

Survival of the Biggest: Large Banks and Financial Crises

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This Paper

- We assemble a historical dataset covering the balance sheets of most commercial banks in 17 advanced economies over the period 1870-2016.
 - ▶ Over 11,000 unique banks, most newly transcribed from archival sources
- We investigate banking industry structure and bank-level dynamics before, during, and after financial crises, focusing on role of **“large banks” (top-5 by assets, by country)**.
 - ▶ Pre-crisis risk taking, crisis dynamics, deposit flows
 - ▶ Failure rates of different types of banks
 - ▶ Reorganization of the banking sector in the aftermath of crises
 - ▶ Role of government interventions in the above
- Broad research questions:
 - ① What types of banks tend to drive credit booms and crises? Which types of banks tend to survive?
 - ② Is the higher survival rate of large banks after crises: Due to more prudence of large banks? Natural advantages of large banks? Or to government interventions?

Findings

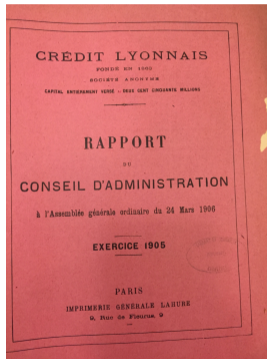
- ① “Survival of the Biggest”
 - ▶ Large banks (i.e., top-5 by assets) rarely exit or fail in crises
 - ▶ In fact, market share of large banks grows in crises, making them even more dominant after
- ② Large banks take more risks in the crisis run-up, perform worse *ex post*
 - ▶ Increased risk-taking along a number of dimensions during the credit boom
 - ▶ After crisis: larger bank stock declines, larger bank-level credit contractions
- ③ Reasons for large banks’ higher survival rates, despite their worse performance:
 - ▶ Regulators are substantially more likely to rescue top-5 banks on the verge of failure
 - ★ Can account for most of the differential survival rate of large banks
 - ▶ Large banks have a more stable funding structure in crises
 - ★ Deposit outflows less sensitive to large declines in stock returns
- ④ Large-bank-dominated systems are not more stable for the macroeconomy
 - ▶ Same crisis probability, but worse macroeconomic outcomes conditional on crisis

Data

- Historical dataset covering the balance sheets of commercial banks for 17 advanced economies since 1870
 - ▶ Countries: Australia, Belgium, Canada, Denmark ... U.K., U.S.
 - ▶ 11,600 unique banks, most newly transcribed from archival sources
- We also gather information on
 - ▶ All entries/exits in our database (New entries, M&As, spinoffs, failures)
 - ▶ Stock prices for the largest 20 banks around banking crises

Historical balance sheet examples

	NAME OF BANK NOM DE LA BANQUE.	Capital Authorized. Capital autorisé.	CAPITAL STOCK.		Amount of Rest or Reserve Fund. Montant du fonds de réserve.	Rate per cent of last Dividend Declared. Taux pour cent de dernier dividende déclaré.	Notes in Circulation. Billets en circulation.	Balance due Government, after deducting advances for Cipe-Lois, P.W.L., etc. Balances due au gouvernement fédéral, déduction faite des avances sur crédits accrus, bordereaux de paie, etc.
			Capital Subscribed. Capital souscrit.	Capital Paid Up. Capital versé.				
		\$	\$	\$	\$	\$	\$	
ONTARIO.								
1	Bank of Toronto..... Toronto.	2,000,000	2,000,000	2,000,000	1,000,000	10	1,258,802	88,298
2	Canadian Bank of Commerce..... do	5,000,000	5,000,000	5,000,000	1,250,000	7	5,565,391	837,607
3	Dominion Bank..... do	3,000,000	2,875,000	2,812,579	2,812,579	10	3,842,866	242,944
4	Ontario Bank..... do	1,500,000	1,385,500	1,345,268	300,000	5	1,329,678	150,321
5	Standard Bank of Canada..... do	2,000,000	1,900,000	1,900,000	700,000	10	372,464	30,236
6	Imperial Bank of Canada..... do	2,500,000	2,500,000	2,497,702	1,251,573	9	2,079,058	87,395
7	Traders' Co..... do	1,500,000	1,250,000	1,271,140	550,000	6	1,242,250	10,000
8	Bank of Hamilton..... Hamilton.	2,000,000	1,981,000	1,973,200	1,375,748	9	1,841,203	16,725
9	Bank of Ottawa..... Ottawa.	2,000,000	1,981,000	1,981,000	1,356,325	9	1,812,288	21,007
10	Western Bank of Canada..... Ottawa.	1,000,000	500,000	499,729	268,000	7	37,814	1,000
	Total, Ontario.....	23,500,000	21,799,000	20,876,818	11,306,478		13,274,298	886,275
QUEBEC.								
11	Bank of Montreal..... Montreal.	12,000,000	12,000,000	12,000,000	7,000,000	10	8,077,287	2,000,075
12	Bank of British North America..... do	4,000,000	4,000,000	4,000,000	1,500,000	6	2,307,315	14,095
13	Provincial Bank of Canada..... do	1,000,000	973,377	713,157	Nil	Nil	611,874	38,126
14	Banque d'Herchberg..... do	1,000,000	1,000,000	1,000,000	500,000	7	1,305,983	20,140
15	Mutuelle Bank..... do	2,500,000	2,500,000	2,500,000	2,050,000	8	2,316,262	37,738
16	Merchant Bank of Canada..... do	5,000,000	5,000,000	5,000,000	2,500,000	7	4,114,779	81,227
17	Banque Nationale..... Quebec.	1,000,000	1,000,000	1,000,000	800,000	6	1,111,311	37,689
18	Cherrier Bank..... do	5,000,000	2,500,000	2,500,000	2,500,000	9	1,911,009	28,110
19	Union Bank of Canada..... do	2,000,000	2,000,000	2,000,000	500,000	6	1,809,018	5,930
20	Banque de St. Jean..... St. Jean.	1,000,000	500,000	500,000	500,000	6	511,445	60,000
21	Banque de St. Hyacinthe..... St. Hyacinthe.	1,000,000	711,000	371,397	71,000	9	730,275	1,000
22	Eastern Townships Bank..... Sherbrooke.	500,000	1,711,000	1,613,070	500,000	7	3,330,000	4,000
	Total, Quebec.....	36,500,000	30,077,753	28,543,047	18,300,000		21,085,275	2,410,968
	Total, Ontario and Quebec.....	60,000,000	51,876,753	49,419,864	29,606,478		34,359,573	4,297,243
	Total, Ontario and Quebec.....	60,000,000	51,876,753	49,419,864	29,606,478		34,359,573	4,297,243
NOVA SCOTIA.								
23	Bank of Nova Scotia..... Halifax.	2,000,000	1,800,000	1,800,000	2,411,000	9	1,776,034	1,6815
24	Royal Bank of Canada..... do	3,000,000	3,000,000	3,000,000	1,200,000	7	1,813,113	137,886

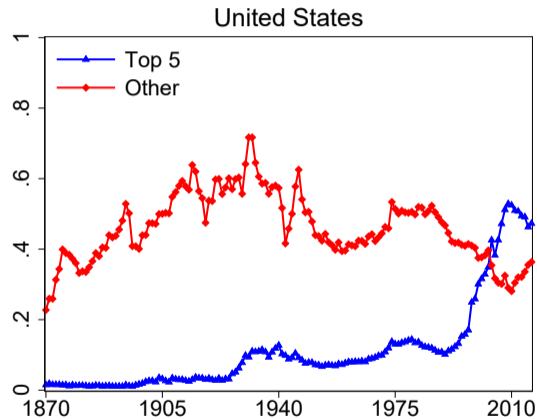
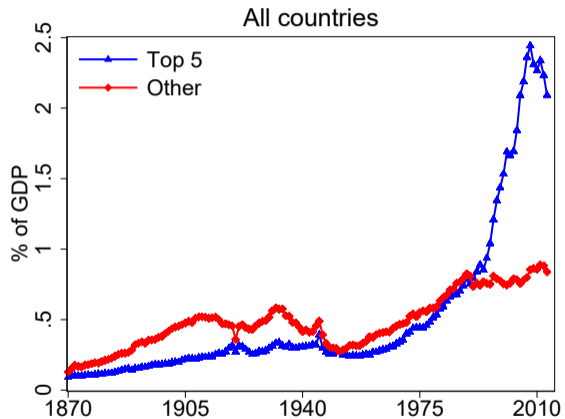


ACTIF	
Espèces en Caisse et dans les Banques..... Fr.	150,000,738 08
Portefeuille.....	1,001,930,407 26
Avances sur garanties et Reports.....	357,115,630 26
Comptes courants.....	368,448,897 50
Portefeuille-titres (Actions, Bons, Obligations et Restes).....	8,250,200 50
Comptes d'ordre et divers.....	1,342,278 84
Inventaires.....	35,000,000 *
Total.....	2,150,254,580 00

PASSIF	
Capital.....	1,000,000,000 00
Réserves.....	1,150,254,580 00
Provisions.....	0 00
Total.....	2,150,254,580 00

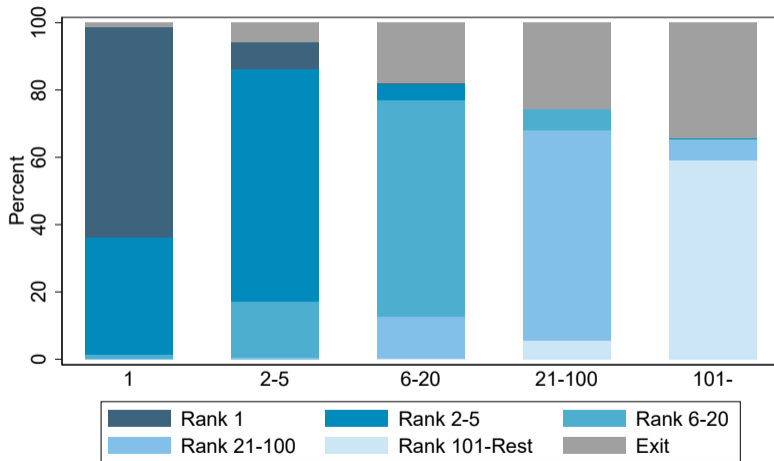
Historical trends

Bank assets-to-GDP of the top-5 banks versus all other banks



Large banks are highly persistent across history

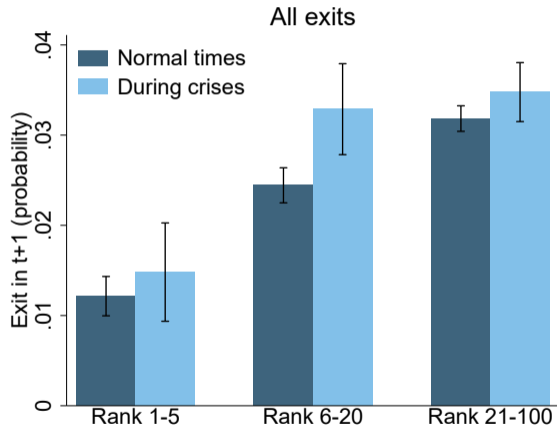
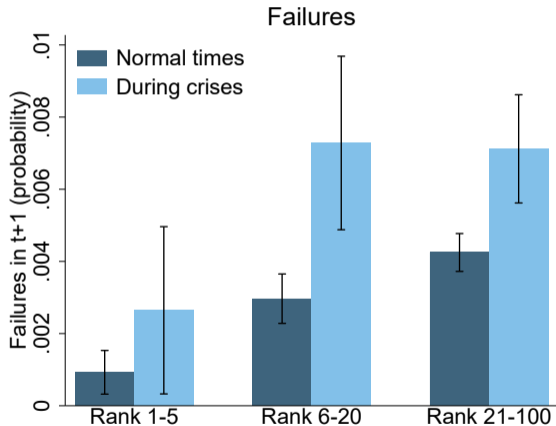
10-year transition probabilities



1. “Survival of the Biggest”

Top-5 banks rarely fail or exit during crises

Failures and exit rates by bank size



Increase in top-5 asset share around banking crises

- Top-5 asset share increases around crises due to M&As

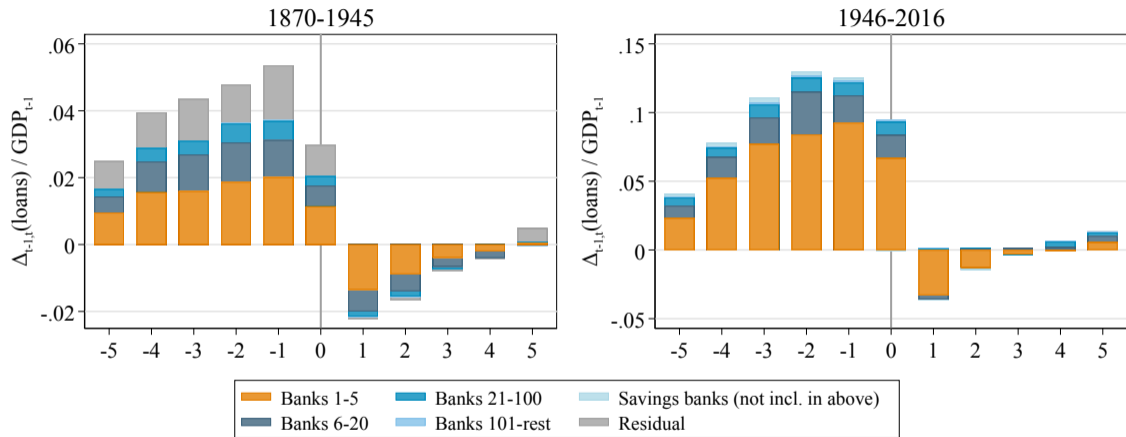


2. Top-5 banks are *not* more prudent around crises

Top-5 banks are *not* more prudent around crises

- 1 Take more risks in run-up to crises (*relative to other banks*)
 - ▶ Increase their loan growth at a faster rate
 - ▶ Decrease equity-to-assets ratio more
 - ▶ Increase noncore-liabilities-to-assets ratio more
 - ▶ Decrease “safe assets”-to-assets ratio more
- 2 Worse stock declines and credit contractions
- 3 This risk-taking differential magnified in large-bank-dominated systems (i.e., when asset share of top-5 banks $\geq 50\%$)

Top-5 banks' contribution to credit cycles around banking crises



Post-1945 period: Top-5 banks comprise **75%** of aggregate credit boom, **100%** of bust

Top-5 banks' contribution to credit cycles around banking crises

$$\Delta_{t,t+1}(\text{credit}/\text{GDP}) = \left[\underbrace{g^{\text{large}} \cdot \text{share}^{\text{large}}}_{\text{Large banks' contribution}} + \underbrace{g^{\text{small}} \cdot (1 - \text{share}^{\text{large}})}_{\text{Small banks' contribution}} \right] \times (\text{credit}/\text{GDP})_t$$

Two reasons large banks' contribution to the aggregate boom can be large:

- $\text{share}^{\text{large}}$ can be big
- $g^{\text{large}} > g^{\text{small}}$

Credit growth in the run-up to banking crises

	Organic loan growth (t = -4 to -1) ×100%		Acquisition loan growth (t = -4 to -1) ×100%		Organic plus Acquisition (t = -4 to -1) ×100%		Raw loan growth (t = -4 to -1) ×100%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Large	0.28 (0.53)		2.53*** (0.45)		2.81*** (0.69)		0.98* (0.54)	
Large × LBDom		1.39** (0.60)		3.24*** (0.50)		4.63*** (0.78)		2.27*** (0.61)
Large × NonLBDom		-3.64*** (1.12)		-0.00 (0.95)		-3.65** (1.48)		-3.59*** (1.16)
Constant	7.90*** (0.09)	7.90*** (0.09)	0.22*** (0.07)	0.22*** (0.07)	8.11*** (0.11)	8.11*** (0.11)	7.82*** (0.09)	7.82*** (0.09)
Difference		5.03*** (1.27)		3.24*** (1.08)		8.28*** (1.67)		5.86*** (1.31)
Episode FEs	✓	✓	✓	✓	✓	✓	✓	✓
R ²	0.23	0.23	0.01	0.01	0.15	0.15	0.21	0.22
Observations	15838	15838	15838	15838	15838	15838	15838	15838

Equity-to-assets, noncore liabilities-to-assets, safe assets-to-assets

In the run-up to banking crises

	Change (Equity/assets)		Level (Equity/assets)		Change (Noncore/assets)		Level (Noncore/assets)	
	(t = -4 to -1) ×100%		(t = -4 to -1) ×100%		(t = -4 to -1) ×100%		(t = -4 to -1) ×100%	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Large	-0.19*** (0.04)		-3.06*** (0.24)		1.02*** (0.15)		12.88*** (0.92)	
Large x LBDom		-0.22*** (0.04)		-3.70*** (0.27)		1.22*** (0.17)		17.98*** (1.05)
Large x NonLBDom		-0.05 (0.09)		-0.78 (0.51)		0.31 (0.33)		-3.57* (1.88)
Constant	0.10*** (0.01)	0.10*** (0.01)	9.23*** (0.04)	9.23*** (0.04)	0.21*** (0.03)	0.21*** (0.03)	21.61*** (0.15)	21.62*** (0.15)
Difference		-0.17* (0.10)		-2.92*** (0.58)		0.91** (0.37)		21.54*** (2.15)
Episode FEs	✓	✓	✓	✓	✓	✓	✓	✓
R ²	0.05	0.05	0.29	0.29	0.07	0.07	0.21	0.22
Observations	14429	14429	15840	15840	13001	13001	14360	14360

Continued

	Change (Safe assets/assets)		Level (Safe assets/assets)	
	(t = -4 to -1) × 100%		(t = -4 to -1) × 100%	
	(1)	(2)	(3)	(4)
Large	0.19 (0.18)		-2.22*** (0.71)	
Large x LBDom		0.04 (0.20)		-2.24*** (0.79)
Large x NonLBDom		0.94** (0.45)		-2.13 (1.65)
Constant	-0.32*** (0.03)	-0.32*** (0.03)	15.89*** (0.11)	15.89*** (0.11)
Difference		-0.90* (0.49)		-0.10 (1.82)
Episode FEs	✓	✓	✓	✓
R ²	0.05	0.05	0.18	0.18
Observations	13522	13522	14895	14895

Large banks perform worse during the crisis... but fail less often

	Bank stock total return (t = 0 to 3) × 100%		Credit contraction (t = 0 to 3) × 100%		Failure rate (t = 0 to 3) × 100%	
	(1)	(2)	(3)	(4)	(5)	(6)
Large	-3.67*		-2.68***		-2.00*	
	(2.10)		(0.76)		(1.05)	
Large × LBDom		-7.74**		-2.91***		-2.29*
		(3.01)		(0.88)		(1.21)
Large × NonLBDom		0.14		-1.98		-1.12
		(2.91)		(1.53)		(2.09)
Constant	-19.19***	-19.01***	0.65***	0.65***	3.43***	3.43***
	(1.28)	(1.28)	(0.12)	(0.12)	(0.17)	(0.17)
Difference		-7.88*		-0.92		-1.17
		(4.19)		(1.76)		(2.42)
Episode FEs	✓	✓	✓	✓	✓	✓
R ²	0.61	0.61	0.04	0.04	0.02	0.02
Observations	954	954	11561	11561	11561	11561

3. Funding dynamics and government interventions during banking crises

Funding dynamics and government interventions during banking crises

- 1 Large banks more stable funding:
 - ▶ Deposit outflows less sensitive to large declines in their bank stock
 - ▶ Methodology of Calomiris and Wilson (2004), Blickle, Brunnermeier, and Luck (2022)
- 2 Regulators substantially more likely to rescue top-5 banks on the verge of failure

Deposit sensitivity to bank stock declines

	Deposit growth _{0,3} (1)	Interbank liab. growth _{0,3} (2)	Cash hold. growth _{0,3} (3)	Failure prob. _{0,3} (4)
Return _{-30%, -60%} × Large	0.03 (3.85)	1.00 (3.48)	0.56 (4.29)	-1.40 (2.83)
× Small	-6.60* (3.87)	-6.23* (3.52)	-11.13*** (4.16)	2.18 (2.36)
Return _{-60%, -90%} × Large	-8.31** (3.81)	-5.32 (3.32)	-8.72** (4.24)	3.55 (2.80)
× Small	-16.61*** (3.84)	-15.11*** (3.46)	-17.71*** (4.07)	3.85 (2.40)
Return _{-90%, -100%} × Large	-12.61** (5.14)	-7.44 (4.56)	-11.80** (5.73)	1.69 (3.85)
× Small	-23.99*** (4.20)	-21.69*** (3.70)	-23.74*** (4.46)	8.13*** (2.78)
Small	-9.58** (4.42)	-10.49** (4.22)	-10.15** (4.81)	3.02 (2.99)
Constant	8.97*** (3.17)	7.85*** (2.97)	9.58*** (3.30)	-2.75 (1.72)
Difference (Large minus Small):				
Return _{-30%, -60%}	-6.63 (5.58)	-7.23 (5.19)	-11.69* (6.13)	3.58 (3.80)
Return _{-60%, -90%}	-8.30 (5.08)	-9.78** (4.64)	-9.00 (5.56)	0.31 (3.58)
Return _{-90%, -100%}	-11.38* (6.26)	-14.24** (5.71)	-11.94* (6.85)	6.44 (4.44)
Episode FEs	✓	✓	✓	✓
R ²	0.35	0.38	0.30	0.08
# Banks	222	214	224	270

Government interventions: rescuing banks on the verge of failure

- “Verge of Failure” defined as: bank equity decline \leq -90% from peak
- Example of banks on verge of failure, USA 2008:
 - ▶ Citigroup (Rank #1)
 - ★ Nov. 2008: Received a Systemic Risk Exception, \$300 billion in troubled asset guarantees, \$20 billion equity injection (in addition to \$30B already from TARP).
 - ★ TARP Inspector General: “The essential purpose of the deal, as Paulson and Geithner later confirmed... was to assure the world that the Government was not going to let Citigroup fail.”
 - ▶ Washington Mutual (Rank #6)
 - ★ FDIC receivership on Sept 25, 2008, sold to JPMorgan Chase for a price of \$1.9 billion plus most debt assumptions. However, unsecured senior debt obligations of the bank not assumed.

Government interventions: rescuing banks on the verge of failure

- Another example, Netherlands 1921:
 - ▶ Rotterdamsche Bankvereniging (Rank #2):
 - ★ 35 million guilder special emergency overdraft facility from central bank, 25 million equity injection and asset purchases, state guarantee of 60 million in liabilities
 - ★ “The Minister [Colijn] declared that it was in the interest of the nation to avoid a catastrophe, and that he was therefore willing to support the [bank] with a substantial sum.”
 - ▶ Marx & Co's Bank (Rank #9)
 - ★ 27 million guilders in liquidity support, so that the bank could be liquidated without a formal bankruptcy.

Government interventions: rescuing banks on the verge of failure

Frequency, conditional on bank equity returns $\leq -90\%$

	Top-5 banks (N=88, freq=13%) (1)	Top 6-20 banks (N=174, freq=11%) (2)	Difference (3)
Bank did not fail or exit	78%	26%	52%***
Saved by regulators from failing	64%	13%	51%***
All creditors protected from losses	90%	59%	31%***

If (hypothetically) regulators never did any of these interventions, then survival rates between large vs. small would be similar:

- $(78\% - 64\%) = 14\%$ vs. $(26\% - 13\%) = 13\%$

Intervention analysis

	Failure		Government rescue		No creditor losses	
	(1)	(2)	(3)	(4)	(5)	(6)
Top-5	-0.48*** (0.07)	-0.47*** (0.09)	0.32*** (0.08)	0.25* (0.13)	0.22*** (0.06)	0.20** (0.09)
Crisis FEs		✓		✓		✓
Observations	218	218	174	174	190	190

4. Large-bank-dominated systems:

Same crisis probability, but worse macroeconomic outcomes

Banking sector structure and financial stability

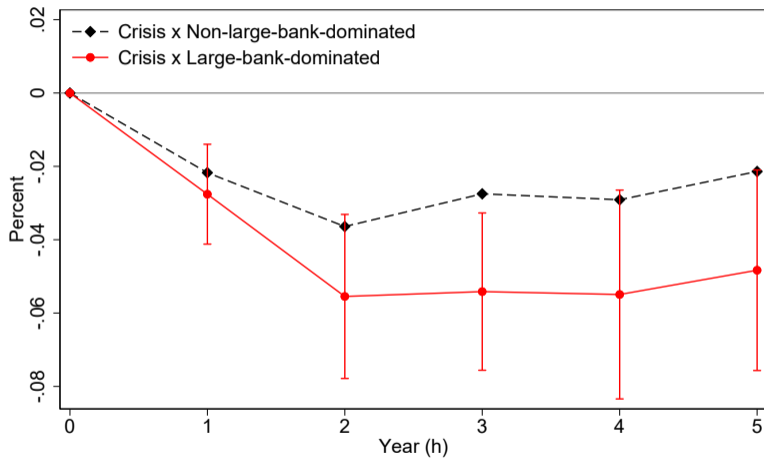
In large-bank-dominated (LBD) financial systems:

- ① No evidence that crises are less frequent (null result)
- ② Conditional on experiencing a crisis, GDP declines and credit contractions are deeper

Crises are not less frequent

	BSZ crisis					JST crisis				
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)
Top 5 asset share _{t-1}	-0.01 (0.01)	-0.00 (0.02)	-0.02 (0.03)	-0.03 (0.03)	0.20 (0.14)	-0.02 (0.01)	-0.00 (0.02)	0.01 (0.03)	0.02 (0.04)	0.05 (0.07)
$\Delta_{t-6,t-1}$ Loans/GDP _{t-1}				0.15** (0.05)	0.24*** (0.08)				0.16*** (0.04)	0.21*** (0.06)
Country fixed effect		✓	✓	✓	✓		✓	✓	✓	✓
Decade fixed effect			✓	✓	✓			✓	✓	✓
Post 1980					✓					✓
Observations	2177	2177	2177	1976	596	2177	2177	2177	1976	596

Conditional on crises, GDP declines are deeper



Conditional on crises, GDP declines are deeper

	Year 1	Year 2	Year 3	Year 4	Year 5
$\text{Crisis}_t \times \text{Large-bank-dominated}_{t-1}$	-0.03*** (0.01)	-0.06*** (0.01)	-0.05*** (0.01)	-0.05*** (0.01)	-0.05*** (0.01)
$\text{Crisis}_t \times \text{Non-large-bank-dominated}_{t-1}$	-0.02*** (0.01)	-0.04*** (0.01)	-0.03* (0.02)	-0.03 (0.02)	-0.02 (0.02)
Difference	-0.01 (0.01)	-0.02 (0.01)	-0.03** (0.01)	-0.03 (0.02)	-0.03* (0.02)
R^2	0.143	0.165	0.162	0.184	0.188
Country fixed effects	✓	✓	✓	✓	✓
Control variables	✓	✓	✓	✓	✓
Observations	1956	1935	1915	1897	1878

Robustness

	Dependent variable: GDP growth, t to t+3					
	(1)	(2)	(3)	(4)	(5)	(6)
	Baseline BSZ Crises	No Controls BSZ Crises	Post 1990 BSZ Crises	Decade FE BSZ Crises	Full Sample JST Crises	Post 1990 JST Crises
$Crisis_t \times Large\text{-}bank\text{-}dominated_{t-1}$	-0.05*** (0.01)	-0.07*** (0.02)	-0.03*** (0.01)	-0.05*** (0.01)	-0.06*** (0.02)	-0.07*** (0.01)
$Crisis_t \times Non\text{-}large\text{-}bank\text{-}dominated_{t-1}$	-0.03* (0.02)	-0.03 (0.02)	0.01 (0.01)	-0.02 (0.02)	-0.04** (0.02)	-0.03* (0.02)
Difference	-0.03** (0.01)	-0.04*** (0.01)	-0.03* (0.02)	-0.02* (0.01)	-0.01 (0.02)	-0.04** (0.02)
R^2	0.162	0.017	0.277	0.241	0.163	0.350
Country fixed effects	✓		✓	✓	✓	✓
Control variables	✓		✓	✓	✓	✓
Observations	1915	2073	392	1915	1915	392

Conclusions

- 1 Banking crises tend to expand the dominance of the largest banks.
 - ▶ This is despite the fact that the largest banks tend to take more risk before crises and suffer greater equity losses in crises.
- 2 Government interventions in crises preventing top-5 failures play an important role.
- 3 Emergence of a financial sector dominated by a few large banks does not appear to be beneficial for financial stability.
 - ▶ No evidence that large-bank-dominated systems have lower crisis frequency. Conditional on crises, large-bank-dominated systems see more severe economic outcomes.

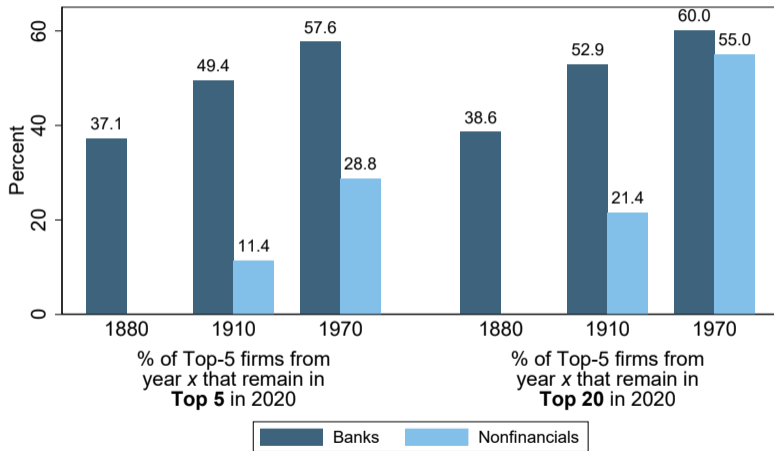
Appendix

Summary statistics

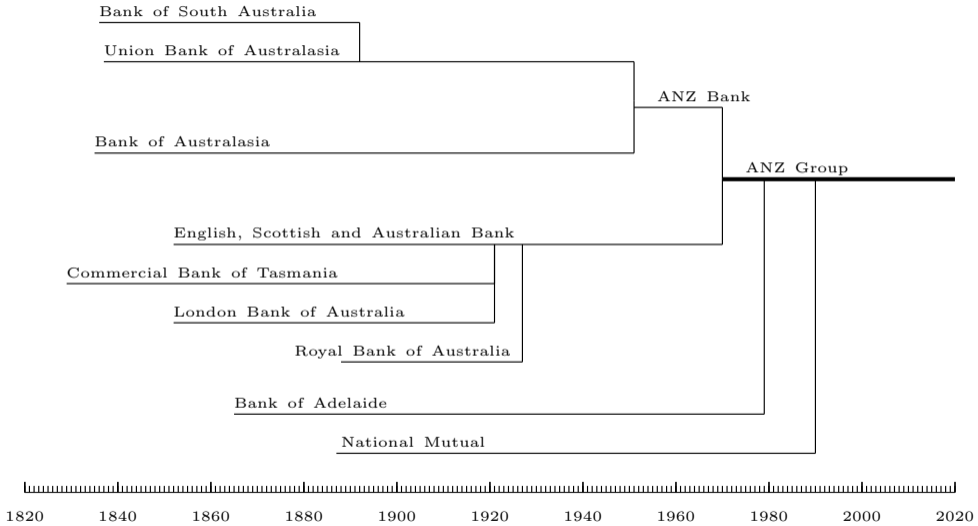
	Median	Mean	S.D.	Min	Max
Number of banks by country-year	39.00	92.46	176.19	1.00	1988.00
Top 5 asset share	0.44	0.47	0.24	0.02	0.99
Ratio of total assets to JRST (2021)	0.77	0.76	0.36	0.01	2.16
Number of observations by bank	41.00	48.34	33.41	1.00	147.00
Bank age	41.00	54.10	46.44	0.00	423.00
1-year asset growth	0.07	0.11	0.20	-0.33	1.13
1-year <i>M&A</i> adjusted asset growth	0.07	0.10	0.19	-0.34	1.10
1-year loan growth	0.08	0.13	0.30	-0.49	1.82

Asset growth and loan growth are winsorized at the 1 percent level.

Persistence of banks versus nonfinancials



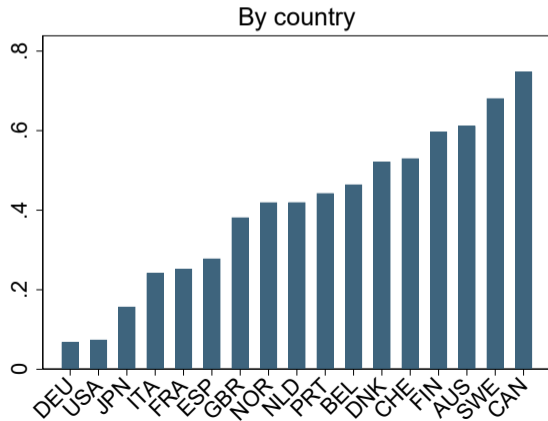
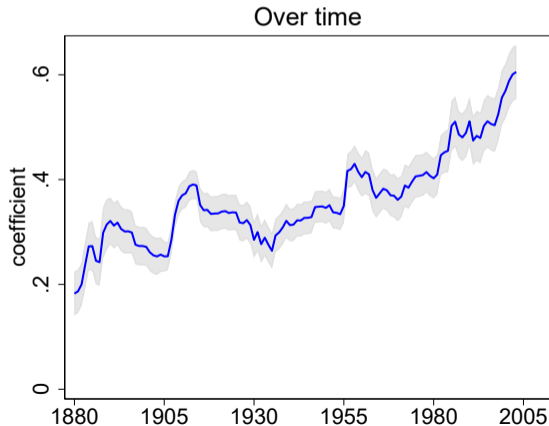
Schematic illustration of bank evolution [back](#)



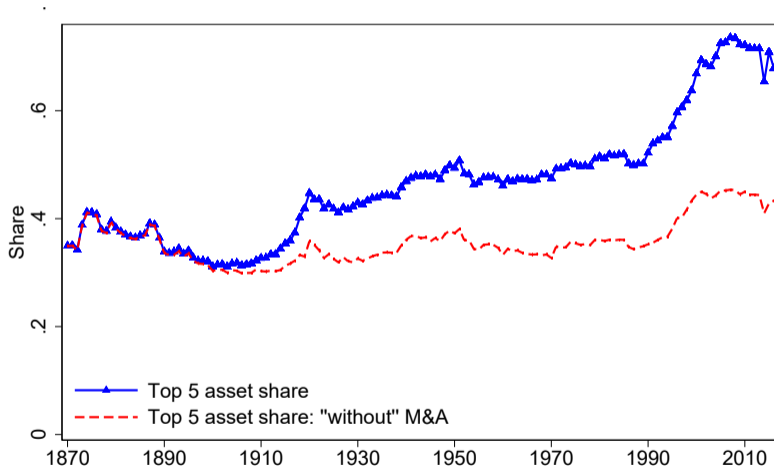
Top-5 banks' contribution to the credit cycle over time and by country

- Decompose aggregate asset growth by bank size using

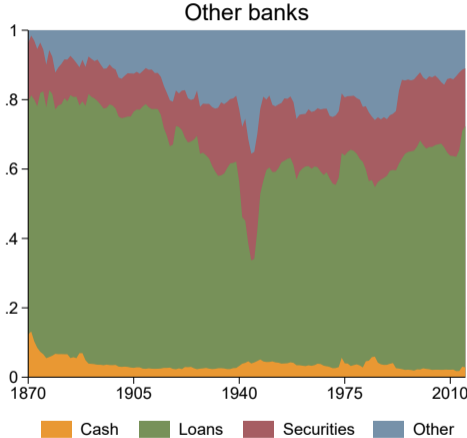
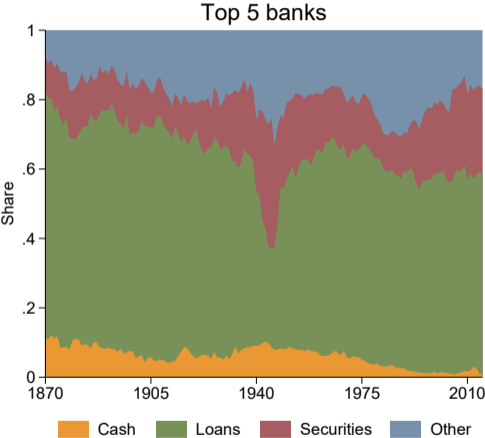
$$g^{aggregate} = \underbrace{g^{large} * MShare_{t-1}^{large}}_{\text{Top 5 growth contribution}} + g^{small} * MShare_{t-1}^{small}$$



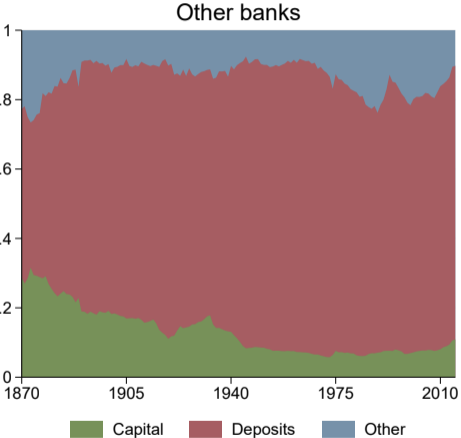
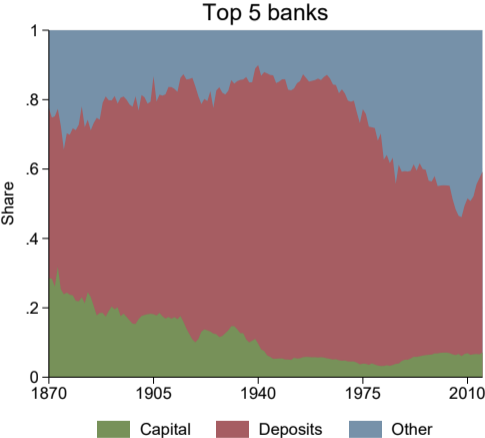
Increase in top-5 asset share attributable to M&A activity



Assets of the median top-5 and other banks



Liabilities of the median top-5 bank and other banks

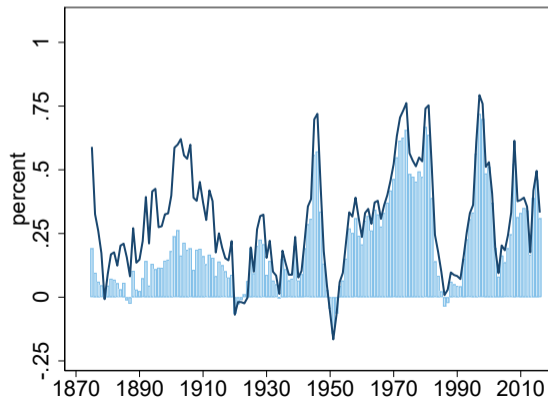


Top-5 banks' contribution to the credit cycle in Canada and the US

- Decompose aggregate asset growth by bank size using

$$g^{\text{aggregate}} = \underbrace{g^{\text{large}} * M\text{Share}_{t-1}^{\text{large}}}_{\text{Top 5 growth contribution}} + g^{\text{small}} * M\text{Share}_{t-1}^{\text{small}}$$

Canada



USA

