How Does

Bank Competition

Affect

Systemic Stability

Systemic Stability
VS
Systemic Risk

interest topic after

Financial Crisis

“Too-Big-To-Fail”

Cost of competition :

too much competition may lead to excessive risk taking as it reduces margins.

- Pressure on profits → choose riskier portfolios (easier to lend money).
- Lower rent → reduces their incentives for monitoring
- Large banks(less competitive) can also diversify better
- Few large bank is easier to monitor and supervise than a large number of small banks

competition → systemic risk

However, lack of competition may also aggravate bank fragility

- High market power → charge higher interest rate → firms take on greater risk → increase fragility to the financial system
- Too large bank frequently receive **"too-big-to-fail"** subsidies from safety nets policy.
- Large banks : more difficult to supervise given their **complexity,** and their ability to **politically capture their supervisions.**

competition → systemic stability

In the past :
A risk on individual financial institutions (absolute level of risk)

This paper :
An individual bank's contribution to the risk of the financial system (systemic risk)

Measured as **Correlation** in the risk taking behavior of banks :

the total variation of changes in the default risk of **a given bank**

explained by

changes in the default risk of

all banks in a given country

This paper

Conclude that

1. **Greather Competition encourages bank to take on more diversified risks,** making banking system less fragile to shocks.

competition → systemic stability

This paper

Conclude that

institutional

regulatory environment

impact

competition
VS
systemic stability

This paper

Conclude that

2. **Correlated risk taking behavior is higher in countries with**

- Weak super vision and private monitoring(1)
- low level of activity restrictions(2)
- with generous deposit and greater low levels of private monitoring(3)
- high government ownership of banks(4)
- and public policies that restrict competition(5)

Have high systemic risk

This paper

Conclude that

3. **Greater adverse effect on systemic stability in countries with**

- Low levels of foreign ownership(1)
- weak investor protections(2)
- generous safety nets(3)
- and where the authorities provide limited guidance for bank asset diversification(4)

If lower competition → greater increase in systemic risk

Methodologies

The sample size

1,872 traded bank

In **63** countries

over the period

1997 to **2009**

Systemic risk index

Competition index

Institutional and Regulatory Variables

Systemic Default Risk Measure

The Market equity value of a company is modeled as a call option on the company's assets

$$V_E = V_A e^{-dT} N(d_1) - X e^{-rT} N(d_2) + \left(1 - e^{-dT}\right) V_A$$

$$d_1 = \frac{\log\left(\frac{V_A}{X}\right) + \left(r - d + \frac{s_A^2}{2}\right) T}{s_A \sqrt{T}}; d_2 = d_1 - s_A \sqrt{T}$$

V_A = value of the bank's asset
V_E = market value of a bank
X = is the face value of debt maturity at time T
r = the risk-free rate
d = dividend rate expressed in terms of Va
s_A = volatility of the value of assets which is related to equity volatility through the following equations

GET V_A and s_A

$$s_E = \frac{V_A e^{-dT} N(d_1) s_A}{V_E}$$

Systemic Default Risk Measure

Distance-to-Default measure

$$dd = \frac{log\left(\frac{V_A}{X}\right) + \left(m - d - \frac{s_A^2}{2}\right)T}{s_A\sqrt{T}}$$

Merton Distance-to-default : the difference between the asset value of the firm and the face value of its debt, scaled by the standard deviation of the firm's asset value

the correlation in the risk taking behavior of banks, measured as
the total variation of changes in **default risk of a given bank**
explained by changes in **default risk of all other banks in a given country**

$$\Delta dd_{i,j,t,w} = \alpha_{i,j,t} + \beta_{i,j,t}\frac{1}{n}\sum_{k=1,k\neq i}^{n}\Delta dd_{k,j,t,w} + \varepsilon_{i,j,t,w}$$

Systemic Default Risk Measure

$$\Delta dd_{i,j,t,w} = \alpha_{i,j,t} + \beta_{i,j,t} \frac{1}{n} \sum_{k=1,k\neq i}^{n} \Delta dd_{k,j,t,w} + \varepsilon_{i,j,t,w}$$

Obtained → **Logistic transformation R-Squared** from above equation

Higher R-Squared for a given bank suggests that the bank is exposed to **similar sources of credit risk** as other banks in a given country

more vulnerable to

Economic , Liquidity and information shocks

Competition Measure

$$MC_{it} = \partial C_{it}/\partial Q_{it} = C_{it}/Q_{it} \times [\beta_1 + 2\times\beta_2\times log(Q_{it}) + \beta_6\times log(W_{1,it}) + \beta_7\times log(W_{2,it}) + \beta_8\times log(W_{3,it})]$$

$$\begin{aligned} log(C_{it}) = \alpha &+ \beta_1\times log(Q_{it}) + \beta_2\times(log(Q_{it}))^2 + \beta_3\times log(W_{1,it}) + \beta_4\times log(W_{2,it}) + \beta_5\times log(W_{3,it}) \\ &+\beta_6\times log(Q_{it})\times log(W_{1,it}) + \beta_7\times log(Q_{it})\times log(W_{2,it}) + \beta_8\times log(Q_{it})\times log(W_{3,it}) \\ &+ \beta_9\times(log(W_{1,it}))^2 + \beta_{10}\times(log(W_{2,it}))^2 + \beta_{11}\times(log(W_{3,it}))^2 + \beta_{12}\times log(W_{1,it})\times log(W_{2,it}) \\ &+ \beta_{13}\times log(W_{1,it})\times log(W_{3,it}) + \beta_{14}\times log(W_{2,it})\times log(W_{3,it}) + \Theta\times Year\ Dummies \\ &+ \Omega\times Bank\ Specialization\ Dummies + \varepsilon_{it} \end{aligned}$$

C_{it} = total costs
Q_{it} = total asset in million
$W_{1,it}$ = ratio of interest expense/ sum of deposit
$W_{2,it}$ = personnel expense / total assets
$W_{3,it}$ = administrative and other operating expense/total asset

Competition Measure

P_{it} is the price of asset and is equal to the ratio of total revenue (interest, commission and fee, trading income, and other operating income) to the total asset

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

The higher = the lower competition

Institutional and Regulatory Variables


4 Groups of variables


Institutional and Regulatory Variables

1st group : restrictions and bank ownership

1. Entry barrier index to obtain license
2. application denied
3. Government ownership
4. Foreign ownership

Institutional and Regulatory Variables

2nd group : related to deposit insurance coverage

1. Deposit insurance coverage ratio = amount of deposit insurance coverage divided by GDP per capita

Institutional and Regulatory Variables

3rd group : bank regulation variables measure activity restrictions and other dimensions of bank supervision

1. Activity restriction measure degree to which the national regulatory authorities allow banks to engage in securities, insurance, and real estate business.
2. Capital stringency measure the amount of capital a bank must maintain.
3. Supervisory power index indicate whether the supervisory authorities have the power and the authority to take specific preventive and corrective actions
4. Diversification index captures whether there are explicit, verifiable, quantifiable guidelines for bank asset diversification and whether banks are allowed to make loans outisde of national borders

Institutional and Regulatory Variables

4th group : private monitoring and information sharing in each country

1. Investor protection index
2. Depth of credit information sharing
3. Existence of a private information bureau

Control variables

Bank level & country level

Bank level control :

1. Bank size
2. Leverage
3. Market-to-book ratio
4. Loan loss provision
5. Reliance on deposit
6. Profitability

Control variables

Bank level & country level

Country level control :

1. GDP per capita – economic development
2. Variance of GDP growth – economic stabiltiy
3. Population – country size
4. Trade openness – global integration
5. Stock market capitalization divided by GDP & Private credit divided by GDP – control for differences in financial development and structure.
6. Control for the log number of banks in each country

Summary statistic

Measure monopoly level

Figure 1: Time series change in Lerner index
This figure shows the evolution of Lerner index over time.

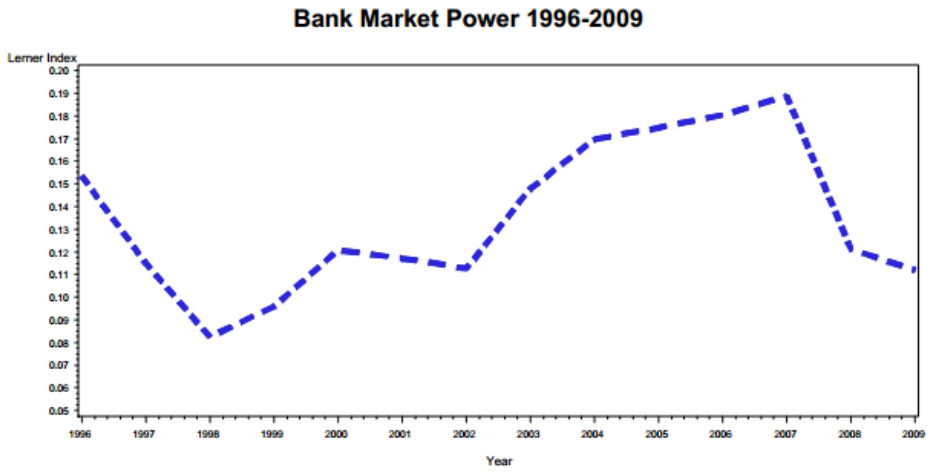
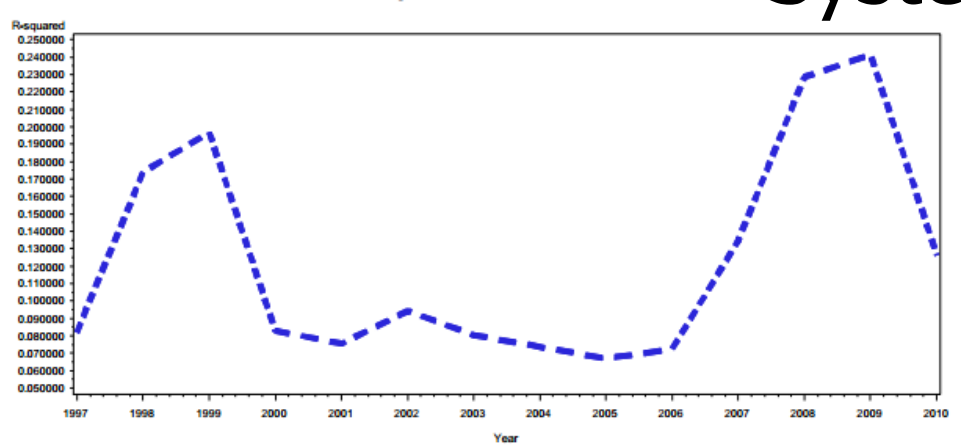


Figure 2: Time series change in R-squared
This figure shows the evolution of R-squared from a regression of a bank's weekly change in distance to default on country average weekly change in distance to default (excluding the bank itself).

Systematic risk



Competition and Systemic Stability (Baseline Results)

Baseline Equation

Lerner Index

$$risk_{ijt} = \beta_0 + \Omega \times bank\_controls_{ijt-1} + \Theta \times country\_controls_{jt-1} + \beta_1 \times competition_{ijt-1} + \alpha_i + \lambda_t + \varepsilon_{ijt}$$

Expect to see positive coefficient

	VARIABLES	(1) risk	(2) risk
Bank control	size	0.250** (0.108)	0.223** (0.109)
	leverage	-0.961 (1.134)	-1.408 (1.232)
	mb	-1.154*** (0.406)	-0.980** (0.447)
	deposits	-0.014 (0.429)	-0.057 (0.461)
	provision	-0.183 (0.126)	-0.176 (0.153)
	roa	21.395*** (3.954)	9.709* (5.541)
Country control control	loggdppca	-1.130 (1.054)	0.363 (1.136)
	vargdpgr	-0.042 (0.033)	-0.053 (0.035)
	logpop	-2.259 (1.561)	1.293 (1.973)
	trade_gdp	-0.010*** (0.003)	-0.003 (0.003)
	stmktcap	0.233 (0.155)	-0.055 (0.165)
	pcrdbofgdp	-0.764*** (0.197)	0.333 (0.261)
	crisis	0.116 (0.105)	0.214* (0.114)
	log_nbank	1.375*** (0.195)	1.399*** (0.213)
	lerner		**1.179*** **(0.303)**
	Constant	46.067 (28.765)	-35.831 (39.272)
	Observations	12,530	11,332
	R-squared	0.437	0.424

Competition, Regulation, and Systemic Stability

Regression Equation :

$$risk_{ijt} = \beta_0 + \Omega \times bank\ controls_{ijt-1} + \Theta \times country\ controls_{jt-1} + \beta_1 \times competition_{ijt-1} + \beta_2 \times regulation_{jt-1} + \beta_3 \times competition_{ijt-1} \times regulation_{jt-1} + \alpha_i + \lambda_t + \varepsilon_{ijt}$$

4 group of regulations

$$risk_{ijt} = \beta_0 + \Omega \times bank\ controls_{ijt-1} + \Theta \times country\ controls_{jt-1} + \beta_1 \times competition_{ijt-1}$$
$$+ \beta_2 \times regulation_{jt-1} + \beta_3 \times competition_{ijt-1} \times regulation_{jt-1} + \alpha_i + \lambda_t + \varepsilon_{ijt}$$

1st group:

competition policies and systemic risk

- Entry barrier
- Application denied
- Government ownership
- Foreign ownership

Control variable

VARIABLES	(1) risk	(2) risk	(3) risk	(4) risk	(5) risk	(6) risk	(7) risk	(8) risk	(9) risk
size	0.223**	0.232**	0.230**	0.257**	0.255**	0.228**	0.225**	0.237**	0.239**
	(0.109)	(0.110)	(0.111)	(0.118)	(0.118)	(0.111)	(0.111)	(0.114)	(0.113)
leverage	-1.408	-1.303	-1.134	-1.232	-1.222	-1.472	-1.412	-1.258	-1.330
	(1.232)	(1.248)	(1.265)	(1.509)	(1.506)	(1.258)	(1.259)	(1.295)	(1.286)
mb	-0.980**	-1.000**	-0.995**	-0.903**	-0.993**	-1.135**	-1.218***	-1.350***	-1.288***
	(0.447)	(0.449)	(0.450)	(0.455)	(0.464)	(0.451)	(0.458)	(0.456)	(0.456)
deposits	-0.057	-0.098	-0.093	-0.441	-0.446	-0.047	-0.043	-0.205	-0.162
	(0.461)	(0.466)	(0.466)	(0.512)	(0.511)	(0.463)	(0.463)	(0.477)	(0.479)
provision	-0.176	-0.161	-0.125	-0.227	-0.229	-0.156	-0.135	-0.156	-0.173
	(0.153)	(0.157)	(0.152)	(0.172)	(0.174)	(0.157)	(0.157)	(0.160)	(0.161)
roa	9.709*	9.990*	10.469*	11.678*	12.423**	10.567*	11.432**	10.500*	11.064*
	(5.541)	(5.631)	(5.511)	(6.192)	(6.300)	(5.630)	(5.654)	(5.753)	(5.771)
loggdppca	0.363	0.098	0.083	-0.119	-0.126	0.532	0.551	1.121	1.166
	(1.136)	(1.167)	(1.164)	(1.247)	(1.249)	(1.163)	(1.160)	(1.207)	(1.214)
vargdpgr	-0.053	-0.046	-0.047	-0.098**	-0.111***	-0.039	-0.050	-0.008	-0.003
	(0.035)	(0.035)	(0.036)	(0.041)	(0.042)	(0.036)	(0.037)	(0.038)	(0.038)
logpop	1.293	1.460	1.587	4.435*	4.536*	-0.157	-0.126	1.424	1.455
	(1.973)	(2.032)	(2.045)	(2.598)	(2.602)	(2.010)	(2.025)	(2.188)	(2.191)
trade_gdp	-0.003	-0.003	-0.003	0.003	0.003	-0.003	-0.003	-0.010**	-0.010**
	(0.003)	(0.004)	(0.004)	(0.005)	(0.005)	(0.004)	(0.004)	(0.005)	(0.005)
stmktcap	-0.055	0.053	0.053	-0.181	-0.170	0.049	0.034	-0.059	-0.049
	(0.165)	(0.180)	(0.180)	(0.218)	(0.218)	(0.177)	(0.178)	(0.201)	(0.203)
pcrdbofgdp	0.333	0.250	0.265	0.058	0.024	0.166	0.162	-0.339	-0.331
	(0.261)	(0.263)	(0.264)	(0.283)	(0.285)	(0.271)	(0.271)	(0.332)	(0.332)
crisis	0.214*	0.221*	0.220*	0.198*	0.203*	0.215*	0.217*	0.336***	0.351***
	(0.114)	(0.117)	(0.117)	(0.120)	(0.120)	(0.116)	(0.116)	(0.124)	(0.124)
log_nbank	1.399***	1.457***	1.438***	1.410***	1.412***	1.518***	1.525***	1.606***	1.607***
	(0.213)	(0.215)	(0.214)	(0.227)	(0.227)	(0.216)	(0.217)	(0.226)	(0.227)

1st group:
competition policies and systemic risk

lerner	1.179***	1.163***	-1.513	1.136***	1.239***	1.150***	1.369***	1.192***	1.502***
	(0.303)	(0.305)	(2.004)	(0.336)	(0.351)	(0.305)	(0.346)	(0.318)	(0.373)
entry_bar		0.029	-0.035						
		(0.085)	(0.098)						
lerner_x_entry_bar			0.358						
			(0.262)						
ap_denied				1.058***	1.116***				
				(0.258)	(0.265)				
lerner_x_ap_denied					-0.733				
					(0.565)				
gov_own						1.305**	1.544**		
						(0.637)	(0.673)		
lerner_x_gov_own							-1.723		
							(1.234)		
foreign_own								-0.235	0.266
								(0.460)	(0.495)
lerner_x_foreign_own									-2.645*
									(1.389)
Constant	-35.831	-37.026	-38.802	-89.781*	-91.468*	-11.130	-11.862	-45.387	-46.579
	(39.272)	(40.327)	(40.562)	(51.384)	(51.387)	(40.467)	(40.716)	(43.381)	(43.349)
Observations	11,332	11,178	11,178	10,562	10,562	11,129	11,129	10,734	10,734
R-squared	0.424	0.424	0.425	0.430	0.430	0.427	0.427	0.435	0.435

More adverse effect btw bank competition and systemic risk on countries where less foreign ownership

$$risk_{ijt} = \beta_0 + \Omega \times bank\ controls_{ijt-1} + \Theta \times country\ controls_{jt-1} + \beta_1 \times competition_{ijt-1}$$
$$+ \beta_2 \times regulation_{jt-1} + \beta_3 \times competition_{ijt-1} \times regulation_{jt-1} + \alpha_i + \lambda_t + \varepsilon_{ijt}$$

2nd group:

Deposit insurance and systemic risk

Prevent Bank Runs and ensure systemic stability

&

Moral hazard, an excessive risk taking behavior

2nd group:
Deposit insurance and systemic risk

pcrdbofgdp	0.333	0.151	0.141
	(0.261)	(0.286)	(0.286)
crisis	0.214*	0.083	0.040
	(0.114)	(0.124)	(0.124)
log_nbank	1.399***	1.399***	1.418***
	(0.215)	(0.241)	(0.242)
lerner	**1.179*** **	**1.116*** **	**-0.016**
	(0.303)	**(0.328)**	**(0.453)**
covratio		**0.143*** **	**0.091***
		(0.052)	**(0.051)**
lerner_x_covratio			**0.535*** **
			(0.166)
Constant	-35.831	-172.131***	-168.682***
	(39.272)	(52.515)	(52.319)
Observations	11,332	10,177	10,177
R-squared	0.424	0.418	0.419

Negative effect on systemic risk by deposit insurance coverage is worsen in less competitive market

$$risk_{ijt} = \beta_0 + \Omega \times bank\ controls_{ijt-1} + \Theta \times country\ controls_{jt-1} + \beta_1 \times competition_{ijt-1}$$
$$+ \beta_2 \times regulation_{jt-1} + \beta_3 \times competition_{ijt-1} \times regulation_{jt-1} + \alpha_i + \lambda_t + \varepsilon_{ijt}$$

3nd group:

Bank Supervision and Systemic Stability

- activity restriction
- capital stringency
- supervisory power
- explicit diversification guideline

3nd group:
Bank Supervision and Systemic Stability

lerner	1.179***	1.185***	2.294***	1.157***	1.229	1.159***	-0.555	1.154***	2.253***
	(0.303)	(0.306)	(0.669)	(0.306)	(0.983)	(0.307)	(1.088)	(0.306)	(0.594)
activity_restriction		-0.058**	-0.033						
		(0.027)	(0.030)						
lerner_x_activity_restriction			-0.151*						
			(0.086)						
capital_stringency				-0.027	-0.025				
				(0.046)	(0.055)				
lerner_x_capital_stringency					-0.014				
					(0.179)				
supervisory_power						-0.051*	-0.077**		
						(0.029)	(0.034)		
lerner_x_supervisory_power							0.154*		
							(0.089)		
diversification_index								-0.188**	-0.014
								(0.088)	(0.107)
lerner_x_diversification_index									-0.875**
									(0.384)
Constant	-35.831	-47.927	-48.691	-39.751	-40.004	-49.144	-54.733	-36.077	-33.212
	(39.272)	(40.744)	(40.671)	(40.991)	(41.312)	(42.103)	(42.711)	(40.318)	(40.623)
Observations	11,332	11,178	11,178	11,178	11,178	11,178	11,178	11,178	11,178
R-squared	0.424	0.425	0.425	0.424	0.424	0.425	0.425	0.425	0.426

Benefit from having strong supervisory powers is less pronounced in less competitive markets.
Benefit in reducing systemic risk with activity restriction and diversification guidelines is greater in less competitive markets

$$risk_{ijt} = \beta_0 + \Omega \times bank\ controls_{ijt-1} + \Theta \times country\ controls_{jt-1} + \beta_1 \times competition_{ijt-1}$$
$$+ \beta_2 \times regulation_{jt-1} + \beta_3 \times competition_{ijt-1} \times regulation_{jt-1} + \alpha_i + \lambda_t + \varepsilon_{ijt}$$

4th group:

Private Monitoring and Systemic Risk

- investor protection
- depth of credit information
- existence of private information collection agency

4th group:
Private Monitoring and Systemic Risk

lerner	**1.179*** **	**0.118**	**-7.768*** **	**0.579**	**-4.462*** **	**1.185*** **	**1.279** **
	(0.303)	**(0.745)**	**(1.779)**	**(0.554)**	**(1.381)**	**(0.305)**	**(0.500)**
invest_protection		**-0.381**	**-0.359**				
		(0.350)	**(0.427)**				
lerner_x_invest_protection			**1.073*** **				
			(0.244)				
credit_info_depth				**-0.184***	**-0.480*** **		
				(0.107)	**(0.139)**		
lerner_x_credit_info_depth					**0.916*** **		
					(0.243)		
private_bureau						**-0.296***	**-0.281**
						(0.164)	**(0.183)**
lerner_x_private_bureau							**-0.112**
							(0.478)
Constant	-35.831	124.167	59.929	20.398	41.547	-45.171	-45.427
	(39.272)	(187.084)	(178.070)	(164.333)	(166.765)	(39.725)	(39.745)
Observations	11,332	3,126	3,126	4,243	4,243	11,308	11,308
R-squared	0.424	0.659	0.668	0.587	0.591	0.424	0.424

More adverse effect btw bank competition and systemic risk on countries where weak investor protection

Benefit from having strong supervisory powers is less pronounced in less competitive markets.

Conclusion

1. **Greather Competition encourages bank to take on more diversified risks,** making banking system less fragile to shocks.

2. **Correlated risk taking behavior is higher in countries with**

- Weak super vision and private monitoring(1)
- low level of activity restrictions(2)
- with generous deposit and greater low levels of private monitoring(3)
- high government ownership of banks(4)
- and public policies that restrict competition(5)

Conclusion

3. **Greater adverse effect on systemic stability in countries with**

- Low levels of foreign ownership(1)
- weak investor protections(2)
- generous safety nets(3)
- where the authorities provide limited guidance for bank asset diversification(4)