Online Appendix

Bank Capital Redux: Solvency, Liquidity, and Crisis

A. Deposit insurance timing

The dating of deposit insurance is based on the variable "Date of inception of explicit DGS" in Demirgüc-Kunt et al. (2014). The dates for our sample are shown in the table below.

AUS:	2008	GBR:	1982
BEL:	1974	ITA:	1987
CAN:	1967	JPN:	1971
CHE:	1984	NLD:	1978
DEU:	1998	NOR:	1961
DNK:	1987	PRT:	1992
ESP:	1977	SWE:	1996
FIN:	1969	USA:	1933
FRA:	1980		

B. Systemic banking crisis timing

The crisis prediction classification models in the paper employ data on all systemic financial crises from 1870 to 2008. Dates of systemic financial crises are based on Jordà et al. (2017) and updates thereof.

AUS:	1893, 1989.
BEL:	1870, 1876, 1885, 1925, 1931, 1934, 1939, 2008.
CAN:	1907.
CHE:	1870, 1910, 1931, 1991, 2008.
DEU:	1873, 1891, 1901, 1931, 2008.
DNK:	1877, 1885, 1908, 1921, 1987, 2008.
ESP:	1883, 1890, 1913, 1920, 1924, 1931, 1977, 2008.
FIN:	1877, 1900, 1921, 1931, 1991.
FRA:	1882, 1889, 1930, 2008.
GBR:	1890, 1974, 1991, 2007.
ITA:	1873, 1887, 1893, 1907, 1921, 1930, 1935, 1990, 2008.
JPN:	1871, 1890, 1901, 1907, 1920, 1927, 1997.
NLD:	1921, 2008.
NOR:	1899, 1922, 1931, 1988.
PRT:	1890, 1920, 1923, 1931, 2008.
SWE:	1878, 1907, 1922, 1931, 1991, 2008.
USA:	1873, 1893, 1907, 1930, 1984, 2007.

C. Business cycle peak timing

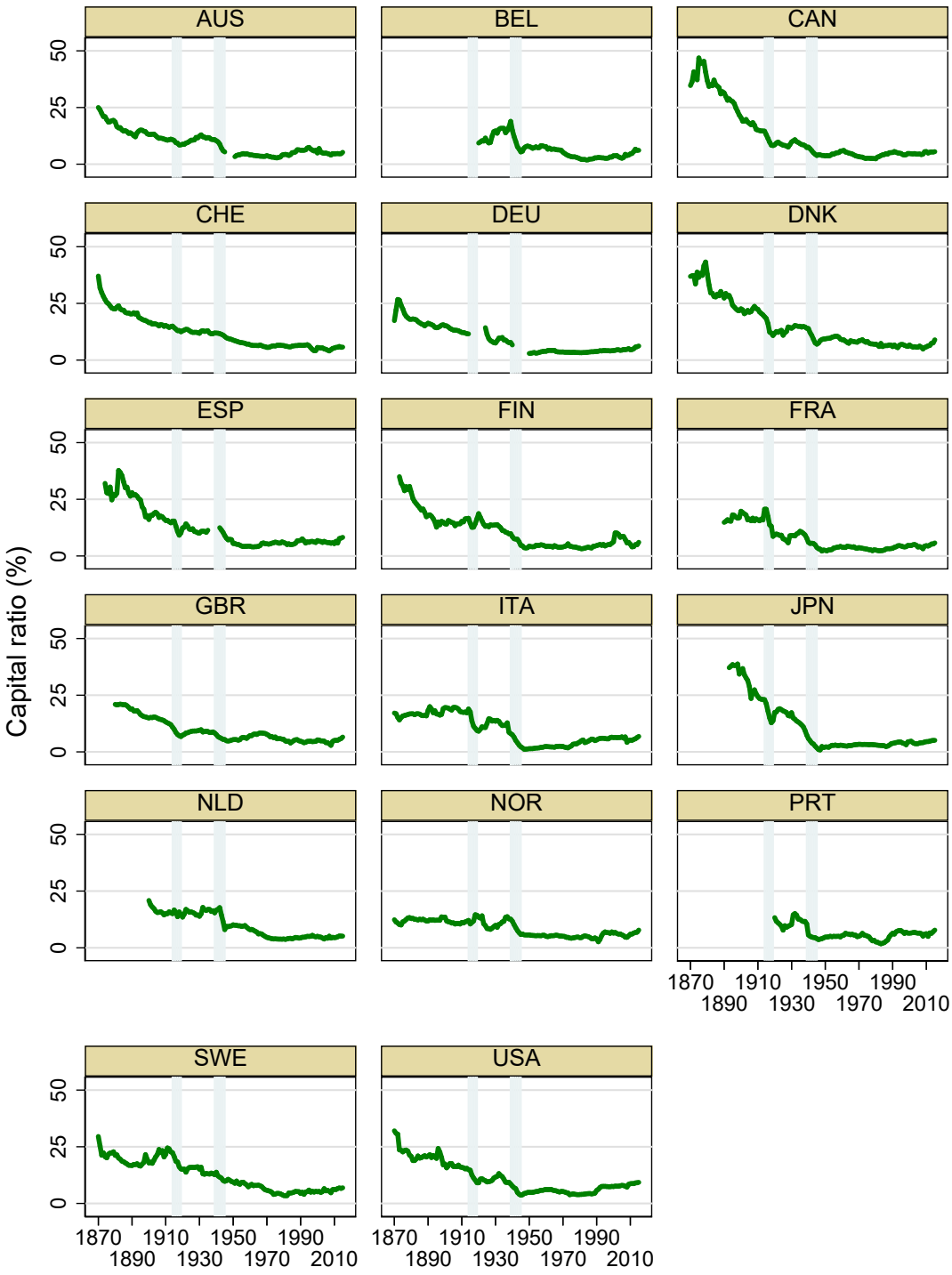
The local projections empirical analysis in the paper employs business cycle peaks from 1870 to 2008, excluding windows around the two world wars, with projections out to five years ahead, with the annual panel sample data. Peak dates and their classificaton are as shown in the table below, where "N" denotes a normal business cycle peak, and "F" denotes a peak associated with a systemic financial crisis (a crisis within ± 2 years of the peak). The dating method uses the Bry and Boschan (1971) algorithm. In the early sample period, with short business cycles, there can be more than one peak within the window. In these cases we classify according to historical narratives.

Table A.1: *Dates of normal (N) and financial crisis (F) recession peaks*

AUS	N	1875	1878	1881	1883	1885	1887	1889	1896	1898	1900	1904
		1910	1913	1926	1938	1943	1951	1956	1961	1973	1976	1981
		2008										
	F	1891	1894	1989								
BEL	N	1872	1887	1890	1900	1913	1916	1942	1951	1957	1974	1980
		1992	2011									
	F	1870	1874	1883	1926	1930	1937	2007				
CAN	N	1871	1874	1877	1882	1884	1888	1891	1894	1903	1913	1917
		1928	1944	1947	1953	1956	1981	1989	2007			
	F	1907										
CHE	N	1875	1880	1886	1890	1893	1899	1902	1906	1916	1920	1933
		1939	1947	1951	1957	1974	1981	1994	2001	2011		
	F	1871	1912	1929	1990	2008						
DEU	N	1879	1898	1905	1908	1913	1922	1943	1966	1974	1980	1992
		2001										
	F	1875	1890	1928	2008							
DNK	N	1870	1872	1880	1887	1911	1914	1916	1923	1931	1939	1944
		1950	1962	1973	1979	1992						
	F	1876	1883	1920	1987	2007						
ESP	N	1873	1877	1892	1894	1901	1909	1911	1916	1927	1932	1935
		1944	1947	1952	1958	1980	1992					
	F	1884	1888	1913	1925	1929	2007					
FIN	N	1870	1883	1890	1898	1907	1913	1916	1938	1941	1943	1952
		1957	1975	2008	2011							
	F	1876	1900	1929	1989							
FRA	N	1872	1874	1892	1894	1896	1900	1905	1907	1909	1912	1916
		1920	1926	1933	1937	1939	1942	1974	1992	2011		
	F	1882	1929	2007								
GBR	N	1871	1873	1875	1877	1883	1896	1899	1902	1907	1918	1925
		1929	1938	1943	1951	1957	1979					
	F	1889	1973	1990	2007							
ITA	N	1870	1883	1897	1918	1925	1932	1939	1974	2002	2011	
	F	1874	1887	1891	1923	1929	1992	2007				
JPN	N	1875	1877	1880	1882	1887	1892	1895	1898	1903	1913	1921
		1929	1933	1940	1973	2001	2007					
	F	1890	1901	1907	1919	1925	1997					
NLD	N	1870	1873	1877	1889	1892	1894	1899	1902	1906	1913	1929
		1937	1939	1957	1974	1980	2001	2011				
	F	2008										
NOR	N	1876	1881	1885	1893	1902	1916	1923	1939	1941	1957	1981
		2007	2012									
	F	1897	1920	1930	1987							
PRT	N	1870	1873	1877	1888	1893	1900	1904	1907	1912	1914	1916
		1925	1927	1934	1937	1939	1941	1944	1947	1951	1973	1982
		1992	2002	2010								
	F	1890	1923	1929	2008							
SWE	N	1873	1876	1881	1883	1885	1888	1890	1899	1901	1904	1913
		1916	1924	1939	1976	1980	2011					
	F	1879	1907	1920	1930	1990	2007					
USA	N	1875	1882	1887	1889	1895	1901	1909	1913	1916	1918	1926
		1937	1944	1948	1953	1957	1969	1973	1979	1981	1990	2000
	F	1873	1892	1906	1929	2007						

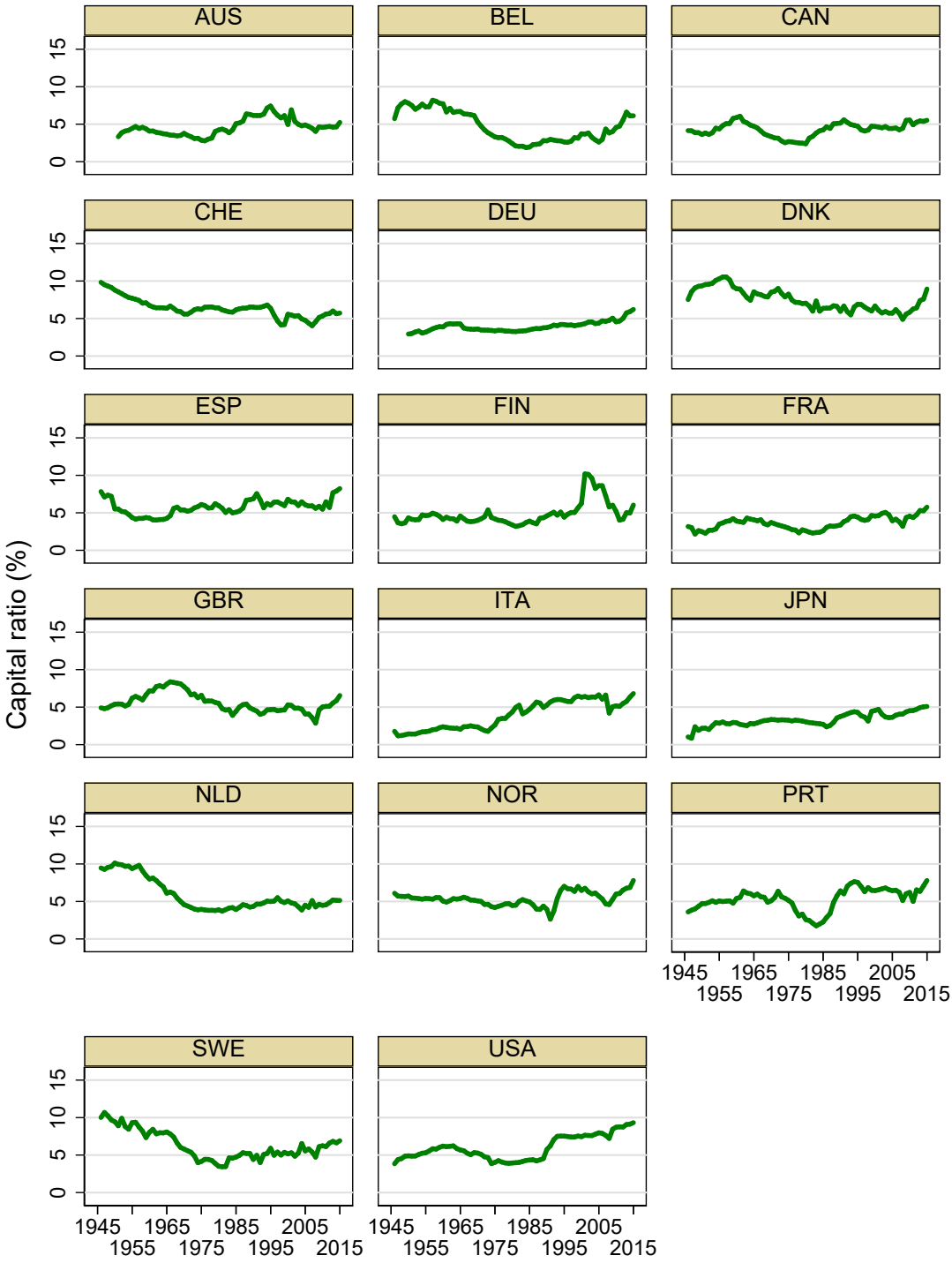
D. Capital ratio series by country

Figure A.1: *Capital ratio by country, full sample.*



Notes: This figure plots the capital ratio for all 17 sample countries from 1870 to 2015. Years of world wars are shown in shading.

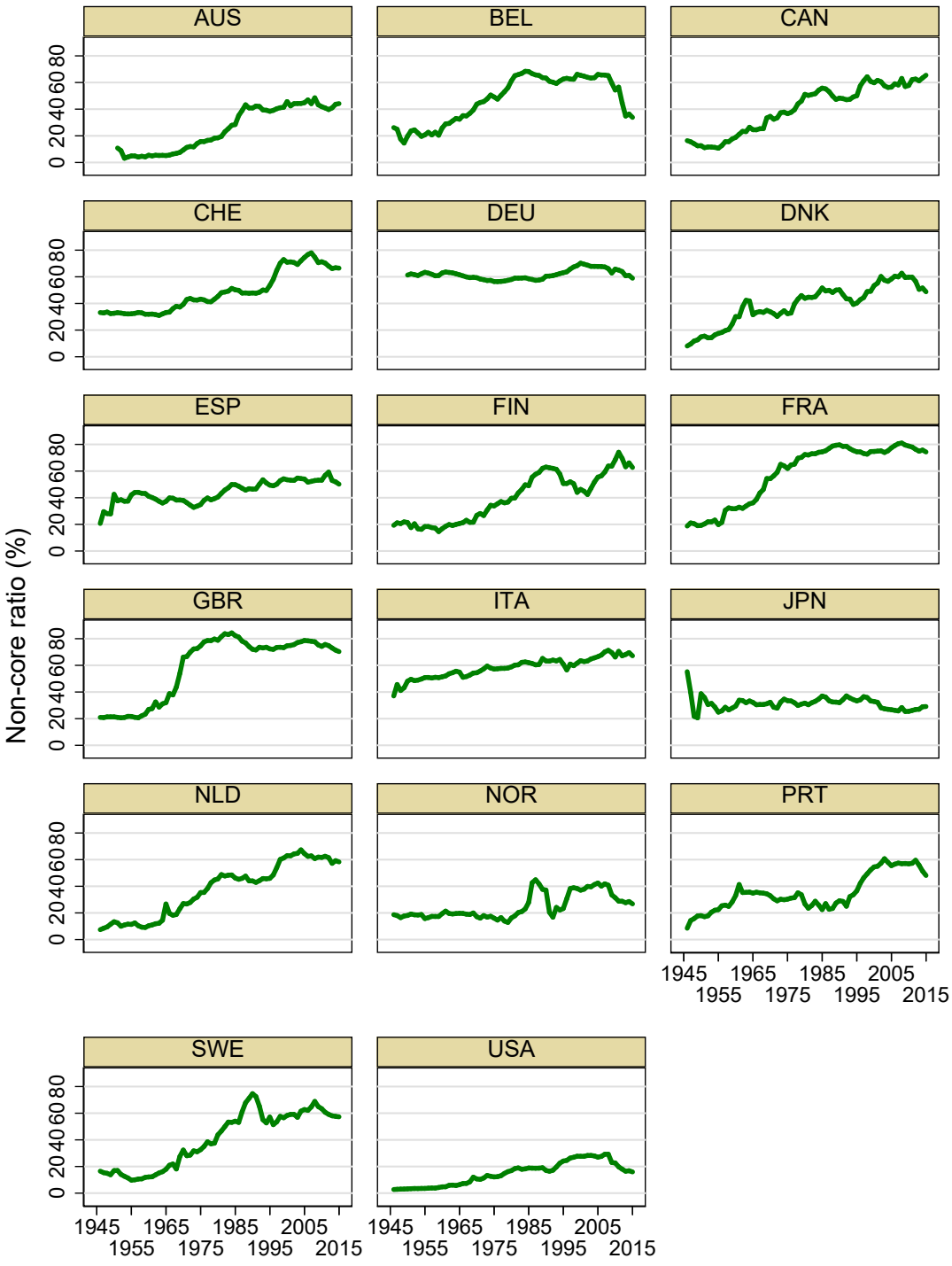
Figure A.2: *Capital ratio, 17 countries, post-WW2 sample.*



Notes: This figure plots the capital ratio for all sample countries for the period between 1945 and 2015.

E. Non-core ratio series by country

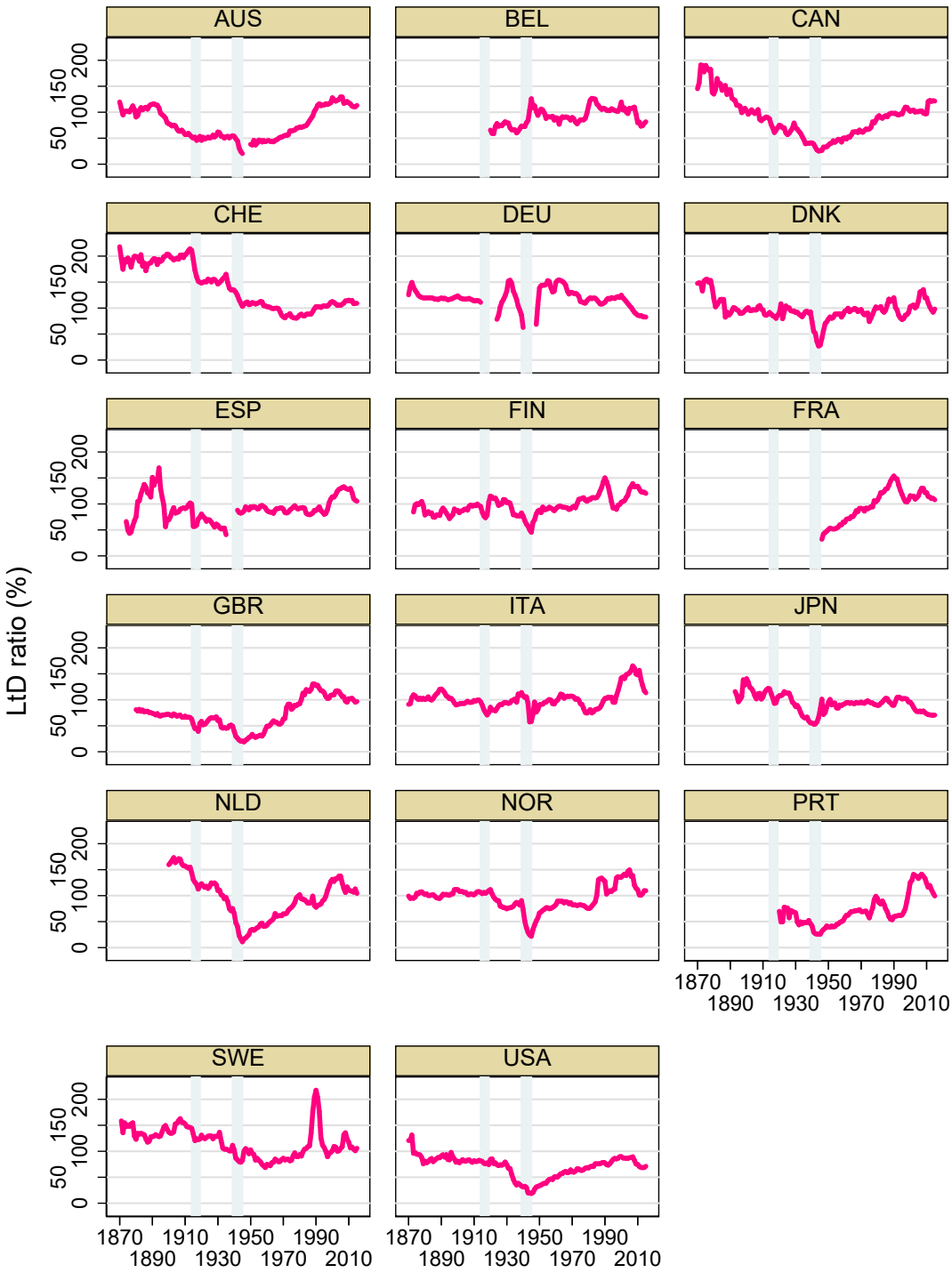
Figure A.3: *Non-core ratio, 17 countries, post-WW2 sample.*



Notes: This figure plots the non-core ratio for all countries from 1945 to 2015.

F. Loan-to-deposits ratio by country

Figure A.4: *LtD ratio, 17 countries, full sample.*



Notes: Years of World Wars are shown in shading.

G. Summary statistics

Table A.2: *Full sample: summary statistics*

	Mean	Min.	Max.	S.D.	Obs.
Capital ratio (%)	10.34	0.85	46.86	7.76	2018
Δ_5 Capital ratio (%)	-0.07	-3.05	2.44	0.42	1773
LtD ratio (%)	97.83	18.44	218.16	31.50	1978
Non-core ratio (%)	35.84	2.35	84.37	20.14	1923

Table A.3: *Post-WW2 sample: summary statistics*

	Mean	Min.	Max.	S.D.	Obs.
Capital ratio (%)	5.11	0.85	10.68	1.76	1149
Δ_5 Capital ratio (%)	0.01	-0.92	1.08	0.21	1064
LtD ratio (%)	93.14	18.44	217.52	27.14	1152
Non-core ratio (%)	41.68	2.91	84.37	19.98	1149

Table A.4: *Capital ratio summary statistics split by crises, full sample*

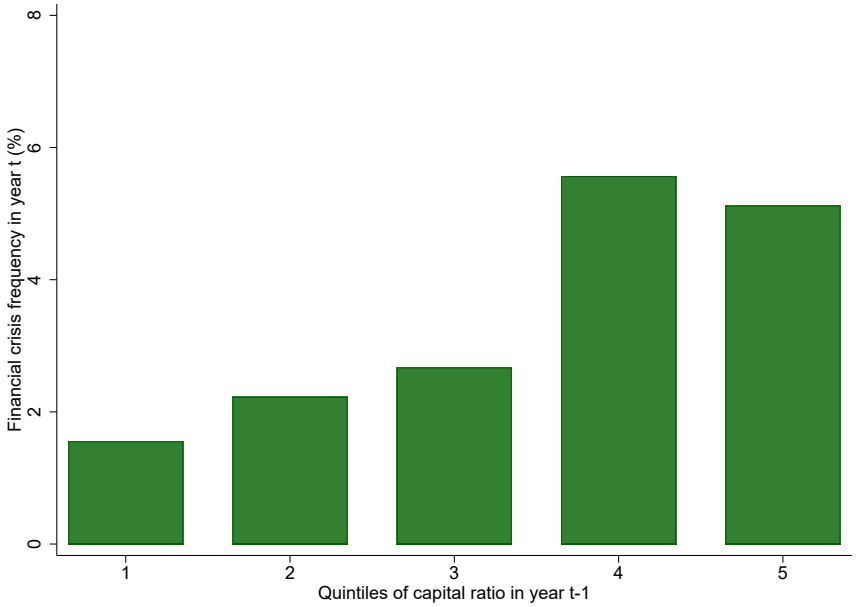
	No crisis observations					Crisis observations (one-period lagged)				
	Mean	Min.	Max.	S.D.	Obs.	Mean	Min.	Max.	S.D.	Obs.
Capital ratio (%)	10.22	0.85	46.86	7.71	1942	13.54	3.81	38.29	8.32	76
Δ_5 Capital ratio (%)	-0.07	-2.41	2.44	0.41	1712	-0.07	-3.05	1.46	0.69	61

Table A.5: *Capital ratio summary statistics split by crises, post-WW2 sample*

	No crisis observations					Crisis observations (one-period lagged)				
	Mean	Min.	Max.	S.D.	Obs.	Mean	Min.	Max.	S.D.	Obs.
Capital ratio (%)	5.11	0.85	10.68	1.77	1125	5.27	3.81	7.89	1.14	24
Δ_5 Capital ratio (%)	0.01	-0.92	1.08	0.21	1040	-0.00	-0.29	0.50	0.17	24

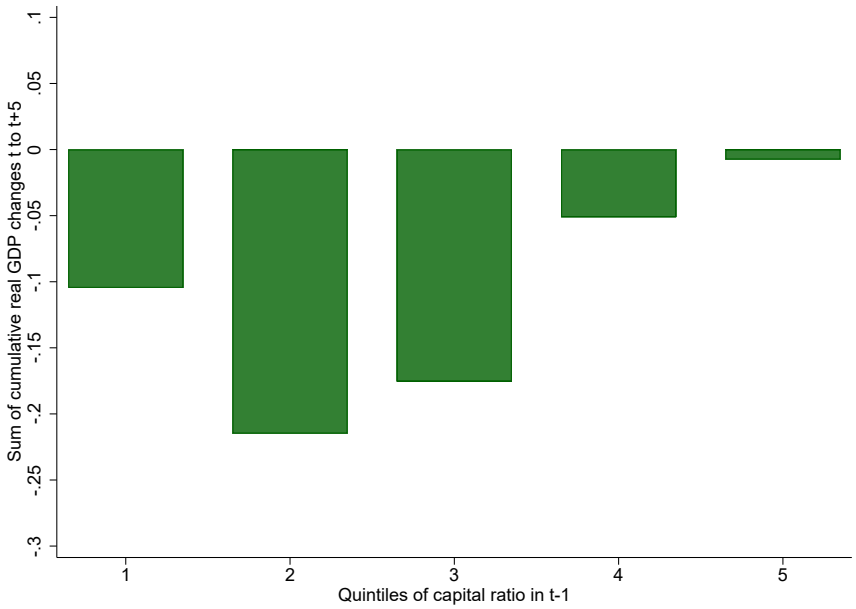
H. Binned barcharts

Figure A.5: *Capital ratio levels and crisis frequency*



Notes: This figure shows the relationship between levels in capital ratios and financial crisis frequencies. Observations are sorted into five equal-sized bins according to the capital ratio in $t-1$ sorted from 1 (lowest capital) to 5 (highest capital). Vertical bars indicate the frequency of financial crises in year t for each of the bins.

Figure A.6: *Capital ratio levels and crisis outcomes*



This figure shows the sum of cumulative growth in log real GDP per capita over the 5 years following a financial recession peak for different quintiles of the capital ratio sorted from 1 (lowest capital) to 5 (highest capital).

I. Capital structure and crisis risk: Robustness checks

I.1 Crisis prediction with standard errors clustered on country and year

Table A.6: *Multivariate probit models for systemic financial crises, standard errors clustered by country and year.*

	(1) Full	(2) Post	(3) Full	(4) Post	(5) Full	(6) Post	(7) Full	(8) Post
Δ_5 Loans/GDP	14.42***	15.37***	13.12***	15.70***	9.47***	7.80***	12.81***	9.51**
	(2.55)	(3.41)	(2.28)	(3.48)	(1.73)	(1.84)	(2.03)	(3.70)
Capital ratio	3.02***	1.49						
	(0.99)	(3.23)						
Δ_5 Capital ratio			-0.67	31.77				
			(15.68)	(41.65)				
LtD ratio					0.60**	1.47***		
					(0.30)	(0.36)		
Non-core ratio							-0.05	4.82**
							(0.69)	(2.10)
Observations	1735	1004	1721	998	1713	1004	1671	1004

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are lagged by one period. All models include country fixed effects. The table corresponds to results in Table 4 in the main text. Here, we do not show marginal effects, but standard errors are clustered by country and year. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table A.7: *Multivariate probit models for systemic financial crises, controlling for asset risk, standard errors clustered by country and year.*

	(1) Full	(2) Full	(3) Post	(4) Post	(5) Full	(6) Full	(7) Post	(8) Post
Δ_5 Loans/GDP	15.42***	14.45***	13.78***	8.84*	15.21***	13.95***	13.99***	9.54*
	(2.37)	(3.45)	(4.71)	(4.81)	(2.24)	(3.20)	(4.59)	(4.94)
Capital ratio	2.96**	3.77**	3.19	0.24				
	(1.26)	(1.78)	(3.67)	(4.76)				
Δ_5 Capital ratio					6.55	17.82	24.28	37.36
					(18.78)	(31.18)	(47.18)	(47.53)
Macrocontrols	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Asset risk	No	Yes	No	Yes	No	Yes	No	Yes
Observations	1582	1277	988	887	1570	1274	984	884

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are lagged by one period. All models include country fixed effects. Macrocontrols include volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. Asset risks include average changes of real house prices and the volatility of house price growth over the previous five years and three lags of log excess returns on the bank index if available, on the general index otherwise. The table corresponds to results in Table 5 in the main text (no marginal effects here). Standard errors are clustered by country and year. $^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

I.2 Deposit insurance

The presence or absence of deposit insurance could affect the link between capital structure and crisis risk. Without deposit insurance, short-term debtors have incentives to monitor banks and force them to endogenously increase capital when they take more risk. When deposit insurance is in place, debtor control is weakened and risk-shifting incentives emerge more strongly. In Table A.8 we repeat the analysis from Table 4, but split the sample depending on whether a deposit insurance scheme is in place or not. We estimate separate models for the two subsamples consisting of observations with deposit insurance (DI), and without (No-DI). Unsurprisingly, the number of observations is higher in the No-DI sample, as deposit insurance was introduced in the mid to late 20th century in most countries. We include changes in credit/GDP, plus country fixed effects, along with risk and macroeconomic controls. With deposit insurance, capital ratios are no longer positively correlated with crisis risk. The coefficient estimate turns negative, but remains statistically weak. A similar pattern emerges for 5-year average annual changes in capital ratios. Once more, we find little evidence that lower capital predicts excessive risk taking by banks. Interestingly, it is only after the introduction of deposit insurance, that the non-core ratio—representing the remaining runnable debt on bank balance sheets—begins to play an important role (see column (8)).

Table A.8: *Multivariate probit models for systemic financial crises, samples split by existence of deposit insurance scheme.*

	(1) No-DI	(2) DI	(3) No-DI	(4) DI	(5) No-DI	(6) DI	(7) No-DI	(8) DI
Δ_5 Loans/GDP	0.56***	0.22**	0.79***	0.21*	0.33**	0.11	0.64***	0.13**
	(0.15)	(0.11)	(0.17)	(0.13)	(0.15)	(0.11)	(0.17)	(0.06)
Capital ratio	0.21***	-0.22						
	(0.03)	(0.18)						
Δ_5 Capital ratio			0.73	-0.87				
			(1.46)	(1.13)				
LtD ratio					0.04***	0.03*		
					(0.01)	(0.02)		
Non-core ratio							-0.02	0.08*
							(0.04)	(0.05)
Macrocontrols	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
Asset risk	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes
AUC	0.88	0.86	0.84	0.86	0.86	0.86	0.84	0.88
	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
Observations	675	536	672	536	627	536	604	536

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are lagged by one period. Samples are split by the existence of a deposit insurance scheme (DI). All models include country fixed effects. Coefficients are marginal effects. Macrocontrols include volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. Asset risks include average changes of real house prices and the volatility of house price growth over the previous five years and three lags of log excess returns on the bank index if available, on the general index otherwise. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

I.3 Market value of capital

We use data from Datastream on the price-to-book ratios for country level bank indices to compute this measure. Including this data causes our sample size to change substantially as the price-to-book ratio is only available for 14 of our 17 sample countries starting in 1973 or later.[1]

Table A.9: *Multivariate probit models for systemic financial crises, market-based capital ratio, controlling for asset risk.*

	(1)	(2)	(3)	(4)
Δ_5 Loans/GDP	0.85***	0.14	0.98***	0.11
	(0.23)	(0.21)	(0.29)	(0.19)
Market-based capital ratio	0.03	-0.16		
	(0.12)	(0.12)		
Δ_5 Market-based capital ratio			0.62	0.24
			(0.88)	(0.53)
Macrocontrols	No	Yes	No	Yes
House Price Changes	No	Yes	No	Yes
AUC	0.68	0.77	0.68	0.83
	(0.07)	(0.06)	(0.07)	(0.04)
Observations	413	410	348	348

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and regressors are lagged by one period. All models include country fixed effects. Coefficients are marginal effects. Macrocontrols include volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. House price changes include average growth of real house prices over the previous five years. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Based on the price-to-book ratio and our balance sheet data, we compute market leverage as:[2]

$$\text{Market Leverage} \equiv \frac{\text{Market Value of Equity}}{\text{Book Value of Assets}} = \text{Price-to-book Ratio} \times \text{Capital Ratio}\,. \qquad (1)$$

Column (1) of Table A.9 shows that, even with this measure, there is still no systematic relationship between bank capital and banking crises. Moreover, measured by the *AUC*, the market capital measure does not add any predictive power. In column (2) we additionally control for macroeconomic risks and house price changes and their volatility. We do not include bank risk premiums here, as bank equity risk premiums are closely related to changes in market capitalization. The coefficient on capital turns negative (the "right" sign), but remains insignificant, in just this one specification. Columns (3) and (4) confirm that short-run variation in this measure is unrelated to crisis risk. In short, the results are in line with our previous findings.

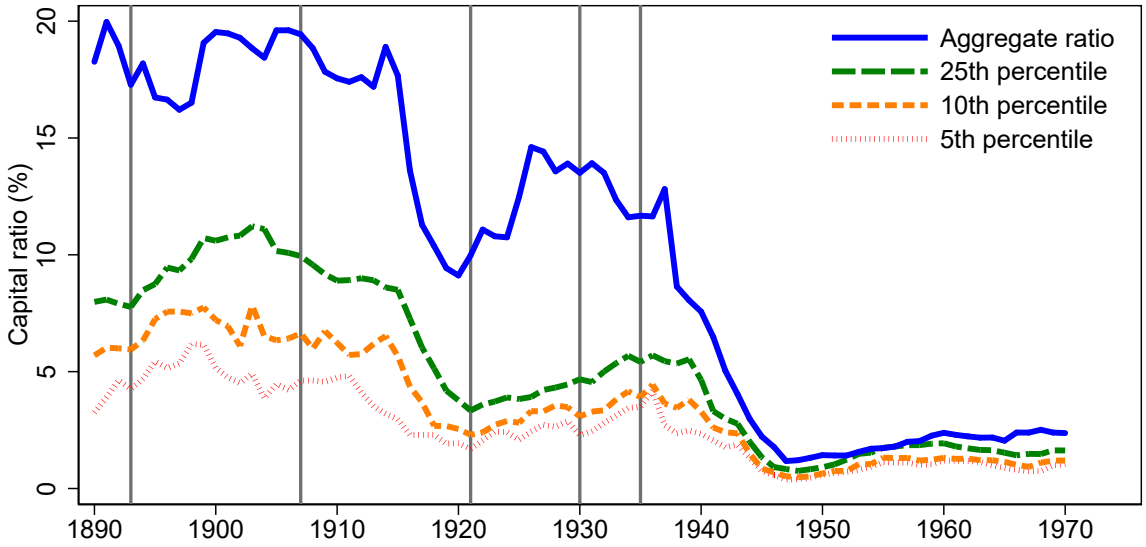
[1] There is insufficient data on price-to-book ratios for bank indices in Finland, Norway and Sweden.

[2] Note that the price-to-book ratio is market value divided by book value of equity and our capital ratio was defined as book value of capital divided by total assets. The price-to-book measure is only available for listed banks contained in the bank index. Hence, we have to assume that this ratio is representative for the entire banking sector.

I.4 Concentration of risk

Aggregate capital ratios could mask substantial heterogeneity within banking systems and risks could be highly concentrated in a few, systemically important institutions or in a subset of banks with very low capital ratios. Our data do not have sufficient granularity for each country to subject these mechanisms to empirical tests. However, we can analyze these mechanisms based on available data for various subsamples. We turn to this now. First, we study whether capital ratios at the most highly levered banks helps predict a financial crisis. Here we rely on evidence from Italy, where the Historical Archive of Credit (Natoli, Piselli, Triglia, and Vercelli, 2016) contains micro-level balance sheet data for the near-universe of banks over more than 80 years, from 1890 to 1973. In a second step, we focus on the capital at the biggest banks, where we have data for a few countries.

Figure A.7: *Capital ratio dispersion of banks in Italy.*



Notes: Percentiles of capital ratio in Italy, 1890–1973: the 5th percentile (red dot), the 10th percentile (orange dash), the 25th percentile (green long dash) and the aggregate ratio (blue solid). Vertical lines correspond to systemic financial crises. See text.

Table A.10: *Probit models for systemic financial crises in Italy, sample 1890–1973.*

	5th pctile	10th pctile	25th pctile	Aggregate
Capital Ratio	1.93	1.21	0.79	0.65*
	(1.41)	(0.99)	(0.70)	(0.37)
AUC	0.64	0.64	0.64	0.67
	(0.08)	(0.08)	(0.09)	(0.12)
Observations	66	66	66	66

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy. Coefficients are marginal effects. Regressors are in one-period lagged levels. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

During the period for which we have data, Italy experienced five systemic banking crises: 1893, 1907, 1921, 1930, and 1935. For our analysis, we use all observations on joint-stock banks and savings banks that are present at least 5 years in the sample and have a market share larger than 0.1% in the

respective year. We exclude cooperative banks as these were sampled only every 5 years. For all the remaining banks we observe the capital ratio yearly.

In Figure A.7 we present the evolution of different percentiles of the capital ratio distribution per year. The paths of the 5th (red dot), the 10th (orange dash), and the 25th percentiles (green long dash) of the distribution of capital ratios across banks display a similar time series pattern as the aggregate ratio (blue solid) used in our macro-level analysis. In addition, the distribution becomes less dispersed over time. Unlike today, it does not seem to be the case that the largest banks have the lowest capital ratios. The banks contained in the 10th percentile for example fluctuate between 6% and 10% of market share, measured by total assets, between 1890 and 1973.

We again estimate a probit model with the crisis dummy as the dependent variable and the lagged capital ratio as an explanatory variable, excluding war years from the sample. Yet instead of only using the aggregate capital ratio, we also use various percentiles of the capital ratio distribution.

The results reported in Table A.10 are consistent with our previous findings. The lagged level of the capital ratio is positively associated with financial instability. The coefficients are insignificant, but similar to the one for the aggregate measure in the same sample. The aggregate measure has the highest AUC, but AUC differences across columns are insignificant. These findings were also confirmed when we re-estimated the specifications using the 5-year changes in capital ratios instead of lagged levels.

I.5 Capitalization of the largest banks

The capitalization of the largest and systemically important banks could be key to understanding financial crisis risks. In fact, current regulations often contain capital surcharges for large and inter-connected institutions. Hence, we test whether low or falling capital ratios of the largest banks signal growing financial fragility.

The analysis in this section builds on micro-data collected and kindly shared by Mazbouri et al. (2017) for a subset of the largest banks in Belgium, France, Germany, Italy, Switzerland, and the UK for the period 1890 to 1970. We extended the coverage using data for the same set of banks in France, Germany, Switzerland, and the UK. We also added recent data from statistics for large commercial banks from the OECD Banking Statistics. In addition, we collected additional data from Denmark, Italy, the Netherlands, Norway, Sweden, and the US. The capital ratio measure used here is now an asset-weighted capital ratio of the largest banks.

The core results are presented in Table A.11. Column (1) shows the baseline regression including the lagged capital ratio of the largest banks for the full sample. Column (2) includes our control variables. Columns (3) and (4) repeat these these specifications in post-WW2 data. The results are similar to our previous findings. As in the aggregated data, the coefficient estimates are positive in the full sample. They turn negative, but insignificant, when estimated on a post-WW2 sample. In columns (5) to (8) we look at short-run variation and use 5-year changes instead of the capital ratio levels. The coefficients in the post-WW2 sample are negative, but insignificant and without adding predictive power as measured by the AUCs.

Table A.11: *Probit models for systemic financial crises. Largest banks.*

	(1) Full	(2) Full	(3) Post	(4) Post	(5) Full	(6) Full	(7) Post	(8) Post
Δ_5 Loans/GDP	1.17***	0.92***	0.82**	0.10	1.29***	1.01***	0.98***	0.00
	(0.19)	(0.23)	(0.37)	(0.13)	(0.22)	(0.31)	(0.37)	(0.19)
Capital ratio large banks	0.06	0.10	-0.28	-0.30				
	(0.05)	(0.08)	(0.49)	(0.19)				
Δ_5 Capital ratio large banks					0.10	0.07	-2.91	-1.55
					(1.28)	(1.30)	(5.33)	(1.57)
Macrocontrols	No	Yes	No	Yes	No	Yes	No	Yes
Asset risk	No	Yes	No	Yes	No	Yes	No	Yes
AUC	0.72	0.78	0.72	0.86	0.74	0.80	0.73	0.88
	(0.05)	(0.05)	(0.07)	(0.04)	(0.05)	(0.04)	(0.08)	(0.04)
Observations	855	673	432	398	771	611	382	352

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are one-period lagged. Data on capital ratios is from the largest banks in a country only (see text). All models include country fixed effects. Coefficients shown are marginal effects. Macrocontrols includes volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. Asset risks include average changes of real house prices and the volatility of house price growth over the previous five years and three lags of log excess returns on the bank index if available, on the general index otherwise. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

I.6 Credit boom and capital ratio interactions

Table A.12: *Probit models for systemic financial crises, credit interacted with high capital ratio indicator.*

	(1) Full	(2) Full	(3) Post	(4) Post	(5) Post	(6) Post
Δ_5 Loans/GDP	0.85***	0.53***	0.45	0.10	0.56	-0.04
	(0.17)	(0.17)	(0.29)	(0.24)	(0.41)	(0.29)
High capital	0.02***	0.01	-0.01	-0.01		
	(0.01)	(0.01)	(0.01)	(0.01)		
High capital (market-based)					-0.00	-0.01
					(0.02)	(0.02)
Δ_5 Loans/GDP x High capital	-0.02	0.28	0.26	0.23	0.48	0.31
	(0.30)	(0.24)	(0.36)	(0.24)	(0.59)	(0.44)
Macrocontrols	No	Yes	No	Yes	No	Yes
Asset risk	No	Yes	No	Yes	No	Yes
AUC	0.75	0.80	0.76	0.84	0.67	0.79
	(0.03)	(0.03)	(0.05)	(0.04)	(0.06)	(0.05)
Observations	1735	1277	1004	887	410	410

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy. All models include country fixed effects. Coefficients are marginal effects. Interactions are between lagged 5-year average annual changes in loans-to-GDP and dummies indicating whether the lagged capital ratio is above (high) the respective sample median. Macrocontrols includes volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. Asset risks include average changes of real house prices and the volatility of house price growth over the previous five years and three lags of log excess returns on the bank index if available, on the general index otherwise. See text. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Rapid balance sheet expansions—that is, credit booms—lie at the heart of financial crisis dynamics. If more skin in the game induces prudent behavior by banks, we would expect to find in the data that credit booms occurring at high levels of bank equity are considerably less likely to end in a crisis than credit booms financed with less equity. Hence we define an indicator variable for high levels of capital, specifically when the lagged capital ratio of the banking sector is above the median in the respective sample.

We then test the proposition using interaction terms in our original model. Table A.12 provides no support for the view that higher capital has disciplining effects. The interaction coefficients for 5-year average annual credit expansion and the indicator for a high capital ratio are typically positive, for the full sample and the post-WW2 period. This holds both for book values of capital (columns 1 to 4) and market values of capital (columns 5 and 6). The inclusion of controls for asset risk and macroeconomic risk predictors lowers the coefficients, but does not change the overall picture. Credit booms financed with more capital are as dangerous as credit booms financed with more debt.

I.7 Baseline probit model results without changes in credit/GDP

Table A.13: *Probit models for systemic financial crises, full sample.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	0.17***					
	(0.03)					
Δ_5 Capital ratio		0.01				
		(1.07)				
LtD ratio			0.06***			
			(0.01)			
Δ_5 LtD				0.43***		
				(0.07)		
Non-core ratio					0.02	
					(0.03)	
Δ_5 Non-core ratio						0.68***
						(0.22)
AUC	0.67	0.62	0.68	0.69	0.63	0.65
	(0.03)	(0.03)	(0.03)	(0.04)	(0.03)	(0.03)
Observations	2018	1773	1978	1743	1923	1698

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year average annual changes (Δ_5) or in one-period lagged levels. Coefficients are shown as marginal effects. All models include country fixed effects. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table A.14: *Probit models for systemic financial crises, post-WW2 sample.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	-0.12					
	(0.31)					
Δ_5 Capital ratio		-0.09				
		(2.20)				
LtD ratio			0.06***			
			(0.00)			
Δ_5 LtD				0.40***		
				(0.08)		
Non-core ratio					0.09***	
					(0.02)	
Δ_5 Non-core ratio						0.65**
						(0.27)
AUC	0.59	0.60	0.80	0.73	0.83	0.65
	(0.06)	(0.06)	(0.04)	(0.06)	(0.03)	(0.05)
Observations	1081	1001	1084	1004	1081	1001

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year average annual changes (Δ_5) or in one-period lagged levels. Coefficients are shown as marginal effects. All models include country fixed effects. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

Table A.15: *Probit models for systemic financial crises, pre-1914 sample.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	0.08					
	(0.15)					
Δ_5 Capital ratio		0.87				
		(1.30)				
LtD ratio			0.12**			
			(0.05)			
Δ_5 LtD				0.69***		
				(0.27)		
Non-core ratio					0.17	
					(0.12)	
Δ_5 Non-core ratio						1.66***
						(0.61)
AUC	0.65	0.67	0.72	0.71	0.66	0.70
	(0.06)	(0.05)	(0.05)	(0.05)	(0.05)	(0.05)
Observations	519	454	518	453	485	425

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year average annual changes (Δ_5) or in one-period lagged levels. Coefficients are marginal effects. All models include country fixed effects. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

I.8 Comparing predictive accuracy across probit models

Table A.16: *AUCs from multivariate probit models for systemic financial crises.*

	(1) Full model	(2) Excl. credit growth	(3) Excl. capital ratio	(4) Excl. non-core ratio
Full sample				
AUC	0.759	0.704	0.713	0.753
$H_0 : AUC = AUC^{Full}$, p-value		0.022	0.009	0.387
N	1671	1671	1671	1671
Pre-WW1 sample				
AUC	0.727	0.672	0.729	0.703
$H_0 : AUC = AUC^{Full}$, p-value		0.043	0.849	0.467
N	397	397	397	397
Post-WW2 sample				
AUC	0.843	0.821	0.840	0.740
$H_0 : AUC = AUC^{Full}$, p-value		0.217	0.644	0.007
N	1004	1004	1004	1004

Notes: This table reports the AUC for different probit classification models. The full model includes lagged values of 5-year annual average changes in loans-to-GDP, the capital ratio, and non-core ratio as regressors. In columns (2)-(4) we drop one regressor at the time. For these specifications we report the AUC and the p-value of a test of equality of the AUC with the AUC of the full model. All models include country fixed effects.

I.9 Probit models without country fixed effects

Table A.17: *Probit models for systemic financial crises, full sample, no fixed effects.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	0.17***					
	(0.04)					
Δ_5 Capital ratio		0.09				
		(1.15)				
LtD ratio			0.04***			
			(0.02)			
Δ_5 LtD				0.46***		
				(0.09)		
Non-core ratio					0.01	
					(0.02)	
Δ_5 Non-core ratio						0.65***
						(0.24)
AUC	0.64	0.54	0.63	0.63	0.52	0.55
	(0.03)	(0.04)	(0.03)	(0.04)	(0.04)	(0.04)
Observations	2018	1773	1978	1743	1923	1698

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year average annual changes (Δ_5) or in one-period lagged levels. Coefficients are marginal effects. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

Table A.18: *Probit models for systemic financial crises, post-WW2 sample, no fixed effects.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	0.11					
	(0.17)					
Δ_5 Capital ratio		-0.34				
		(2.06)				
LtD ratio			0.05***			
			(0.01)			
Δ_5 LtD				0.37***		
				(0.08)		
Non-core ratio					0.07***	
					(0.01)	
Δ_5 Non-core ratio						0.61***
						(0.23)
AUC	0.55	0.51	0.74	0.68	0.74	0.57
	(0.05)	(0.05)	(0.05)	(0.06)	(0.05)	(0.06)
Observations	1149	1064	1152	1067	1149	1064

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year average annual changes (Δ_5) or in one-period lagged levels. Coefficients are marginal effects. Robust standard errors in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$.

I.10 Probit models excluding the global financial crisis

Table A.19: *Multivariate probit models for systemic financial crises, full sample excluding the global financial crisis.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	0.19***					
	(0.02)					
Δ_5 Capital ratio		0.12				
		(1.08)				
LtD ratio			0.06***			
			(0.02)			
Δ_5 LtD				0.44***		
				(0.07)		
Non-core ratio					-0.02	
					(0.03)	
Δ_5 Non-core ratio						0.71***
						(0.26)
AUC	0.71	0.63	0.68	0.68	0.63	0.64
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
Observations	1865	1544	1766	1460	1711	1415

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year average annual changes (Δ_5) or in one-period lagged levels for a pre-2007 sample. Coefficients are marginal effects. All specifications include a country fixed effect. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

I.11 Probit models excluding the US and the UK

Table A.20: *Multivariate probit models for systemic financial crises, full sample excluding the US and the UK.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	0.17***					
	(0.03)					
Δ_5 Capital ratio		0.00				
		(1.10)				
LtD ratio			0.05***			
			(0.02)			
Δ_5 LtD				0.40***		
				(0.07)		
Non-core ratio					0.00	
					(0.03)	
Δ_5 Non-core ratio						0.67***
						(0.26)
AUC	0.68	0.63	0.68	0.69	0.63	0.66
	(0.03)	(0.04)	(0.03)	(0.04)	(0.03)	(0.04)
Observations	1768	1553	1728	1523	1725	1520

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year annual average changes (Δ_5) or in one-period lagged levels. Coefficients are marginal effects. All models include country fixed effects. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

Table A.21: *Multivariate probit models for systemic financial crises, post-WW2 sample excluding the US and the UK.*

	(1)	(2)	(3)	(4)	(5)	(6)
Capital ratio	-0.09					
	(0.34)					
Δ_5 Capital ratio		1.24				
		(2.01)				
LtD ratio			0.06***			
			(0.00)			
Δ_5 LtD				0.36***		
				(0.07)		
Non-core ratio					0.07**	
					(0.03)	
Δ_5 Non-core ratio						0.73**
						(0.32)
AUC	0.57	0.60	0.80	0.74	0.85	0.66
	(0.07)	(0.07)	(0.05)	(0.07)	(0.04)	(0.06)
Observations	945	875	948	878	945	875

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and the regressors are in lagged 5-year annual average changes (Δ_5) or in one-period lagged levels. Coefficients are marginal effects. All models include country fixed effects. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

I.12 Country-decade fixed effects

Table A.22: *Multivariate probit models for systemic financial crises, full sample including country-decade fixed effects.*

	(1)	(2)	(3)	(4)	(5)	(6)
Δ_5 Loans/GDP	3.89***	2.12**	3.26***	2.61***	1.12	1.87*
	(0.81)	(0.96)	(0.79)	(0.84)	(0.91)	(0.96)
Capital ratio	-0.43			1.46		
	(0.94)			(1.09)		
LtD ratio		0.51***			0.35***	
		(0.17)			(0.13)	
Non-core ratio			0.92***			0.78***
			(0.25)			(0.26)
Macrocontrols	No	No	No	Yes	Yes	Yes
Asset risk	No	No	No	Yes	Yes	Yes
AUC	0.72	0.75	0.73	0.83	0.83	0.83
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)
Observations	521	512	502	393	384	384

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy and regressors are lagged by one period. Coefficients are marginal effects. All models include country-decade fixed effects. Macrocontrols includes volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. Asset risks include average changes of real house prices and the volatility of house price growth over the previous five years and three lags of log excess returns on the bank index if available, on the general index otherwise. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

I.13 Crisis chronology: robustness

Table A.23: *Multivariate probit models for systemic financial crises, using Baron et al. (2020) crisis chronology, controlling for asset risk.*

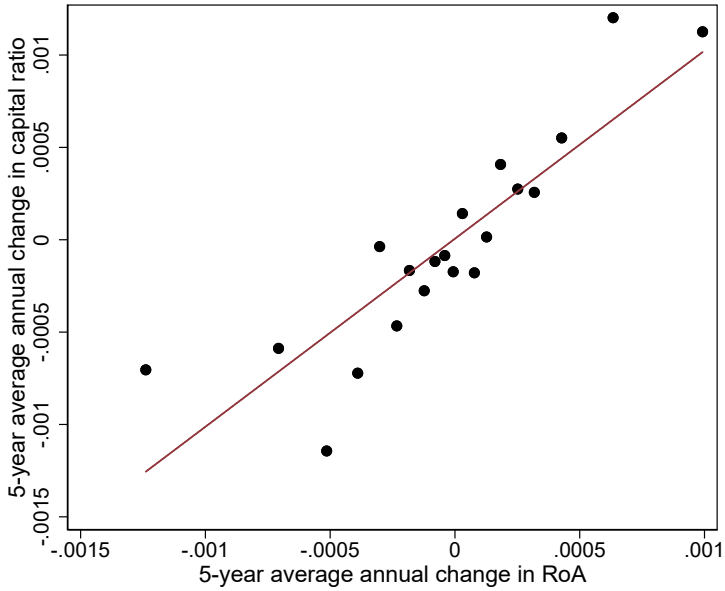
	(1) Full	(2) Full	(3) Post	(4) Post	(5) Full	(6) Full	(7) Post	(8) Post
Δ_5 Loans/GDP	1.02***	0.80***	0.84***	0.31**	1.00***	0.80***	0.87***	0.33**
	(0.11)	(0.15)	(0.10)	(0.14)	(0.11)	(0.16)	(0.10)	(0.15)
Capital ratio	0.13***	0.10	0.09	-0.17				
	(0.04)	(0.09)	(0.33)	(0.24)				
Δ_5 Capital ratio					-0.29	-0.16	2.62	0.67
					(1.16)	(1.28)	(2.26)	(1.59)
Macrocontrols	No	Yes	No	Yes	No	Yes	No	Yes
Asset risk	No	Yes	No	Yes	No	Yes	No	Yes
AUC	0.74	0.81	0.75	0.87	0.72	0.81	0.75	0.87
	(0.03)	(0.03)	(0.05)	(0.03)	(0.03)	(0.03)	(0.05)	(0.03)
Observations	1735	1329	1067	939	1721	1326	1061	936

Notes: The table shows probit classification models where the dependent variable is a financial crisis dummy based on Baron et al. (2020) and regressors are lagged by one period. All models include country fixed effects. Coefficients are marginal effects. Macrocontrols include volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. Asset risks include average changes of real house prices and the volatility of house price growth over the previous five years and three lags of log excess returns on the bank index if available, on the general index otherwise. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, $^{**}\ p < 0.05$, $^{***}\ p < 0.01$

I.14 Instrumenting changes in capital ratios

The surprising finding that more capital increases the likelihood of a crisis (albeit by a very small amount indistinguishable from zero statistically) runs counter to intuition. Thus, our strategy of controlling for observable factors that simultaneously explain crisis risk and are correlated with capital may have been insufficient. Regulators, market participants, or both could force banks to increase capital buffers when crisis risk is perceived to be high. This type of simultaneity bias could be masking the true relationship. Here, we will use an instrumental variable approach to address potential endogeneity. The instrument relies on variation in the wiggle room that banks have to adjust capital buffers by retaining profits. Cohen and Scatigna (2016) show that retained earnings have been the most important source of bank capital increases in advanced economies after the financial crisis and that banks also retained a significant fraction of earnings in earlier periods.

Figure A.8: *RoA as an instrument for capital ratio changes*



Notes: The figure shows binned scatterplots for 5-year average changes in capital ratios and trimmed 5-year average changes in RoA. Observations are collapsed into 20 equal sized bins according to 5-year average annual changes in RoA. Each point represents the group specific means of 5-year average annual changes in capital ratios and 5-year average annual changes in RoA. A fitted regression line is shown in red.

This behavior is also reflected in balance sheet data. As of 2018Q3, undivided profits account for 37.8% of total bank equity capital of commercial and savings banks in the US, which is slightly below the average share for the post-1984 period.[3] The higher profits are relative to total assets, the more banks can increase capital ratios by retaining these profits in the bank. Hence, retained earnings are a natural instrument for variation in capital ratios that can be justifiably be considered independent of perceptions of impending financial fragility.

We will exploit this relationship using data for banking sector profit and loss accounts from Richter and Zimmermann (2018) and instrument changes in capital ratios with changes in return on assets (RoA), the ratio of net income after tax to book assets. We define the 5-year change in this variable as $\Delta_5 RoA_{i,t} = RoA_{i,t} - RoA_{i,t-5}$. Including controls for asset growth and bank risk premia ensures that we capture only variation in capital ratios that is driven by changes in RoA that are unrelated to risk taking, following Meiselman et al. (2018). For the instrument to be relevant, a

[3]Numbers are based on data from the "FDIC - Quarterly Banking Profile Time Series Spreadsheets".

positive first-stage association between changes in RoA and changes in the capital ratio is required. Figure A.8 presents evidence of such a strong relationship between 5-year average changes in RoA and 5-year average changes in capital ratios.

There is no formal way to evaluate the validity of the instrument with just identification, as it is the case here. However, the economic justification seems clear. In good times, returns on assets increase. Banks will then retain some of the higher profits earned. Controlling for asset growth and bank risk, banks acquire more "skin in the game," which in turn allows us to evaluate whether it reduces future crisis risk. It turns out that even as we are able to obtain a more intuitive link between capital and crisis risk, this link is tenuous economically and statistically, as we will see next.

Table A.24 presents the instrumental variable probit results for the post-WW2 sample and starts from a simple benchmark model including only changes in the loans-to-GDP ratio over the previous five years, as shown in the first column; this model has an AUC of 0.75. In the second column, we now add changes in the capital ratio over the last five years. The change in the capital ratio is insignificant—just as in our previous exercises—and it does not add any predictive accuracy to the benchmark model; the AUC is still 0.75. In column (3), the IV model now instruments changes in the capital ratio with changes in RoA. The first-stage regression (unreported) confirms the relevance of the instrument and has an F-statistic of 45.05. The coefficient for changes in capital ratios instrumented with RoA turns negative. But the coefficient of the capital ratio remains insignificant and does not add any predictive accuracy in comparison to previous models. Thus, if our IV strategy purges the estimates of endogeneity, it does not alter our main finding. Columns (4) to (6) follow the same strategy, but also include macrocontrols and asset risks as in our previous exercises. The message of the table is clear: changes in capital ratios are unrelated to financial crisis risks, even when we account for endogeneity. The results are statistically and economically small.

Table A.24: *Instrumental variable regression.*

	(1) No Cap	(2) Cap	(3) IV	(4) No Cap	(5) Cap	(6) IV
Δ_5 Loans/GDP	0.72***	0.72***	0.73**	0.26*	0.27	0.27
	(0.09)	(0.09)	(0.31)	(0.15)	(0.17)	(0.25)
Δ_5 Capital ratio		0.16	-0.23		0.27	-0.10
		(2.02)	(7.83)		(1.50)	(4.35)
Asset risk	No	No	No	Yes	Yes	Yes
Macrocontrols	No	No	No	Yes	Yes	Yes
AUC	0.75	0.75	0.72	0.85	0.85	0.83
	(0.06)	(0.06)	(0.06)	(0.05)	(0.05)	(0.04)
Observations	844	844	844	749	749	749

Notes: The table shows probit classification models where the dependent variable is the financial crisis dummy. Column (1) includes lagged 5-year average annual changes in loans-to-GDP. Column (2) additionally includes lagged 5-year average annual changes in capital ratios. In column (3) 5-year average annual changes in capital ratios are instrumented with 5-year average annual changes in RoA. The F-statistic of the first stage regression for this model is 45.05. Columns (4), (5) and (6) additionally include macrocontrols and asset risks. Macrocontrols includes volatilities of real GDP per capita, inflation, loans-to-GDP and short-term interest rates as well as averaged real GDP per capita growth, inflation, and short term interest rates over the previous five years. Asset risks include average changes of real house prices and the volatility of house price growth over the previous five years and three lags of log excess returns on the bank index if available, on the general index otherwise. Coefficients shown are marginal effects. All models include country fixed effects. Clustered (by country) standard errors in parentheses. $^{*}p < 0.10$, ** $p < 0.05$, *** $p < 0.01$

J. Local projections robustness checks

J.1 Local projections without controls

An estimate using panel local projections without covariates can be obtained from,

$$\Delta_h y_{i,t(p)} = \sum_{i=1}^{I-1} \alpha_{i,h} D_{i,t(p)} + \mu_h + \gamma_h^{HI} d_{i,t(p)} \times \delta_{i,t(p)} + \gamma_h^{LO} d_{i,t(p)} \times (1 - \delta_{i,t(p)}) + \epsilon_{i,t(p)}. \quad (2)$$

Table A.25: *Normal versus financial recessions, real GDP per capita by capital ratio, no 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	-1.94***	-0.06	2.29***	3.96***	5.34***	9.60***
	(0.14)	(0.27)	(0.28)	(0.38)	(0.29)	(1.20)
Financial recession, high capital ratio	-1.39*	-2.71**	-3.42***	-2.29	-2.97*	-12.79**
	(0.76)	(1.01)	(1.02)	(1.52)	(1.43)	(4.48)
Financial recession, low capital ratio	-1.06*	-3.87***	-6.12***	-6.92***	-7.43***	-25.40***
	(0.52)	(1.18)	(1.54)	(1.87)	(1.40)	(6.00)
R^2	0.531	0.187	0.179	0.195	0.257	0.177
H_0: financial high = low, p-value	0.65	0.28	0.16	0.05	0.04	0.08
Observations	248	248	248	248	248	248

Notes: Standard errors (clustered by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the cumulative change in real GDP per capita from the start of the recession. Financial recessions are binned depending on whether the lagged capital ratio of the banking sector at the peak was above or below the historical mean.

Estimates in Table A.25 are for the full sample of N = 248 recessions. On average, financial recessions are worse than normal recessions, as shown by the negative coefficients in the second and third rows. However, though the path is still much worse than normal, the economy recovers faster from a financial recession with a well-capitalized banking sector. After 5 years, output per capita is more than four percentage points lower relative to a normal recession when the banking sector is poorly capitalized (-7.43%) than otherwise (-2.97%).

Table A.25 reports the p-value of a test of the null that the coefficients for low and high bank capital ratios at the start of the crisis are equal. The tests show that the coefficients are generally statistically different from each other (with p-values below 0.10 after year 3). However, economically speaking, higher bank capital at the onset of a financial crisis coincides with a considerably faster economic recovery. Over the 5-year period considered, the relative cumulative GDP costs of a financial crisis with a below-average capitalized banking sector amount, on average, to a loss of more than 12 percentage points of cumulative GDP as reported in column (6) of the table (compare -25.40% with -12.79%).

J.2 Local projections with standard errors clustered on country and year

Table A.26: *Normal versus financial recessions, real GDP per capita by capital ratio, with controls, full sample, standard errors clustered by country and year.*

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***
	(0.13)	(0.29)	(0.34)	(0.45)	(0.41)	(1.39)
Financial recession, high capital ratio	-1.36	-3.01***	-3.69***	-2.60**	-3.09***	-13.75***
	(0.85)	(1.07)	(0.95)	(1.15)	(0.86)	(3.82)
Financial recession, low capital ratio	-1.22*	-4.80***	-7.63***	-9.42***	-9.46***	-32.52***
	(0.65)	(1.14)	(1.58)	(1.63)	(1.05)	(5.35)
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	0.88	0.17	0.06	0.00	0.00	0.00
Observations	210	210	210	210	210	210

Notes: Standard errors (clustered by country and year) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the cumulative change in real GDP per capita from the start of the recession. Financial recessions are binned depending on whether the lagged capital ratio of the banking sector at the peak was above or below the historical mean. Corresponds to Table 7 in the main text.

J.3 Local projections with continuous measure and standard errors clustered on country and year

Table A.27: *Normal versus financial recessions, real GDP per capita with continuous capital ratios, with controls, full sample, standard errors clustered by country and year.*

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***
	(0.13)	(0.30)	(0.34)	(0.44)	(0.41)	(1.36)
Financial recession	-1.28**	-4.04***	-5.95***	-6.52***	-6.76***	-24.55***
	(0.56)	(0.88)	(0.83)	(1.08)	(0.62)	(3.38)
Normal recession	-0.03	-0.05	0.06	-0.03	-0.05	-0.10
× capital ratio	(0.03)	(0.05)	(0.08)	(0.09)	(0.09)	(0.31)
Financial recession	-0.06	0.12**	0.21**	0.28***	0.31***	0.86**
× capital ratio	(0.04)	(0.05)	(0.10)	(0.10)	(0.08)	(0.34)
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	0.44	0.00	0.00	0.00	0.00	0.00
H_0: normal × capital =						
financial × capital, p-value	0.44	0.00	0.19	0.01	0.00	0.01
Observations	210	210	210	210	210	210

Notes: Standard errors (clustered by country and year) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the cumulative change in real GDP per capita from the peak. Financial refers to the average path after financial recessions relative to the average recession. Interaction terms refer to marginal effects of capital ratios after normal and financial recessions relative to the historical mean. Capital ratios have been multiplied by 100. Corresponds to Table 8 in the main text.

J.4 Local projections using pre-2006 sample

Table A.28: *Normal vs. financial recessions, capital ratio bins above and below historical average, controls included, pre-2006 sample.*

100 × log real GDP per capita

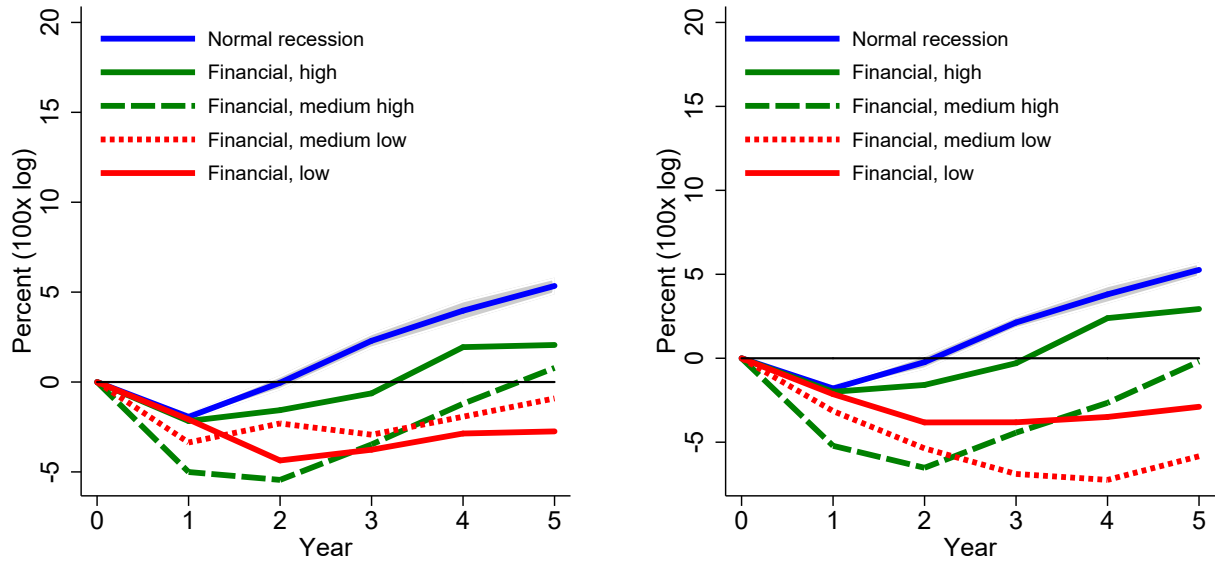
	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5	(6) Sum
Recession	-1.78***	-0.12	2.33***	4.14***	5.64***	10.22***
	(0.13)	(0.28)	(0.30)	(0.42)	(0.35)	(1.30)
Financial recession, high capital ratio	-0.34	-3.13**	-4.09***	-3.39*	-4.08*	-15.03***
	(0.46)	(1.17)	(1.13)	(1.72)	(1.93)	(5.14)
Financial recession, low capital ratio	-2.46**	-4.98***	-8.35***	-9.50***	-8.65***	-33.94***
	(0.88)	(1.37)	(2.13)	(2.39)	(2.13)	(7.95)
Controls	Yes	Yes	Yes	Yes	Yes	Yes
R^2	0.603	0.307	0.366	0.343	0.410	0.349
H_0: financial high = low, p-value	0.01	0.16	0.15	0.05	0.17	0.07
Observations	193	193	193	193	193	193

Notes: Standard errors (clustered by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the cumulative change in real GDP per capita from the start of the recession. Financial recessions are binned depending on whether lagged capital ratios at the beginning of the recession are below or above the historical average.

J.5 Local projections based on capital ratio quartiles

Figure A.9: *Normal versus financial recessions binned by capital ratio*

(a) *No controls, full sample.* **(b)** *With controls, full sample.*



Notes: This figure displays the average path of real GDP per capita after financial recessions depending on the capitalization of the banking sector in the year prior to to the peak. The specification interacts the financial recession dummy with a dummy $q_{j,i,t(p)}$ that is 1 if the lagged banking sector capital ratio at the peak is in the j-th quartile of all financial recessions, and zero else.

$$\Delta_h y_{i,t(p)} = \sum_{i=1}^{I-1} \alpha_{i,h} D_{i,t(p)} + \mu_h + \sum_{j=1}^{4} \gamma_h^j d_{i,t(p)} \times q_{j,i,t(p)} + \epsilon_{i,t(p)}.$$

The grey area is the 90% confidence region for the normal recession path. Full sample results: 1870-2013, excluding world wars and 5-year windows around them.

J.6 Local projections with real private credit per capita as dependent variable

Table A.29: *Normal versus financial recessions, real private credit per capita binned by capital ratio, no controls, full sample.*

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

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5
Recession	2.86***	6.56***	11.31***	14.91***	18.08***
	(0.25)	(0.44)	(0.56)	(0.65)	(0.80)
Financial recession, high capital ratio	-1.11	-2.33	-3.48	-5.30	-6.32
	(1.40)	(1.81)	(2.57)	(3.40)	(4.93)
Financial recession, low capital ratio	-0.59	-6.43***	-10.46***	-13.64***	-17.22***
	(1.06)	(2.14)	(2.72)	(3.29)	(4.00)
R^2	0.159	0.240	0.340	0.364	0.390
H_0: financial high = low, p-value	0.75	0.12	0.06	0.10	0.12
Observations	237	237	237	237	237

Notes: Standard errors (clustered by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the cumulative change in real private credit per capita from the peak. Financial recessions are binned depending on whether lagged capital ratios at the beginning of the recession are below or above the historical average.

Table A.30: *Normal versus financial recessions, real private credit per capita binned by capital ratio, controls included, full sample.*

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

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5
Recession	2.29***	4.94***	9.07***	12.57***	15.93***
	(0.40)	(0.56)	(0.62)	(0.80)	(1.01)
Financial recession, high capital ratio	-2.25	-3.00	-5.49*	-8.62**	-10.54*
	(1.44)	(2.25)	(2.75)	(3.77)	(5.37)
Financial recession, low capital ratio	-0.02	-4.48*	-9.45***	-13.75***	-18.06***
	(1.04)	(2.12)	(2.85)	(3.65)	(4.52)
Controls	Yes	Yes	Yes	Yes	Yes
R^2	0.252	0.325	0.428	0.434	0.438
H_0: financial high = low, p-value	0.17	0.58	0.32	0.35	0.31
Observations	199	199	199	199	199

Notes: Standard errors (clustered by country) in parentheses. * $p < 0.10$, ** $p < 0.05$, *** $p < 0.01$. The dependent variable is the cumulative change in real private credit per capita from the peak.Financial recessions are binned depending on whether lagged capital ratios at the beginning of the recession are below or above the historical average.

K. Return predictability: univariate results

Table A.31: *Balance sheet measures and mean returns on the bank equity index.*

Cumulative returns	(1) 1-year	(2) 2-year	(3) 3-year	(4) 1-year	(5) 2-year	(6) 3-year
Panel A	RHS: Δ_3 Loans/GDP			RHS: Δ_3 Assets/GDP		
See column header	-0.041***	-0.082***	-0.113***	-0.021***	-0.037***	-0.061***
	(0.005)	(0.011)	(0.018)	(0.007)	(0.010)	(0.015)
R^2	0.022	0.045	0.062	0.009	0.014	0.027
Observations	914	883	854	914	883	854
Panel B	RHS: Capital ratio			RHS: Δ_3 Capital ratio		
See column header	-0.061	-0.105	-0.117	-0.017	-0.007	0.040
	(0.049)	(0.094)	(0.131)	(0.017)	(0.030)	(0.041)
R^2	0.004	0.005	0.005	0.001	0.000	0.001
Observations	914	883	854	914	883	854
Panel C	RHS: Δ_3 LtD ratio			RHS: Δ_3 Non-core ratio		
See column header	-0.027***	-0.058***	-0.083**	-0.001	-0.007	-0.035*
	(0.008)	(0.021)	(0.032)	(0.006)	(0.015)	(0.021)
R^2	0.008	0.019	0.027	0.000	0.000	0.005
Observations	901	870	841	886	855	826

Notes: The dependent variable is the log excess return on the bank equity index from Baron and Xiong (2017) cumulated over h years, where h is specified in the column header. RHS variables are standardized at the country level using past data to avoid look-ahead bias. All specifications include country fixed effects. Standard errors in parentheses are computed using the Driscoll-Kraay method accounting for autocorrelation of up to 17 lags. *,**,*** indicates significance at the 0.1, 0.05, 0.01 level, respectively.

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