

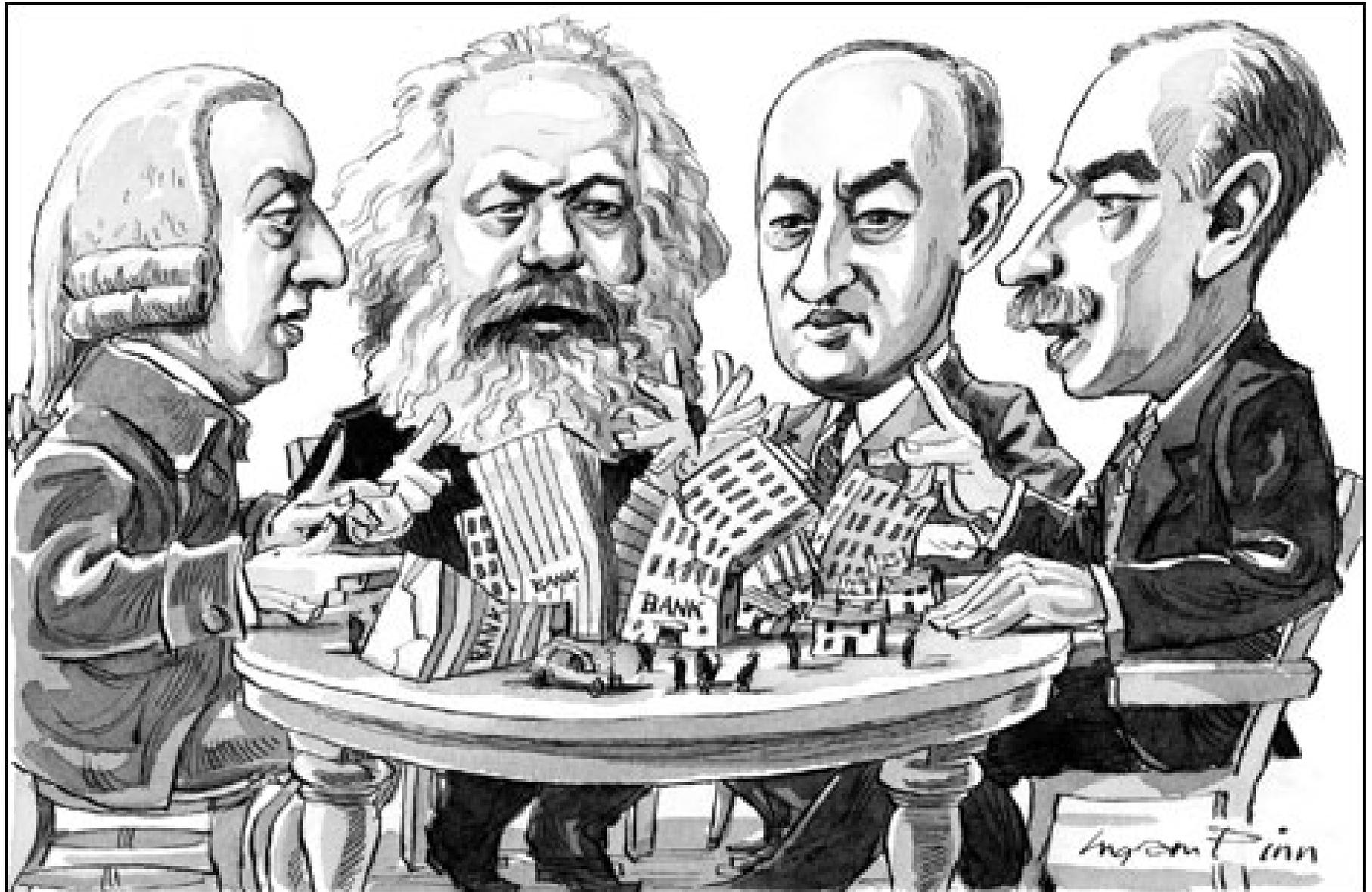


Catharsis – Tracing the Real Effects of Bank Insolvency and Resolution

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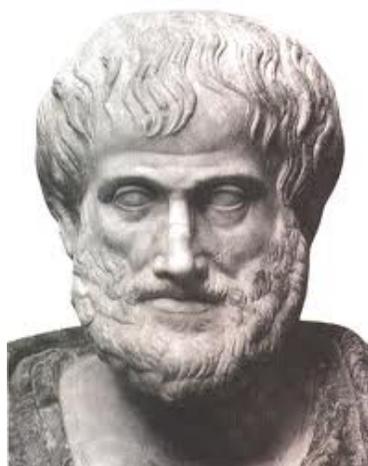
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What to do with broke banks?



Let's see what Aristotle and Schumpeter have to say...

Great thoughts ...



“ Tragedy, is [...] serious, complete, and of a certain magnitude; **through pity and fear** effecting the **proper catharsis** [=purgation]. ”

Aristotle

“ The problem [is not] how capitalism administers existing structures, [but] how it creates and destroys them. This **creative destruction** causes continuous progress. Situations emerge [...] in which many firms may have to perish. ”

Joseph Schumpeter



... and their application to failed bank treatment

Bank insolvency resolution can be thought of as a **process of catharsis**: Resolving failed banks in a **rules-based and prompt way** increases **real economic performance**

- **Cleans** out existing **moral hazard** (=purgation from corrupted incentives)
- **Improves** functioning of the banking system, e.g. its **credit allocation**
- Prevents **regulatory forbearance**

Contents

- **Why is insufficient bank insolvency resolution problematic and what are the solutions?**
- How can this be tested empirically?
- What are the results?

Literature (1/2) – What are the problems with insolvent banks if not resolved?

Bank incentive distortions	Individual moral hazard (ex ante)	<ul style="list-style-type: none"> Anticipation of bailout, excessive risk or complexity taking, unsound balance sheet blow-up, insufficient screening/monitoring (<i>Beltratti/Stulz, 2009; Dell’Ariccia/Marquez, 2006; DeYoung et al., 2011; Fortin et al., 2010; Marin/Vlahu, 2011</i>) → Suboptimal credit allocation
	Individual moral hazard (ex post)	<ul style="list-style-type: none"> Gambling for resurrection: Insolvent bank seen as out-of-the-money option, values high volatility over expected NPV (<i>Igan/Tamirisa, 2008</i>) Financial zombies create real zombies: Roll-over NPL (<i>Caballero et al., 2008; Peek/Rosengren, 2005</i>) Looting/private rent seeking (<i>Akerlof/Romer, 1993; LaPorta et al., 2003</i>)
	Collective moral hazard	<ul style="list-style-type: none"> Herding into asset classes to create ‘too-many-to-fail’ (<i>Acharya, 2009; Brown/Dinc, 2011; Kasa/Spiegel, 2008; Stever/Wilcox, 2007</i>) Rolling-over NPL and collective disclosure to avoid blame (<i>Rajan, 1994</i>)
Banks’ monitors incentive distortions	Depositors	<ul style="list-style-type: none"> No incentive for monitoring: small, dispersed, insured (<i>Calomiris/Kahn, 1991; Kaufman, 2006; Marin/Vlahu, 2011</i>) Potential collusion of insured depositors if rents are shared (<i>Detragiache/Demirgüc-Kunt, 2005; Demirgüc-Kunt et al., 2008</i>)
	Regulators	<ul style="list-style-type: none"> Time-inconsistency/inability of bank-closure decision, no commitment (<i>Acharya/Yorulmazer, 2007; DeYoung et al., 2011; Mailath/Mester, 1994</i>) Political economy: rent-seeking, regulatory capture (<i>Kane, 1987; Brown/Dinc, 2005; Imai, 2009; Kane, 1987</i>)

Absence of a rules-based bank insolvency resolution regime can entail moral hazard, lead to suboptimal credit allocation and negatively affect real output

Literature (2/2) – Bailout vs. Catharsis, which resolution policies are most effective to (re)establish incentives in financial intermediation?

'Accommodating' policies – The bailout effect

What is it?

- **Aim:** Sustain financial intermediary as legal entity
- **Instruments:** (blanket) guarantees, open liquidity assistance, recapitalization, regulatory forbearance

'Cleansing' policies – The catharsis effect

- **Aim:** End of existence of financial intermediary as legal entity
- **Instruments:** purchase and assumption, closure and liquidation

How does it tackle the problem?

- Create or sustain **incentive distortions** (*Kane/Klingebiel, 2004*)
- Do not speed recovery, do not mitigate output loss, but increase cost of crises and moral hazard in the long-run (*Giannetti/Simonov, 2009; Honohan/Klingebiel, 2003; Dell'Araccia et al., 2008*)

- **Reestablish incentives** (*Achary, 2009; Caprio et al., 2010; DeYoung et al., 2011; Kane, 2002; Panyagometh/Roberts, 2009; Perotti/Suarez, 2002; Rancièrè et al., 2008*)
- More pronounced if not discretionary (*Demirgüç-Kunt/Serven, 2010; Kaufman, 2011/2006*)

Rules-based resolution of failed banks reestablished incentives and improves the functioning of banking and economic performance

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Nice story – but: Is it true? How can we test this?

We subject a **clear insolvency rule to econometric testing** of its effect on the real economy:

*Test 'positive capital closure rule',
i.e. X% simple capital ratio as 'should-be'-
trigger for insolvency (Kaufman, 2011;
Kane, 1987/2002; Lindgren, 2005)¹*

¹ Kaufman and Kane, e.g., explicitly relate the phenomenon of “undercapitalized zombies” to moral hazard and insufficient insolvency regimes for financial institutions and advocate a simple trigger

Identification strategy to prove causal relation between bank catharsis effect and real economic performance

<p>1 $\Delta \ln(\text{output}_{i,t}) = \alpha + \beta * \text{bank catharsis indicator}_{k,t} + FE + X_{i,t} + Z_{k,t} + \varepsilon_{i,t}$</p> <p>Growth of individual firms, as measured, e.g. by $\Delta \ln(\text{revenue})$</p>	<p>Core variable of interest, captures how rules-based banks are resolved: (Resolved bank assets_{t-x}) / (Bank assets that should have been resolved_{t-x})</p> <p>Test 'positive capital closure rule', i.e. X% simple capital ratio as 'should-be'-trigger for insolvency (Kaufman, 2011; Lindgren, 2005)</p>	<p>Firm FE Year FE</p>	<p>Set of country-level control variables Set of firm-level control variables</p>	OLS
<p>2 Identification problem: Endogeneity due to omitted variables and simultaneity (not all captured by FE & controls)</p>	<p>Solution: Instrumental variable, instrumenting bank resolution by IV; IVs: two bank insolvency law variables¹, allows for diagnostic overID tests (cp/contrast Jayaratne/Strahan, 1996; Giannetti/Ongena, 2009)</p> <ul style="list-style-type: none"> ▪ IV condition 1: Relevance of resolution law for actual resolution ▪ IV condition 2: Exclusion of any causal effect of bank resolution law on firm performance other than through actual resolution 			IV/ GMM
<p>3 Identification problem:</p> <ul style="list-style-type: none"> ▪ So far, we proved correlation, but how to prove causation? ▪ Still endogeneity in IV? 	<p>Solution: Interaction, using dependence on bank finance in an interaction term (cp. Rajan/Zingales, 1998; Giannetti/Ongena, 2009 and others)</p> $\Delta \ln(\text{output}_{i,t}) = \alpha + \beta_1 * \text{bankdep}_i + \beta_2 * \text{bank catharsis indicator}_{k,t} + \beta_3 * (\text{bankdep}_i * \text{bank catharsis indicator}_{k,t}) + X_{i,t} + \text{bankdep}_i * Z_{k,t} + \sum_i \gamma_i * \text{firm}_i + \sum_{k,t} \delta_{k,t} * \text{country year}_{k,t} + \varepsilon_{i,t}$			X

1 Variable 1: existence of separate bank insolvency law; variable 2: Insolvency declaration power of a public agency
Indicators: firm i, industry j, country k, year t

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<p>1 $\Delta \ln(\text{output}_{i,t}) = \alpha + \beta * \text{bank catharsis indicator}_{k,t} + FE + X_{i,t} + Z_{k,t} + \varepsilon_{i,t}$</p> <p>Growth of individual firms, as measured, e.g. by $\Delta \ln(\text{revenue})$</p>	<p>Core variable of interest, captures how rules-based banks are resolved: (Resolved bank assets_{t-x}) (Bank assets that should have been resolved_{t-x})</p> <p>Test 'positive capital closure rule', i.e. X% simple capital ratio as 'should-be'-trigger for insolvency (Kaufman, 2011; Lindgren, 2005)</p>	<p>Firm FE Year FE</p>	<p>Set of country-level control variables Set of firm-level control variables</p> <p>OLS</p>
<p>2 Identification problem: Endogeneity due to omitted variables and simultaneity (not all captured by FE & controls)</p>	<p>Solution: Instrumental variable, instrumenting bank resolution by IV; IVs: two bank insolvency law variables¹, allows for diagnostic overID tests (cp/contrast Jayaratne/Strahan, 1996; Giannetti/Ongena, 2009)</p> <ul style="list-style-type: none"> IV condition 1: Relevance of resolution law for actual resolution IV condition 2: Exclusion of any causal effect of bank resolution law on firm performance other than through actual resolution 		<p>IV/ GMM</p>
<p>3 Identification problem:</p> <ul style="list-style-type: none"> So far, we proved correlation, but how to prove causation? Still endogeneity in IV? 	<p>Solution: Dif-in-Dif, using dependence on bank finance in an interaction term (cp. Rajan/Zingales, 1998, Giannetti/ Ongena, 2009 and others)</p> <ul style="list-style-type: none"> Core idea: Even if firm growth and bank catharsis experience correlation due to endogeneity, it is extremely unlikely to do so in a systematic way for firms with different bank dependence Allows additional fixed effects filters (e.g. country-year) 		<p>X</p>

1 Variable 1: existence of separate bank insolvency law; variable 2: Insolvency declaration power of a public agency
Indicators: firm i, industry j, country k, year t

Model	(1)	(2)	(3)	(4)	(5)
	OLS	OLS	OLS	OLS	OLS
Dependent variable	$\Delta \ln(\text{OpRev})$				
Catharsis indicator (8% CR)	0.344*** (0.00564)	0.441*** (0.00511)	0.310*** (0.00664)	0.398*** (0.00624)	0.0620*** (0.00721)
<i>Firm-level controls</i>					
Bank dependence		0.0730*** (0.00614)		0.129*** (0.00693)	
Firm age (log)		-0.0733*** (0.000468)		-0.0695*** (0.000520)	-0.294*** (0.00456)
Lagged share of total assets		0.310** (0.126)		0.127 (0.124)	-0.187 (0.405)
Profitability		0.459*** (0.00338)		0.445*** (0.00376)	0.802*** (0.00677)
<i>Country-level controls</i>					
Financial development			-0.0759*** (0.00112)	-0.0725*** (0.00106)	-0.0556*** (0.00428)
Bank undercapitalization			0.00630*** (0.00237)	0.0509*** (0.00234)	0.0166*** (0.00379)
Bank concentration CR3			-0.0137*** (0.00222)	-0.0157*** (0.00204)	0.00615 (0.00520)
GNI per capita			-0.00175*** (0.000065)	-0.00159*** (0.000066)	-0.0126*** (0.00090)
Political openness			0.00233*** (0.000397)	0.0111*** (0.000364)	0.0302*** (0.00110)
Constant	0.118*** (0.000393)	0.246*** (0.00183)	0.214*** (0.00304)	0.204*** (0.00338)	0.882*** (0.0231)
Firm FE	NO	NO	NO	NO	YES
Year FE	NO	NO	NO	NO	YES
Observations	1,792,558	1,555,980	1,440,787	1,252,126	1,252,126
R-squared	0.002	0.040	0.012	0.045	0.164
Growth rate differential (additional % of firm growth) ^[1]	1.8	2.3	1.6	2.1	0.3

Robust clustered standard errors in parentheses *** p<0.01, ** p<0.05, * p<0.1

There seems to be a **statistically and economically significant** effect of bank catharsis on real firm performance, but can we **exclude endogeneity concerns?**

Identification strategy to prove causal relation between bank catharsis effect and real economic performance

<p>1 $\Delta \ln(\text{output}_{i,t}) = \alpha + \beta * \text{bank catharsis indicator}_{k,t} + FE + X_{i,t} + Z_{k,t} + \varepsilon_{i,t}$</p> <p>Growth of individual firms, as measured, e.g. by $\Delta \ln(\text{revenue})$</p>	<p>Core variable of interest, captures how rules-based banks are resolved: (Resolved bank assets_{t-x}) / (Bank assets that should have been resolved_{t-x})</p> <p>Test 'positive capital closure rule', i.e. X% simple capital ratio as 'should-be'-trigger for insolvency (Kaufman, 2011; Lindgren, 2005)</p>	<p>Firm FE Year FE</p>	<p>Set of country-level control variables Set of firm-level control variables</p> <p style="text-align: right;">OLS</p>
<p>2 Identification problem: Endogeneity due to omitted variables and simultaneity (not all captured by FE & controls)</p>	<p>Solution: Instrumental variable, instrumenting bank resolution by IV; IVs: two bank insolvency law variables¹, allows for diagnostic overID tests (cp/contrast Jayaratne/Strahan, 1996; Giannetti/Ongena, 2009)</p> <ul style="list-style-type: none"> IV condition 1: Relevance of resolution law for actual resolution IV condition 2: Exclusion of any causal effect of bank resolution law on firm performance other than through actual resolution 		<p style="text-align: right;">IV/ GMM</p>
<p>3 Identification problem:</p> <ul style="list-style-type: none"> So far, we proved correlation, but how to prove causation? Still endogeneity in IV? 	<p>Solution: Dif-in-Dif, using dependence on bank finance in an interaction term (cp. Rajan/Zingales, 1998, Giannetti/ Ongena, 2009 and others)</p> <ul style="list-style-type: none"> Core idea: Even if firm growth and bank catharsis experience correlation due to endogeneity, it is extremely unlikely to do so in a systematic way for firms with different bank dependence Allows additional fixed effects filters (e.g. country-year) 		<p style="text-align: right;">X</p>

1 Variable 1: existence of separate bank insolvency law; variable 2: Insolvency declaration power of a public agency
Indicators: firm i, industry j, country k, year t

Model	(1)	(2)
Dependent variable	IV GMM $\Delta \ln(\text{OpRev})$	IV GMM $\Delta \ln(\text{OpRev})$
Catharsis indicator (8% CR)	1.146*** (0.0281)	0.828*** (0.0497)
<i>Firm-level controls</i>		
Bank dependence		0.0684*** (0.00982)
Firm age (log)		-0.0647*** (0.000706)
Lagged share of total assets		-0.679** (0.299)
Profitability		0.341*** (0.00512)
<i>Country-level controls</i>		
Financial development		0.0204*** (0.00191)
Bank undercapitalization		-0.0158*** (0.00405)
Bank concentration CR3		0.175*** (0.00867)
GNI per capita		0.00371*** (0.000118)
Political openness		-0.0183*** (0.00102)
Constant	0.162*** (0.000862)	0.482*** (0.00519)
Year FE	NO	YES
Observations	717,211	606,588
R-squared	0.01	0.108
Weak instrument test (F) ^[1]	7700	4500
Hansen test (p-value) ^[2]	0.567	0.218
Endogeneity test (p-value) ^[3]	0.000	0.000

- **Effect confirmed** in general
 - **Validity of instrument:**
 - ✓ **IV condition 1:** Relevance of resolution law IVs for actual resolution (theory and confirmed in first stage)
 - ✓ **IV condition 2:** Exogeneity of instrument, i.e. exclusion of any causal effect of bank resolution law IVs on firm performance other than through actual resolution
 - Theory: Direct effect unlikely
 - Diagnostic: Hansen OI test does not reject, but drops
 - Potential problem of **reverse causality** (e.g. economic dev't or lobbying for laws)?
- **Use additional strategy to overcome endogeneity concerns and prove causality**

Notes: [1] Uses the Kleibergen-Paap Wald F statistic [2] Tests the null hypothesis that the instruments are uncorrelated with the error [3] Tests the null hypothesis that the estimation results are not altered by using instrumental variables

Identification strategy to prove causal relation between bank catharsis effect and real economic performance

<p>1</p> <p>$\Delta \ln(\text{output}_{i,t}) = \alpha + \beta * \text{bank catharsis indicator}_{k,t} + FE + X_{i,t} + Z_{k,t} + \varepsilon_{i,t}$</p> <p>Growth of individual firms, as measured, e.g. by $\Delta \ln(\text{revenue})$</p>	<p>Core variable of interest, captures how rules-based banks are resolved: (Resolved bank assets_{t-x}) (Bank assets that should have been resolved_{t-x})</p> <p>Test 'positive capital closure rule', i.e. X% simple capital ratio as 'should-be'-trigger for insolvency (Kaufman, 2011; Lindgren, 2005)</p>	<p>Firm FE Year FE</p>	<p>Set of country-level control variables Set of firm-level control variables</p> <p>OLS</p>
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1 Variable 1: existence of separate bank insolvency law; variable 2: Insolvency declaration power of a public agency
Indicators: firm i, industry j, country k, year t

Model	(1)	(2)	(3)
Dependent variable	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$
Catharsis indicator (8% CR)	0.298*** (0.0250)		
Catharsis indicator x bank dependence	0.496*** (0.132)	0.691*** (0.149)	0.530*** (0.163)
Firm-level controls	YES	NO	YES
Country-level controls	YES	NO	YES
Constant	YES	YES	YES
Country-Year FE	NO	YES	YES
Firm FE	NO	YES	YES
Observations	1,252,126	1,792,441	1,252,126
R-squared	0.046	0.398	0.432
Growth rate differential (additional % of firm growth) ^[1]	2.1	0.8	0.6

Robust clustered standard errors in parentheses

*** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$

- Particularly firms **more dependent on bank financing** benefit from the bank catharsis effect
- Model controls for **all sorts of fixed effects**, even country-year trend and firm FE (more detailed than industry fixed effects used in literature!)
- Endogeneity unlikely:** Even if firm growth and bank resolution might experience correlation due to omitted variables/reverse causation, it is extremely unlikely to do so in a systematic way for firms with different bank dependence (everything else is captured by fixed effects/trends)

Extensions – Nice effect, but can we get a bit more of a ‘smoking gun’? What is the channel of transmission for the catharsis effect? (1/2)

Model	(1)	(2)	(3)	(4)	(5)
Dependent variable	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$
	Panel A	Panel B: Split sample		Panel C: Split sample	
	Full sample	Active firms	Insolvent firms	High profitability firms ^[1]	Low profitability firms ^[1]
Catharsis indicator x bank dependence	0.530*** (0.163)	0.587*** (0.167)	-0.305 (0.753)	0.762** (0.366)	-0.513 (0.488)
Firm-level controls	YES	YES	YES	YES	YES
Country-level controls	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Observations	1,252,126	1,179,171	72,955	368,498	314,340
R-squared	0.432	0.428	0.480	0.653	0.616
Growth rate differential (additional % of firm growth) ^[2]	0.6	0.7	N/A	0.9	N/A

Notes: [1] Profitability is defined as ROA lagged by one year, sample is cut at the 33rd and 67th percentiles

- **Quality channel:** If our initial hypothesis is correct, rules-based resolution will increase incentives for better credit allocation decisions, i.e. **banks will prefer high quality customers** rather than gambling with lending decisions for high volatility → High quality firms benefit more
- **Test using sample cuts¹:** higher quality (e.g. profitability) firms receive particularly strong growth push, no/negative effect for low quality firms → **Quality of lending channel is reestablished**

¹ One could also run models with triple interactions (similar results), but sample cut results are displayed for ease of presentation and interpretation

Extensions – Nice effect, but can we get a bit more of a ‘smoking gun’? What is the channel of transmission for the catharsis effect? (2/2)

Model	(1)	(2)	(3)
Dependent variable	Δ debt/assets	Δ debt/assets	Δ debt/assets
Catharsis indicator	0.00454 (0.00433)	-0.122*** (0.0138)	
Catharsis indicator x bank dependence		0.651*** (0.0709)	0.710*** (0.0840)
Firm-level controls	YES	YES	YES
Country-level controls	YES	YES	YES
Constant	YES	YES	YES
Firm FE	YES	YES	YES
Year FE	YES	YES	NO
Country-Year FE	NO	NO	YES
Observations	957,432	957,367	957,367
R-squared	0.041	0.042	0.312

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

- **Quantity channel:** If our initial hypothesis is correct, rules-based resolution and the resulting realignment of incentives in credit allocation would not lead to more bank invest overall, but we could expect a **reallocation of credit to firms that need credit most**, i.e. are willing to pay optimal risk-adjusted rates

→ **Firms that need credit (not all firms!) are able to expand their debt ratio¹**

¹ Note that we use the change in debt to non-equity-liabilities ratio to make sure that results are not driven by a loss in equity

Extensions – Where is a positive capital closure rule most successful?

Model	(1)	(2)	(3)
Dependent variable	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$
	Panel A	Panel B: Split sample	
	Full sample	High access to international finance ^[1]	Low access to international finance ^[1]
Catharsis indicator x bank dependence	0.530*** (0.163)	1.253*** (0.388)	0.0305 (0.246)
Firm-level controls	YES	YES	YES
Country-level controls	YES	YES	YES
Constant	YES	YES	YES
Country-Year FE	YES	YES	YES
Firm FE	YES	YES	YES
Observations	1,252,126	337,343	503,041
R-squared	0.432	0.530	0.530
Growth rate differential (additional % of firm growth) ^[2]	0.6	1.5	N/A

Notes: [1] Access to alternative funding/international finance is defined as (loans from non-resident banks + international debt issues)/GDP, sample is cut at the 33rd and 67th percentiles [2] The growth rate differential presents a measure (in %

- A priori, **direction of catharsis effect not necessarily positive**
 - **Counterargument:** Positive effect outweighed by **negative effects/costs of bank insolvencies**
 - Avoid myopic policy recommendations, test under which economic conditions catharsis works
 - One such condition: **Openness to foreign competitors and credit supply** to avoid credit crunch
- **High access to alternative funding** sources is catalytic: the **negative effects of closures** (potential of credit supply shock) **are milder, the positive catharsis effect more pronounced**

Robustness tests try to overcome potential concerns with our results

Potential concern	Robustness test
Results driven by particular countries or outliers	<ul style="list-style-type: none"> Exclude largest economies (all together and each at once) Exclude all countries with <10,000 observations Employ sample that is not censored in dependent variable Censor explanatory variable (1/99)
Results driven by definition or cutoff of catharsis indicator	<ul style="list-style-type: none"> Use catharsis indicator computed around alternative cutoffs (e.g. 7% and 9%) for tests Use yearly averages in capital and assets for computing the catharsis indicator Use tier 1 capital ratio (also with varying cutoffs) Exclude M&A banks from the definition of resolved banks
Results driven by definition of bank dependence	<ul style="list-style-type: none"> Use alternative bank dependence index, calculated using US SIC sector classification with less subsectors ('rough cut') than NACE-4 (in reference model)
Results driven by other model specifications	<ul style="list-style-type: none"> Run models including/excluding controls and fixed effects, run random effects Use alternative control variable definitions

All results are comparable in economic and statistical significance

Robustness (1/2): Restricted/lifted samples

Model	(1)	(2)	(3)	(4)	(5)
Robustness test	Reference case	Excluding top 3 countries	Excluding countries with few observations	No cleaning in dep. variable	Cleaning (1/99) in expl. variable
Dependent variable	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$
Catharsis indicator x bank dependence	0.530*** (0.163)	0.527*** (0.175)	0.554*** (0.163)	0.761** (0.356)	0.590*** (0.219)
Firm-level controls	YES	YES	YES	YES	YES
Country-level controls	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Observations	1,252,126	890,227	1,221,023	1,272,329	854,737
R-squared	0.432	0.433	0.429	0.348	0.477
Growth rate differential (additional % of firm growth) ^[1]	0.6	0.6	0.7	0.9	0.7

Notes: [1] The growth rate differential presents a measure (in % growth) of the difference in the growth rate between a firm located half a standard deviation above the mean of financial dependence as compared to a firm with a financial dependence measure half a standard deviation below the mean, if located in a country half a standard deviation above the mean of the bank catharsis indicator rather than in a country half a standard deviation below the mean

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Robustness (2/2): Alternative variable definitions

Model	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Robustness test	Reference case	Alternative cutoff (7%)	Alternative cutoff (9%)	Resolution w/o M&A	Average capital ratio (8%)	Tier 1 ratio (8%)	SIC-level bank dependence
Dependent variable	$\Delta \ln(\text{OpRev})$						
Catharsis indicator x bank dependence	0.530*** (0.163)	0.344*** (0.128)	0.621*** (0.173)	0.595*** (0.171)	0.272** (0.130)	0.332*** (0.0668)	0.373** (0.171)
Firm-level controls	YES						
Country-level controls	YES						
Constant	YES						
Country-Year FE	YES						
Firm FE	YES						
Observations	1,252,126	1,252,126	1,252,126	1,252,126	812,358	1,183,467	1,272,625
R-squared	0.432	0.432	0.432	0.432	0.476	0.436	0.412
Growth rate differential (additional % of firm growth) ^[1]	0.6	0.5	0.7	0.7	0.5	1.1	0.4

Notes: [1] The growth rate differential presents a measure (in % growth) of the difference in the growth rate between a firm located half a standard deviation above the mean of financial dependence as compared to a firm with a financial dependence measure half a standard deviation below the mean, if located in a country half a standard deviation above the mean of the bank catharsis indicator rather than in a country half a standard deviation below the mean

Robust clustered standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

Summary and potential policy implications

Catharsis in the financial sector?! ?	YES!	<ul style="list-style-type: none">▪ We find a significant effect of bank catharsis on firm performance: Firms grow stronger under a more rules-based resolution regime for failed banks
Is that causal, not endogeneity? ?	YES!	<ul style="list-style-type: none">▪ Trying to overcome endogeneity concerns by using IV and interaction with bank dependence▪ Robustness checks for alternative samples / variables
How does this work? ?	QUALITY & QUANTITY	<ul style="list-style-type: none">▪ Quality: Improved credit allocation (to high quality firms) instead of gambling▪ Quantity: Reallocation of credit to firms that need it
Any conditions or limitations? ?	YES!	<ul style="list-style-type: none">▪ High access to alternative funding sources ensures milder negative effects of credit crunch (and vice versa!)▪ Closure rule is hypothetical, with 0-50% implementation

What are the policy Implications? ?	<ul style="list-style-type: none">▪ We need incentive compatible bank insolvency regulation to make catharsis work!▪ Careful about conditions and limitations of catharsis effect!
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BACKUP

Summary statistics

Variable group and name	Source	Mean	SD	Min	Max	N
<i>Dependent variables</i>						
Growth oper. revenue ($\Delta \ln(\text{OpRev})$)	AM	12.66	(46.50)	-174.11	321.2	1794189
Growth debt/asset ($\Delta \text{debt/assets}$)	AM	1.18	(17.88)	-95.75	71.59	1311729
<i>Explanatory variables</i>						
Catharsis indicator (7% CR)	BS	2.52	(6.49)	0	54.25	2188814
Catharsis indicator (8% CR)	BS	2.34	(5.25)	0	44.07	2192690
Catharsis indicator (9% CR)	BS	2.23	(4.76)	0	33.24	2196761
Catharsis indicator (8% CR, avg)	BS	2.90	(8.38)	0	63.81	1508650
Financial dependence (NACE-based)	AM	19.62	(7.03)	0.8	57.68	2195945
Financial dependence (SIC-based)	AM	19.56	(6.01)	0.8	51.52	2195941
<i>Industry- and firm-level variables</i>						
Lagged share of firm in country-year total assets	AM	0.01	(0.29)	0	100	1905364
Firm age (log)	AM	2.54	(0.98)	0	6.8	2163383
RoA (profits/assets)	AM	5.64	(11.7)	-43.75	59.07	1919068
Firm status	AM	0.94	(0.23)	0	1	2196075
<i>Country-level variables</i>						
Financial development	WB FS	109.05	(52.03)	13.24	269.76	1796423
Bank system undercapitalization	BS	72.63	(30.54)	0	98.74	2196075
Bank concentration CR3	WB FS	62.78	(24.23)	11.9	100	1882352
GNI per capita	WDI	19481	(10661)	419.34	54772	2190554
Political openness index	P4	9.12	(1.87)	-7	10	2179883
Bank insolvency law	WB BRS	0.44	(0.50)	0	1	878093
Bank insolvency power	WB BRS	0.99	(0.09)	0	1	1101317
International debt issues/GDP	WB FS	60.46	(40.39)	0.13	344.39	1880281
Loans from non-resident banks/GDP	WB FS	62.22	(84.88)	2.16	1509.92	1882619

Sources: Amadeus (Amadeus), Bankscope (BS), Kroszner et al., 2007 (KLK), Marshall and Cole, 2011 Polity4 database (P4), World Bank Bank Regulation and Supervision dataset (WB BRS), World Bank Financial Structure dataset (WB FS), World Development Indicators database (WDI)

Robustness (2/2): Alternative variable definitions

Model	(1)	(2)	(3)	(4)	(5)
Robustness test	Reference case	Alternative cutoff (7%)	Alternative cutoff (9%)	Catharsis indicator average	SIC-level bank dependence
Dependent variable	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$	$\Delta \ln(\text{OpRev})$
Catharsis indicator (8%) x bank dependence	0.530*** (0.163)				0.373** (0.171)
Catharsis indicator (7%) x bank dependence		0.344*** (0.128)			
Catharsis indicator (9%) x bank dependence			0.621*** (0.173)		
Catharsis indicator (8%, avg) x bank dependence				0.272** (0.130)	
Firm-level controls	YES	YES	YES	YES	YES
Country-level controls	YES	YES	YES	YES	YES
Constant	YES	YES	YES	YES	YES
Country-Year FE	YES	YES	YES	YES	YES
Firm FE	YES	YES	YES	YES	YES
Observations	1,252,126	1,252,126	1,252,126	812,358	1,272,625
R-squared	0.432	0.432	0.432	0.476	0.412
Growth rate differential (additional % of firm growth) ^[1]	0.6	0.5	0.7	0.5	0.4

Open issues and directions for further research

Open issues and limitations of findings

- There are **circumstances** where **catharsis effect might not work** (e.g. extremely closed banking system)
 - Hypothetical closure rule is in fact partly hypothetical: We only measured low levels of implementation (0%-50% and skewed), hence **inference should only be drawn for these levels** (which might be enough to discipline banks if random, while 100% might turn into negative effects)
- Careful with policy recommendations!

Directions for further research

- Explore further **policies and rules** of bank insolvency resolution
 - So far, tested simple positive capital closure rules, but **other/more complex (resolution) rules** can also be tested if data is available (e.g. **insolvency prediction** via hazard model), using flexibility of our identification approach
- Explore details of **transmissions channels** (e.g. using bank-level data to test for individual bank behaviour)
- Test further **conditions of effectiveness and moderating effects**

What is the core idea?



Bank insolvency resolution can be thought of as a **process of catharsis**: Resolving failed banks in a **rules-based and prompt way** increases **real economic performance**

- Counteracts existing **moral hazard**
- **Improves** functioning of the banking system, e.g. its **credit allocation**
- Prevents **regulatory forbearance**

Robustness tests try to overcome potential concerns with our results

Potential concern	Robustness test
Results driven by particular countries or outliers	<ul style="list-style-type: none"> ▪ Exclude largest economies (all together and each at once) ▪ Exclude all countries with <10,000 observations ▪ Employ sample that is not censored in dependent variable ▪ Censor explanatory variable (1/99)
Results driven by definition or cutoff of catharsis indicator	<ul style="list-style-type: none"> ▪ Use catharsis indicator computed around alternative cutoffs (e.g. 7% and 9%) for tests ▪ Use yearly averages in capital and assets for computing the catharsis indicator ▪ Use tier 1 capital ratio (also with varying cutoffs) ▪ Exclude M&A banks from the definition of resolved banks
Results driven by definition of bank dependence	<ul style="list-style-type: none"> ▪ Use alternative bank dependence index, calculated using US SIC sector classification with less subsectors ('rough cut') than NACE-4 (in reference model)
Results driven by other model specifications	<ul style="list-style-type: none"> ▪ Run models including/excluding controls and fixed effects, run random effects ▪ Use alternative control variable definitions



All results are comparable in economic and statistical significance