SOVEREIGNS VERSUS BANKS

CREDIT, CRISES, AND CONSEQUENCES

Òscar Jordà[⋆] Moritz Schularick[†] Alan M. Taylor[§]

"Policy Analysis in the Aftermath of the Great Recession"
Istanbul, Turkey
16 – 17 October 2014

[⋆]Federal Reserve Bank of San Francisco; University of California, Davis
[†]University of Bonn; CEPR
[§]University of California, Davis; NBER; CEPR

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

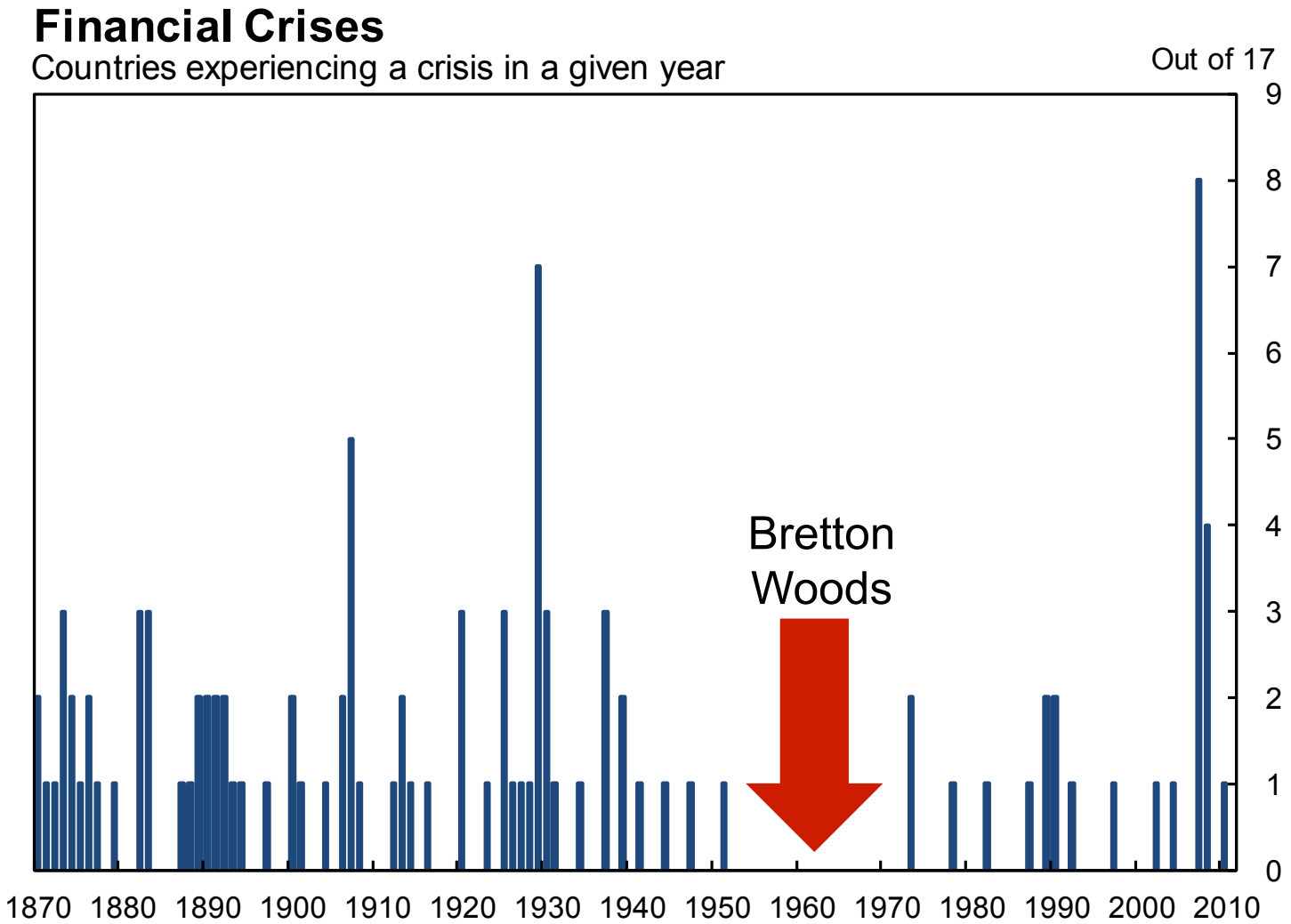
Total economy debt levels have risen strongly, but mainly through the private sector

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

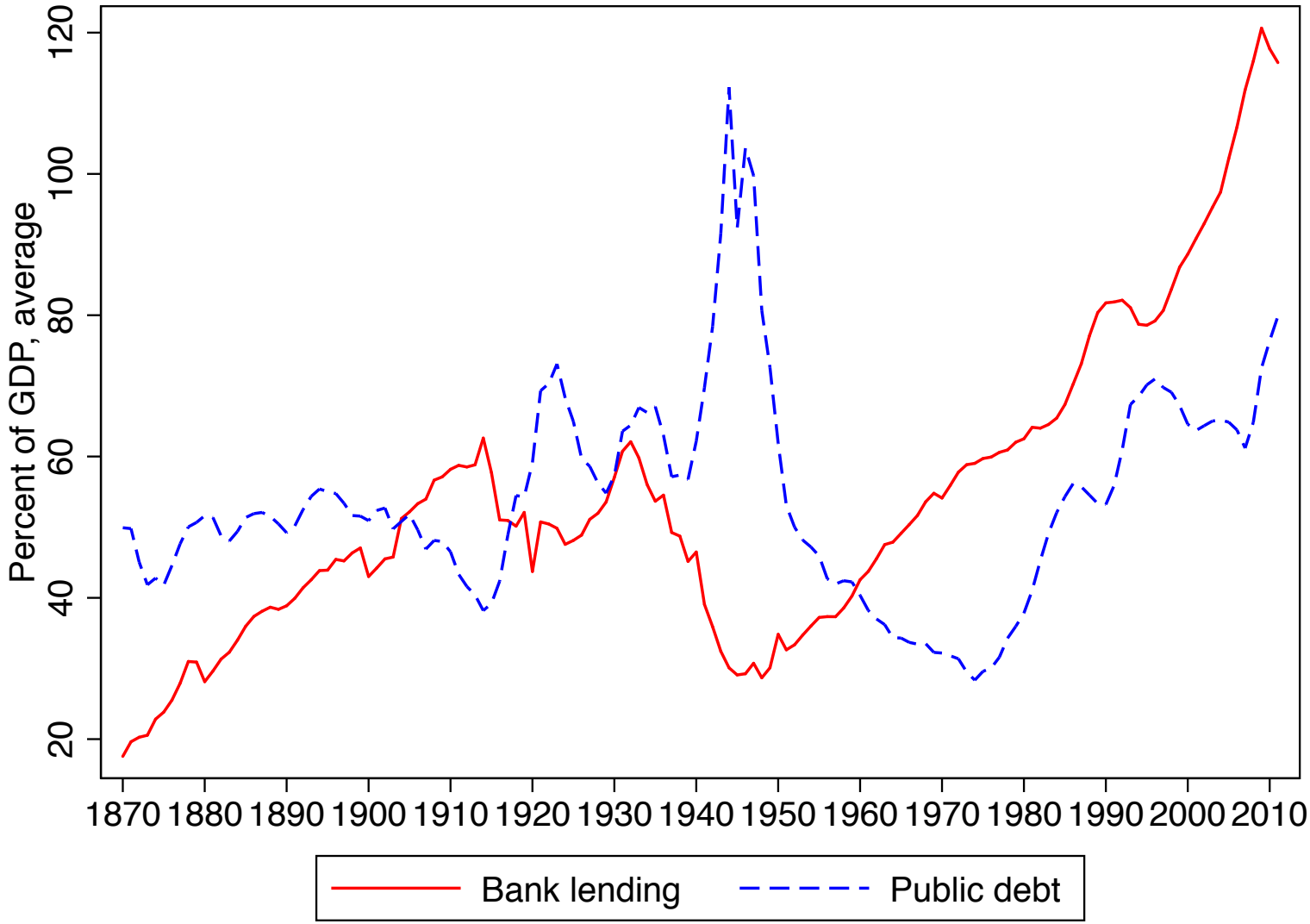
Pre-WWI	Interwar	Bretton Woods	Post-BW
3 yrs	4 yrs	6 yrs	10 yrs

2. Declining rate of growth in expansions

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

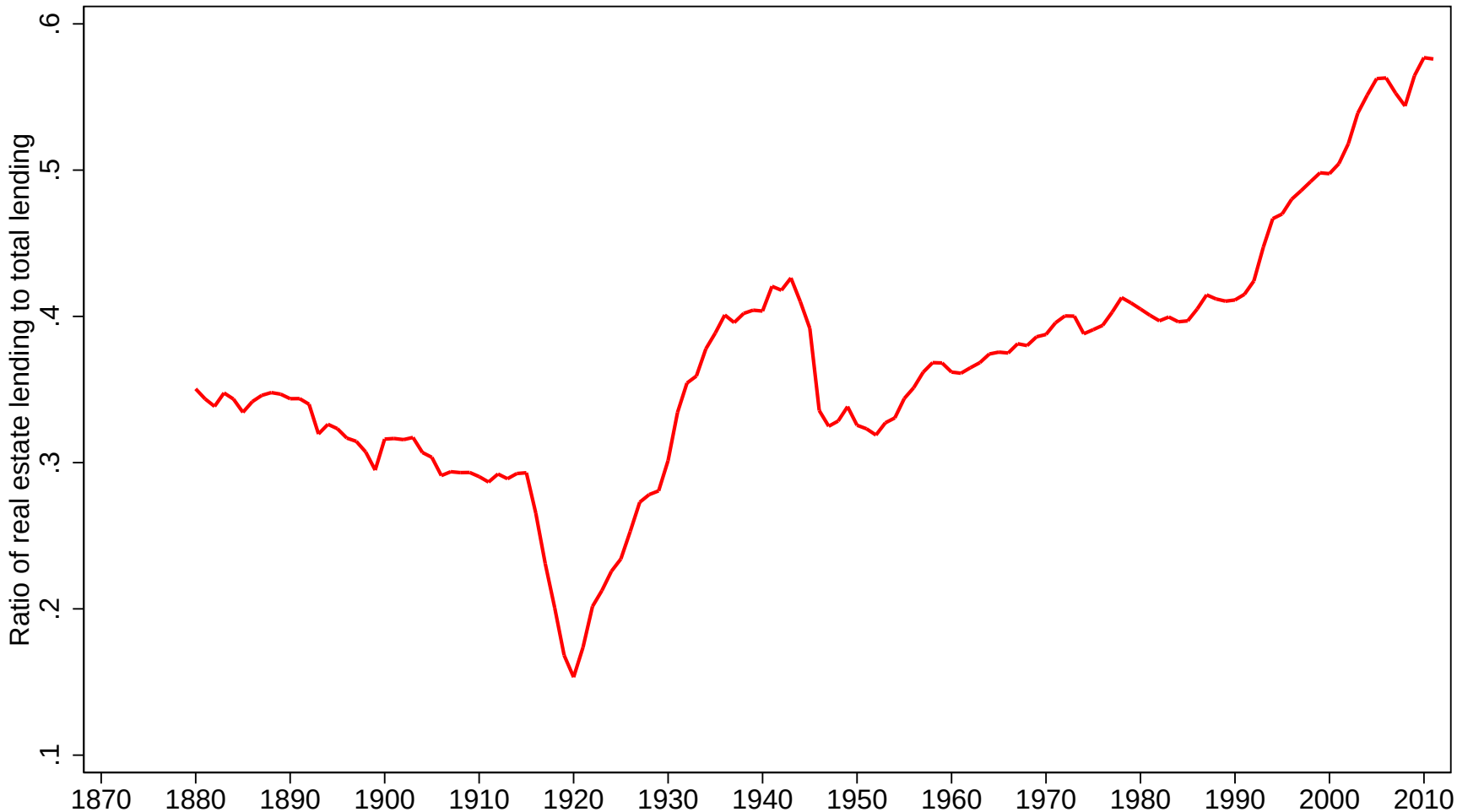
3. Private credit pro-cyclical (expansions +, recessions -)
4. Public debt counter-cyclical (expansions -, recessions +)
5. After no trend 1900–70, both private credit and public debt have grown, at a combined 9 p.p.y. (pct. pt. / year) since 1970s, and cyclicality gave way to upward trends. Unprecedented in history

Public debt versus private credit

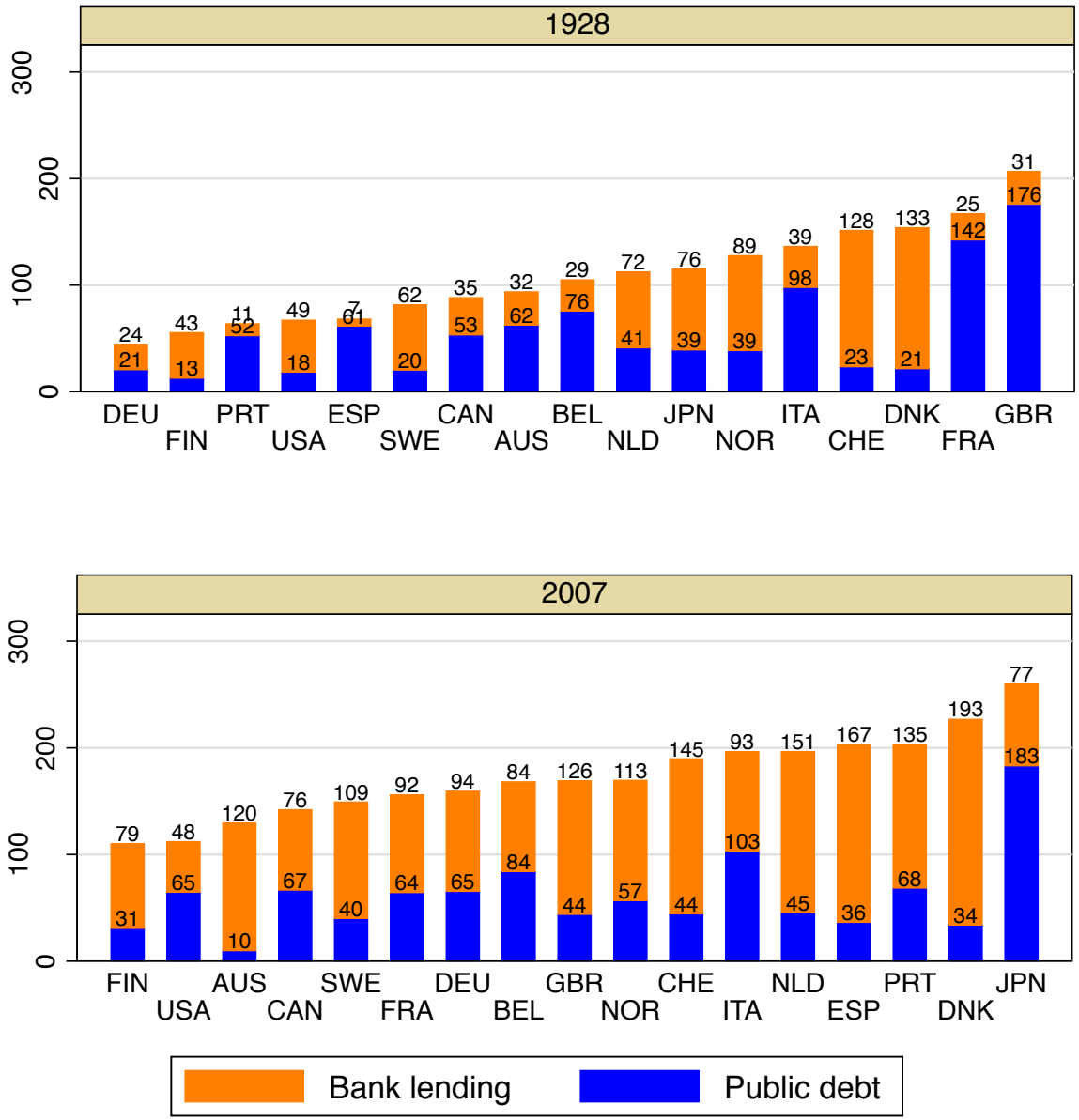


Lending is now mostly about mortgages

Share of real estate in total lending (17 country average)



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					

- 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

Expansion averages

Full sample	All Recessions		Financial Recessions		Normal Recessions	
Financial recession indicator	0.23		1		0	
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

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

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

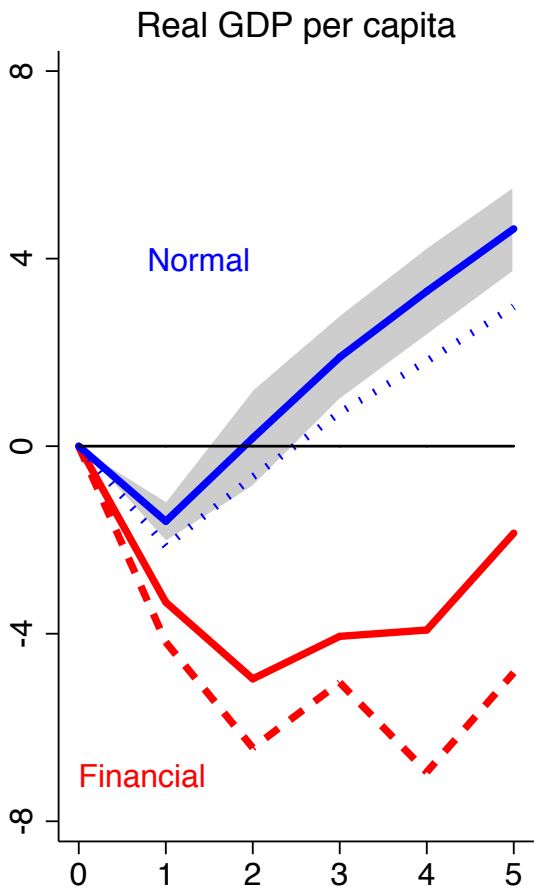
1. **First**, examine how the overhang of a private credit boom changes the expected path of the economy

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

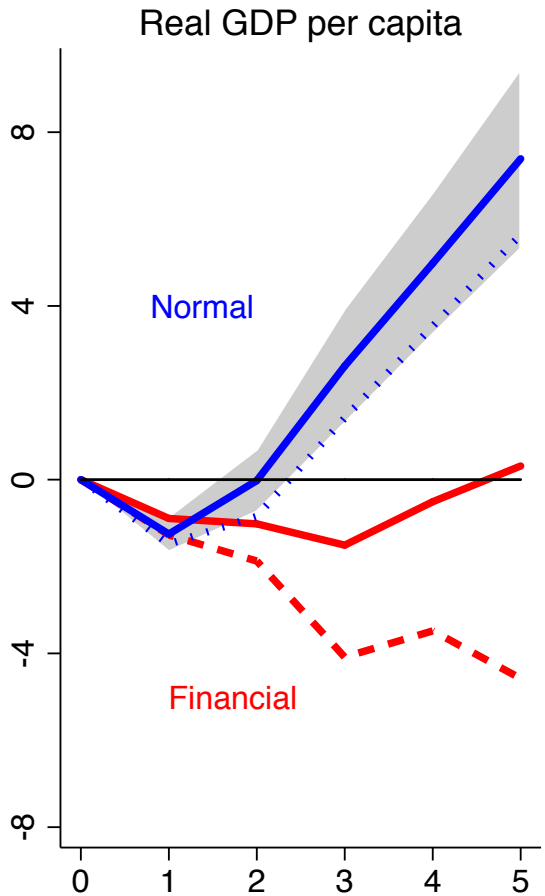
3. **Third**, look at the combination of the two

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

Private credit overhang: "credit bites back"



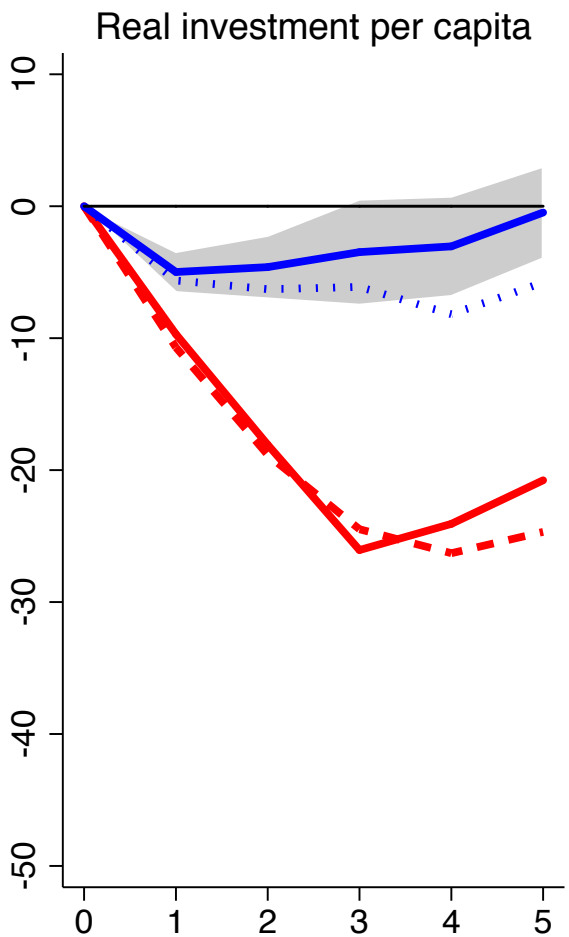
1870–2011



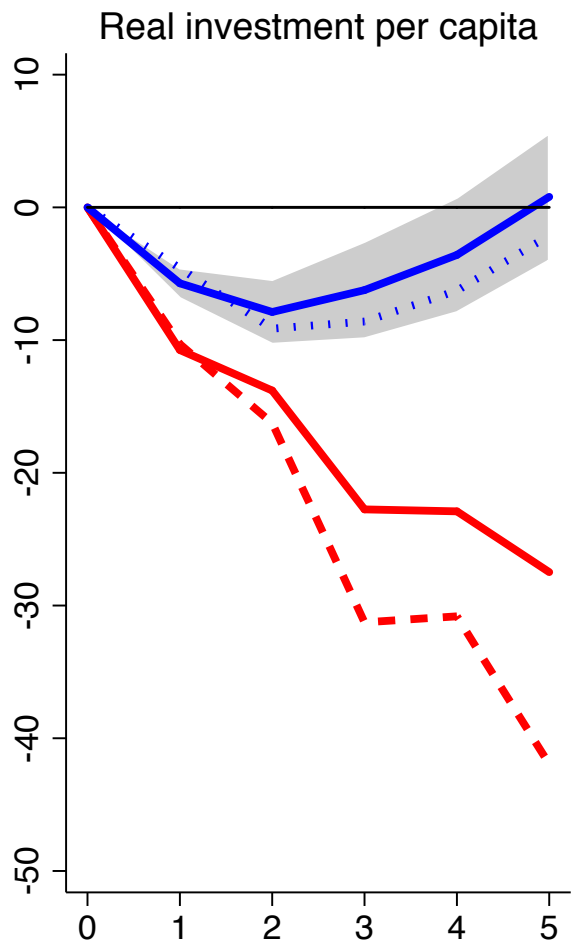
1946–2011

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

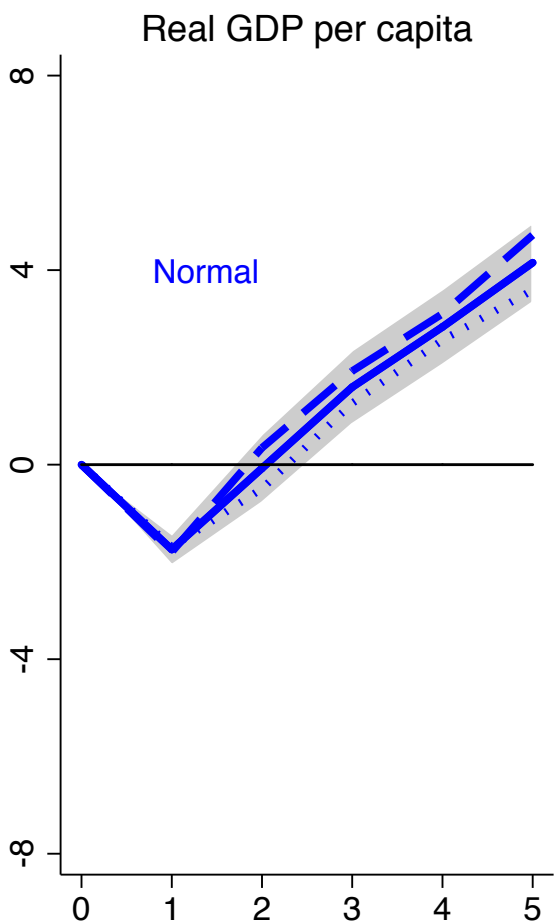
The dotted line is when private credit during the expansion grew at the mean + 1 sd

Next step: public debt overhang

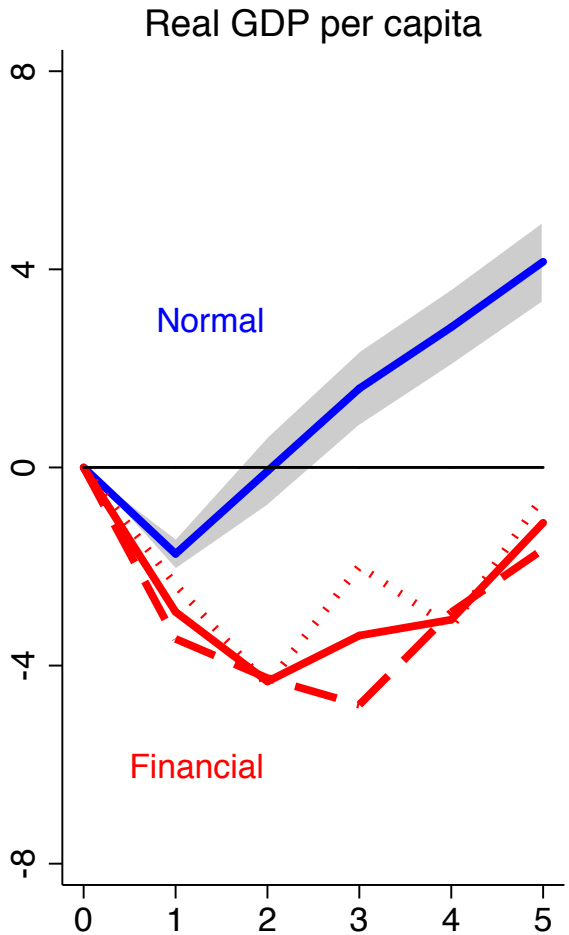
Reinhart, Reinhart, and Rogoff (2012): high public debt level associated with lower growth

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%

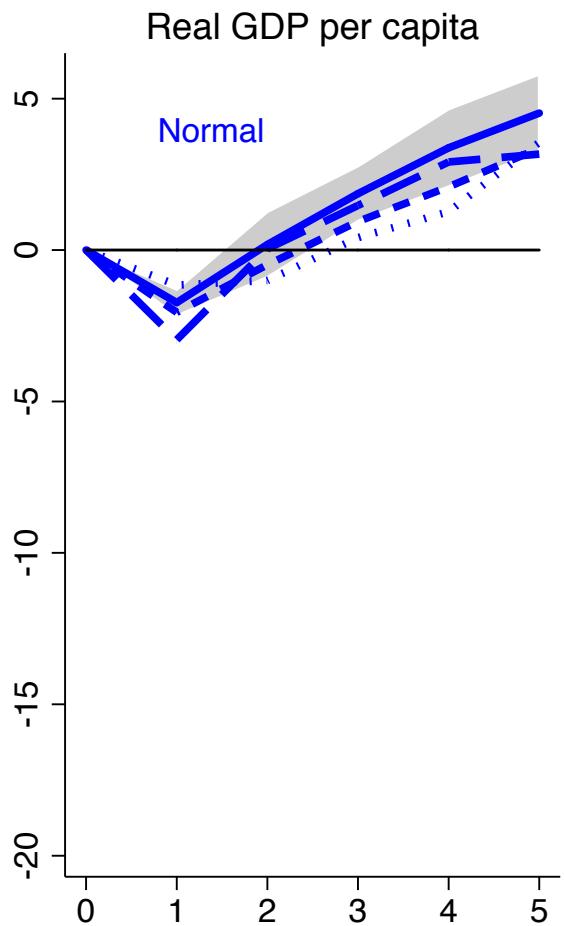
Public credit AND private debt overhang

The third and last step — let's combine things:

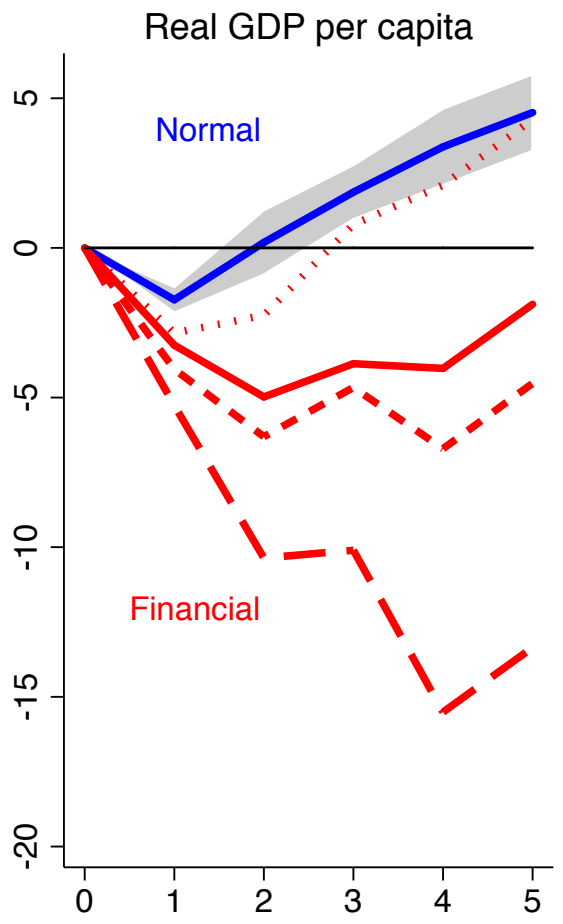
- Consider how responses are modulated by the level of public debt at the start of the recession
- AND condition on the annual change in private credit during in the prior expansion

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

Conclusion 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

Conclusion 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

Conclusion 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

Coming attractions: JST greatest hits

The Great Mortgaging (NBER 20501): Housing finance's increasingly important role in financial crises. New data on lending (mortgages vs. not)

Betting the House (ISOM 2014, WP soon): Nexus between low interest rates, mortgage lending and house prices using trilemma instrument

Bubbles, Credit, and Business Cycles (JME-SNB-SGE, WP soon): Nexus between credit and equity/house price bubbles. Role in financial crises and the recession/recovery