

SOVEREIGNS VERSUS BANKS

Òscar Jordà^{*} Moritz Schularick[†] Alan M. Taylor[§]

European Commission

Annual Research Conference 2015

Brussels, November 23

^{*}Federal Reserve Bank of San Francisco; University of California, Davis

[†]University of Bonn; CEPR

[§]University of California, Davis; NBER; CEPR

The questions

- Is public debt or private debt the main risk for financial stability?
- What's the interaction between private and public debt in post-crisis deleveraging?
- Is there a precautionary reason to keep public debt low?

How we answer these questions

Based on the near universe of advanced economies' business cycles since 1870, 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

What we find

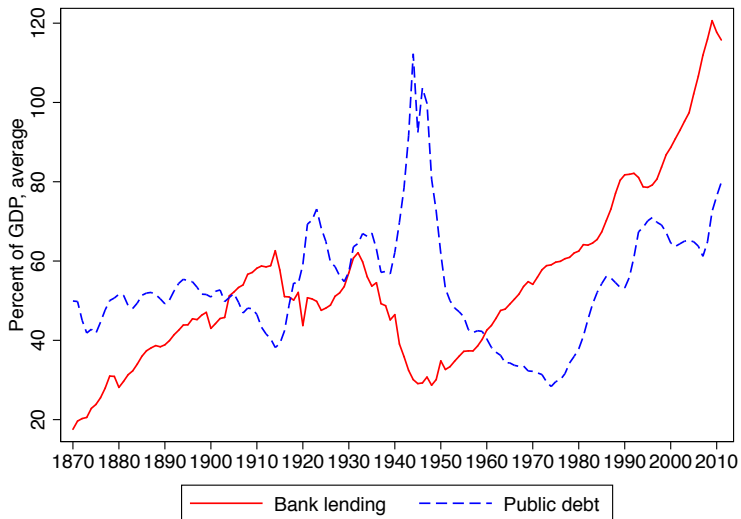
- Total economy debt levels have risen strongly, but mainly through the private sector.
- Private credit booms, not public debt booms, are the best predictor of financial crises.
- High levels of public debt do not matter much over the business cycle.
- But: the capacity of the public sector to use its balance sheet when the private sector deleverages is critical.

MAJOR TRENDS IN THE DATA

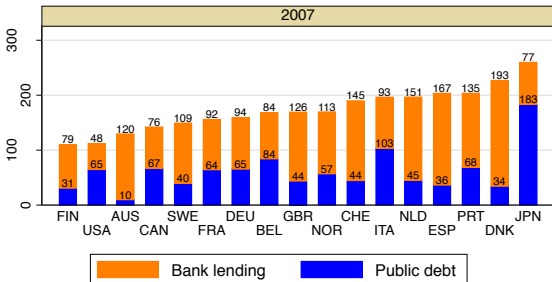
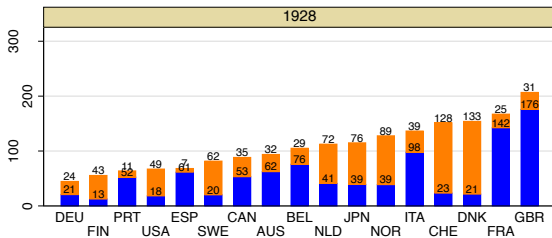
Our data

- **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

Public debt versus private credit



Sovereigns v. banks: Total liabilities then and now



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

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 cyclicalit y gave way to upward trends. Unprecedented in history

DEBT AND FINANCIAL CRISES

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 | |

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:

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

- 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 (5-year moving average) | 21.79*** (5.39) | | 21.34*** (5.44) | 26.63** (13.00) | |
| Change in public debt/GDP (5-year moving average) | | -2.83 (1.88) | -3.17 (3.68) | | -4.21 (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) × (Lagged level of public debt/GDP) | | | | -3.63 (9.34) | 0.45 (3.02) |
| Observations | 1901 | 1983 | 1805 | 1895 | 1850 |
| Area under the curve (AUC) | 0.68 (0.03) | 0.61 (0.03) | 0.68 (0.03) | 0.68 (0.03) | 0.61 (0.03) |

- Public debt does not predict crises, private credit does.
- Public debt rises after crises, not before.

FISCAL CAPACITY AND THE COSTS OF FINANCIAL CRISES

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
- How do private and public balance sheets jointly determine the cost of financial crises?

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 $t(p)$
 - ... when private credit grew above country-specific historical average in the expansion: $(x_{i,t(p)} - \bar{x}_i)_{\text{credit}}$
 - ... when the public debt to GDP level is above/below/at historical average at start of the recession: $(x_{i,t(p)} - \bar{x}_i)_{\text{debt}}$
 - ... when both interact
 - ... does any of this change the expected path of the economy through recession and recovery $(y_{t(p)}, \dots, y_{t(p)+h})$?

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)

Local projections: average effect of the overhang

Paths in **normal** versus **financial** recessions and **experiments**

$$\begin{aligned} \underbrace{\Delta_h y_{it(p)+h}^k}_{\text{outcome}} &= \underbrace{\theta_N^k d_{it(p)}^N + \theta_F^k d_{it(p)}^F}_{\text{average conditional paths}} \\ &+ \underbrace{\beta_{h,N}^k d_{it(p)}^N (x_{it(p)} - \bar{x}_i) + \beta_{h,F}^k d_{it(p)}^F (x_{it(p)} - \bar{x}_i)}_{\text{effect of the overhang}} \\ &+ \underbrace{\sum_{l=0}^L \Gamma_{h,l}^k Y_{it(p)-l}}_{\text{controls (demeaned)}} + \underbrace{\alpha_i^k}_{\text{fixed effects (demeaned)}} + \underbrace{u_{h,it(p)}^k}_{\text{error term}} \end{aligned}$$

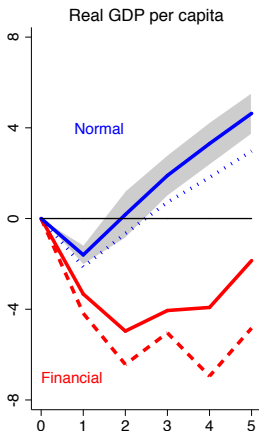
where $\underbrace{k = 1, \dots, K;}_{\text{variables}}$ $\underbrace{h = 1, \dots, H;}_{\text{horizons}}$ $\underbrace{l = 1, \dots, L;}_{\text{lags}}$ $\underbrace{p = 1, \dots, P}_{\text{recessions}}$

Two steps

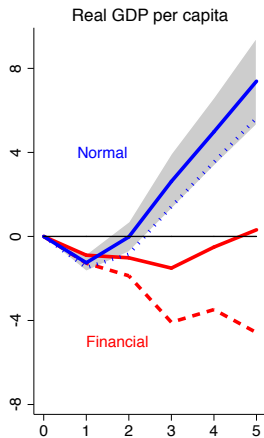
- 1 **First**, examine how the overhang of a private credit boom changes the expected path of the economy
- 2 **Second**, study how high/low levels of public debt affect the path

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

Private credit overhang: “credit bites back”



1870–2011



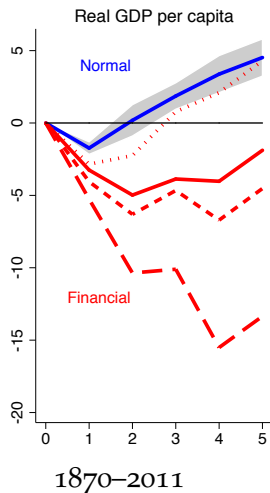
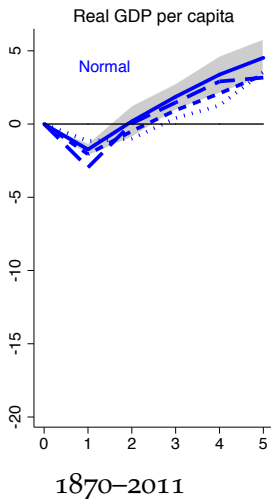
1946–2011

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

Public credit AND private debt overhang

- 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 after private credit booms



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** Fiscal space matters after private sector credit booms.
There is a case to keep public debt low for precautionary reasons to counteract private sector deleveraging if need be.