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Bank Bailouts, Interventions, and Moral Hazard

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Motivation

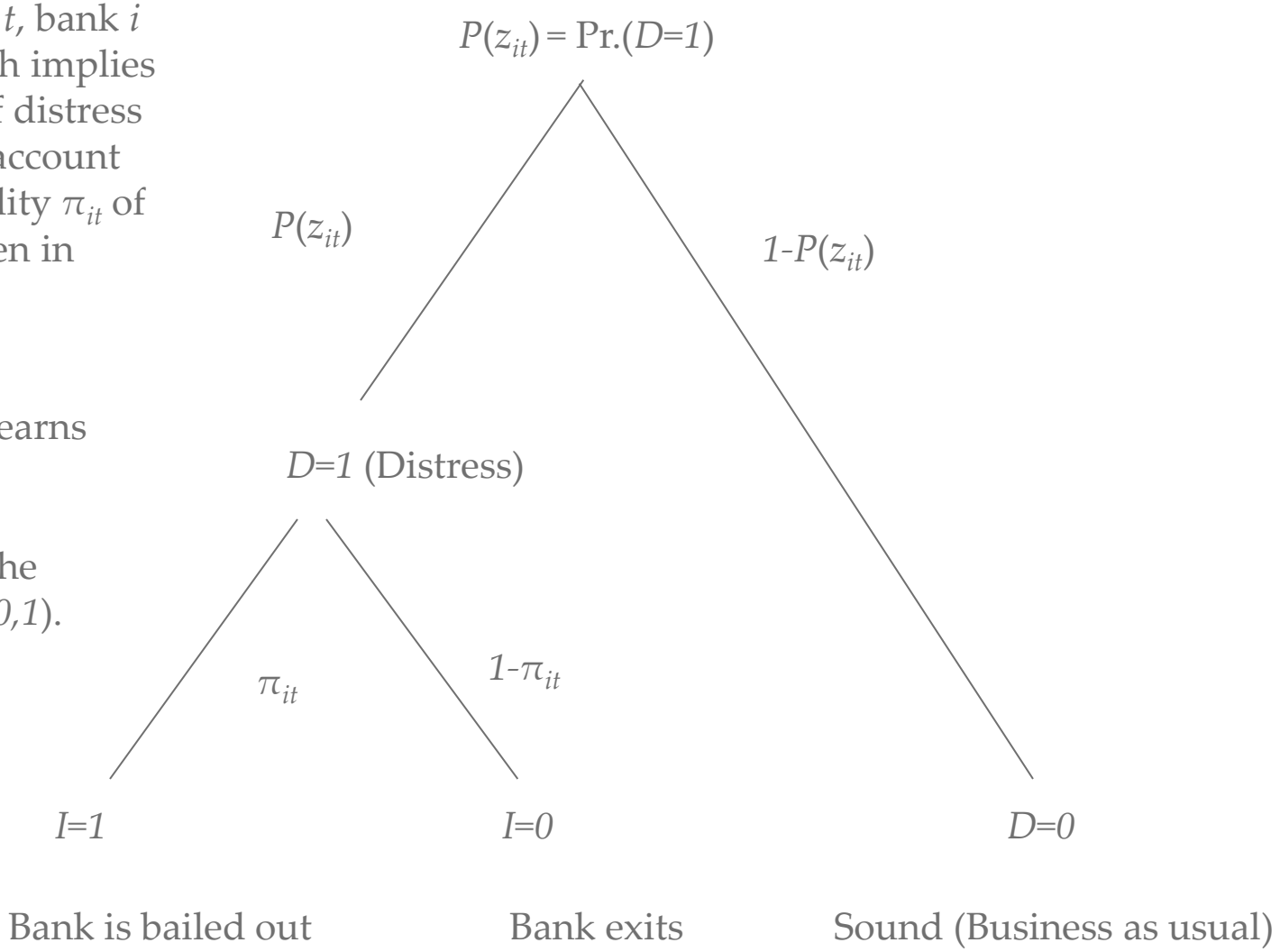
Moral Hazard due to Bailout Expectations?

- Cannot simply regress risk-taking measures on bailouts
- Separate bad luck from bad behavior =>structural model
- Identifying covariates: political, supervisor,and banking market traits
- Can interventions mitigate moral hazard?

Economic Mechanism

***T=0*:** In every period *t*, bank *i* chooses risk z_{it}, which implies a probability $P(z_{it})$ of distress (*D=0,1*), taking into account an expected probability π_{it} of being bailed out when in distress.

***T=1*:** The regulator learns that the bank is in distress *and* decides whether to bail out the bank or let it exit (*I=0,1*).



Definitions of events

- **Sound:** Business as usual (D=0)
- **Distress:** Regulator deems risk of bank so high, that without intervention it will cease as an ongoing concern. (D=1)
- Interventions:
- **Bailout:** Equity capital has been injected into the bank. (I=1)
- **Exit:** Restructuring merger, or foreclosure. (I=0)

  (In both cases the bank as an ongoing concern ceases to exist)

Econometric Specification

$$\pi_{it} = E[I_{it}] = \Phi(X_{it-1}\alpha + Z_{it}\beta) \qquad \text{(bailout)}$$

$$P(z_{it}) = E[D_{it}] = \Phi(\gamma\,\pi_{it} + X_{it-1}\kappa) \qquad \text{(distress)}$$

- Main interest is in γ *(moral hazard effect)*
- Estimate using a two-step procedure
- Identification relies on exclusion restriction (Z_{it} *not in distress equation*)

Sample

Table 1
Sound and distressed banks over time

Year	Sound		Distressed				Total
			Bailout		Exit		
	N	*% of total*	*N*	*% of total*	*N*	*% of total*	*N*
1995	3,238	94.3	165	4.8	32	0.9	3,435
1996	3,111	93.8	176	5.3	28	0.8	3,315
1997	2,975	92.7	189	5.9	47	1.5	3,211
1998	2,812	92.0	174	5.7	69	2.3	3,055
1999	2,576	91.5	169	6.0	71	2.5	2,816
2000	2,323	90.9	167	6.5	65	2.5	2,555
2001	2,114	89.6	171	7.2	74	3.1	2,359
2002	1,946	89.5	172	7.9	56	2.6	2,174
2003	1,819	89.7	157	7.7	52	2.6	2,028
2004	1,767	91.6	135	7.0	27	1.4	1,929
2005	1,728	92.6	113	6.1	26	1.4	1,867
2006	1,696	94.0	87	4.8	21	1.2	1,804
Total	28,105	92.0	1,875	6.1	568	1.9	30,548

Notes: Based on banks with complete cases in the regression analysis. Distress is defined as the occurrence of either a bailout or exit of the bank due to a restructuring merger induced by the regulator. Bailout is defined as a capital injection by the responsible insurance fund of the bank.

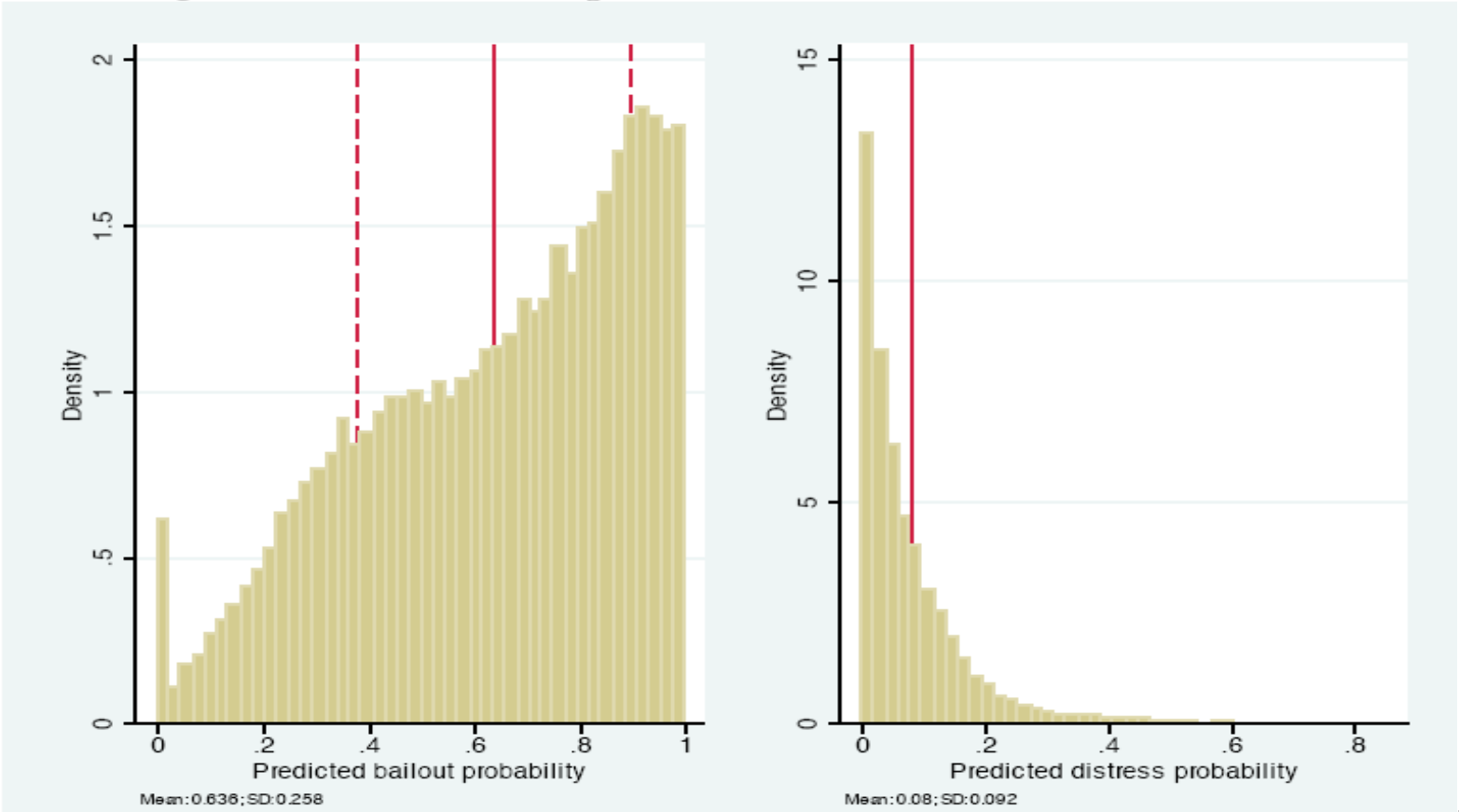
Results

Table 4
Identification of bailout probabilities and moral hazard effects

	Parsimonious		Politics		Associations		Regulator	
Equation	*Bailout*	*Distress*	*Bailout*	*Distress*	*Bailout*	*Distress*	*Bailout*	*Distress*
Explanatory covariates (X)								
Predicted bailout		0.063***		0.059***		0.057***		0.072***
probability$_t$		[0.021]		[0.020]		[0.016]		[0.012]
Size$_{t-1}$	0.062***	0.005***	0.063***	0.005***	0.062***	0.005***	0.064***	0.005***
	[0.005]	[0.002]	[0.005]	[0.002]	[0.005]	[0.002]	[0.005]	[0.001]
Hidden reserves$_{t-1}$	-0.098***	-0.075***	-0.096***	-0.076***	-0.074**	-0.078***	-0.076**	-0.075***
	[0.034]	[0.008]	[0.033]	[0.008]	[0.033]	[0.007]	[0.033]	[0.007]
Non-performing	0.002**	0.001***	0.002***	0.001***	0.003***	0.001***	0.003***	0.001***
loan share$_{t-1}$	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]
Customer loan	0.002**	-0.000	0.002**	-0.000	0.002**	-0.000	0.002**	-0.000
share$_{t-1}$	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]
Return on equity$_{t-1}$	0.000	-0.002***	0.000	-0.002***	0.000	-0.002***	0.000	-0.002***
	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]
Fee to interest	0.000*	-0.000***	0.000*	-0.000***	0.000	-0.000***	0.000	-0.000***
income ratio$_{t-1}$	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]	[0.000]
Cost efficiency$_{t-1}$	-0.001	-0.001***	-0.001	-0.001***	-0.001	-0.001***	-0.001	-0.001***
	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]
Liquid asset share$_{t-1}$	0.010	0.003*	0.010	0.003*	0.011	0.003*	0.008	0.003*
	[0.012]	[0.002]	[0.012]	[0.002]	[0.012]	[0.002]	[0.012]	[0.001]
Regional market	0.002***	-0.000	0.002**	-0.000	0.002***	-0.000	0.002**	-0.000
share$_{t-1}$	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]	[0.001]	[0.000]
Public limited	-0.183*	-0.026***	-0.190*	-0.027***	-0.203**	-0.027***	-0.206**	-0.027***
company indicator$_t$	[0.099]	[0.007]	[0.101]	[0.007]	[0.101]	[0.007]	[0.104]	[0.007]
Corporate insolvencies$_{t-1}$	0.093*	0.029***	0.122**	0.030***	0.134**	0.031***	0.179***	0.028***
	[0.052]	[0.010]	[0.054]	[0.010]	[0.055]	[0.009]	[0.056]	[0.009]
Annual real GSP	0.003	0.006***	0.005	0.006***	0.009	0.006***	0.011	0.006***
per capita growth$_{t-1}$	[0.008]	[0.001]	[0.008]	[0.001]	[0.008]	[0.001]	[0.008]	[0.001]
State unemployment	-0.006	0.003**	-0.014*	0.003**	-0.010	0.003**	-0.020**	0.003**
rate$_{t-1}$	[0.006]	[0.001]	[0.007]	[0.001]	[0.009]	[0.001]	[0.009]	[0.001]

Economic Significance

Figure A.2. Predicted probabilities of bailouts and distress



Alternative risk measures/ Robustness

Alternative risk measures as dependent in 2nd equation:

Z-Score, Non-performing Loan share (NPL), Tier-I capital ratios, Net Fixed Interest Rate Assets (NFIRA), Fixed Interest Rate Gap (FIRG)

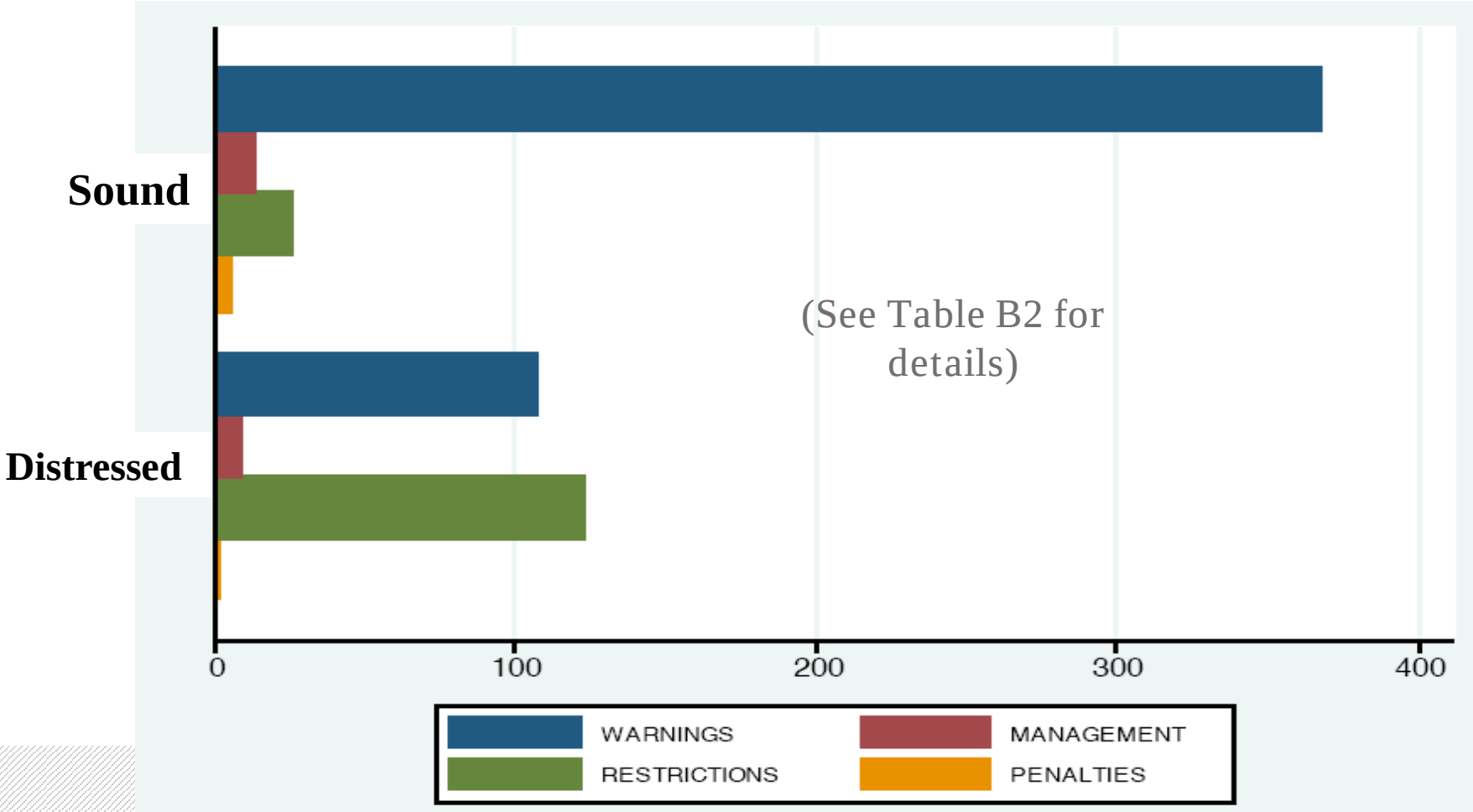
Other robustness checks:

Bank-Year clustering (biased std. errors?), OLS-OLS (pure identification?), bootstrap/maximum likelihood (generated regressor?), Subsample of banks in subtree (extrapolation?)

Ownership:

A number of subsamples: gov't owned, local savings, publicly inc., etc.

Can interventions reduce moral hazard?



Results Interventions

Table 8

Regulatory intervention and moral hazard

Dependent variable	Distress	z-score	Tier I	NPL	NFIRA	FIRG
Predicted bailout probability$_t$	0.071***	-1.466**	0.332	5.458***	-1.931**	-0.075**
	[0.011]	[0.599]	[0.972]	[0.905]	[0.953]	[0.036]
Warnings	0.056	-1.566	-4.548**	1.364	-4.692**	0.115
	[0.052]	[1.185]	[1.843]	[1.286]	[2.092]	[0.084]
Warnings $\times \hat{\pi}$	-0.018	0.816	6.098***	0.345	3.412	-0.238**
	[0.036]	[1.521]	[2.147]	[1.943]	[2.770]	[0.114]
Management	0.826***	-6.399**	-8.152	-4.229	-9.431	0.119
	[0.181]	[3.051]	[7.473]	[3.123]	[7.723]	[0.363]
Management $\times \hat{\pi}$	-0.400**	6.221	5.859	3.117	17.034	-0.455
	[0.161]	[4.701]	[9.195]	[6.225]	[13.216]	[0.561]
Restrictions	0.348*	-0.819	37.247	0.335	-8.363	-0.223
	[0.197]	[4.097]	[35.165]	[2.489]	[7.331]	[0.301]
Restriction $\times \hat{\pi}$	0.047	-1.048	-38.353	-0.309	6.786	0.125
	[0.060]	[4.565]	[36.451]	[2.785]	[8.779]	[0.348]
Penalties	0.658	-31.552***	-9.911*	25.342*	55.140***	1.098
	[0.506]	[2.171]	[5.912]	[14.294]	[19.943]	[1.043]
Penalties $\times \hat{\pi}$	-0.320*	44.081***	14.466*	-30.268*	-68.386***	-1.572
	[0.167]	[2.414]	[7.557]	[16.303]	[23.617]	[1.199]

Conclusion

- Increase in bailout expectations has economicly significant impact on risk taking.
- Interventions can help mitigate moral hazard, but only in the form of penalties or when directly addressing management.
- Warnings and restrictions seem less effective.