How Competitive and Stable is Commercial Banking in China after Bank Reform?

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Study Purpose

- Using 1992-2008 data for fifteen major banks in China

1. To estimate the degree of concentration and competition in the Chinese banking industry.
2. To see the effects of concentration and the Lerner index on financial stability in the Chinese banking industry.
3. To compare the Chinese experience with the Korean experience in their trend of concentration and effect on competition.

Developments in the Chinese Banking

- Mono Bank System (the People's Bank of China) until 1978
  - Dual role of central and commercial banking
- Two Tier Banking System (First Bank Reform)
  - The People's Bank of China as the central bank
  - Four state commercial banks created (1978-1984)
    - Bank of China (BOC)
    - Construction Bank of China (CBC)
    - Industrial and Commerce Bank of China (ICBC)
    - Agricultural Bank of China (ABC)
  - Three policy banks were added in the 1990s

Developments in the Chinese Banking

- Second Bank Reform
  - A Variety of new bank types were created.
    - 14 joint-equity banks were established, where shares were held by the government, cooperatives and private sector..
    - City banks owned by local governments
    - Foreign banks allowed to do business in China
  - Restructuring of four state banks (reduction of branches and layoff of employees)
  - Capital injection of about $100 billions into four state banks in 2003-2005.

Financial Liberalization in China

- Gradual Liberalization of Interest Rate
  - Liberalizing foreign currency interest rates prior to domestic currency interest rates
  - Liberalizing the lending rates prior to the deposit rates
  - Liberalizing the large and long-tem fund rates prior to the small and short-term fund rates
  - Liberalizing inter-bank lending rates and inter-bank bond market rates
- Equal treatment of domestic and foreign banks
- Allowing foreign banks to own up to 25% of domestic banks

Bank Concentration in China

- Continuous addition of new banks
  - one bank system to 4 state banks system in the 1980s → more than 20 banks in the 1990s → more than 300 banks currently
- Increase in # of banks ➔ decrease in market concentration
  - HHI of bank assets: 2743 in 1992 → 2054 in 2000 → 1642 in 2008
- Still four banks dominate the banking market
  - Four Chinese banks are among Top Ten Banks in the world.

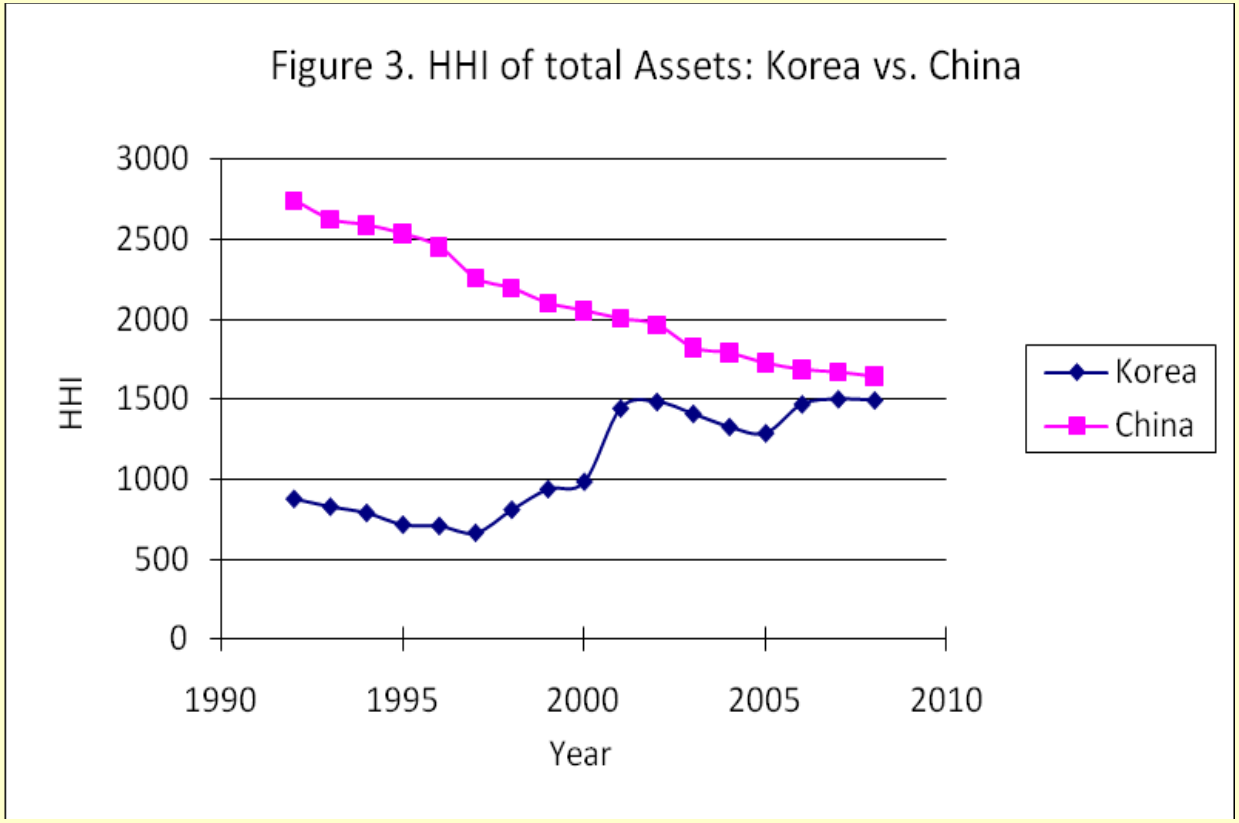
Bank Concentration in Korea

- Increase in mergers and consolidation
  - # of banks: 26 in 1997 → 17 in 1999 → 13 in 2008
- Increase in market concentration
  - HHI of bank assets: 664 in 1997 → 937 in 1999 → 1466 in 2008
- Increase in mergers ➔ increase in market concentration (not so in the US or Japan)
- Why different results from the US or Japan?
  - Korean bank mergers are typically horizontal mergers among banks with overlapping geographical markets.

Table 1 Market Concentration of Korean and Chinese Banks.

Year	Korea		China	
	HHI	CR_3	HHI	CR_4
1992	876	36.42	2743	94.23
1993	827	34.69	2625	93.25
1994	788	33.15	2589	93.11
1995	715	30.15	2534	91.49
1996	707	29.78	2453	90.38
1997	664	28.32	2257	86.47
1998	808	34.46	2194	83.14
1999	937	38.67	2101	81.93
2000	983	40.99	2054	78.72
2001	1441	52.23	2004	75.58
2002	1481	54.38	1967	71.75
2003	1407	53.18	1822	67.44
2004	1325	51.09	1789	65.62
2005	1286	51.17	1726	62.71
2006	1466	52.27	1686	61.32
2007	1498	58.66	1669	60.74
2008	1491	58.54	1642	60.67

Concentration ratio in the Korean banking industry has increased while that of the Chinese banking industry has decreased. However, the Chinese banking market is still more concentrated.



Review of Studies On Bank Competition

- China
  - Wong & Wong (2001)
    - Description of the bank concentration trend in the 90s
  - Yuan (2006)
    - Examine Chinese banking competition for 1996-2000 and conclude monopolistic competition.
  - Fu (2009)
    - Study period: 1997-2006
    - Bank competition increased after China's accession to World Trade Organization in 2001.

Review of Studies On Bank Competition

- Korea
  - Kim (2003), B-L model
    - 1996-2002, monthly data
    - Bank behavior is consistent with perfect competition.
    - They behave more competitively even after the increase in concentration
  - Lee and Lee (2005), P-R model
    - 1992-2002, annual data
    - Monopolistic competition during the sample period
    - Weakening competition after the crisis.
  - Park (2009) QREF, P-R Model
    - Study period: 1992-2006, annual data
    - Banks under monopolistic competition with no significant change from pre-crisis to post-crisis period.

Empirical Models of Measuring the Degree of Competition

- Markup Test Model or Bresnahan and Lau model (B-L model)
  - estimating the markup of price over marginal cost as a measure of market power.
- Revenue Test Model or Panzar and Rosse model (P-R model).
  - Estimating the extent to which a change in a vector of input prices is reflected in gross revenue (Input price elasticity of revenue).

Competition Level Estimate

- Panzar-Rosse model: $H = \Sigma\ (\delta R/\delta w_i)\ (w_i/R)$
- H=1: perfect competition, H≤0: monopoly, 0≤H≤1: monopolistic competition or oligopoly
- Model Specification (from Park, 2009)

$$\ln(R_{it}) = \alpha + \beta_1 \ln(w_{1,it}) + \beta_2 \ln(w_{2,it}) + \beta_3 \ln(w_{3,it}) + \gamma_k \Sigma z_k + \varepsilon_{it} \quad (1)$$

  - where R_{it} is bank i's revenue at time t, w_1 is the input price of labor, w_2 is the input price of capital, w_3 is the input price of funds, and z_k is a vector of control variables affecting the bank's revenue function.

$$\ln(R_{it}) = \alpha + \beta_1 [\ln(w_{1,it}) - \ln(w_{3,it})] + \beta_2 [\ln(w_{2,it}) - \ln(w_{3,it})] + (\beta_1 + \beta_2 + \beta_3) \ln(w_{3,it}) + \gamma_k \Sigma z_k + \varepsilon_{it} \quad (2)$$

  - where $\beta_1 + \beta_2 + \beta_3 = H$

Competition Level Estimate

- Variables
  - Dependent Variables: IR (interest revenue) and TR (total revenue)
  - Three Main Independent Variables
    - W1: personnel expenses/employees
    - W2: ratio of depreciation allowance and maintenance cost/fixed assets
    - W3: ratio of interest expenses/total deposits and borrowings
  - Control variables: ASSET, BRANCH, NPL Share, Equity Ratio and NINT(non-interest earnings)

Table 3 Test of Competition Condition

1. Estimation Results of Equation 2 for Chinese banks

	Fixed Effects Model		Random Effects Model	
	lnIR	lnTR	lnIR	lnTR
Constant			-0.595* (-1.712)	-0.654 (-1.585)
lnW_1	0.116** (2.394)	0.131** (2.607)	0.161*** (3.697)	0.171*** (3.491)
lnW_2	-0.063 (-1.431)	0.035 (0.459)	-0.035* (-1.885)	0.041 (1.026)
lnW_3	0.018** (2.645)	0.081** (2.170)	0.093** (9.251)	0.047** (10.462)
lnASSET	1.066*** (22.417)	1.009*** (21.383)	0.962*** (25.014)	0.932*** (28.936)
NINT	-0.270 (-1.462)	0.942 (1.271)	-0.347 (-1.545)	0.819 (1.231)
NPL SHARE	-0.004*** (-4.167)	-0.006*** (-4.427)	-0.004*** (-5.426)	-0.005*** (-4.857)
Equity Ratio	0.013 (1.480)	0.014 (1.610)	0.014 (1.607)	0.016 (1.433)
ADJ. R^2	0.592	0.623	0.724	0.768
H statistic	**0.213*** (9.046)**	**0.245*** (10.277)**	**0.243*** (12.752)**	**0.268*** (11.744)**
Wald test: H=0 (ρ-value)	23.92*** (0.000)	29.32*** (0.000)	28.34*** (0.000)	20.29*** (0.000)
Wald test: H=1 (ρ-value)	512.93*** (0.000)	575.62*** (0.000)	714.22*** (0.000)	790.43*** (0.000)

Estimation Results

- w_1, w_2, w_3 : positive (w_1 & w_3 significant)
- Assets (size effect): positive and significant
- NPL (credit risk effect): negative and significant
- Equity (operational risk effect): positive, but insignificant → no stronger signal effect
- NINT (diversification effect): insignificant

Table 2 Test of Competition Condition

2. Estimation Results of Equation 2 for Korean banks

	Fixed Effects Model		Random Effects Model	
	lnIR	lnTR	lnIR	lnTR
Constant			-0.256**	-0.277**
			(-1.917)	(-1.895)
lnW_1	0.126***	0.127***	0.130***	0.123***
	(7.325)	(7.053)	(8.736)	(8.462)
lnW_2	-0.003	0.005	0.022	0.028
	(-0.083)	(0.313)	(0.978)	(1.531)
lnW_3	0.647***	0.648***	0.654***	0.656***
	(29.969)	(28.121)	(29.562)	(28.934)
lnASSET	0.947***	0.942***	0.931***	0.929***
	(44.757)	(43.151)	(47.001)	(46.082)
NINT	-0.365***	1.276***	-0.389***	1.205***
	(-5.769)	(21.737)	(-6.519)	(20.542)
NPL SHARE	-0.002	-0.001	-0.001	-0.000
	(-1.306)	(-0.848)	(-0.775)	(-0.412)
BIS	0.011***	0.012***	0.012***	0.014***
	(7.915)	(8.231)	(8.783)	(8.812)
ADJ. R^2	.997	.997	0.997	.997
H statistic	**0.776*** **	**0.753*** **	**0.812*** **	**0.822*** **
	(24.192)	**(24.828)**	**(26.553)**	**(26.678)**
Wald test: H=0 (ρ-value)	537.27***	551.35***	665.89***	636.29***
	(0.000)	(0.000)	(0.000)	(0.000)
Wald test: H=1 (ρ-value)	62.34***	47.71***	42.63***	36.47***
	(0.000)	(0.000)	(0.000)	(0.000)

Table 4 Test of Equilibrium Condition for Korea and China: Estimation Results of Equation 4 with the dependent variable, lnROA

	Korea	China
lnW_1	0.004 (0.511)	-0.009 (-0.944)
lnW_2	-0.005 (-1.316)	0.007 (0.655)
lnW_3	-0.008*** (-2.866)	-0.058** (-2.175)
lnASSET	-0.009 (-1.328)	0.022* (1.984)
NINT	0.018 (1.502)	0.004 (0.145)
NPL	-0.003* (-1.978)	-0.012** (-2.158)
BIS	0.006*** (4.082)	0.002 (1.343)
ADJ. R^2	0.634	0.478
H statistic	-0.004 (-0.146)	-0.059*** (-2.372)
Wald test: H=0 (ρ-value)	2.53 (0.115)	5.712** (0.017)

Table 5 Market Concentration and Competition Level Over Time

1. China

Year	HHI - Total Assets	H-statistic with lnIR	H-statistic with lnTR
1992-1994	2652	0.136	0.149
1993-1995	2583	0.164	0.174
1994-1996	2525	0.182	0.192
1995-1997	2415	0.207	0.228
1996-1998	2301	0.215	0.247
1997-1999	2184	0.233	0.269
1998-2000	2116	0.259	0.278
1999-2001	2053	0.271	0.299
2000-2002	2008	0.298	0.321
2001-2003	1931	0.302	0.343
2002-2004	1859	0.342	0.338
2003-2005	1779	0.365	0.376
2004-2006	1734	0.389	0.402
2005-2007	1694	0.405	0.427
2006-2008	1666	0.426	0.449

Table 5 Market Concentration and Competition Level Over Time

2. Korea

Year	HHI - Total Assets	H-statistic with lnIR	H-statistic with lnTR
1992-1994	830	0.520	0.543
1993-1995	777	0.609	0.623
1994-1996	736	0.525	0.554
1995-1997	695	0.410	0.461
1996-1998	726	0.877	0.924
1997-1999	802.	0.884	0.944
1998-2000	909	0.751	0.780
1999-2001	1120	0.690	0.675
2000-2002	1301	0.672	0.664
2001-2003	1443	0.636	0.642
2002-2004	1404	0.638	0.598
2003-2005	1339	0.627	0.608
2004-2006	1359	0.641	0.613
2005-2007	1416	0.623	0.592
2006-2008	1485	0.653	0.614

Effect on Financial Stability

- Z score:

  $$Z_{it} = \alpha + \beta k \Sigma C_{k,i\ t-1} + \gamma k \Sigma X_{k,i\ t-1} + \delta k \Sigma Y_{k,t-1} + \varepsilon_{it} \quad (5)$$

  where Z_{it} = the Z score indicating financial stability, $C_{k,i\ t-1}$ = competitiveness variables, $X_{k,i\ t-1}$ = bank specific variables and $Y_{k,t-1}$ = macroeconomic variables.

- Lerner Index:

  $$L_{it} = (P_{it} - MC_{it}) / P_{it}$$

  $$MC = TC/Q\ [\alpha + \beta \ln Q + \sum \varphi k \ln W_k + \delta T]$$

  where TC= total expenses, Q = total assets, W_k represents three input prices of labor, fixed capital and funding. T (Trend) is used to capture technical changes in the cost function over time.

Table 6 Estimation Results of Equation (5), Dep. Variable: ln Z score

Category	Variable	Model 1	Model 2
Competition Variables	Ln Lerner Index	1.024** (0.001)	
	Net Interest Margin		0.118** (0.003)
	HHI (Assets)	-0.225* (0.048)	-0.294 (0.053)
Bank Specific Variables	EQUITY	0.024 (0.096)	0.018 (0.087)
	Loans/ Assets	-0.137* (0.041)	-0.155* (0.049)
	Ln Branch	0.294* (0.039)	0.332* (0.026)
	NPL	-0.064** (0.007)	-0.057** (0.009)
Macroeconomic Variables	GDP Growth Rate	0.072 (0.198)	0.104 (0.153)
	Inflation Rate	-0.131 (0.208)	-0.097 (0.167)
	CRISIS	-0.042 (0.115)	-0.058 (0.182)
Adj. R^2		0.826	0.794

Estimation /results

- Lerner index and net interest rate have positive and significant effects,
- HHI is negatively related to the Z score
- Equity: positive, but not significant
- NPL: negative and significant
- Loans/Assets (leverage): negative effects
- Branch: positive effects
- CRISIS dummy and macro variables: insignificant

Findings: China

- The Chinese banking market is close to oligopoly.
- Strong presence of the size effect.
- Non-interest revenue is not significant → Strong financial intermediary function (contrast to weakening financial intermediary function of banks in Japan and Korea)
- NPL has a significant negative effect on revenue.
- Equity ratio does not have a significant positive effect on revenue (no strong signaling effect)

Findings: Korea

- Korean banks have been monopolistically competitive except for the financial crisis period.
- Although an increase in market concentration has not changed the overall level of competition measured by the H-statistic, market concentration has raised the average interest margin.
- NPL has an insignificant negative effect on revenue.
- Equity ratio has a significant positive effect on revenue (strong signaling effect)