Competition, Risk-Shifting, and Public Bail-out Policies

Reint Gropp (European Central Bank, University of Frankfurt)
Hendrik Hakenes (MPI Bonn)
Isabel Schnabel (University of Mainz, MPI Bonn, and CEPR)

ProBanker Symposium
Maastricht University, June 5, 2007

1. Motivation

- Widespread view: Public guarantees towards banks (public banks, “too big to fail” banks) distort banking competition
- Argument: Cheaper refinancing of protected banks because creditors anticipate bank bail-outs in case of insolvency
- Through their effect on banks’ risk-taking, public guarantees may endanger the stability of banking systems

Effects of Public Guarantees on the Risk-taking ... of Protected Banks

- 2 channels:
  1. Weakening of **"market discipline"**
     → Increased risk-taking of protected banks
  2. **Charter value effect:** Public guarantees increase protected banks' margins and charter values
     (Cordella/Yeyati JFI 2003, Hakenes/Schnabel 2005)
     → Decreased risk-taking of protected banks
- Proposition: The effect of public guarantees on **protected banks'** risk-taking is **ambiguous**

Effects of Public Guarantees on the Risk-taking ... of Competitor Banks

- Public guarantees decrease the **competitor banks'** margins and charter values (Hakenes/Schnabel 2005)
  $\rightarrow$ **Higher risk-taking** of competitor banks
- Argument: Public guarantees make banking business more profitable $\rightarrow$ Expansion of protected banks
  $\rightarrow$ Fiercer competition for deposits or loans
  $\rightarrow$ Decrease in margins and charter values
- Proposition: Public guarantees unambiguously **increase** the risk-taking of **competitor banks**

Empirical Relevance of Public Guarantees

- Reduction in public ownership of banks, especially in developed countries
- But: High concentration in the banking sectors of many countries
- Partly a direct consequence of privatization (e. g., UniCredito)
- Conjecture: Many banks (especially large banks) benefit from **implicit government guarantees**
- Distortion of competition just as with explicit guarantees

Goal of this Paper

- Empirical examination of the question how public guarantees affect the risk-taking of protected banks and competitor banks
- Wide definition of public guarantees (including explicit and implicit guarantees)
- How to measure implicit guarantees?
- Idea: Exploitation of **rating information** to gauge the degree of public guarantees
    1. Fitch: Support Ratings
    2. Fitch, Moody's: Financial Strength vs. Issuer Ratings

Empirical Literature

- Effect of (public) guarantees on the risk-taking of **protected banks**:
  - "Too big to fail": Boyd/Runkle JME 1993, Boyd/Gertler 1994, Schnabel JEH 2004, 2005
  - Public banks: De Nicolò/Loukoianova (2006)
  - Deposit insurance: Hovakimian/Kane JoF 2000, Gropp/Vesala RoF 2004
  - Predominant result: Higher risk-taking of protected banks

Empirical Literature

- Effect of (public) guarantees on the risk-taking of **competitor banks**:
  - Has not yet been analyzed
  - Related findings: Higher insolvency risk of banks in countries with higher market shares or higher concentration ratio of publicly owned banks (De Nicolò 2000, De Nicolò/ Loukoianova 2006)

Empirical Literature

- Public guarantees and the stability of banking systems
  - Government ownership of banks: Caprio/Martinez 2000, Barth et al. JFI 2004
  - Deposit insurance: Demirgüc-Kunt/Detragiache JME 2002
  - Concentration in banking: De Nicolò et al. 2003, Beck et al. 2003
  - Results mixed

2. Data

- **BankScope data** (Bureau van Dijk)
- 30 OECD countries
- Cross-section for 2003
- Additional data sources: Fitch, Moody's, OECD, International Financial Statistics, World Bank, European Central Bank, ...
- Bank data:
  - Balance sheet data for more than 5000 banks
  - Use of unconsolidated balance sheets
  - Exclusion of central banks, investment banks, "non-banking credit institutions," multilateral development banks

Coverage of Banks

- Coverage of banks generally quite good
- For some countries, BankScope is biased towards large banks
- This poses no problems in our context:
  - Coverage of large banks is very important (protected banks are typically large)
  - Missing banks have small market shares
  - Competitive effects of guarantees affect small and large banks in the same way
  - Large number of small banks in the sample
- Robustness check: Use total assets from the OECD instead of BankScope

Empirical Model

$$Risk_i = \alpha \cdot p_i + \beta \cdot MSI_{-i} + \gamma \cdot X_i + \epsilon_i$$

Risk-taking of bank i = function of

- a bank's own bail-out probability p_i
- "market share of insured competitor banks" MSI_{-i}
- control variables X_i (total assets of bank i, Herfindahl index in country of bank i, deposit insurance, GDP per capita, transparency of banking system, bank type)

Risk Measures

- Risk-weighted assets (Basel I) / total assets
- Liquid assets / total assets
- Problem loans / total assets (current and future values)
- Regulatory capital / risk-weighted assets (Basel I)
- Book capital / total assets

Bail-out Probabilities

- Translation of Fitch Support Ratings into bail-out probabilities:
  - Support rating = 1 ("extremely high probability of external support"): $p = 1$ (Example: Deutsche Bank AG)
  - Support rating = 5 ("external support ... cannot be relied upon"): $p = 0$ (Example: Aareal Bank AG)
  - Public banks: $p = 1$ (Example: Westdeutsche Landesbank)
  - Domestic subsidiaries are assigned the rating of their mother company (Example: Comdirect Bank: $p = 0.9$, subsidiary of Commerzbank AG)
  - No support rating: $p = 0$ (Example: Bankhaus Bauer AG)

Bail-out Probabilities

Support rating	Description by Fitch	Assigned bail-out probability
1	A bank for which there is an extremely high probability of external support. The potential provider of support is very highly rated in its own right and has a very high propensity to support the bank in question. This probability of support indicates a minimum Long-term rating floor of 'A-'.	1
2	A bank for which there is a high probability of external support. The potential provider of support is highly rated in its own right and has a high propensity to provide support to the bank in question. This probability of support indicates a minimum Long-term rating floor of 'BBB-'.	0.9
3	A bank for which there is a moderate probability of support because of uncertainties about the ability or propensity of the potential provider of support to do so. This probability of support indicates a minimum Long-term rating floor of 'BB-'.	0.5
4	A bank for which there is a limited probability of support because of significant uncertainties about the ability or propensity of any possible provider of support to do so. This probability of support indicates a minimum Long-term rating floor of 'B'.	0.25
5	A bank for which external support, although possible, cannot be relied upon. This may be due to a lack of propensity to provide support or to very weak financial ability to do so. This probability of support indicates a Long-term rating floor no higher than 'B-' and in many cases no floor at all.	0

Market Share of Insured Competitor Banks (MSI)

- Measures competitive distortion due to the protection of **competitor banks** from the viewpoint of bank i:

$$MSI_{-i} = \sum_{j \neq i} p_j \frac{a_j}{A}$$

- Example: Country with 3 equally sized banks (1 public bank, 1 private bank with support rating = 3, 1 private bank that is not rated)
  - $p_1 = 1$, $p_2 = 0.5$, $p_3 = 0$
  - $MSI_{-1} = 0.17$, $MSI_{-2} = 0.33$, $MSI_{-3} = 0.5$

Descriptive Statistics

1. At the bank level
2. At the country level

Descriptive Statistics, Bank Level

Table 3: Descriptive statistics at the bank level

Variable	Nobs	Mean	Std. dev.	Minimum	Maximum
Risk-weighted assets / total assets (in %)	1639	66.81	19.17	0.05	139.76
Liquid assets / total assets (in %)	5401	23.22	19.94	0.00	100.00
Problem loans / total assets (in %)	2317	2.90	3.45	0.00	40.08
Problem loans 2004 / total assets (in %)	2008	2.91	4.49	0.00	121.69
Regulatory capital ratio (in %)	1869	18.68	25.79	0.00	641.60
Equity ratio (in %)	5394	9.48	10.66	0.00	100.00
MSI1	5448	0.62	0.15	0.00	0.87
Own bail-out probability corresponding to MSI1	5448	0.21	0.38	0.00	1.00
MSI2	5448	0.56	0.18	0.00	0.87
Own bail-out probability corresponding to MSI2	5448	0.17	0.37	0.00	1.00
Total assets (in Billion USD)	5448	10.60	53.30	0.002	1110.00

Country	MSI1country	MSI2country	Public share	Herfindahl	Deposit insurance	GDP per capita	Transparency
Australia	82%	80%	9%	13.3	0	24,455	12
Austria	30%	28%	7%	12.4	1	34,044	8
Belgium	69%	33%	0%	19.9	1	31,094	9
Canada	78%	78%	1%	19.2	2	23,621	11
Czech Republic	64%	63%	6%	19.6	1	5,695	9
Denmark	58%	58%	0%	11.4	2	39,661	7
Finland	87%	87%	10%	65.1	1	32,284	10
France	61%	58%	4%	8.2	2	30,790	8
Germany	77%	77%	48%	3.1	3	32,826	11
Greece	72%	57%	37%	16.8	1	14,162	10
Hungary	60%	34%	19%	19.3	1	5,903	9
Iceland	54%	57%	29%	24.7	1	31,385	8
Ireland	51%	39%	4%	10.3	1	30,551	11
Italy	60%	42%	3%	4.9	3	21,396	12
Japan	52%	45%	12%	3.3	2	45,029	11
South Korea	84%	60%	39%	8.6	2	14,937	11
Luxembourg	38%	38%	24%	4.0	1	59,053	11
Mexico	59%	41%	23%	17.3	3	3,721	12
Netherlands	82%	85%	9%	22.7	1	31,287	10
New Zealand	0%	0%	0%	17.9	0	18,947	12
Norway	40%	39%	26%	15.4	3	40,043	11
Poland	60%	57%	25%	12.7	1	4,557	11
Portugal	50%	52%	27%	15.5	1	13,034	10
Slovakia	60%	38%	2%	24.6	1	4,655	8
Spain	66%	60%	0%	6.7	1	18,050	11
Sweden	80%	72%	8%	11.5	1	33,665	10
Switzerland	71%	71%	18%	21.1	1	46,554	10
Turkey	63%	46%	35%	14.2	3	2,947	9
United Kingdom	67%	61%	0%	3.1	1	22,974	12
USA	37%	29%	0%	1.7	3	31,891	11

Table 4: Descriptive statistics at the country level. Notes: MSI1country and MSI2country give the overall value for each country. Note that the variables used in the regression differ from the aggregate variable in that they do not include the respective bank itself.

3. Estimation Results

- Strong evidence that protection of some banks increases the risk-taking of **competitor banks**
- Banks' own bail-out probability is insignificant or risk-decreasing
  $\rightarrow$ No evidence that public guarantees increase the risk-taking of **protected banks**
- Potential explanations:
  - Charter value effect dominates market discipline effect
  - Better supervision of protected banks

Table 5: Reduced form regressions using MSI1

Dependent variable	Risk-weighted assets		Liquid assets		Problem loans		Problem loans 2004		Regulatory Capital		Equity ratio	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
MSI1	20.439	0.002	-4.380	0.029	5.164	0.000	6.485	0.000	-0.459	0.919	-5.412	0.000
Own bail-out probability	-0.852	0.719	5.910	0.000	0.654	0.103	0.042	0.920	8.731	0.065	1.084	0.062
ln(Total assets)	0.427	0.175	-1.445	0.000	-0.023	0.684	-0.181	0.139	-3.557	0.000	-2.242	0.000
Herfindahl index	-0.270	0.018	-0.291	0.000	-0.053	0.004	-0.077	0.074	0.302	0.125	-0.011	0.787
Deposit insurance	6.941	0.000	-6.828	0.000	-0.376	0.133	-0.520	0.421	0.365	0.789	-0.512	0.089
GDP per capita 2002	-0.425	0.000	-0.136	0.000	-0.012	0.327	-0.047	0.066	0.149	0.291	-0.169	0.000
Transparency	-5.910	0.000	0.428	0.168	0.125	0.133	0.220	0.081	0.775	0.449	-0.042	0.801
+ Bank type dummies												
Nobs	1639		5401		2317		2008		1869		5394	
R²	0.08		0.18		0.16		0.12		0.06		0.22	
MSI1	129.489	0.000	-34.120	0.001	4.845	0.076	1.042	0.712	1.309	0.942	-4.762	0.343
Own bail-out probability	0.798	0.757	0.894	0.419	0.419	0.306	-0.105	0.800	10.129	0.080	2.309	0.001
ln(Total assets)	1.586	0.000	-1.519	0.000	-0.081	0.204	-0.221	0.102	-4.181	0.000	-2.363	0.000
+ Bank type dummies												
+ Country dummies												
Nobs	1639		5401		2317		2008		1869		5394	
R²	0.16		0.32		0.27		0.19		0.12		0.25	

Notes: All regressions include dummy variables for bank types. The regressions in the lower panel include countries dummies. We use robust standard errors throughout.

Table 5: Reduced form regressions using MSI1

Dependent variable	Risk-weighted assets		Liquid assets		Problem loans		Problem loans 2004		Regulatory Capital		Equity ratio	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
MSI1	20.439	0.002	-4.380	0.029	5.164	0.000	6.485	0.000	-0.459	0.919	-5.412	0.000
Own bail-out probability	-0.852	0.719	5.910	0.000	0.654	0.103	0.042	0.920	8.731	0.065	1.084	0.062
ln(Total assets)	0.427	0.175	-1.445	0.000	-0.023	0.684	-0.181	0.139	-3.557	0.000	-2.242	0.000
Herfindahl index	-0.270	0.018	-0.291	0.000	-0.053	0.004	-0.077	0.074	0.302	0.125	-0.011	0.787
Deposit insurance	6.941	0.000	-6.828	0.000	-0.376	0.133	-0.520	0.421	0.365	0.789	-0.512	0.089
GDP per capita 2002	-0.425	0.000	-0.136	0.000	-0.012	0.327	-0.047	0.066	0.149	0.291	-0.169	0.000
Transparency	-5.910	0.000	0.428	0.168	0.125	0.133	0.220	0.081	0.775	0.449	-0.042	0.801
+ Bank type dummies												
Nobs	1639		5401		2317		2008		1869		5394	
R^2	0.08		0.18		0.16		0.12		0.06		0.22	
MSI1	129.489	0.000	-34.120	0.001	4.845	0.076	1.042	0.712	1.309	0.942	-4.762	0.343
Own bail-out probability	0.798	0.757	0.894	0.419	0.419	0.306	-0.105	0.800	10.129	0.080	2.309	0.001
ln(Total assets)	1.586	0.000	-1.519	0.000	-0.081	0.204	-0.221	0.102	-4.181	0.000	-2.363	0.000
+ Bank type dummies												
+ Country dummies												
Nobs	1639		5401		2317		2008		1869		5394	
R^2	0.16		0.32		0.27		0.19		0.12		0.25	

Notes: All regressions include dummy variables for bank types. The regressions in the lower panel include countries dummies. We use robust standard errors throughout.

Table 5: Reduced form regressions using MSI1

Dependent variable	Risk-weighted assets		Liquid assets		Problem loans		Problem loans 2004		Regulatory Capital		Equity ratio	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
MSI1	20.439	0.002	-4.380	0.029	5.164	0.000	6.485	0.000	-0.459	0.919	-5.412	0.000
Own bail-out probability	-0.852	0.719	5.910	0.000	0.654	0.103	0.042	0.920	8.731	0.065	1.084	0.062
ln(Total assets)	0.427	0.175	-1.445	0.000	-0.023	0.684	-0.181	0.139	-3.557	0.000	-2.242	0.000
Herfindahl index	-0.270	0.018	-0.291	0.000	-0.053	0.004	-0.077	0.074	0.302	0.125	-0.011	0.787
Deposit insurance	6.941	0.000	-6.828	0.000	-0.376	0.133	-0.520	0.421	0.365	0.789	-0.512	0.089
GDP per capita 2002	-0.425	0.000	-0.136	0.000	-0.012	0.327	-0.047	0.066	0.149	0.291	-0.169	0.000
Transparency	-5.910	0.000	0.428	0.168	0.125	0.133	0.220	0.081	0.775	0.449	-0.042	0.801
+ Bank type dummies												
Nobs	1639		5401		2317		2008		1869		5394	
R^2	0.08		0.18		0.16		0.12		0.06		0.22	
MSI1	129.489	0.000	-34.120	0.001	4.845	0.076	1.042	0.712	1.309	0.942	-4.762	0.343
Own bail-out probability	0.798	0.757	0.894	0.419	0.419	0.306	-0.105	0.800	10.129	0.080	2.309	0.001
ln(Total assets)	1.586	0.000	-1.519	0.000	-0.081	0.204	-0.221	0.102	-4.181	0.000	-2.363	0.000
+ Bank type dummies												
+ Country dummies												
Nobs	1639		5401		2317		2008		1869		5394	
R^2	0.16		0.32		0.27		0.19		0.12		0.25	

Notes: All regressions include dummy variables for bank types. The regressions in the lower panel include countries dummies. We use robust standard errors throughout.

Robustness Checks

- Country fixed effects as controls for unobserved heterogeneity
- Various estimation specifications, alternative measures for some variables, such as total assets in the banking sector
- Assignment of mother company ratings to foreign subsidiaries
- Weighting by total deposits or total loans instead of total assets

$\Rightarrow$ Results are robust to all modifications

Extension (1)

- Only a subset of banks has support ratings
- Alternatives:
    - Use of **Financial Strength Ratings** and **Issuer Ratings**
    - (Work in progress) Estimation of relationship between support ratings and observable characteristics (e. g., total assets, market share, bank type) and out-of-sample prediction for banks that are not rated

Financial Strength Ratings vs. Issuer Ratings

- FSR measures banks' inherent strength, ignoring the possibility of external support
- IR measures banks' overall strength, taking into account external support
- Ratings are transformed into default probabilities on the basis of historical default rates
- Banks' own bail-out probabilities are estimated from the following relationship: $td_i = d_i\,(1 - p_i) \Leftrightarrow p_i = 1 - \frac{td_i}{d_i}$

Rating Fitch/IBCA	**Default prob.**	**Rating Moody's**	**Default prob.**
AAA	0.00	Aaa	0.00
AA+	0.00	Aa1	0.00
AA	0.00	Aa2	0.00
AA-	0.00	Aa3	0.07
A+	0.00	A1	0.00
A	0.00	A2	0.02
A-	0.14	A3	0.02
BBB+	0.33	Baa1	0.12
BBB	0.15	Baa2	0.10
BBB-	0.54	Baa3	0.46
BB+	1.06	Ba1	0.69
BB	2.09	Ba2	0.67
BB-	1.90	Ba3	2.19
B+	2.29	B1	3.46
B	1.74	B2	7.65
B-	1.96	B3	11.86
C-CCC	27.20	Caa–C	26.05

Table 2: Historical one-year ahead default probabilities for non-financial firms (in percent), as used for the construction of MSI2.

Results

- Qualitative results remain unchanged
- MSI is again significant with the expected sign
- Banks' own bail-out probability is insignificant or risk-decreasing

Table 6: Reduced form regressions using MSI2

Dependent variable	Risk-weighted assets		Liquid assets		Problem loans		Problem loans 2004		Regulatory Capital		Equity ratio	
	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value	Coef.	p-value
MSI2	20.535	0.008	-8.786	0.000	4.234	0.000	5.661	0.000	7.193	0.398	-4.763	0.000
Own bail-out probability	-3.408	0.199	5.676	0.000	0.439	0.324	-0.119	0.778	7.274	0.002	1.029	0.042
Total assets	0.498	0.110	-1.439	0.000	-0.015	0.787	-0.181	0.134	-3.306	0.000	-2.225	0.000
Herfindahl index	-0.309	0.012	-0.278	0.000	-0.048	0.016	-0.075	0.116	0.259	0.138	-0.021	0.595
Deposit insurance	6.833	0.000	-6.722	0.000	-0.392	0.087	-0.508	0.390	0.980	0.538	-0.520	0.082
GDP per capita 2002	-0.484	0.000	-0.129	0.000	-0.032	0.003	-0.068	0.003	0.100	0.440	-0.157	0.000
Transparency	-5.542	0.000	0.415	0.177	0.196	0.022	0.315	0.014	0.870	0.402	-0.124	0.458
Nobs	1639		5401		2317		2008		1869		5394	
R^2	0.09		0.18		0.16		0.12		0.06		0.22	
MSI2	119.780	0.000	-34.199	0.001	5.772	0.052	2.121	0.435	1.814	0.915	-2.242	0.660
Own bail-out	0.548	0.849	0.314	0.766	0.631	0.170	0.169	0.686	7.252	0.016	2.617	0.000
Total assets	1.533	0.000	-1.475	0.000	-0.084	0.176	-0.231	0.086	-3.839	0.000	-2.345	0.000
Nobs	1639		5401		2317		2008		1869		5394	
R^2	0.16		0.32		0.27		0.19		0.12		0.25	

Notes: All regressions include dummy variables for bank types. The regressions in the lower panel include countries dummies. We use robust standard errors throughout.

Extension (2): Structural Model (Work in Progress)

- Theory predicts that competitive effects work through banks' margins
- Margins and risk-taking are determined simultaneously
  - Margins influence risk-taking $(-)$
  - Risk-taking influences margins $(+)$
- Estimation of simultaneous equation model, using instrumental variables

4. Conclusion

- Strong evidence of competitive effects of explicit and implicit guarantees
  $\Rightarrow$ The higher the "market share of insured **competitor** banks," the higher the risk-taking
- No evidence of increased risk-taking of **protected** banks

Policy Implications

- Results on the effects of (explicit and implicit) public guarantees on the **competitor banks'** risk-taking are worrisome from a stability perspective
- Risk-taking of competitor banks is much harder to contain than that of a few large protected banks
- Implications for regulation and supervision?

- Competitive distortions may be relevant even after a privatization of state-owned banks because of existing **implicit guarantees**