Bank Capital Redux: Solvency, Liquidity, and Crisis

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Basel III Minimum capital requirement

2. The Basel III framework introduced a simple, transparent, non-risk based leverage ratio to act as a credible supplementary measure to the risk-based capital requirements. The leverage ratio is intended to:

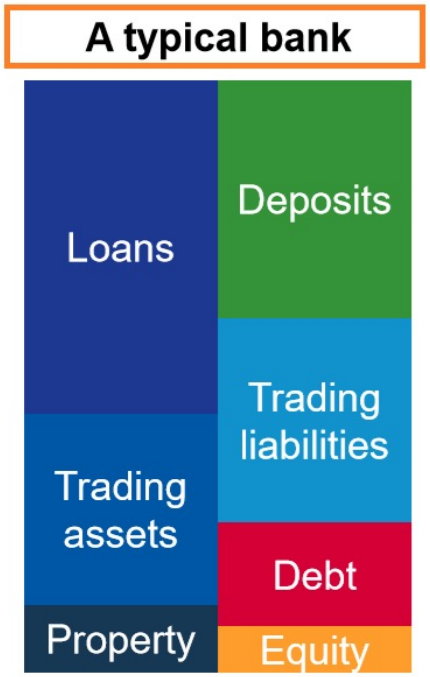
- restrict the build-up of leverage in the banking sector to avoid destabilising deleveraging processes that can damage the broader financial system and the economy; and
- reinforce the risk-based requirements with a simple, non-risk based "backstop" measure.

6. The Basel III leverage ratio is defined as the capital measure (the numerator) divided by the exposure measure (the denominator), with this ratio expressed as a percentage:

$$\text{Leverage ratio} = \frac{\text{Capital measure}}{\text{Exposure measure}}$$

7. The Committee will continue to test a minimum requirement of 3% for the leverage ratio during the parallel run period (ie from 1 January 2013 to 1 January 2017). Additional transitional arrangements are set out in paragraphs 59 to 61 below.

—— *Basel Committee on Banking Supervision*



Key findings

- Does higher bank capital reduce the risk of banking crisis? NO
- Does better capitalized banking system recover faster after crisis? YES

Data

TABLE 1
Coverage of the new bank liabilities dataset.

	Total	Capital	Deposits	Other (non-core)
Australia	1870–1945	1870–1945	1870–1945	1870–1945
	1950–2015	1951–2015	1950–2015	1951–2015
Belgium	1920–2015	1920–2015	1920–2015	1920–2015
Canada	1870–2015	1870–2015	1870–2015	1870–2015
Denmark	1870–2015	1870–2015	1870–2015	1870–2015
Finland	1873–2015	1873–2015	1873–2015	1873–2015
France	1890–2015	1890–2015	1946–2015	1946–2015
Germany	1870–1920	1870–1920	1870–1920	1870–1920
	1924–1940	1924–1940	1924–1940	1924–1940
	1950–2015	1950–2015	1950–2015	1950–2015
Great Britain	1880–2015	1880–2015	1880–2015	1946–2015
Italy	1870–2015	1870–2015	1870–2015	1870–2015
Japan	1893–2015	1893–2015	1893–2015	1893–2015
Netherlands	1900–2015	1900–2015	1900–2015	1900–2015
Norway	1870–2015	1870–2015	1870–2015	1870–2015
Portugal	1920–2015	1920–2015	1920–2015	1920–2015
Spain	1874–1935	1874–1935	1874–1935	1874–1935
	1942–2015	1942–2015	1942–2015	1942–2015
Sweden	1870–2015	1870–2015	1871–2015	1871–2015
Switzerland	1870–2015	1870–2015	1870–2015	1870–2015
United States	1870–2015	1870–2015	1870–2015	1870–2015

Data

TABLE 2
Snapshots of a banking system balance sheet: U.S. in 1929 and 2007.

(a) End of year 1929			
Cash/liquid	17 %	Deposits	79 %
Loans	56 %	Non-core	9 %
Securities	22 %		
Other	5 %	Capital	11 %
Total assets	100 %	Total liabilities and capital	100 %
(b) End of year 2007			
Cash/liquid	4 %	Deposits	65 %
Loans	59 %	Non-core	27 %
Securities	14 %		
Other	22 %	Capital	8 %
Total assets	100 %	Total liabilities and capital	100 %

Ratios

- $\text{LtD ratio} = \dfrac{\text{Loans}}{\text{Deposits}}$
- $\text{Capital ratio} = \dfrac{\text{Capital}}{\text{Total assets}}$
- $\text{Non}-\text{core ratio} = \dfrac{\text{Other liabilities}}{\text{Deposits} + \text{Other liabilities}}$

- Capital = paid-up capital + retained earnings + reserves

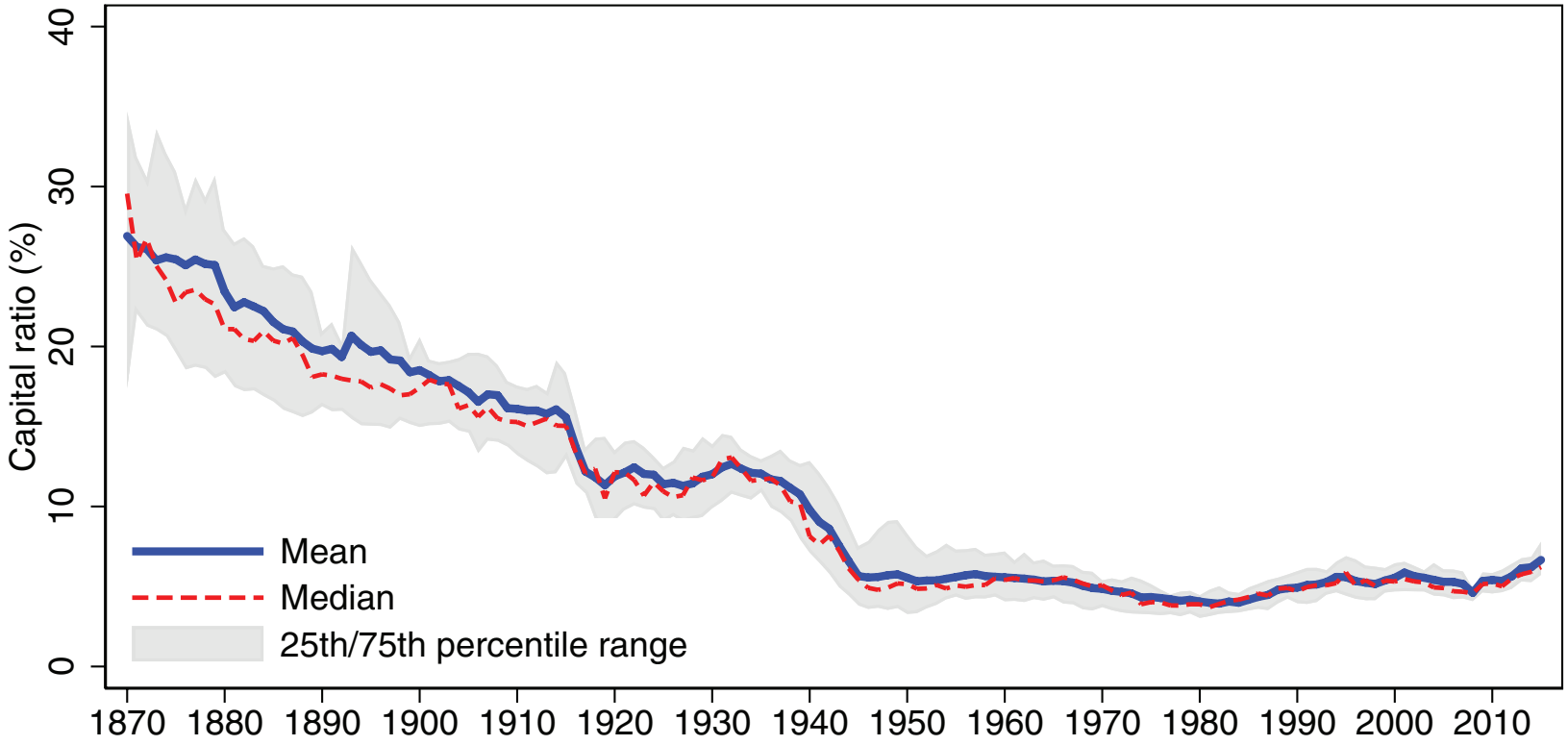


FIGURE 1

Capital ratio, averages by year for 17 countries, full sample.

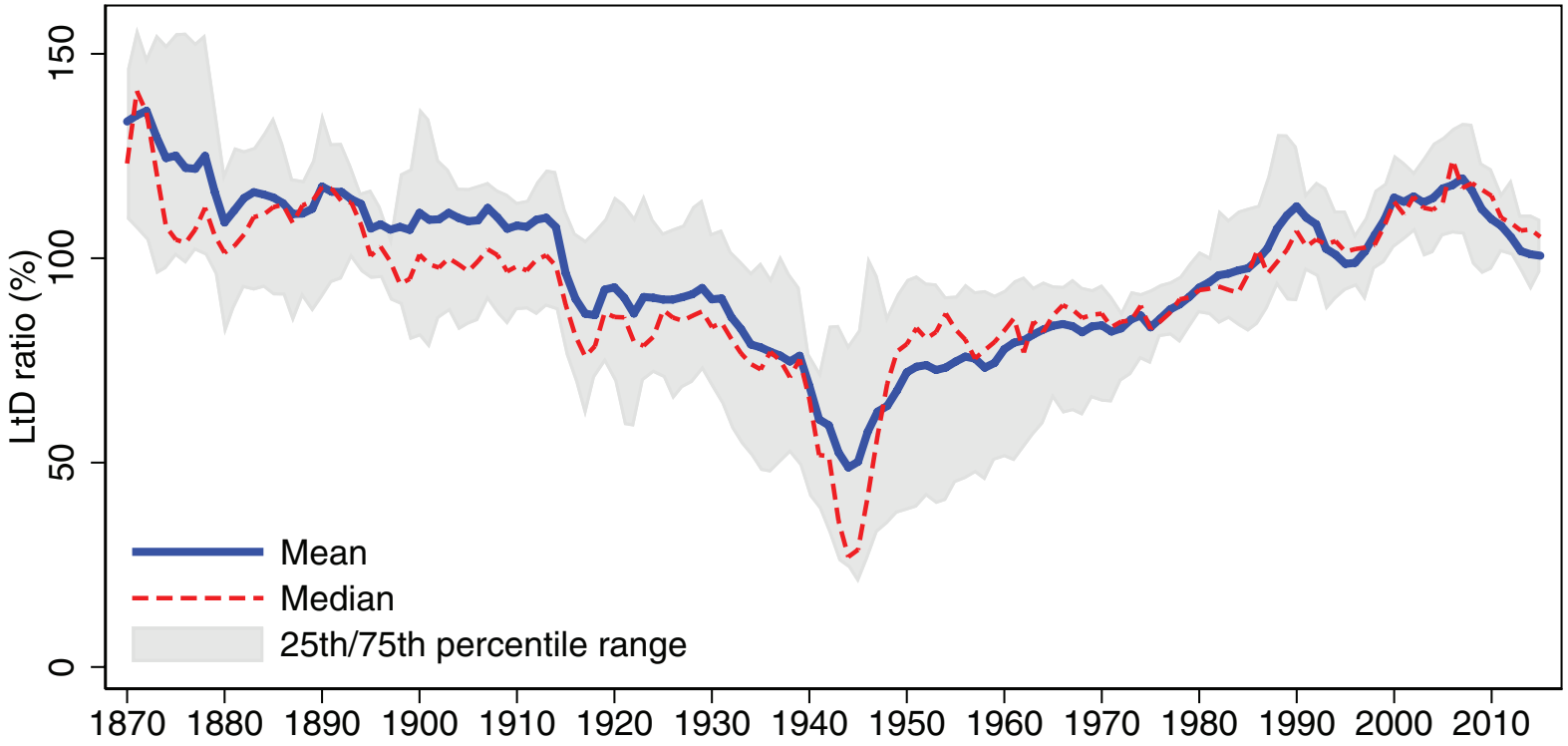


FIGURE 3

LtD ratio, averages by year for 17 countries, full sample.

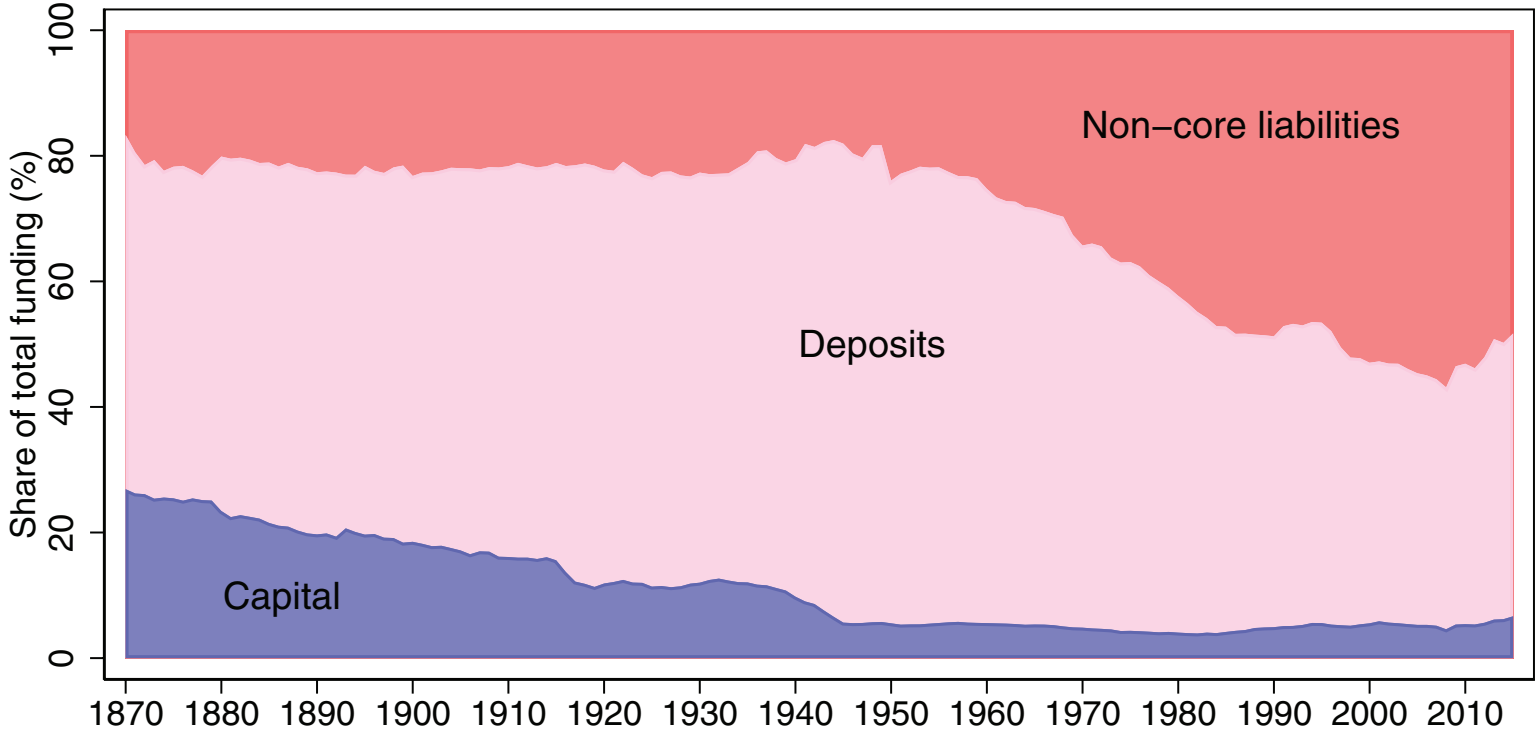


FIGURE 2

Composition of liabilities, averages by year for 17 countries, full sample.

Event study around crisis year

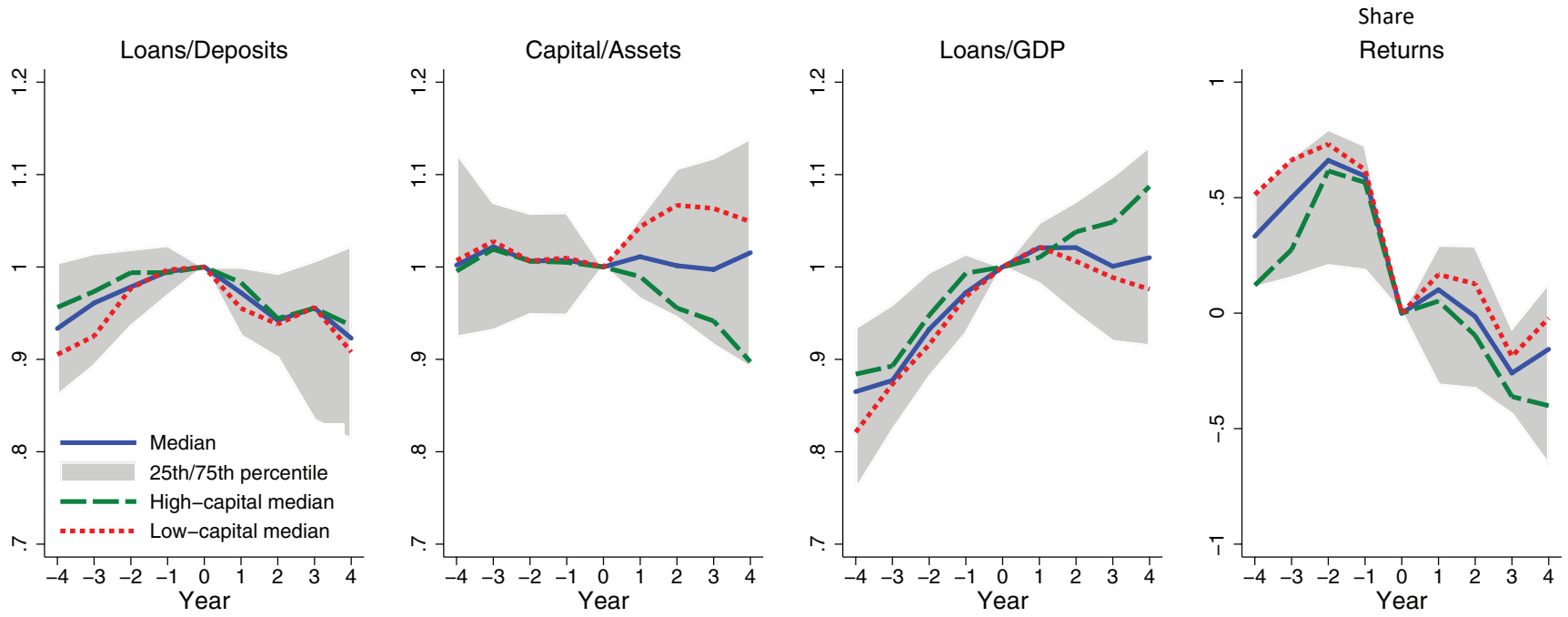


FIGURE 4

Event study of key variables centred on the crisis year.

Capital structure and crisis risk

- Probit model of crisis risk
- $\Pr(S_{it} = 1) = \Phi(\alpha_i + \boldsymbol{\beta X_{it}})$
- Benchmark:
  - 5-year average annual change in loans/GDP
- Additional predictors:
  - 1-year lagged capital ratio
  - 5-year average annual change in capital ratio

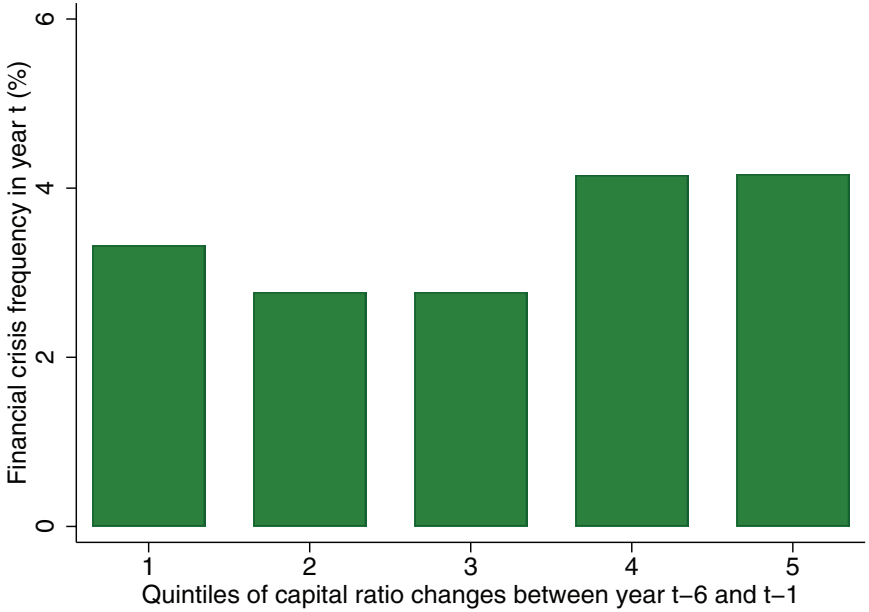


FIGURE 6

Capital ratio changes and crisis frequency.

TABLE 4
Multivariate probit models for systemic financial crises.

	(1) Full	(2) Post	(3) Full	(4) Post	(5) Full	(6) Post	(7) Full	(8) Post
Δ_5 Loans/GDP	0.82***	0.62***	0.81***	0.64***	0.57***	0.26***	0.80***	0.17*
	(0.11)	(0.07)	(0.10)	(0.07)	(0.12)	(0.09)	(0.12)	(0.10)
Capital ratio	0.17***	0.06						
	(0.03)	(0.23)						
Δ_5 Capital ratio			−0.04	1.29				
			(1.21)	(1.90)				
LtD ratio					0.04**	0.05***		
					(0.02)	(0.01)		
Non-core ratio							−0.00	0.09***
							(0.02)	(0.01)
AUC	0.75	0.74	0.72	0.75	0.72	0.80	0.71	0.84
	(0.03)	(0.05)	(0.03)	(0.05)	(0.03)	(0.04)	(0.03)	(0.03)
Observations	1735	1004	1721	998	1713	1004	1671	1004

TABLE 5

Multivariate probit models for systemic financial crises, controlling for asset risk.

	(1) Full	(2) Full	(3) Post	(4) Post	(5) Full	(6) Full	(7) Post	(8) Post
Δ_5 Loans/GDP	0.90***	0.63***	0.40***	0.26*	0.91***	0.63***	0.41***	0.27*
	(0.10)	(0.10)	(0.13)	(0.14)	(0.10)	(0.11)	(0.13)	(0.16)
Capital ratio	0.17***	0.16***	0.09	0.01				
	(0.04)	(0.05)	(0.18)	(0.19)				
Δ_5 Capital ratio					0.39	0.81	0.72	1.07
					(1.32)	(1.47)	(1.67)	(1.66)
Macrocontrols	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
Asset prices	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*	*No*	*Yes*
AUC	0.75	0.80	0.80	0.83	0.73	0.79	0.80	0.83
	(0.03)	(0.04)	(0.05)	(0.04)	(0.03)	(0.03)	(0.04)	(0.04)
Observations	1582	1277	988	887	1570	1274	984	884

Robustness checks

- Clustering
- Deposit insurance
- Market value of capital
- Heterogeneity within banking systems
- Booms split by level of capital
- Split samples by period
- Saturated model
- Further subsamples and crisis chronologies
- IV estimate: past return on assets

Bank capital and the severity of recessions

$$\Delta_h y_{i,t(p)} = \sum_{i=1}^{I-1} \alpha_{i,h} D_{i,t(p)} + \mu_h + \gamma_h^{HI} d_{i,t(p)} \times \delta_{i,t(p)} + \gamma_h^{LO} d_{i,t(p)} \times \left(1 - \delta_{i,t(p)}\right) + \boldsymbol{\Phi} \boldsymbol{X}_{\boldsymbol{i,t(p)}} + \epsilon_{i,t(p)}$$

- $t(p)$: calendar time period t where the business cycle peak p takes place
- $\alpha_{i,h} D_{i,t(p)}$: normalized fixed effect, $\sum_{i=1}^{I-1} \alpha_{i,h} D_{i,t(p)} = 0$
- $d_{i,t(p)}$: financial or normal crisis
- $\delta_{i,t(p)}$: capital ratio above or below average
- Average path of output h year after
  - Financial crisis with above average capitalized banks: $\mu_h + \gamma_h^{HI}$
  - Financial crisis with below average capitalized banks: $\mu_h + \gamma_h^{LO}$

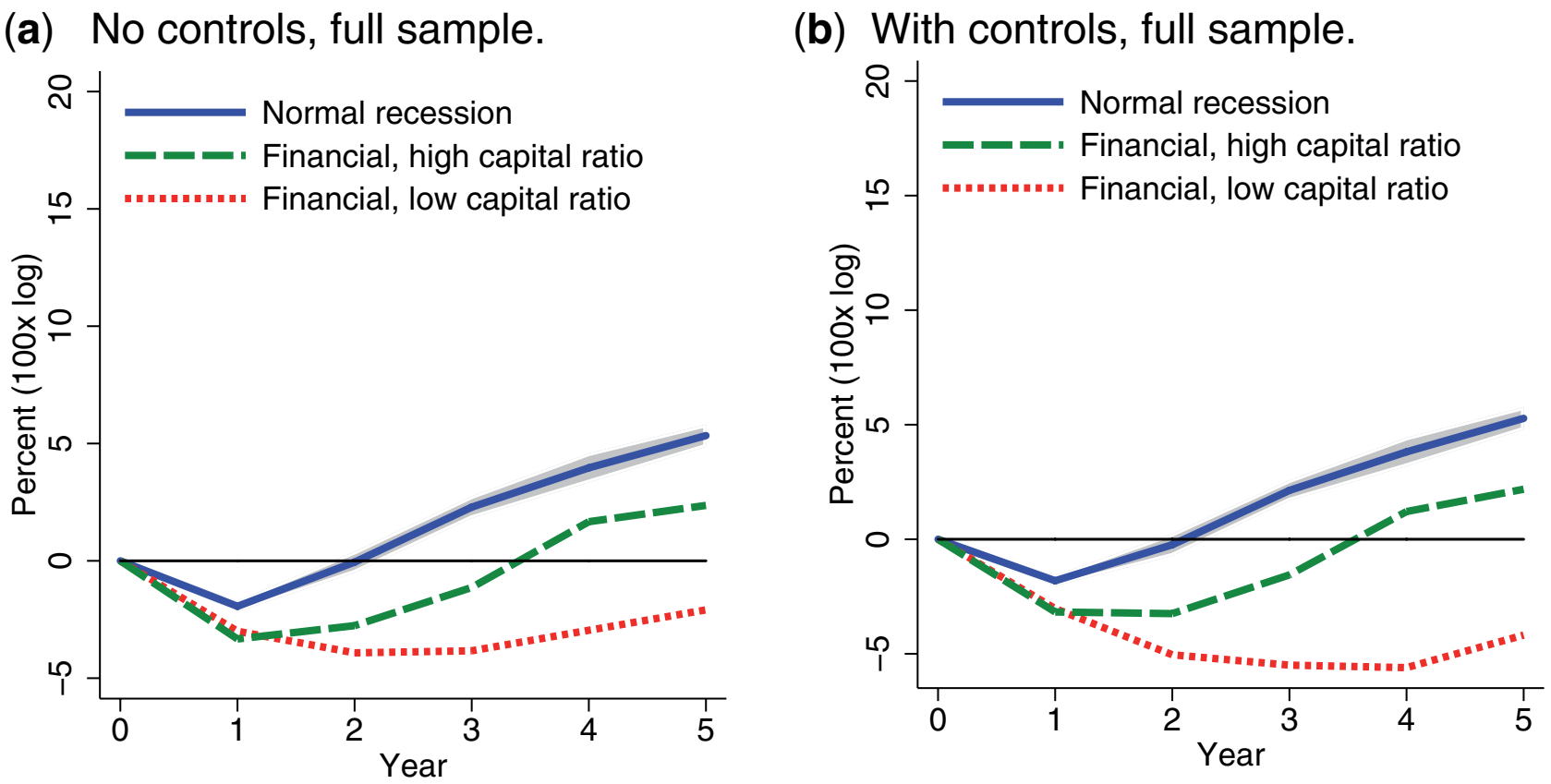


FIGURE 7

Normal versus financial recessions, real GDP per capita by capital ratio.

TABLE 7

Normal versus financial recessions, real GDP per capita by capital ratio, with controls, full sample.

Dependent variable: change in 100 × log real GDP per capita relative to Year 0

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5	(6) Sum
Recession	−1.81***	−0.24	2.13***	3.81***	5.28***	9.17***
	(0.14)	(0.29)	(0.27)	(0.38)	(0.30)	(1.21)
Financial recession,	−1.36	−3.01**	−3.69***	−2.60*	−3.09**	−13.75***
high capital ratio	(0.79)	(1.10)	(1.03)	(1.42)	(1.26)	(4.33)
Financial recession,	−1.22*	−4.80***	−7.63***	−9.42***	−9.46***	−32.52***
low capital ratio	(0.61)	(1.14)	(1.58)	(1.83)	(1.49)	(6.08)
Macroeconomic controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R^2	0.558	0.327	0.339	0.330	0.397	0.331
H_0: financial high = low,						
p-value	0.85	0.15	0.08	0.01	0.01	0.03
Observations	210	210	210	210	210	210

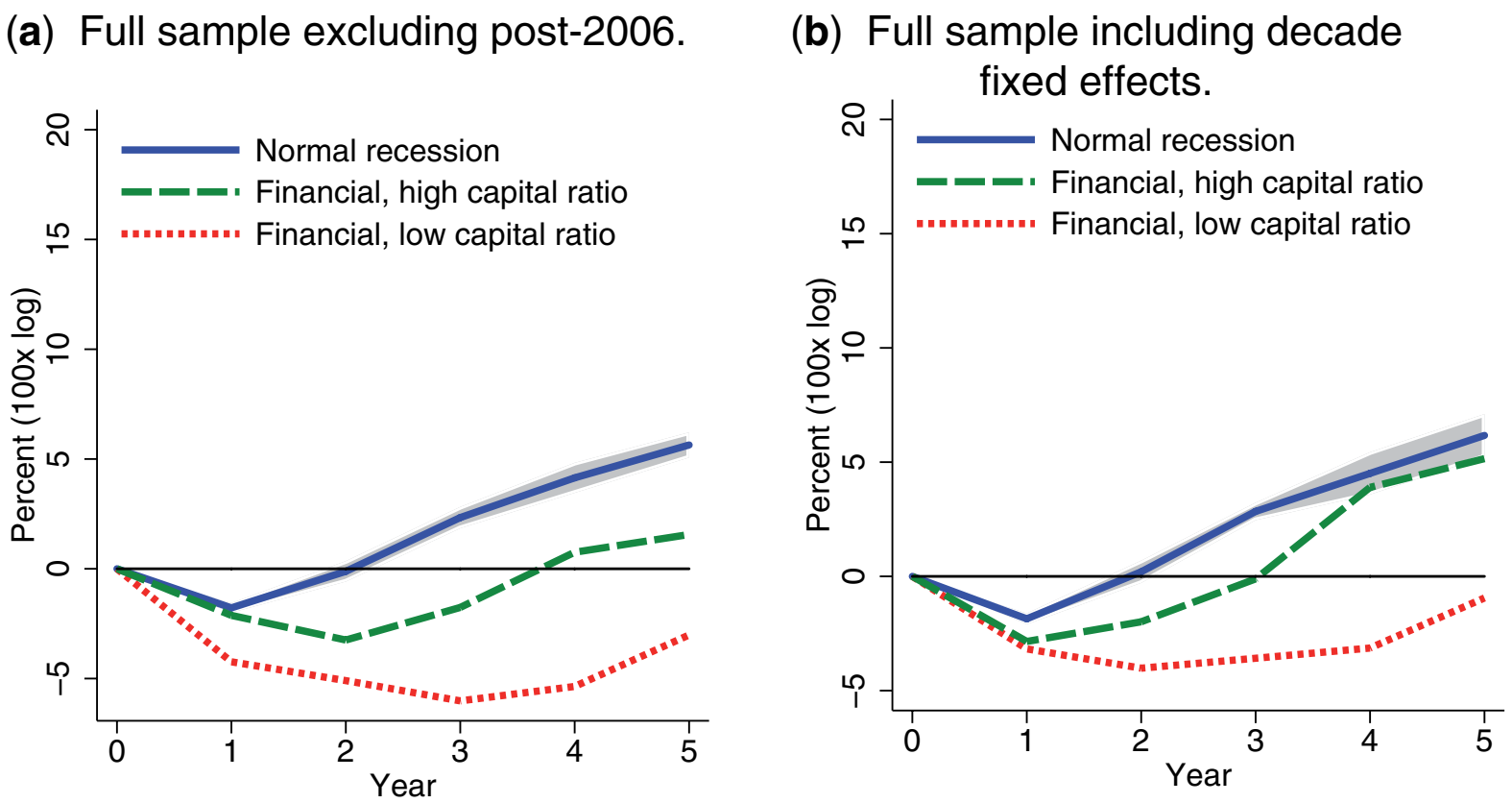


FIGURE 8

Normal versus financial recessions, real GDP per capita binned by bank capital, controls included, alternative estimates.

TABLE 9

Normal versus financial recessions, real GDP per capita binned by capital ratio, with controls, full sample including decade fixed effects.

Dependent variable: change in 100 × log real GDP per capita relative to Year 0

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5	(6) Sum
Recession	−1.86***	0.20	2.84***	4.51***	6.17***	11.87***
	(0.15)	(0.30)	(0.23)	(0.56)	(0.57)	(1.54)
Financial recession,	−0.99	−2.19*	−2.95*	−0.61	−1.02	−7.76
high capital ratio	(0.75)	(1.04)	(1.40)	(2.03)	(2.12)	(5.94)
Financial recession,	−1.32	−4.22***	−6.43***	−7.65***	−7.11***	−26.72***
low capital ratio	(0.91)	(1.39)	(1.85)	(2.13)	(1.73)	(7.35)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R^2	0.598	0.413	0.447	0.464	0.514	0.466
H_0: financial high = low,						
p-value	0.78	0.21	0.14	0.03	0.06	0.06
Observations	210	210	210	210	210	210

Bank capital and the severity of recessions

Capital ratio as a continuous treatment

$$\Delta_h y_{i,t(p)} = \sum_{i=1}^{I-1} \alpha_{i,h} D_{i,t(p)} + \mu_h + \gamma_h d_{i,t(p)} + \gamma_h^N (1 - d_{i,t(p)})(w_{i,t(p)} - \overline{w}_{i,N}) + \gamma_h^F d_{i,t(p)} \left(w_{i,t(p)} - \overline{w}_{i,F}\right) + \epsilon_{i,t(p)}$$

- $t(p)$: calendar time period t where the business cycle peak p takes place
- $\alpha_{i,h} D_{i,t(p)}$: normalized fixed effect, $\sum_{i=1}^{I-1} \alpha_{i,h} D_{i,t(p)} = 0$
- $d_{i,t(p)}$: financial or normal crisis
- $w_{i,t(p)}$: capital ratio
- $\overline{w}_i$: mean of capital ratio

TABLE 8

Normal versus financial recessions, real GDP per capita with continuous capital ratios, with controls, full sample.

Dependent variable: change in 100 × log real GDP per capita relative to Year 0

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5	(6) Sum
Recession	−1.79***	−0.24	2.04***	3.74***	5.21***	8.97***
	(0.14)	(0.27)	(0.22)	(0.32)	(0.26)	(1.01)
Financial recession	−1.28**	−4.04***	−5.95***	−6.52***	−6.76***	−24.55***
	(0.58)	(0.95)	(0.82)	(1.20)	(0.90)	(3.78)
Normal recession	−0.03	−0.05	0.06	−0.03	−0.05	−0.10
× capital ratio	(0.03)	(0.05)	(0.08)	(0.10)	(0.11)	(0.33)
Financial recession	−0.06	0.12*	0.21*	0.28**	0.31**	0.86*
× capital ratio	(0.04)	(0.06)	(0.11)	(0.12)	(0.12)	(0.42)
Controls	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*	*Yes*
R^2	0.563	0.333	0.334	0.308	0.388	0.318
H_0: normal = financial, p-value	0.49	0.01	0.00	0.00	0.00	0.00
H_0: normal × capital = financial × capital, p-value	0.54	0.02	0.28	0.04	0.02	0.05
Observations	210	210	210	210	210	210

Inspecting the mechanism: the credit channel

Highly leveraged intermediaries cannot extend credit after an initial shock to their balance sheets

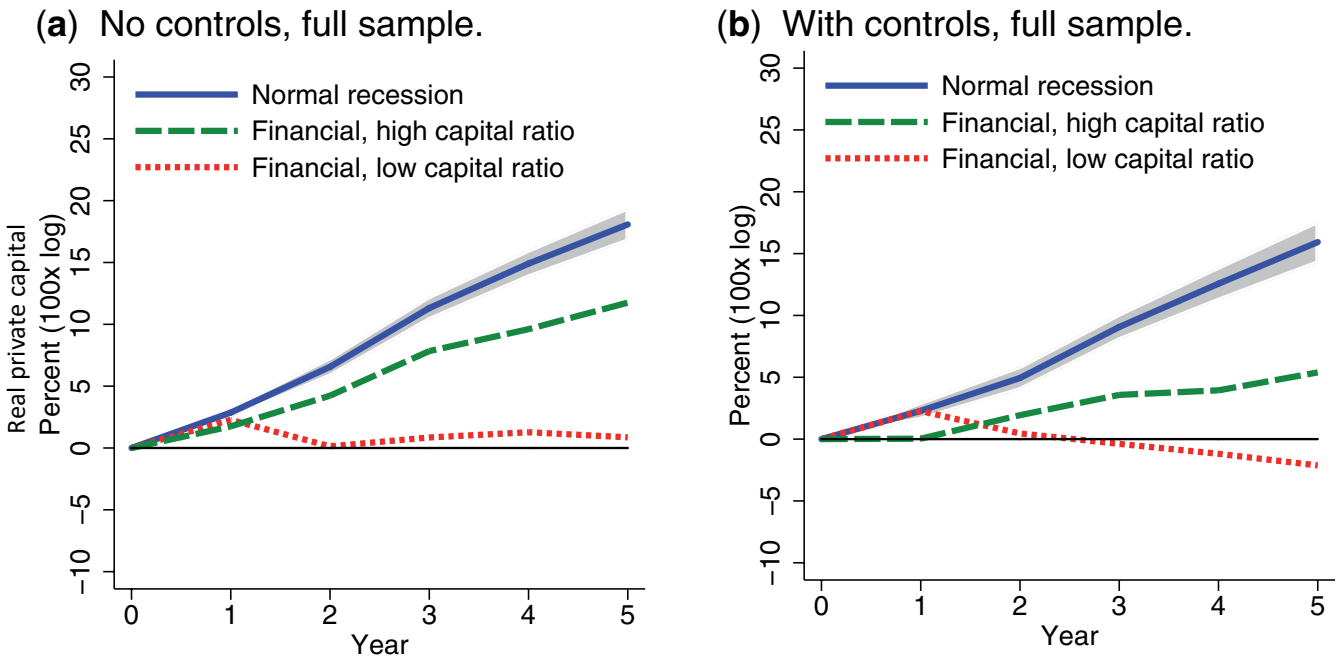


FIGURE 9

Normal versus financial recessions, real private credit per capita binned by bank capital.

Summary

- Crisis occur when overly exuberant expectations are adjusted and the prices of leveraged assets fall rapidly, putting lenders' solvency in doubt
- Higher capital ratios are no shortcut to evaluate and achieve financial stability
- Capital buffers play a role in limiting damage to the economy
- To avoid financial crisis, other policy measures focusing on asset growth and liquidity may be needed