Effect Standardization in Meta-Analysis

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Presentation Outline

Bank Competition and Financial Stability: Much Ado about Nothing?

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2. Model and Measures of Competition and Stability
3. Dataset of Collected Estimates
4. Testing for Publication Bias
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Motivation

- The effect of banking sector competition on financial stability not conclusive in the empirical literature
- Theory supports ***two opposing views:***

1. Competition-fragility hypothesis: more competition leads to more fragility
   - In more competitive systems, placing substantial emphasis on profits, banks have higher incentives to take excessive risks, which leads to higher instability. In addition, the incentives of banks to properly screen borrowers are reduced, which again contributes to system fragility.
2. Competition-stability hypothesis: competition fosters stability
   - Lower lending rates facilitate lending as they reduce entrepreneurs' cost of borrowing. Lower cost of borrowing ➡ higher the chance of investment success ➡ ↓ banks' credit portfolio risk ➡ ↑ stability within the sector.

Model and Measures of Competition and Stability I

- To examine the effect of bank competition on stability, we focus on the following model used in the literature:

$$Stability_{it} = \alpha + \beta \cdot Competition\ Measure_{it} + \sum_{k=1}^{N} \gamma_{kit} X_{kit} + e_{it} \quad (1)$$

where i signifies cross-sections, t time index, X is a set of control variables

- Measures of stability: indirect: NPL, bank profitability: ROA/ROE, profit volatility: ROA/ROE volatility, bank capitalization: CAR, Equity/TA, systemic banking crisis dummy, bank failure dummies, Z-score:

$$Z_{it} = \frac{ROA_{it} + {}^{E_{it}}/_{TA_{it}}}{\sigma_{ROA_{it}}}$$

Model and Measures of Competition and Stability II

- Measures of competition: indirect: Lerner index, H-statistic (Panzar and Rosse, 1987), Boone (2008) index, market structure indicators: concentration ratios (C3) and Herfindahl-Hirschman index

$$Lerner_{it} = \left(P_{TA_{it}} - MC_{TA_{it}}\right)/P_{TA_{it}}$$

- Shown that bank concentration is not a good indicator of the competitive nature of the system – concentration and competition highlight different banking sector characteristics (Claessens and Laeven, 2004)

Dataset of Collected Estimates I

- Search for relevant studies: Google Scholar and RePEc search engines
- Keyword combinations: “competition” and “stability,” “competition” and “fragility,” “concentration” and “stability,” and “concentration” and “fragility”
- Omission of studies that do not report statistics from which standard errors can be computed
- If an original study checks for a ***nonlinear relationship*** between competition and stability (i.e. reporting 2 coefficients associated with the measure of competition), the overall impact on stability needs to be linearized:

$$\beta = \widehat{\beta_1} + 2\widehat{\beta_2}\bar{x} \qquad SE(\beta) = \sqrt{SE\left(\widehat{\beta_1}\right)^2 + 4SE\left(\widehat{\beta_2}\right)^2 \bar{x}^2} \qquad (2)$$

Dataset of Collected Estimates II

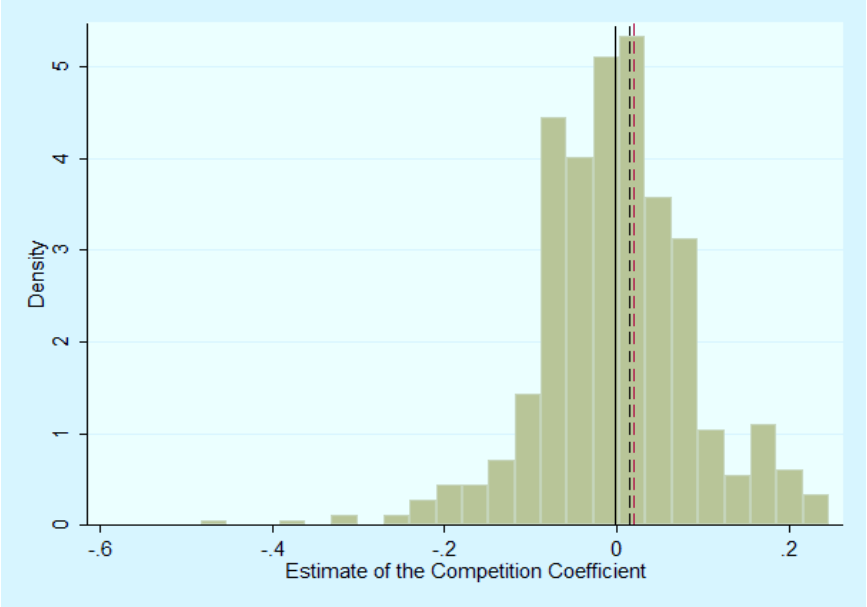
- Broad scope of measures used in the literature to proxy for competition and financial stability ➡ necessary to recompute the individual estimates to a common metric :

1. To adjust signs of the collected estimates as some financial stability proxies measure financial fragility (NPL, ROA/ROE volatility) and some competition proxies (e.g. Lerner index) investigate how uncompetitive a market is. This ensures that estimates directly reflect the relationship between competition and stability.
2. To apply transformation of estimates into partial correlation coefficients (PCC) and calculate their standard errors:

$$PCC = \frac{t}{\sqrt{t^2+df}} \qquad SEPCC = \sqrt{\frac{(1-PCC^2)}{df}} \qquad (3)$$

Dataset of Collected Estimates III

- Distribution of PCC of collected competition coefficient estimates:



- Mean of PCC = -0.0009
- Mean of the median of PCC from individual studies = 0.0099
- Mean of PCC for published studies =0.0116

- # all estimates = 598
- # estimates from published studies = 376

- PCC of competition coefficient estimates across countries:

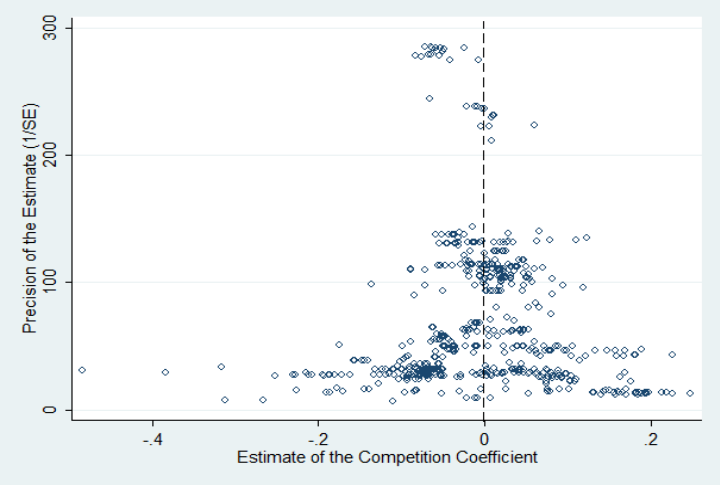
	Unweighted			Weighted			No. of estimates
	Mean	95% Conf. Int.		Mean	95% Conf. Int.		
All	-0,001	-0,025	0,023	-0,012	-0,035	0,011	598
Developed	0,020	-0,032	0,073	0,011	-0,030	0,052	201
Developing and transition	0,001	-0,022	0,023	-0,019	-0,051	0,012	194

- Weighted = estimates are weighted by the inverse of the number of estimates reported per study.

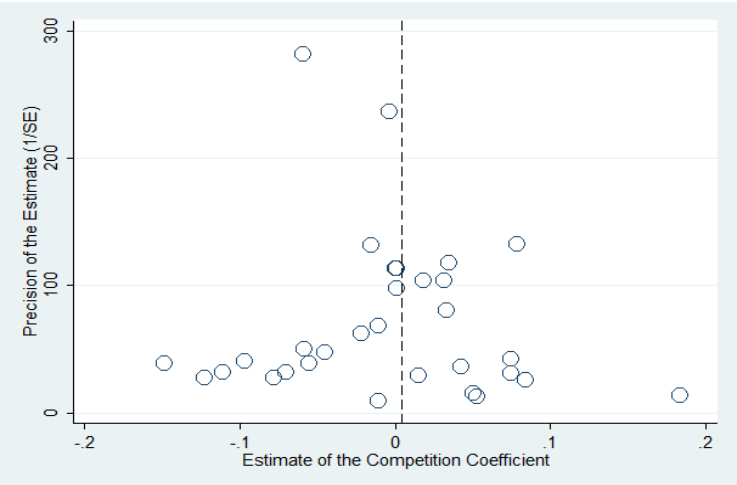
Testing for Publication Bias I

1. Visual testing: Funnel plots

All estimates



Median estimates from studies



- No clear signs of publication selection bias

2. Funnel asymmetry tests:

$$PCC_i = \beta_0 + \beta_1 SE(PCC_i) + \varepsilon_i \qquad (4)$$

where β_0 is the mean PCC of the coefficient estimate corrected for potential publication bias, β_1 measures the extent of publication bias

Testing for Publication Bias II

Unweighted regressions	Fixed Effects	Fixed Effects_Published	Instrument	Instrument_Published
SE (publication bias)	-1.671**	-1.898**	-1.614***	-2.291***
Constant (effect beyond bias)	0.044**	0.073**	0.043***	0.086***
No. of estimates	598	376	598	376
No. of studies	31	21	31	21
Weighted regressions	**Fixed Effects**		**Fixed Effects_Published**	
SE (publication bias)	-1.568***		-1.636***	
Constant (effect beyond bias)	0.034***		0.044***	
No. of estimates	598		376	
No. of studies	31		21	

- A moderate negative publication bias is present while the estimated size of the competition-stability effect beyond publication bias appears to be close to 0
- To correct equation (4) for heteroskedasticity by weighting it by the precision of estimates:

$$t_i = \beta_1 + \beta_0(1/SE(PCC_i)) + \mu_i \qquad (5)$$

where β_0 is the mean PCC of the coefficient estimate corrected for potential publication bias, β_1 measures the extent of publication bias

Testing for Publication Bias III

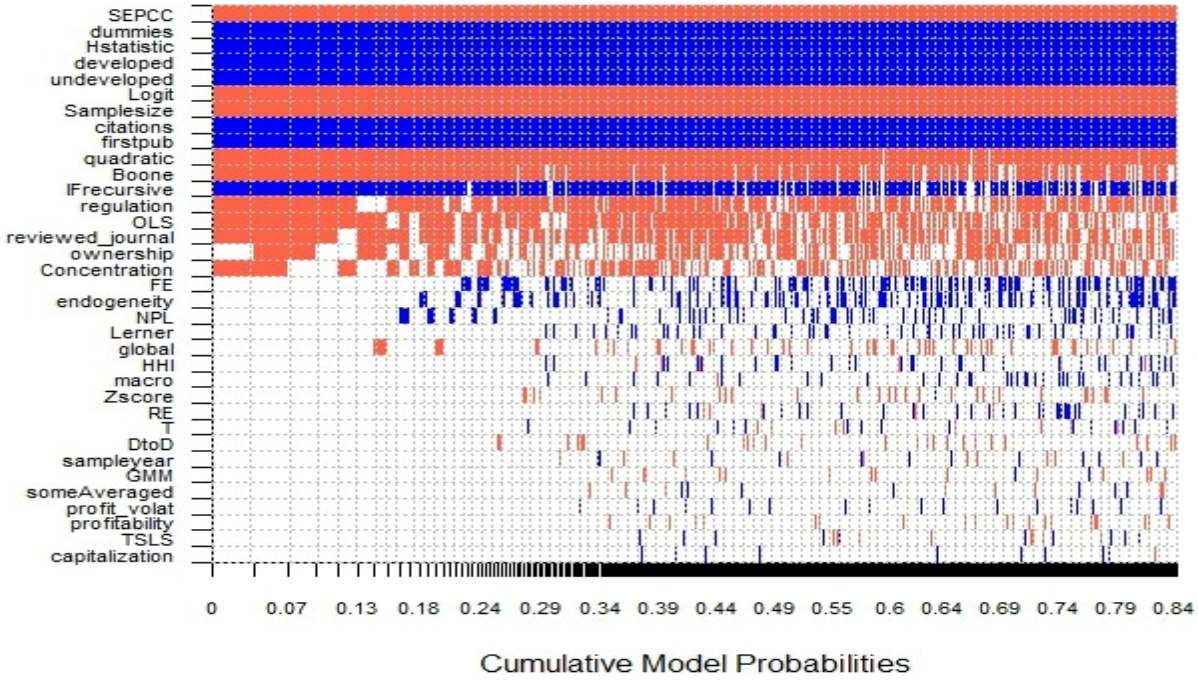
Unweighted regressions	Fixed Effects	Fixed Effects_Published	Instrument	Instrument_Published
1/SE (effect beyond bias)	0.005	0.065	0.019**	0.053***
Constant (publication bias)	-0.757	-4.000*	-1.706**	-3.344***
No. of estimates	598	376	598	376
No. of studies	31	21	31	21
Weighted regressions	**Fixed Effects**		**Fixed Effects_Published**	
1/SE (effect beyond bias)	0.013		0.056**	
Constant (publication bias)	-1.539**		-4.339**	
No. of estimates	598		376	
No. of studies	31		21	

- The competition-stability effect beyond bias remains close to 0
- According to Doucouliagos and Stanley (2013) the literature suffers from substantial selectivity if $\hat{\beta}_1$ from equation (5) is statistically significant and $1 \leq |\hat{\beta}_1| \leq 2$
- However, the magnitude of the constant term as well as its statistical significance varies over different specifications
- Ultimately, publication bias is present in the literature

Explaining Variation in the Coefficient Estimates I

- Adding characteristics of coefficient estimates and studies into equation (4) to explore what study aspects explain the estimate of the competition coefficient
  - Weighting regressions by the inverse number of estimates per study to place the same weight on each study
- 8 groups of study aspects: data characteristics, Countries examined, Design of the analysis, Treatment of stability, Treatment of competition, Estimation methods, Control variables and Publication characteristics
  - 35 study aspects altogether
- Too many regressors to introduce into equation (4) to explain the competition coefficient estimate ➡ solving model uncertainty by means of Bayesian model averaging (BMA)
  - BMA runs many regressions with different subsets of 2^{35} possible combinations of explanatory variables (35 regressors included in the model)
  - Posterior inclusion probability (PIP) reported for each variable to show the probability with which a variable is included in the true model

Explaining Variation in the Coefficient Estimates II



- Columns = individual models
- Blue color = the variable included and the estimated sign is positive
- Red color = the variable included and the estimated sign is negative
- No color = the variable not included in the model
- The horizontal axis: cumulative posterior model probabilities

- The variables are sorted by their PIP in a descending order
- Variables with PIP > 0.5 considered useful for explaining variation in the competition coefficient estimate
- 15 selected explanatory variables

Explaining Variation in the Coefficient Estimates III

- Interpretation of BMA results:
  - Presence of publication bias: positive and insignificant estimates are underreported in the literature
  - The larger the size of the original data sample, the smaller the reported coefficient
  - Estimates for developed countries tend to be slightly ↑ than for non-OECD countries
  - Investigating for nonlinear relationship yields ↓ estimates
  - Measuring stability in a binomial framework ↑ estimates
  - Measuring competition by H-statistic ↑ estimates while Boone index ↓ estimates
  - Estimation by logit/probit and OLS ↓ estimates
  - Supervisory and regulatory controls ↓ estimates
  - Outlets with higher impact factors and more citations report ↑ estimates
  - Peer reviewed journals favor ↓ estimates (weak PIP)
  - Reported estimates of competition coefficient ↑ overtime
- Estimation by OLS for variables with PIP > 0.5 gives very similar results

Best Practice Coefficient Estimates

- An attempt to estimate competition coefficient corrected for potential estimation mistakes, placing greater weight on estimates in quality outlets and in journals
  - For each variable with PIP > 0.5, a preferred value, a sample minimum or a sample maximum, or in case of no preference, a sample mean is plugged in
  - A linear combination of regression parameters computed for these variables
- **Sample maxima: sample size, IF, # citations, reviewed journal, regulation and Boone index**
- **Sample minima: SE of PCC, OLS, dummies, logit, quadratic and H-statistic**
- **Sample means: all other variables**

Best practice	Weighted				Unweighted			
	Estimate	95% Conf. Int.		Diff.	Estimate	95% Conf. Int.		Diff.
All	0,022	-0,022	0,066	0,034	0,038	0,000	0,076	0,039
Developed	0,096	0,049	0,144	0,085	0,091	0,045	0,137	0,071
Developing and transition	0,019	-0,035	0,072	0,038	0,055	0,011	0,099	0,054

- **All best practice coefficient estimates are larger than reported means**
- **Estimate for developed countries + all unweighted estimates are significant on 5% significance level but small magnitudes (Doucouliagos, 2011) ➡ negligible effect of bank competition on financial stability on the whole**

Conclusions

- Meta-analysis on the effect of banking sector competition on financial stability (598 estimates originating from 31 studies)
- Main robust result: bank competition does not affect financial stability in any way
- Presence of publication bias confirmed: positive and insignificant estimates are underreported in the literature
- Several aspects of estimation and study design influence the magnitude and sign of competition coefficient estimates
- Robustness check by excluding concentration-stability estimates from the dataset:
  - Main results unchanged
  - Supported by results of BMA: market structure measures as proxies for competition have low inclusion probabilities and do not bias effect estimates
- To the authors' knowledge the only meta-analysis resolving ambiguity originating from the 2 opposing theoretical views in the literature

Thank you for your attention

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