When Credit Bites Back. Lessons from Economic History

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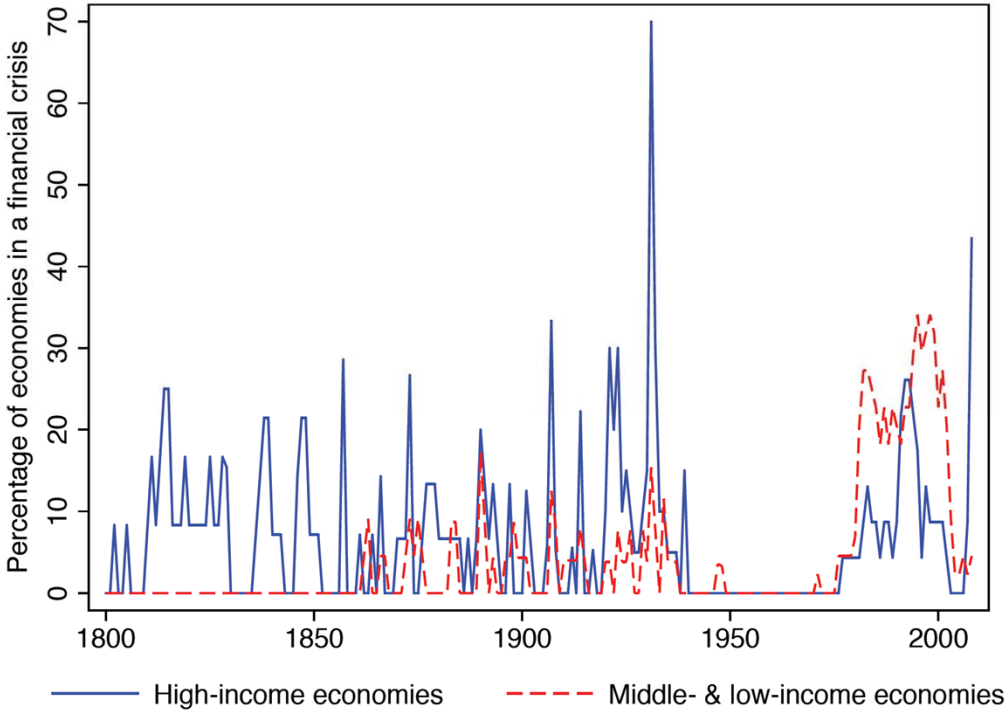
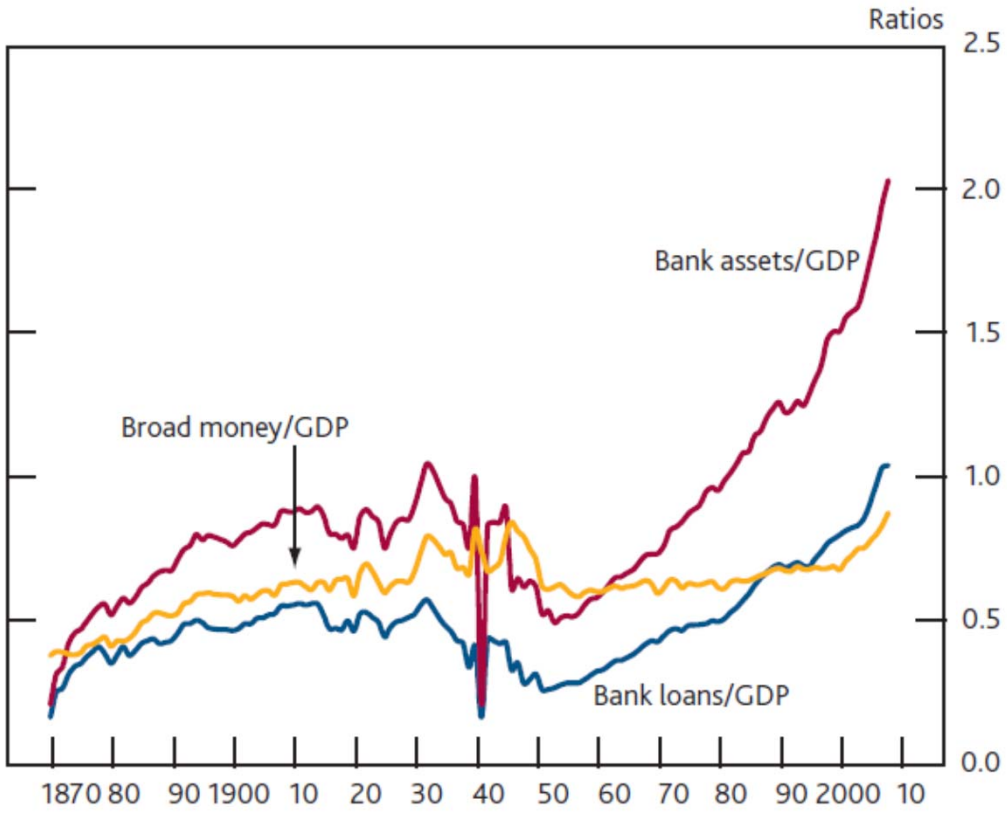
Financial Crises Are Back

- A long standing problem
- Exception: 1940 to 1970 oasis of calm. Why?



Notes and source: The chart shows the percentage of economies in each subgroup that were in a financial crisis in the each year in the period 1800 to 2008. Data from Qian, Reinhart, and Rogoff (2010).

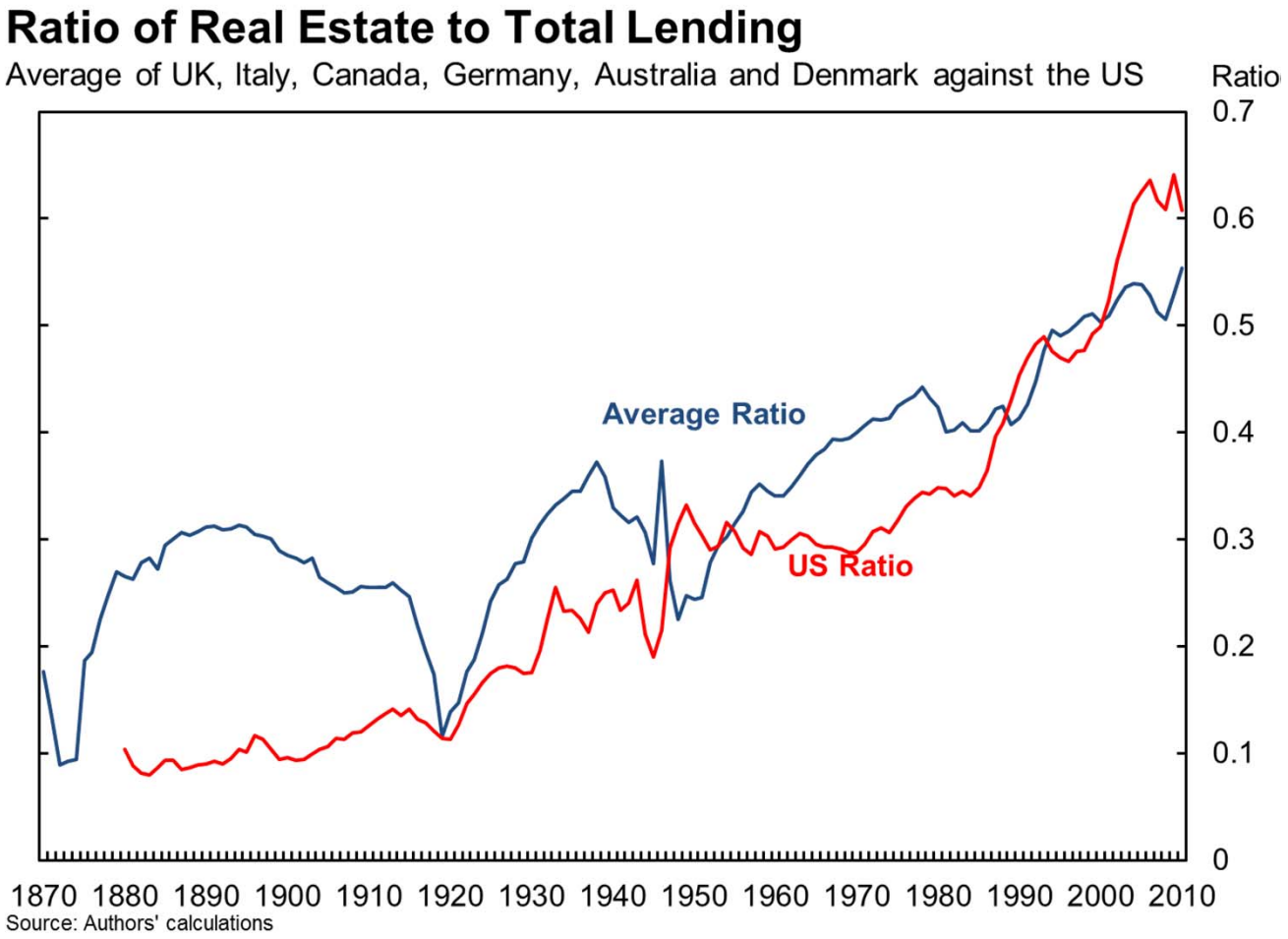
The Age of Credit: The Brick Standard?



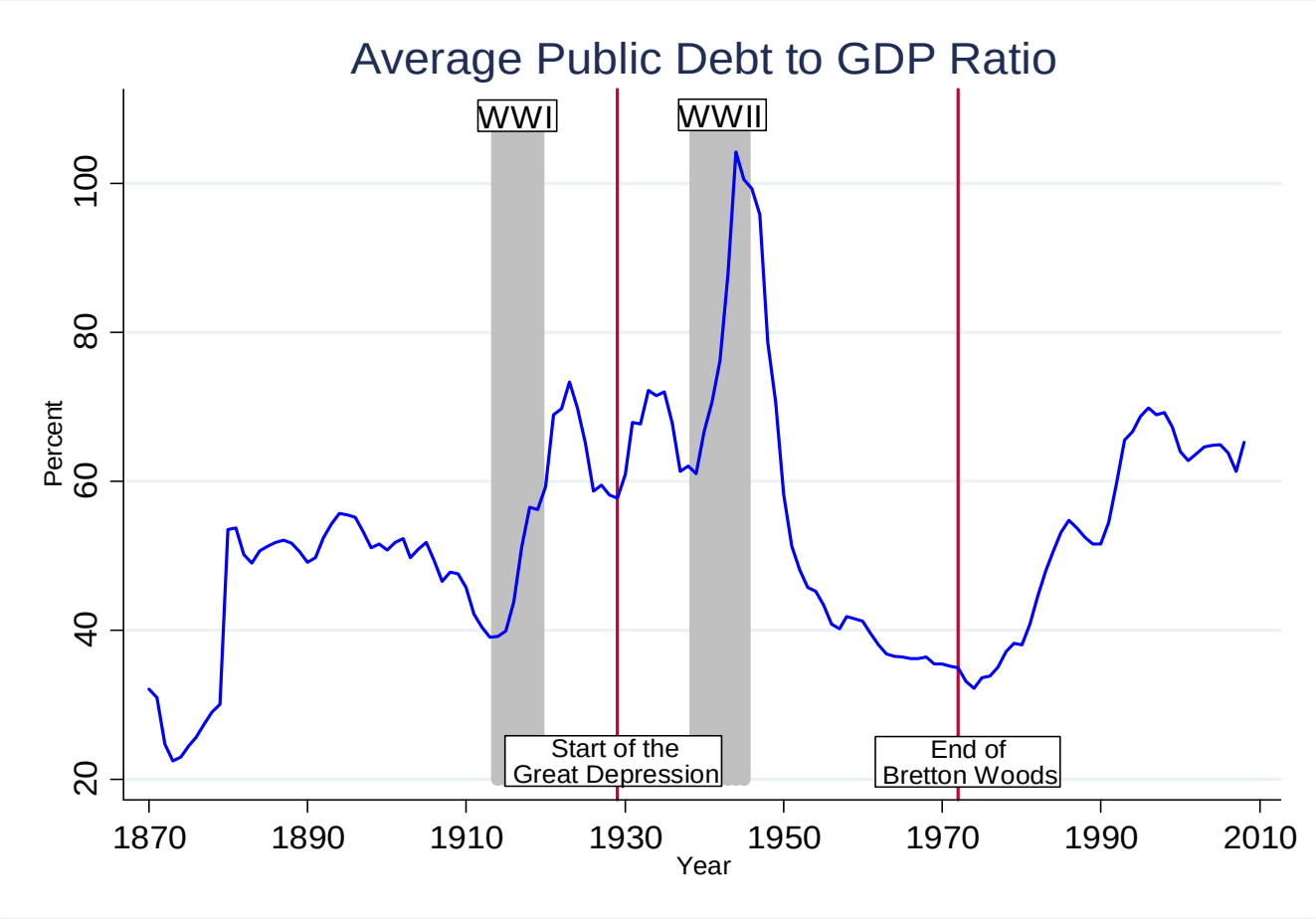
Source: Schularick and Taylor (2009).

(a) Fourteen-country averages by year.

Share of Real Estate Lending



Public Debt over Time



Predicting Binary Events: Assessment

- Let $\hat{S}_t(h) = I(y_t > c_h); h = 1, ..., H; S_{t+h} \in \{0, 1\}$
- Four possible errors of classification (e.g. $h = 0$)

	Prediction		
		Crisis	Calm
Outcome	Crisis	$TP(c) = P(\hat{S}_t = 1 \mid S_t = 1)$	$TP(c) = P(\hat{S}_t = 0 \mid S_t = 1)$
	Calm	$TP(c) = P(\hat{S}_t = 1 \mid S_t = 0)$	$TP(c) = P(\hat{S}_t = 0 \mid S_t = 0)$

- *TP(c) + FN(c) = 1 = TN(c) + FP(c)*
- *FP(c) = Type I error, 1-specificity, size*
- *FN(c) = Type II error, 1-sensitivity, 1-Power*

The Costs and Benefits of Correct Classification

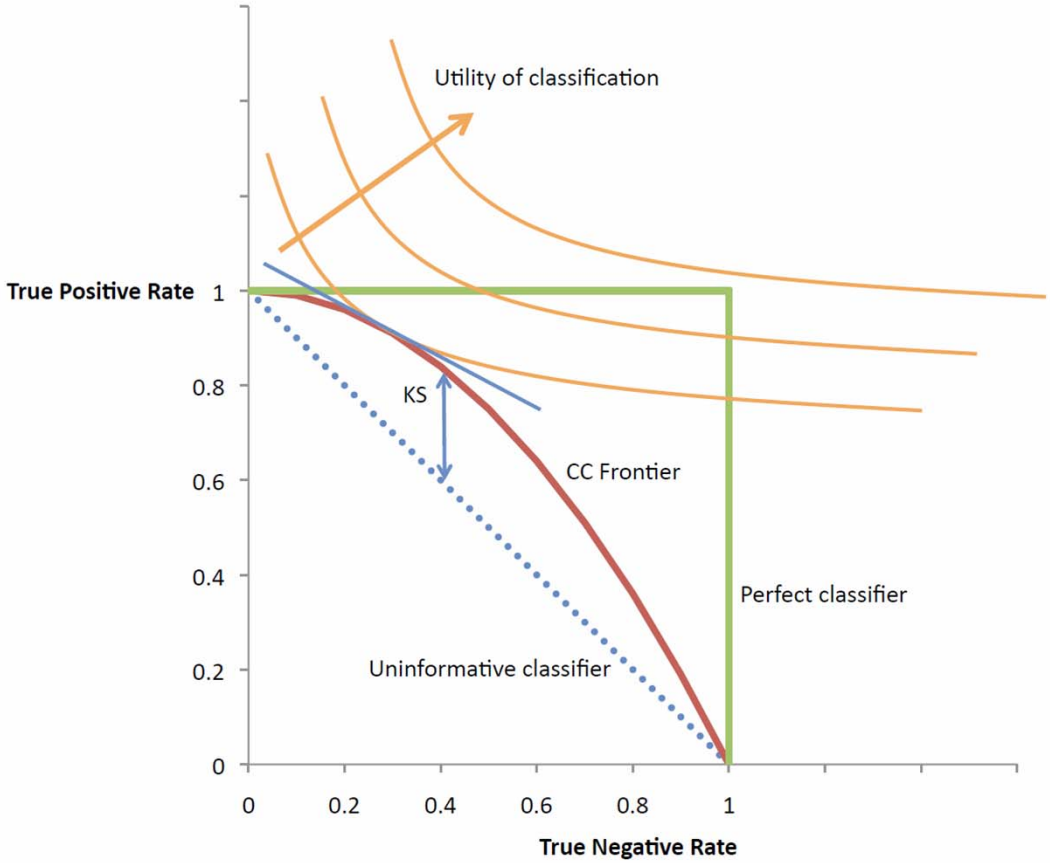
- Charles Sanders Peirce (1884): the utility of the method:

$$\begin{aligned} U(c) = \quad & U_{pP}TP(c)\pi + U_{nP}(1 - TP(c))\pi + \\ & U_{pN}(1 - TN(c))(1 - \pi) + U_{nN}TN(c)(1 - \pi) \end{aligned}$$

- With $\pi = P(S_t = 1)$.
- And plotting all combinations

$$\{TP(c), TN(c)\} \text{ for } c \in (-\infty, \infty)$$

The Correct Classification Frontier

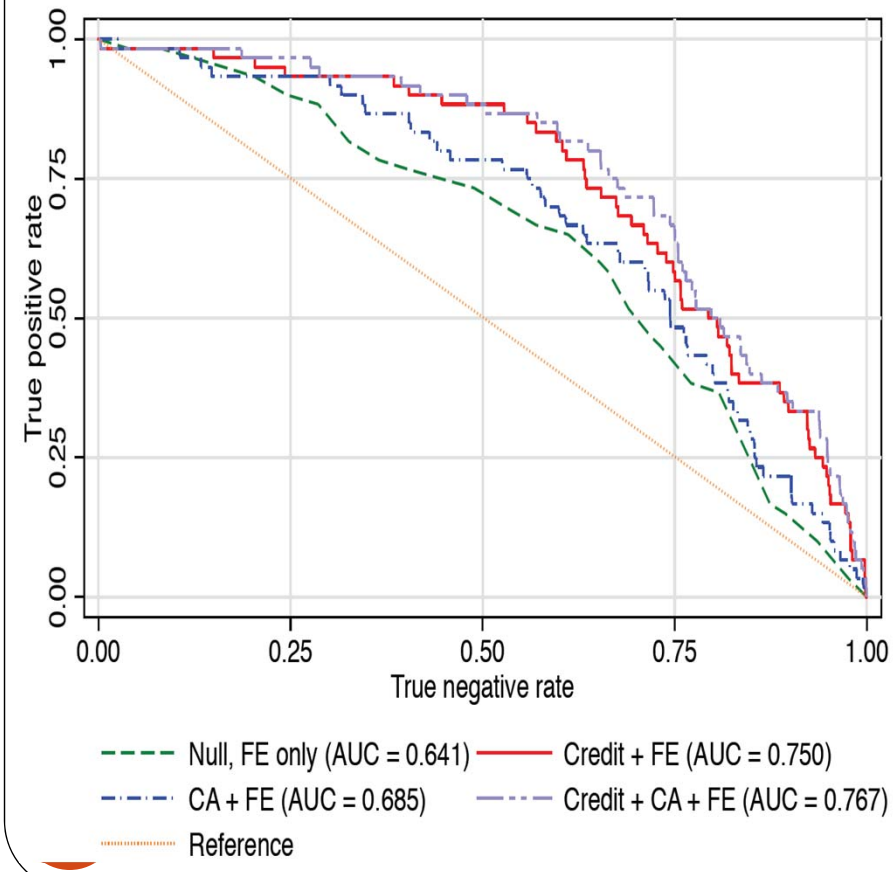


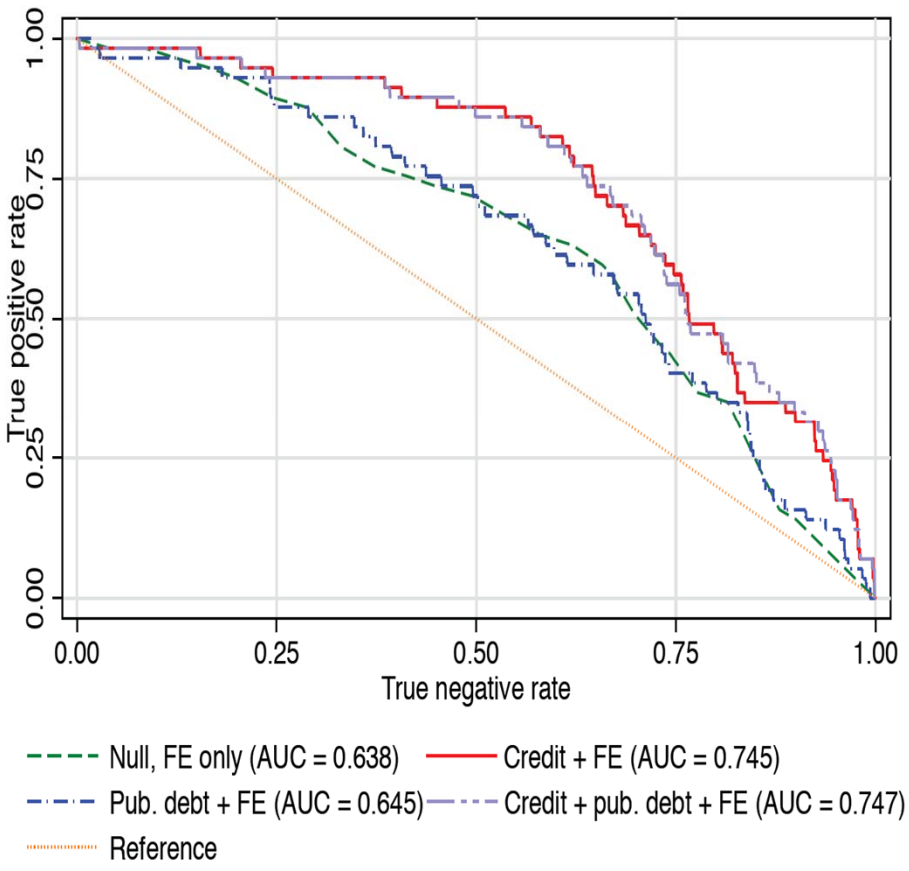
Predicting Financial Crises

- The Usual Suspects:
  - Current account deficit
  - Public debt
  - Excess credit

Credit, credit, credit

- Using lagged credit growth, current account and public debt as a classifier for financial crises





The Questions

- Is credit an epiphenomenon?
- If not, how does it relate to the business cycle?

What's New?

- Things we would like to know, and now do (Reinhart and Rogoff, and other sources over the years):
  - *Sovereign crisis data (0-1)* ✔
  - *Bank crisis data (0-1)* ✔
  - *Public debt level data* ✔
  - *Bank credit level data* ✖
- We have a new panel database of *private bank credit creation*:
  - 14 advanced countries, 1870 to 2008 (Schularick and Taylor 2012)
- Estimate impacts extending local projections (Jordà, 2005)
  - E.g., allows us to separate responses in normal and financial recessions, and do other conditioning (without VARs)

The Findings

- Build-up of excess credit during the expansion correlated with severity of subsequent recession.
  - *This relationship is more pronounced in financial crises but also present in normal recessions.*

- The costs of financial crises are high, variable:
  - Similar result to Cerra and Saxena (2008), Reinhart and Rogoff (2009a,b); Coelings and Zubanov (2010)
  - *But the magnitude of these costs depends on excess credit generated during the preceding expansion*

The Full Dataset

- 14 countries: Canada, Australia, Denmark, France, Germany, Italy, Japan, the Netherlands, Norway, Spain, Sweden, Switzerland, U.K. and U.S.

- Variables: growth rate of real GDP and C per capita, real private loans, and real M2; I/GDP, and CA/GDP; CPI inflation, short- and long-term interest rates.

- Recessions and Crises: Bry and Boschan (1971) for recessions. Jordà, Schularick and Taylor (2011) split into normal vs. financial recessions.

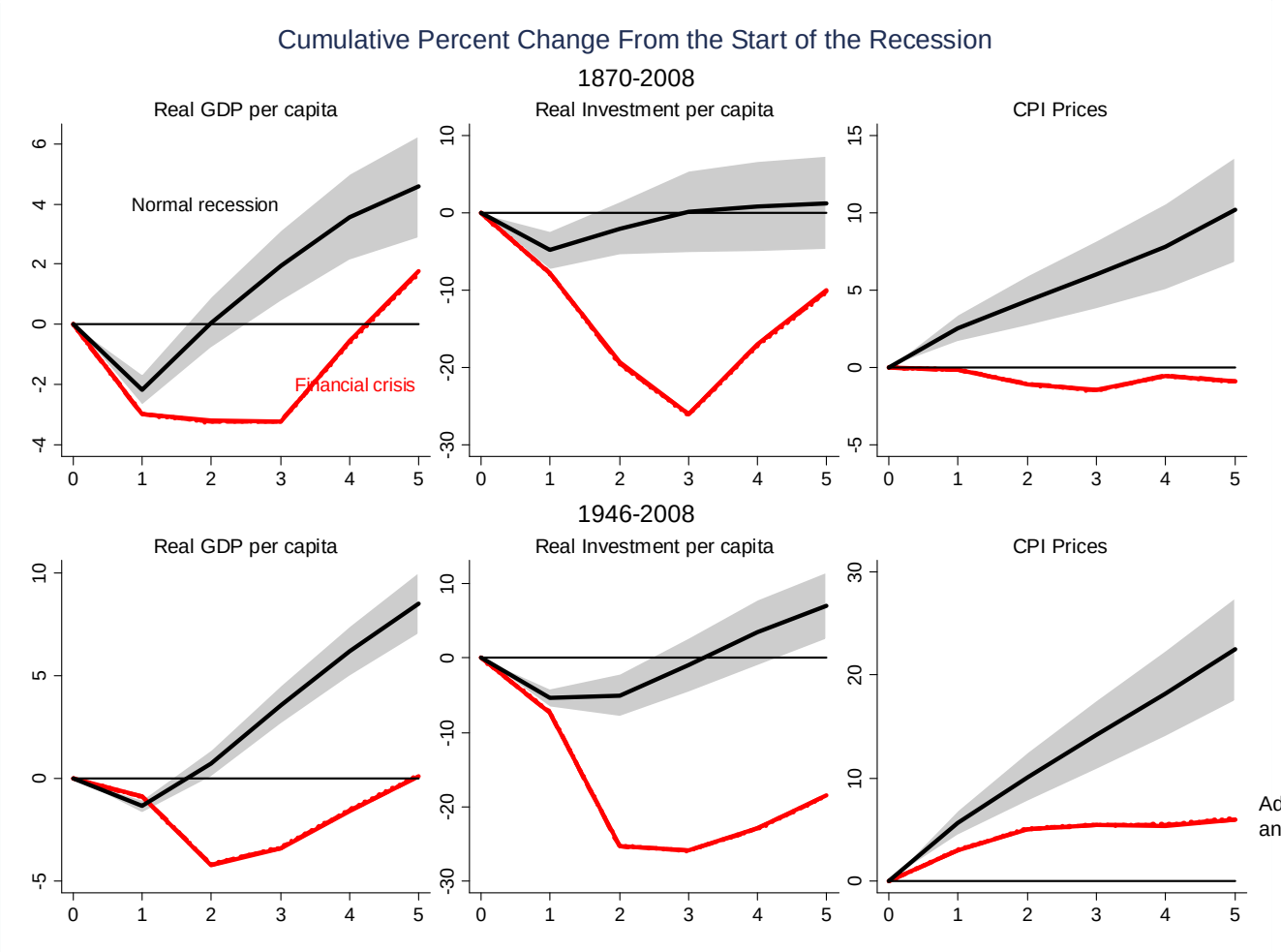
The End of Bretton Woods

- In the U.S., the ratio of financial assets to GDP goes from 150% in 1975 to 350% in 2008
- In the U.K., the financial sector's balance sheet was 34% in 1964. By 2007 it was 500%
- For the 14 countries in our sample the ratio of bank loans to GDP almost doubled since 1970

Credit and the Boom

- After WWII, credit appears to be correlated with the expansion phase trend of GDP
- When credit is above the mean:
  - Expansions last longer: 6.9 → 11.8 years
  - Consequently GDP amplitude is higher: 23% → 48%
  - And the rate of growth is faster 3% → 3.5%
- All good? Is credit welfare enhancing?
  - What happens in the subsequent recession?

Credit and the Recession: A Simple Picture of 140 Years and 14 countries



Adjusted for UK 1973 and Spain 1978

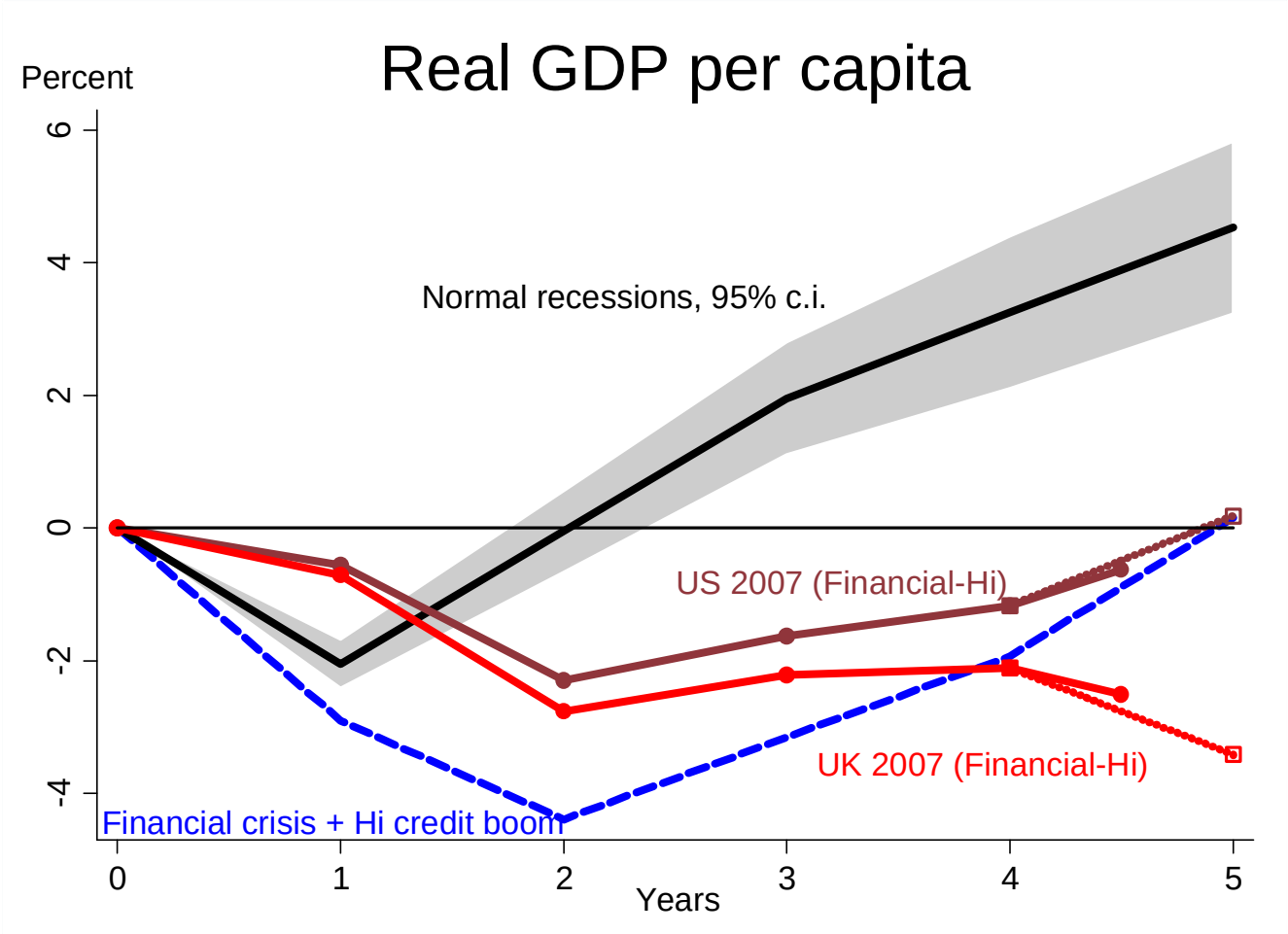
Table 5: Normal v. Financial Bins split into Excess Credit Terciles

	(1) Year 1	(2) Year 2	(3) Year 3	(4) Year 4	(5) Year 5
Normal recession (N)	-2.0*	-0.0	2.0*	3.3*	4.5*
	(0.2)	(0.3)	(0.4)	(0.6)	(0.7)
Financial recession × lo boom ($F \times lo$)	-4.0*	-2.1+	-2.3	1.5	3.8
	(0.7)	(1.2)	(1.7)	(2.3)	(2.6)
Financial recession × med boom ($F \times med$)	-2.3*	-4.0*	-4.3*	-3.1	-1.1
	(0.7)	(1.2)	(1.7)	(2.2)	(2.5)
Financial recession × hi boom ($F \times hi$)	-3.6*	-5.3*	-3.9*	-2.9	-0.4
	(0.7)	(1.2)	(1.7)	(2.2)	(2.5)
F-test Equality of coefficients, Normal=Financial lo (p)	0.01	0.10	0.02	0.45	0.79
F-test Equality of coefficients, Normal=Financial med (p)	0.78	0.00	0.00	0.01	0.03
F-test Equality of coefficients, Normal=Financial hi (p)	0.04	0.00	0.00	0.01	0.06
Observations, Normal	173	173	173	173	173
Observations, Financial lo	11	11	11	11	11
Observations, Financial med	12	12	12	12	12
Observations, Financial hi	12	12	12	12	12
Observations	208	208	208	208	208

Standard errors in parentheses. $^{+}$ $p < 0.10$, * $p < 0.05$

Notes: Dependent variable: $\Delta_h y_{it(r)+h}$ = change in log real GDP per capita at horizon h. Financial recessions are divided into terciles (lo-med-hi) based on the excess credit variable (ξ), and a separate indicator is constructed for each of the respective bins.

The Scorecard so far



The Dynamics of Excess Credit

- Our focus is the recession/recovery path as a function of credit during the prior boom.
  - Business cycle, usual normalization (e.g. Romer and Romer, 1989) = start of the recession.
  - Financial crisis, usual normalization (e.g. Reinhart and Rogoff, 2008 et seq.) = financial crisis date.
- But we also want to condition on pre-existing economic conditions reflected in the context of a system of variables (as in a VAR), as well as allow for various "treatments."

Calculating the Conditional Cumulative Response

- Objective: calculate a cumulative "treatment" effect due to excess credit in the boom on to a system of variables, conditional on all that information and lags.

- Unfortunately, no exogenous source of variation nor natural experiment.

- However, by conditioning on lots of other information, we make it less likely to find an independent effect through credit.

Definition

- ***Cumulated response***:

$$CR(\Delta_h y^k_{it(r)+h}, \delta) =$$
$$E_{it(r)}(\Delta_h y^k_{it(r)+h} | x_{it(r)} = \overline{x} + \delta; Y_{it(r)}, Y_{it(r)-1}, ...)$$
$$- \quad E_{it(r)}(\Delta_h y^k_{it(r)+h} | x_{it(r)} = \overline{x}; Y_{it(r)}, Y_{it(r)-1}, ...)$$

- h denotes horizon, k variable in the system, i country, r recession, $t(r)$ calendar time for *r-th* recession
- x is the treatment variable, δ is the treatment
- $Y_{it} = [\Delta y^1_{it}, ..., \Delta y^J_{it}, y^{J+1}_{it}, ..., y^K_{it}]'$
- $\Delta_h y_{t+h} = y_{t+h} - y_t$

Estimation

- Apply *local projection* approach
- Panel, fixed effects:

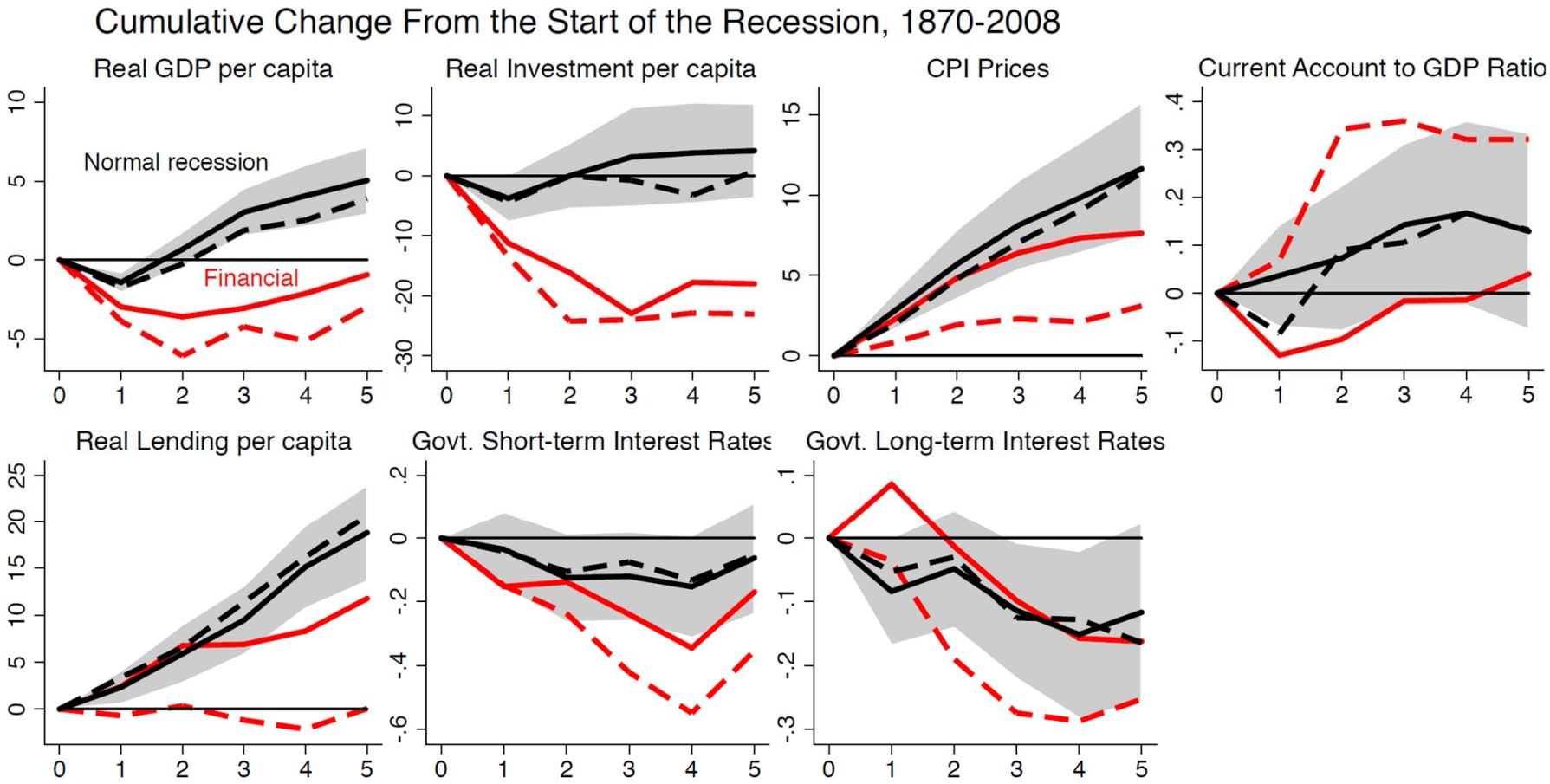
$$\Delta_h y^k_{it(r)+h} = \alpha^k_i + \theta^k_N + \theta^k_F + \beta^k_{h,N}(x_{t(r)} - \overline{x}_N) + \beta^k_{h,F}(x_{t(r)} - \overline{x}_F) + \sum_{j=0}^{p} \Gamma^k_j Y_{it(r)-j} + u^k_{it(r)}; \quad k = 1, .., K; \quad h = 1, ..., H$$

- Then $\widehat{CR}_N(k, h, \delta) = \hat{\beta}^k_{h,N}\delta$ and similarly for financial recessions.
- x is percentage point deviation in loans to GDP ratio from trough to peak (peak = start of recession)

The System

Seven variable system:

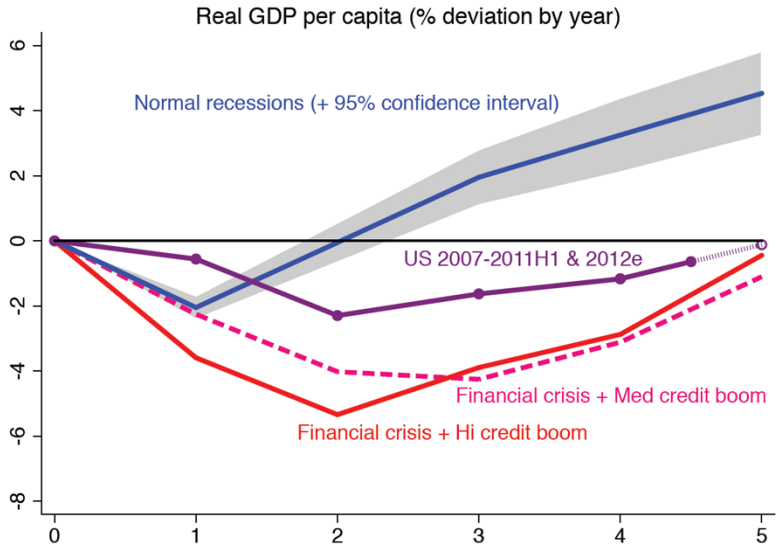
- Real per capita GDP growth
- Real per capita investment growth
- Real per capita private lending growth (*stack the case against *x*)
- Inflation (CPI)
- Short-term (usually 3-months) interest rates (on government bonds).
- Long-term (usually 5-years) interest rates (on government bonds).
- Current account to GDP ratio



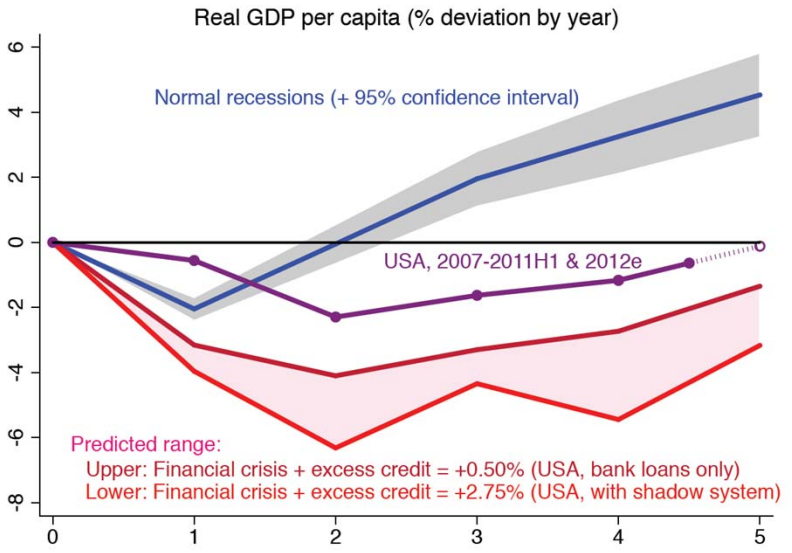
Notes: See text. These IRFs correspond to regression equation (5) for four different treatments. The solid lines show the predicted values for the cases of average normal recession ($N = 1, \xi = \bar{\xi_N}$), average financial recession ($F = 1, \xi = \bar{\xi_F}$). The dotted lines show the predicted values for the cases of normal recession and financial recession where ξ is set at 1 s.d. above the mean in each bin. The shaded 95% confidence interval is also shown for the average normal recession case. For all cases the controls are set to their historical mean values.

Example: The U.S. 2007-2012

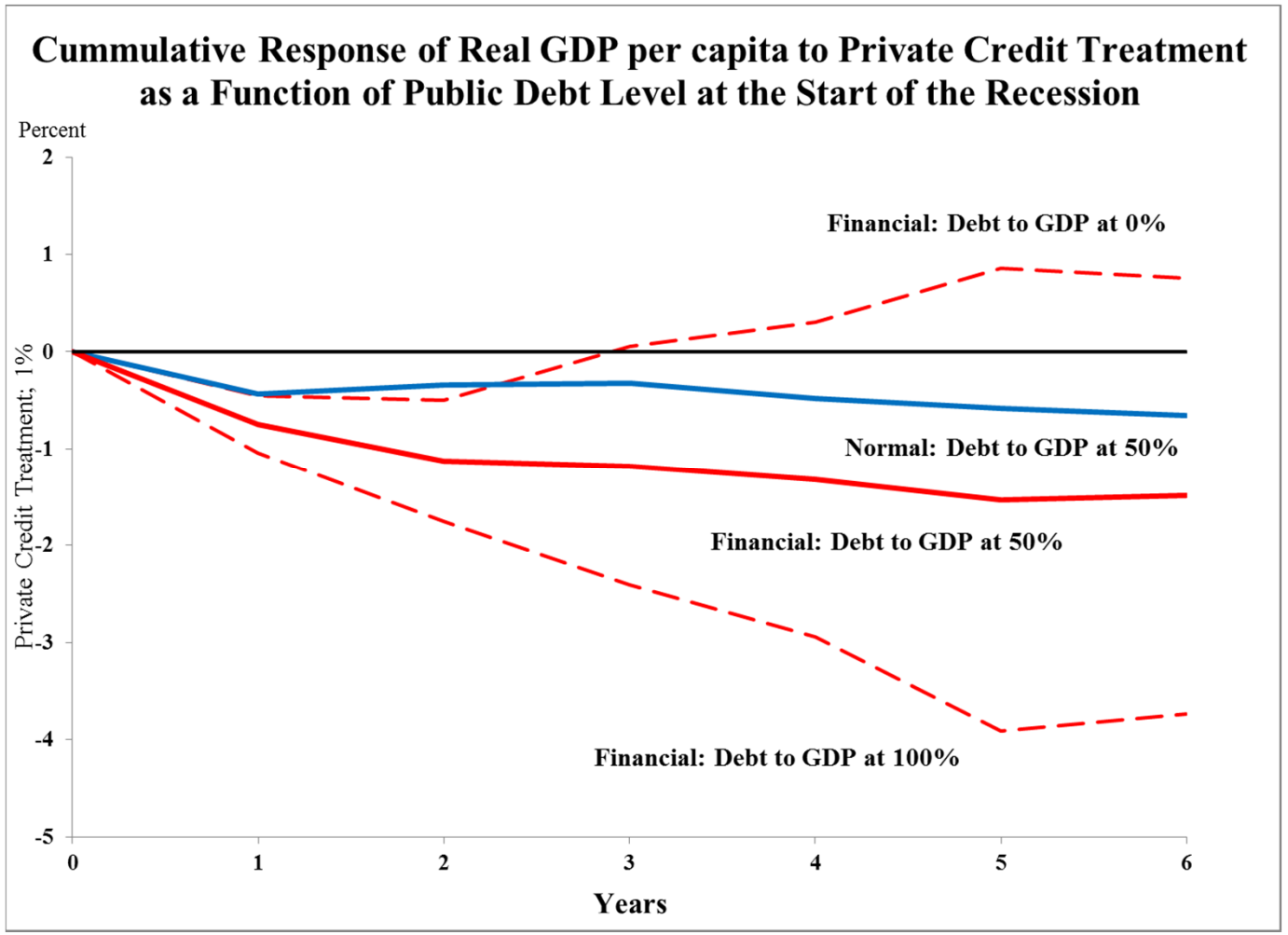
(a) Based on unconditional paths, discrete excess credit treatment



(b) Based on conditional paths, continuous excess credit treatment



What About Public Debt? A Preview



Conclusion

- Leveraged economies more vulnerable to shocks.
- The credit intensity of the boom matters for the path of the recession. It makes it worse.
- These effects are compounded in a financial crisis.
- Potentially important policy.

Future Research

- Causality
- Private + public debt + more data (up to 17 countries)
- Disaggregate data on lending
- Stay tuned…