SOVEREIGNS VERSUS BANKS
CREDIT, CRISES, AND CONSEQUENCES

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What we do

Based on the near universe of advanced economies' business cycles in the modern era, in this paper we:

- Examine the co-evolution of public debt and private credit in a new dataset for 17 countries since 1870
- Ask whether one (or both) of these stocks of liabilities is a harbinger of financial crises
- Quantify the effects in recessions of private and public debt overhang and their interaction

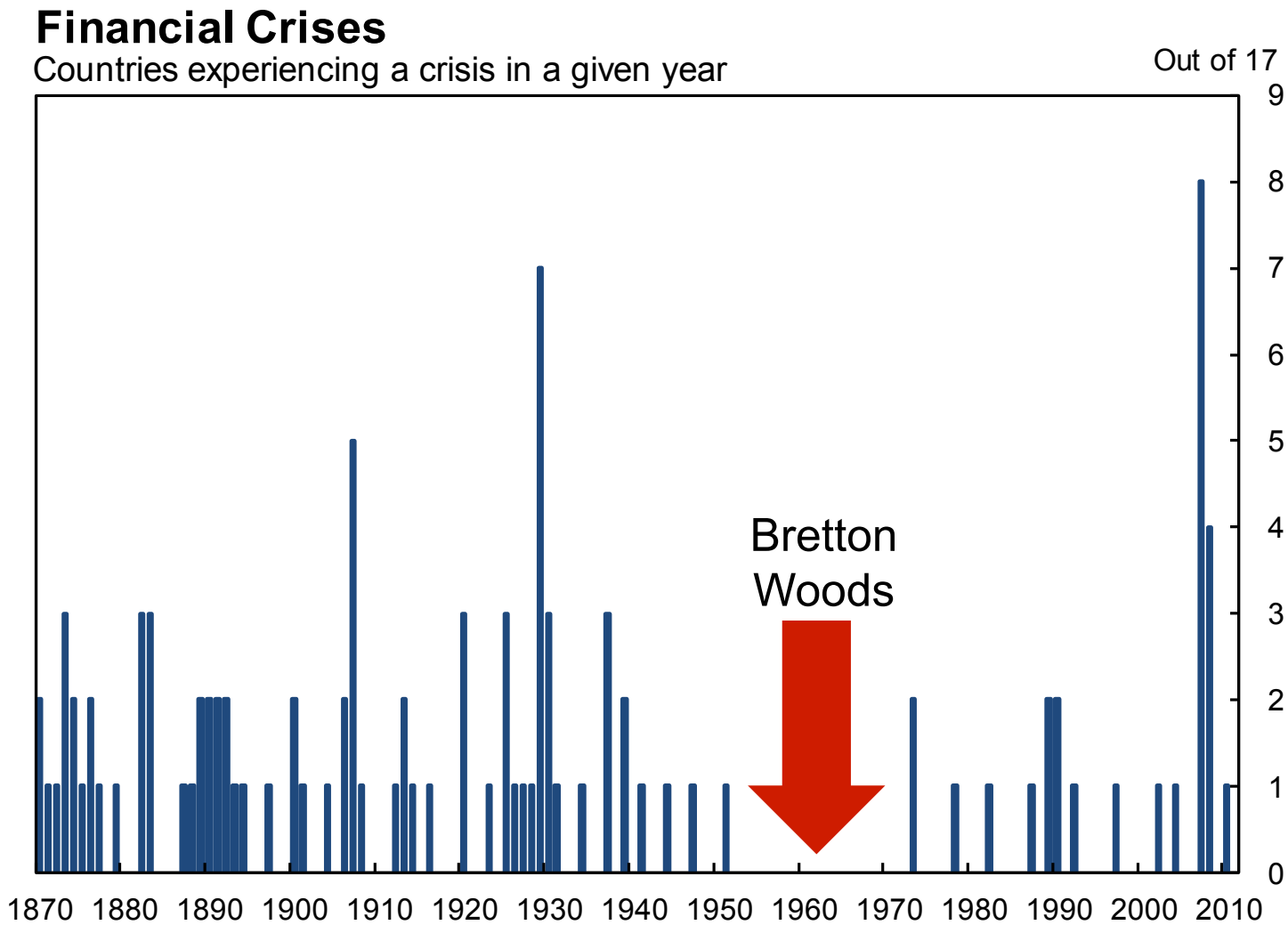
How we do it

- Begin by characterizing salient features of our new private credit and public debt data
- Evaluate the ability of private credit and public debt to predict financial crisis events using novel methods for binary classifiers
- Use local projections and saturated regression control methods to measure the recession/recovery path of economies as a function of private/public overhang semiparametrically

What we find

- Total economy debt levels have risen strongly, but mainly through the private sector
- Private credit booms, not public debt booms, are the best predictor of financial crises
- Private debt overhangs are a problem: more credit intensive booms tend to be followed by deeper recessions and slower recoveries
- High levels of public debt do not matter in normal recessions, but play an important role in financial crisis recessions (fiscal space limited)

Financial crises return... Why? With what effects?



Two narratives about debt and crises

1. Dangers of private sector credit booms:
   - Solvency/liquidity risk for households/intermediaries
   - Bursting of private debt boom in US, Spain, UK
2. Dangers of excessive public borrowing:
   - Doubts on sovereign debt undermine banks: "doom loop"
   - Arguably the story in Greece, Italy, Portugal

Which debts should we worry about as causes of crises?

Two narratives about debt overhang

1. Private sector debt overhang
   - Household debt overhang: Mian/Sufi (2009, 2011)
   - Balance sheet recessions: Koo (2008); Eggertsson/Krugman (2012)
2. Public sector debt overhang
   - Drag from high public debt: Reinhart/Rogoff (2009, 2010); Checherita/Rother (2010); Kumar/Woo (2010)

Which debts should we worry about as causes of post-crisis drag on growth?

Big questions

- Broadly, what are the macroeconomic consequences of private and public leveraging and deleveraging?
- What then are the implications for policy?
  - Macro-prudential regulation? Fiscal rules? Both?
- Economic history has a lot to offer with "rare events"
  - The return of large T: Reinhart/Rogoff on public debt and economic performance (TTID etc.)
  - Our new focus is private credit: Schularick/Taylor (AER); Jordà/Schularick/Taylor (IMF, JMCB)

MAJOR TRENDS IN THE DATA

Our data

- **17 countries:** Belgium, Canada, Australia, Denmark, Finland, France, Germany, Italy, Japan, Netherlands, Norway, Portugal, Spain, Sweden, Switzerland, U.K., U.S.

- **Variables:** private and public debt, nominal GDP, real GDP per capita, investment/GDP, CA/GDP, CPI inflation, short- and long-term interest rates

- **Recession and Crisis Dates:** Bry and Boschan (1971) for recessions. Jordà, Schularick, and Taylor (2012) for normal versus financial recessions and crisis dates

Five stylized facts

1. Expansions have become longer lasting

Pre-WWI	Interwar	Bretton Woods	Post-BW
3 yrs	4 yrs	6 yrs	10 yrs

2. The annual rate of growth of expansions has declined

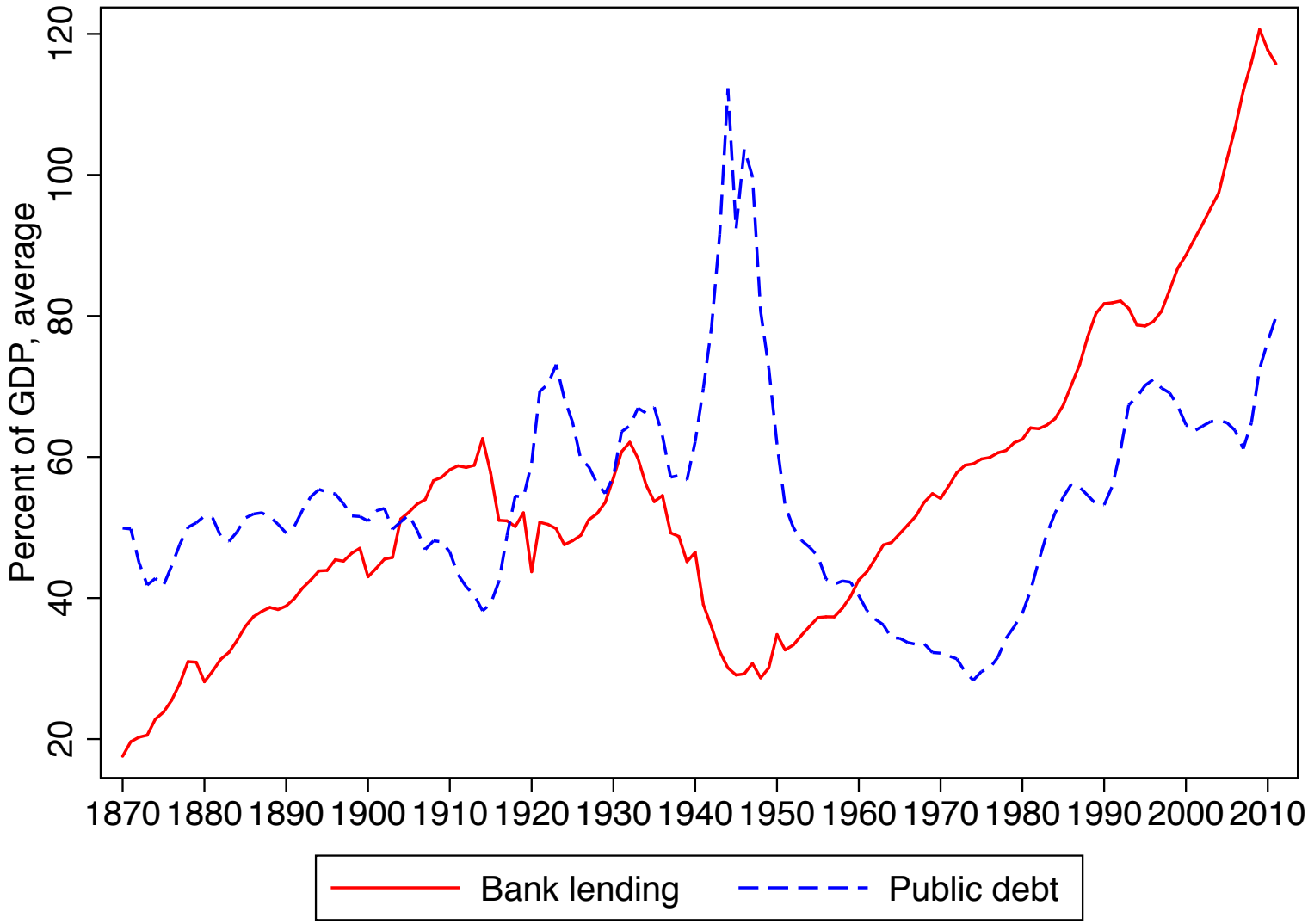
Pre-WWI	Interwar	Bretton Woods	Post-BW
3.6%	5.2%	4.3%	2.7%

3. Private credit pro-cyclical (expansions +, recessions -)

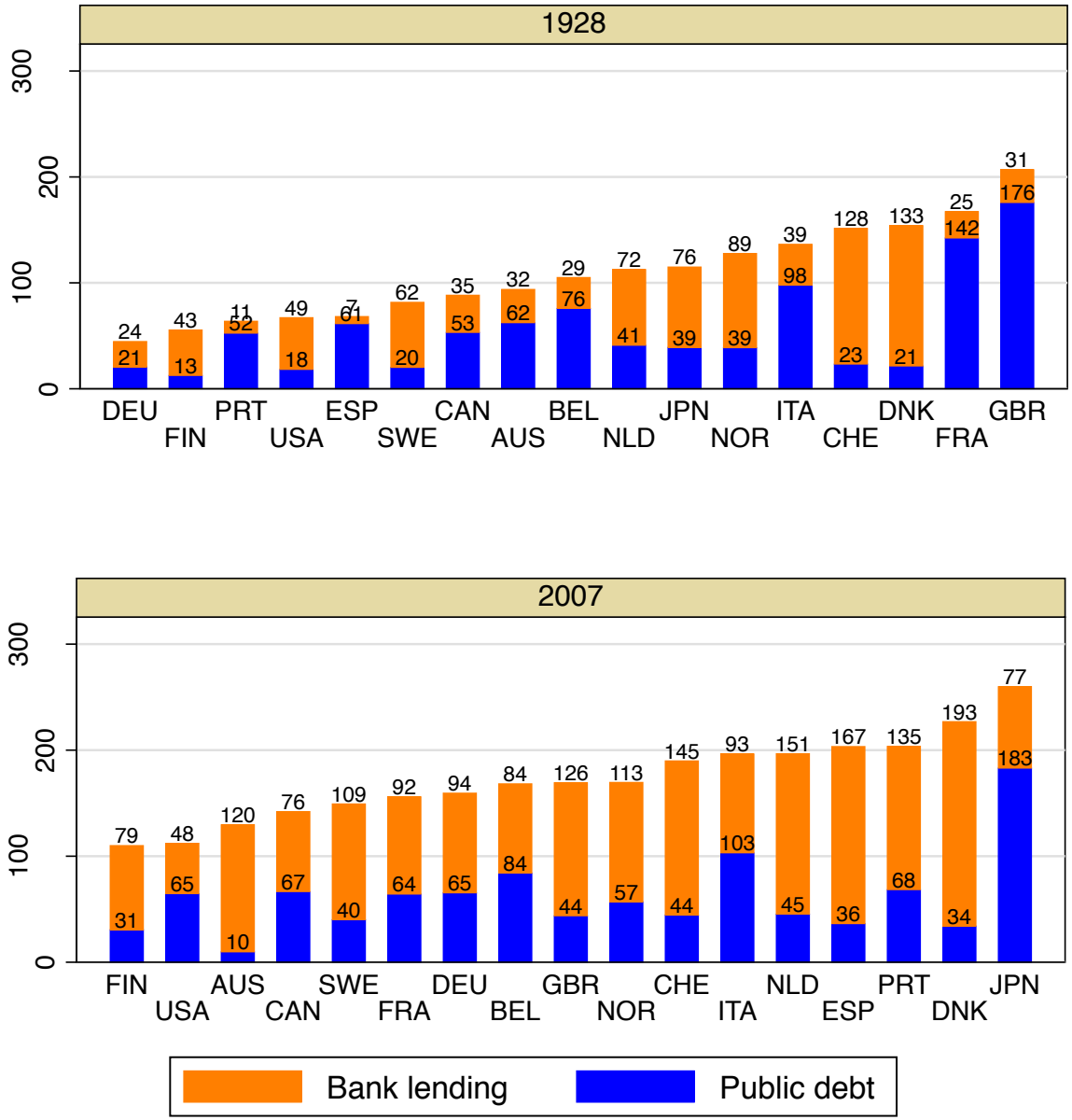
4. Public debt counter-cyclical (expansions -, recessions +)

5. After no trend 1900–70, both private credit and public debt have grown, at a combined 9 p.p.y. (pct. pt. / year) since 1970s, and cyclicality gave way to upward trends. Unprecedented in history

Public debt versus private credit



Sovereigns v. banks: Total liabilities then and now



DEBT AND FINANCIAL CRISES

Business cycle chronology

Examples of business cycle peaks

Total = 269; N = 206; F = 63 (all, including wartime periods)

CAN	N	1871	1877	1882	1884	1888	1891	1894	1903	1913	1917	1928
		1944	1947	1953	1956	1981	1989					
	F	1874	1907									
CHE	N	1875	1880	1886	1890	1893	1899	1902	1906	1912	1916	1920
		1933	1939	1947	1951	1957	1974	1981	1994	2001		
	F	1871	1929	1990								
DEU	N	1879	1898	1905	1913	1922	1943	1966	1974	1980	1992	2001
	F	1875	1890	1908	1928							
DNK	N	1870	1880	1887	1911	1914	1916	1923	1939	1944	1950	1962
		1973	1979	1992								
	F	1872	1876	1883	1920	1931	1987					
ESP	N	1873	1877	1892	1894	1901	1909	1911	1916	1927	1932	1935
		1940	1944	1947	1952	1958	1974	1980	1992			
	F	1883	1889	1913	1925	1929	1978					
FIN	N	1870	1883	1890	1898	1907	1913	1916	1938	1941	1943	1952
		1957	1975									
	F	1876	1900	1929	1989							

- Peaks of *real GDP per capita* from Bry-Boschan algorithm
- Financial recession $F = 1 \iff$ fin. crisis within ± 2 years
- Normal recession $N = 1$ otherwise

Predicting financial crises

- Is private or public borrowing the greater risk to financial stability?
- Model the log-odds ratio of a financial crisis using panel logit with country fixed effects:

$$\log \frac{P[S_{it} = 1|X_{it}]}{P[S_{it} = 0|X_{it}]} = \beta_{0i} + \beta_1 X_{it} + e_{it}$$

- 5-yr moving averages: parsimonious summary of medium-term fluctuations and interactions
- Binary classification and predictive ability tests

Private credit predicts financial crises

Classifier logit model	(1)	(2)	(3)	(4)	(5)
Change in private credit/GDP	21.79***		21.34***	26.63**	
(5-year moving average)	(5.39)		(5.44)	(13.00)	
Change in public debt/GDP		-2.83	-3.17		-4.21
(5-year moving average)		(1.88)	(3.68)		(3.29)
Lagged level of private credit/GDP				-0.03	
				(0.63)	
Lagged level of public debt/GDP					-0.03
					(0.29)
(Lagged level of private credit/GDP)				-3.63	0.45
× (Lagged level of public debt/GDP)				(9.34)	(3.02)
Observations	1901	1983	1805	1895	1850
Area under the curve (AUC)	0.68	0.61	0.68	0.68	0.61
	(0.03)	(0.03)	(0.03)	(0.03)	(0.03)

- Public debt does not predict crises, private credit does...
- ...but let's not kid ourselves, crises are difficult to predict

Not all cycles are created equal

Full sample	All Recessions		Financial Recessions		Normal Recessions	
Financial recession indicator	0.23		1		0	
Observations	269		63		206	
Normal recession indicator	0.77		0		1	
Observations	269		63		206	
Change in private credit/GDP	0.70	(2.26)	1.73	(2.35)	0.41	(2.15)
Observations	198		44		154	
Change in public debt/GDP	-0.76	(6.06)	-0.13	(3.65)	-0.95	(6.62)
Observations	218		51		167	
Public debt level/GDP	0.51	(0.36)	0.50	(0.34)	0.51	(0.37)
Observations	247		58		189	

- Private credit grows much faster in expansions that end in financial crisis.... Consistent with crisis prediction story

DEBT BOOMS AND OVERHANGS: PUBLIC AND PRIVATE

Debt hangovers

- On the private side, arguments over whether deleveraging after credit booms may weigh on aggregate demand
  - Koo (2008); Mian and Sufi (2012); Krugman and Eggertsson (2012): balance sheet repair after asset price collapse or tightening of borrowing limits
- On the public side, arguments over whether high levels of public debt may slow down growth
  - Reinhart et al. (2012): Studied 26 episodes where public debt to GDP ratio exceeded 90% and found that these episodes were associated with growth slowdown

Empirical challenge

- Can we disentangle these issues based on our near universe of modern business cycle data?
- We think so:
  - Consider a county i coming out of a business cycle expansion p and entering a recession at time $t(p)$
  - Examine when private credit grows above country-specific historical average in the expansion: $(x_{i,t(p)} - \overline{x}_i)_{\text{credit}}$
  - Examine when debt to GDP level is above/below/at historical average at start of the recession: $(x_{i,t(p)} - \overline{x}_i)_{\text{debt}}$
  - Examine the possible interaction terms
  - Do these change the expected path of the economy through recession and recovery $(y_{t(p)}, ..., y_{t(p)+h})$?

Empirical strategy

- Examine outcomes over time
- Use a saturated regression control strategy: condition on broad range of lagged macro variables that may both relate to the shape of the recovery and to the size of the overhang
- Use semiparametric approach for added flexibility and to examine nonlinearities easily
- To do all this use methods of local projections (Jordà 2005)

Panel local projections: Average effect of the overhang

Paths in normal versus financial recessions and experiments

$$\underbrace{\Delta_h y^k_{it(p)+h}}_{\text{outcome}} = \underbrace{\theta^k_N d^N_{it(p)} + \theta^k_F d^F_{it(p)}}_{\text{average conditional paths}}$$

$$+ \underbrace{\beta^k_{h,N} d^N_{it(p)} \left(x_{it(p)} - \bar{x}_i\right) + \beta^k_{h,F} d^F_{it(p)} \left(x_{it(p)} - \bar{x}_i\right)}_{\text{effect of the overhang}}$$

$$+ \underbrace{\sum_{l=0}^{L} \Gamma^k_{h,l} Y_{it(p)-l}}_{\text{controls (demeaned)}} + \underbrace{\alpha^k_i}_{\text{fixed effects (demeaned)}} + \underbrace{u^k_{h,it(p)}}_{\text{error term}}$$

where $\underbrace{k = 1, ..., K;}_{\text{variables}}$ $\underbrace{h = 1, ..., H;}_{\text{horizons}}$ $\underbrace{l = 1, ..., L;}_{\text{lags}}$ $\underbrace{p = 1, ..., P}_{\text{recessions}}$

Three steps

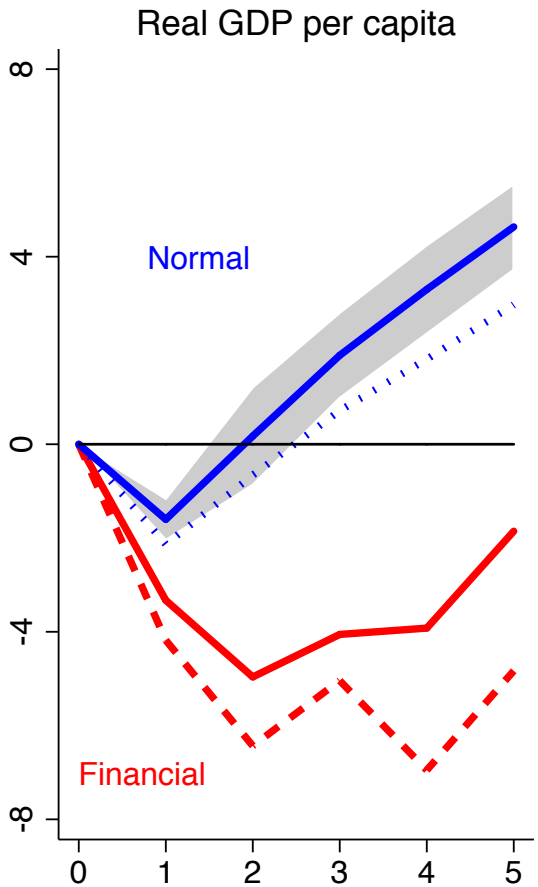
1. **First**, examine how the overhang of a private credit boom changes the expected path of the economy

2. **Second**, study the overhang effects of high levels of public debt on the path

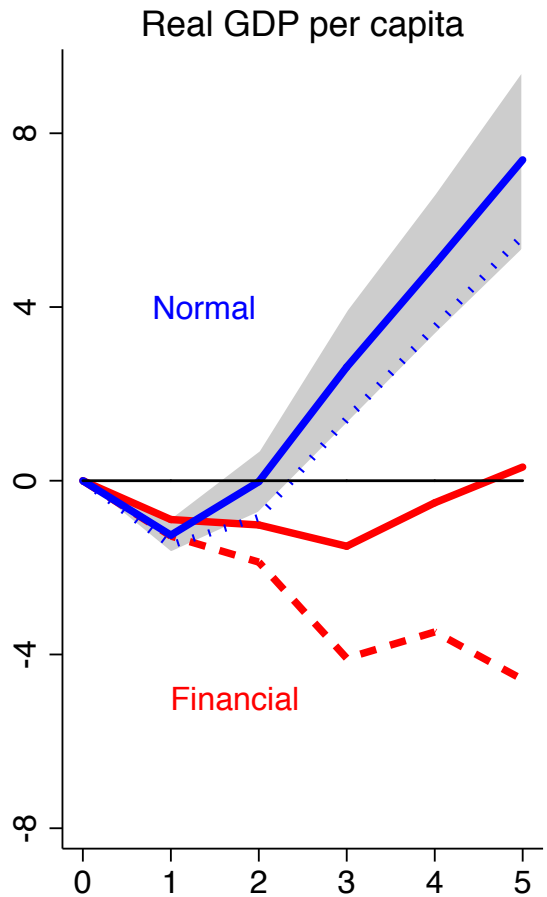
3. **Third**, look at the combination of the two

Controls: lags of output, investment, lending, prices, interest rates, public debt

Private credit overhang: "credit bites back"



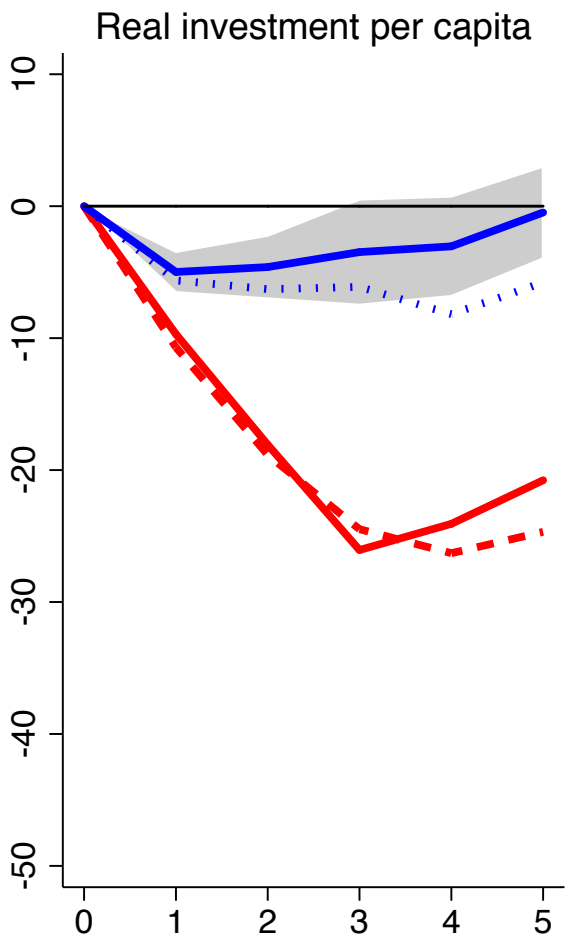
1870–2011



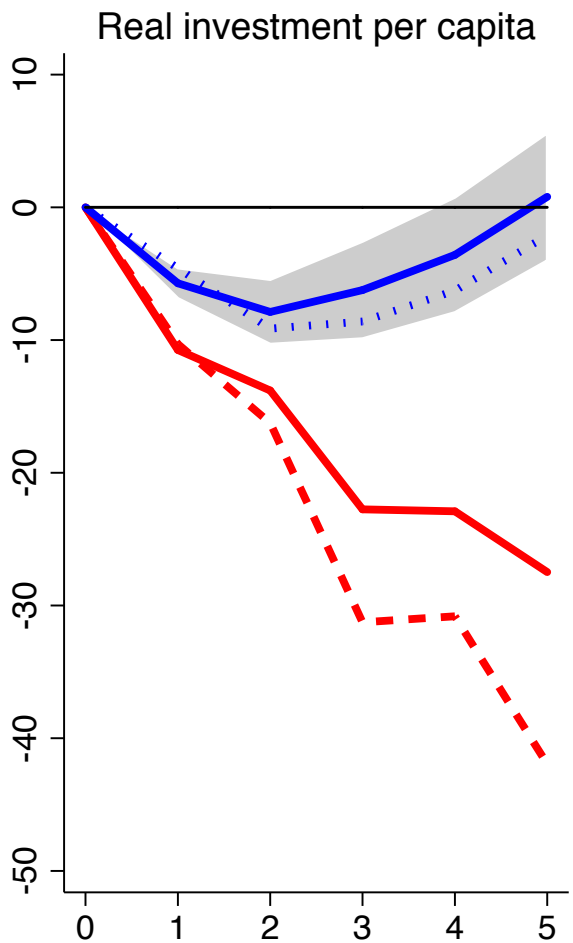
1946–2011

The dotted line is when private credit during the expansion grew at the mean + 1 sd

Private credit overhang: "credit bites back" (2)



1870–2011



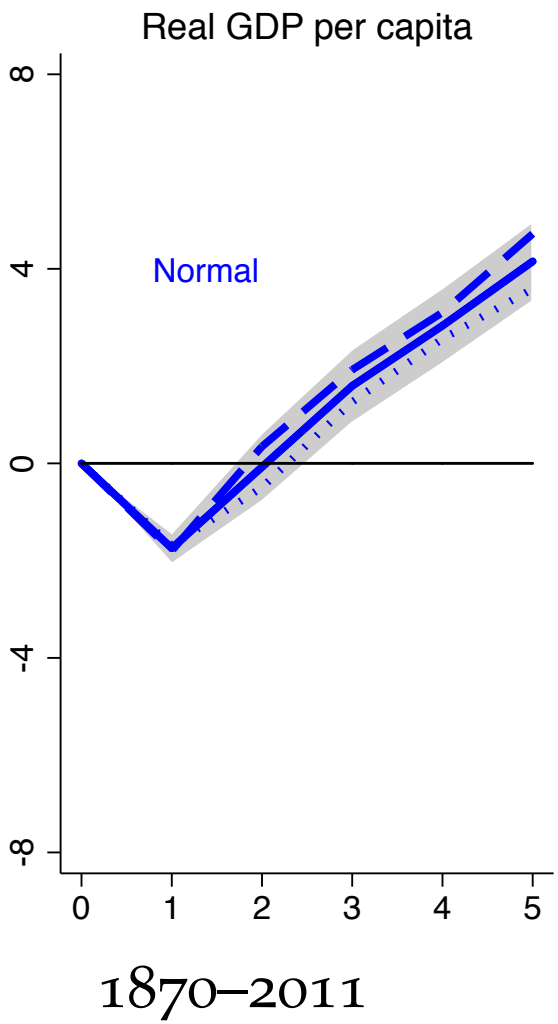
1946–2011

The dotted line is when private credit during the expansion grew at the mean + 1 sd

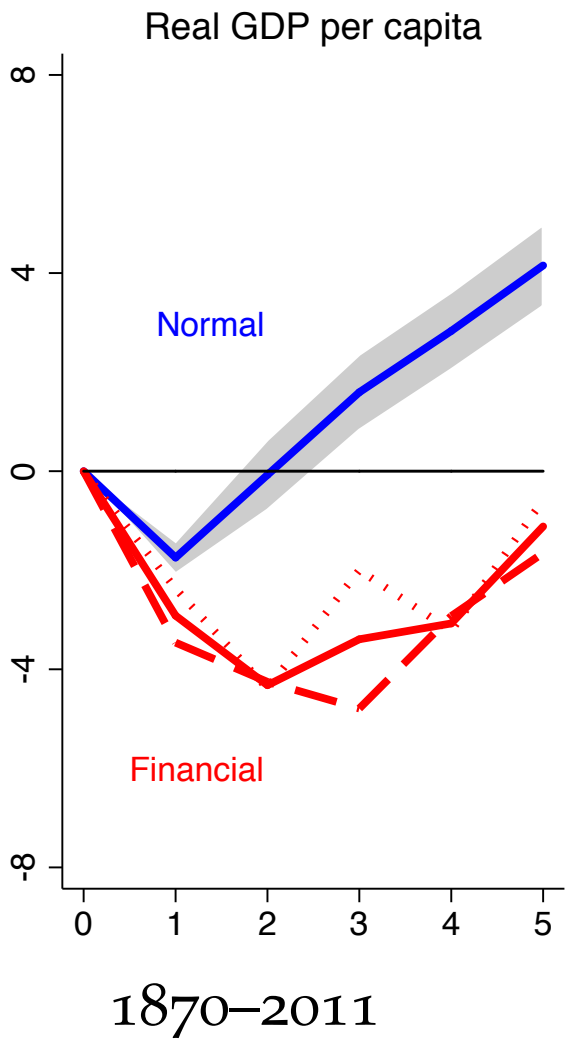
Next step: public debt overhang

- Reinhart, Reinhart, and Rogoff (2012): high public debt level associated with lower growth
- How does the expected recovery path of the economy change if government debt is at 15/50/85% of GDP? (where 50% is about the historical mean)

Crisis recessions and public debt overhang



1870–2011



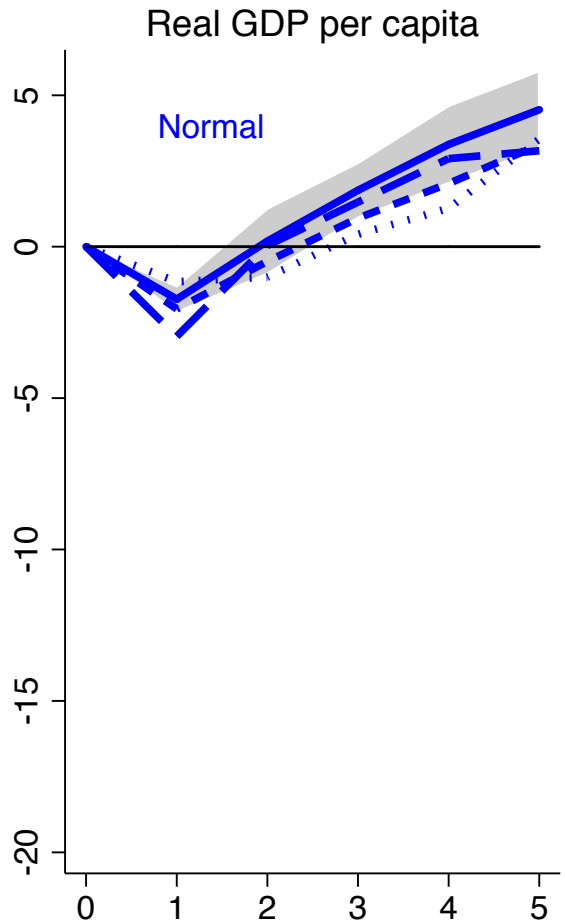
1870–2011

The dotted/solid/dashed line is when public debt at 15/50/85%

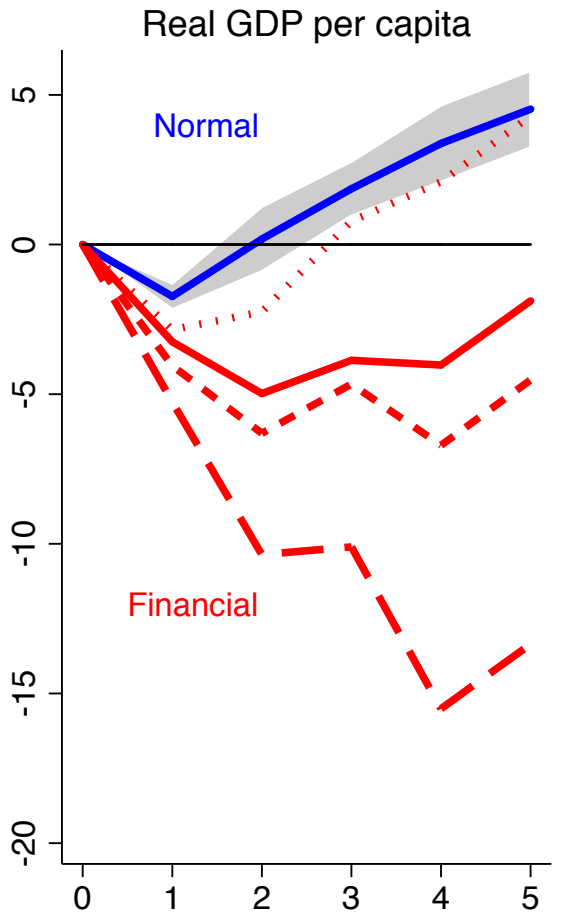
Public credit AND private debt overhang

- The third and last step — let's combine things:
  - Consider how responses are modulated by the level of public debt at the start of the recession
  - AND condition on the annual change in private credit during in the prior expansion
- Complicated interaction structure, but can be estimated in same way with fixed effects panel

Fiscal space important after private credit booms



1870–2011



1870–2011

The dotted/shortdash/longdash line is when public debt is at 15/50/85% and private credit at mean + 1 sd

Main conclusions

1. In advanced economies, financial stability risks typically originate in the private sector.
   To understand the driving forces of financial crises, one has to study private borrowing and its problems

2. Private credit booms in the expansion phase adversely affect the post-recession path of output.
   Private credit overhang is a regular phenomenon of the modern business cycle

3. High levels of public debt can matter for the path of economies out of recessions, confirming the results of Reinhart et al.
   Yet significant negative effects of high public debt arise only after financial crises and seem to make little difference in normal times