0.421)	
$Cash_{it} \times GDPgrt$			-0.080***
			(0.058)
constant	0.000	-0.002	0.000
	(0.002)	(0.001)	(0.002)
Total observations	10,350	10,350	10,350
# Firm observation	4,022	4,022	4,022
Bootstrapped	0.993	0.988	0.988
P-value			

Note) I is investment, K is capital stock, S is sales, Cash is ratio of cash stock to total assets, MP is bank's market power. Estimation is by GMM, country-time and fixed effects are removed by country-time and forward mean differencing prior to estimation. Instruments are first and second lags of I/K, S/K, Cash, CF, MP, and industry dummies. Main regression is conducted by weighted method, which weights are equal to a value of one divided by the number of observations per country. P-values for J-statistic (test of over-identifying restrictions) are obtained using distribution or Bootstrap simulation with 200 repetitions (the p-value is not available for weighted regressions). Heteroskedasticity adjusted standard errors in parentheses; ***, **, and * represent significance at 1%, 5%, and 10% respectively.

Table 2 shows main results on bank's market power and financial constraints. In the baseline model, the estimation results imply statistically significant reduced form persistence coefficients, which validate the assumption of a lagged term in the adjustment cost function. The response of investment to marginal productivity of capital as measured by the sales to capital ratio is statistically significant in the baseline model.

Our main interest, the cash coefficient, β_3, has with a positive sign and significance at 1%, which is consistent with the existence of credit constraints. The interaction between cash stock and bank's concentration, β_4 has a negative one and is significant at 1%. The implication of negative coefficient on the interaction term is that financial constraints are less severe in countries at the time that they have highly market power in the banking sectors. Thus, the market power in the banking sector has a significant effect on firm-level investment through the stochastic discount factor and mitigates financial constraints on Asian firms. The magnitude of the interaction effect suggests that bank's market power will reduce the effect of internal funds on investment. Finally, the partial effect of one standard deviation increase in cash stock on the investment to capital ratio is about -0.092.[1)] The Hansen test statistics for over-identifying restrictions is estimated and rejected the null.

4.2 Size Effect and Business Cycle Effect

We extend the baseline model for the size effect with considering firm size. If countries with high bank's market power tend to have the largest firms in the sample, then results might be explained not by the structural differences in the banking sector but by firm size. Firm size is introduced as follows:

$$\frac{I}{K_{it}} = \beta_1 \frac{I}{K_{it-1}} + \beta_2 \frac{S}{K_{it}} + \beta_3 Cash_{it} + \beta_4 Cash_{it} MP_{ct} + \beta_5 Cash_{it} Z_{ct} + f_i + d_{ct} + u_{it}, \quad (10)$$

where Z is either firm size, as indicated by the log of real dollar total assets or (later) real GDP growth for business cycle effect. Instruments when estimating eqaion (10) include lags of all variables in equation (10) and 2-digit industry dummies.

In extended mode in Table 2, equation (10) is estimated with indicating firm size. The coefficient of I/K_{it-1}, β_1 is 0.223 and the coefficient of S/K_{it}, β_2 is 0.037, which are positive and statistically significant. Our main concern is how the interaction of cash and bank concentration is affected by incorporating size effect with cash into the model. The coefficient of the interaction of cash and bank concentration is -0.143, which is negative and

1) The partial effect is equal to the standard deviation of cash stock times the coefficient on cash plus that same standard deviation times the coefficient on the interaction term times the level of bank concentration.

statistically significant. The coefficient of the interaction of size and cash, β_5, is also -1.432, negative and statistically significant. Thus, the finding that increases in bank's market power are associated relaxation of credit constraint is robust to the addition of firm size to the baseline regression equation. The p-value for J-statistic test of over-identifying restrictions using Bootstrap simulation is 0.988 which is consistent with choosing reasonably set of instrumental variables.

We now check for robustness of results by allowing outcomes to vary over the business cycle. Many researchers emphasize the relationship between financial friction and the business cycle (see., Bernanke and Gertler (1989), Gertler and Gilchrist (1994), and Oliner and Rudebusch (1996), among others). The background of this line of studies is that with imperfect capital markets more financially constrained or distressed firms are hit harder in a recession. Recent findings by Bernanke et al. (1996) for the U.S. and by Vermeulen (2002) for the four largest European countries support this design.

To address this issue, we use real GDP growth for business cycle indicator. When the business cycle indicator variable is added to the basic model, the result is shown in column (3) in Table 2. We find a statistically significant negative effect of real business cycle on financial constraints, in that the estimated coefficient on the interaction variable of cash and real GDP growth is negative and statistically significant, but relatively small magnitude. In column (3) of extended model the coefficient on the interaction of cash and bank's market power is still statistically significant and negative, indicating robustness of the finding that increased bank concentration mitigates firm financial constraints in the presence of a business cycle indicator.

5. CONCLUSIONS

This paper examines the effect of bank market power on access to external finance through firms' investment decisions with sample of 29,714 listed firms in 11 Asian countries between 1995 and 2009. We control firm size, countries business cycle and other financial development measure to check the robustness of our results. Based on Euler equation model derived by dynamic investment model, the estimation results show that with a highly concentrated banking sector firms are less financially constrained. The estimated coefficients on cash stock suggest that low concentration in the banking sector creates more information costs and from the coefficient of the interaction of size and cash is negative indicating that larger firms are less credit constrained than smaller firms.

These results are consistent with information hypothesis that more market power increases bank's advantage to produce information on potential borrowers, since the effect is greater in those situations (i.e. for bigger firms and during expansions) when asymmetric information problems are less severe.

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