Zombies at Large?
Corporate Debt Overhang and the Macroeconomy

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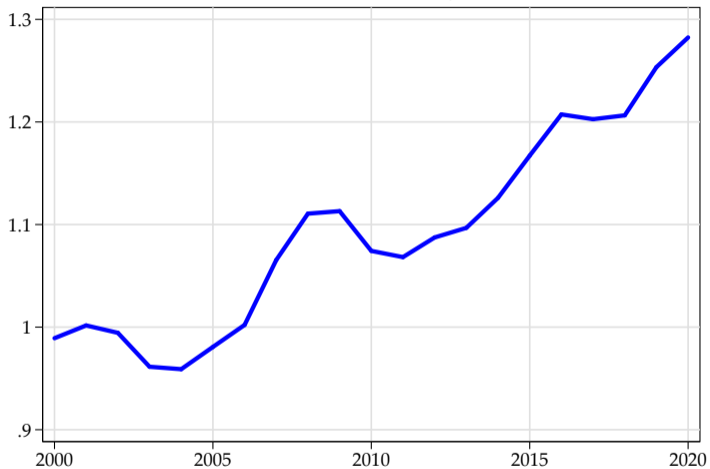[2] University of Bonn
[3] Federal Reserve Bank of New York, and University of Bonn
[4] University of California, Davis, and Federal Reserve Bank of San Francisco

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US Business Credit/GDP

Notes: The figure shows non-financial business credit over GDP for the US.

Motivation

- The Covid-pandemic hit many economies after a decade-long corporate debt boom.

- Corporate debt has risen further in the Covid-recession.

- Will corporate debt overhang restrain investment and negatively impact the macroeconomy going forward?

- Do we need to dial down expectations for the recovery?

- Cf. household debt often seen as an important drag post-2008 (Jorda et al, 2013; and Mian/Sufi/Verner, 2017)

What we do

- We turn to macrofinancial history to study the consequences of corporate debt boom for the business cycle.

- We construct a new data set for business debt, covering nearly all advanced economies' business cycles since the 19th century.

- Data: 18 countries, 1870-2020, some gaps before WW2.

- Other macrofinancial data from JST database:
  www.macrohistory.net/data

What we find

- Corporate debt booms typically do not leave a large imprint on the macroeconomy.

- Scant evidence that recessions are deeper and recoveries slower after corporate debt booms.

- Stark difference to household debt (cf. Mian, Sufi, Verner 2017; Auclert et al. 2019).

- **Caveat:** costs of corporate debt booms become visible when reorganization regimes are inefficient.

Why worry about corporate debt overhang?

- Myers (1977): default risk undermines the incentives to invest for highly indebted firms.

- Some projects with positive net present value will not be realized as equity holders do not benefit in case of default.

- Debt overhang may depress any expenditure with delayed returns (hiring, training, advertising).

- Zombification could prolong and amplify these problems and depress investment.

Empirical evidence on debt overhang

- **International firm-level evidence:**
  Kalemli-Özcan, Laeven, and Moreno, 2020; Popov, Barbiero, and Wolski, 2018

- **Corporate bonds and U.S. downturns:**
  Giesecke, Longstaff, Schaefer, and Strebulaev 2014

- **Household debt:**
  Jordà, Schularick, and Taylor, 2016; Mian, Sufi, Verner, 2017; Auclert, Dobbie, and Goldsmith-Pinkham, 2019

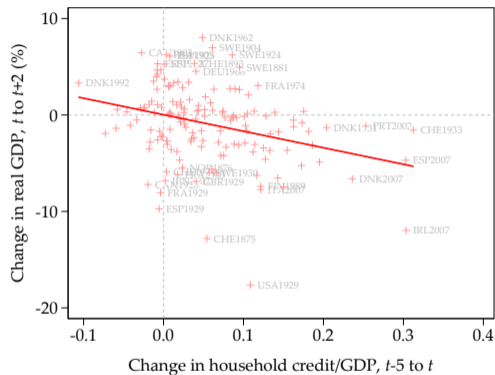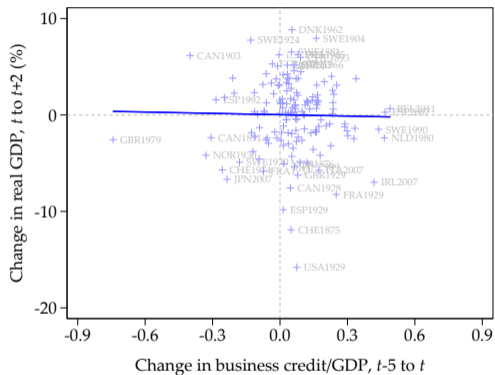- **Zombie firms:** Caballero, Hoshi, and Kashyap, 2008

Data

- Long-run annual data for total business sector **debt liabilities.**

- Bank loans, bonds and lending from non-bank intermediaries.

- Total of 18 countries, pre-WW2 series for 9 countries (480 pre-WW2 data points).

- Business cycles dated by Bry and Boschan (1971) algorithm.

Warming up: business credit and GDP growth

Notes: Scatter plot and linear fit of 2-year real GDP per capita growth after business cycle peaks against business the change in the credit/GDP ratio in the preceding 5 years. Each point is a cyclical peak or start of a recession.

Household vs business credit

Notes: Scatter plot and linear fit of 2-year real GDP per capita growth after business cycle peaks against business the change in the credit/GDP ratio in the preceding 5 years. Each point is a cyclical peak or start of a recession.

Empirical strategy: variables and definitions

i Country

$t(p)$ Calender year of business cycle peak p

$\Delta_h y_{it(p)+h}$ h-year change of log real GDP pc. (cumulative)

$\Delta_5 x^B_{it(p)}$ five-year change in business credit/GDP

$\Delta_5 x^H_{it(p)}$ five-year change in household credit/GDP

$w_{it(p)}$ Rich dynamic controls ▸ Details
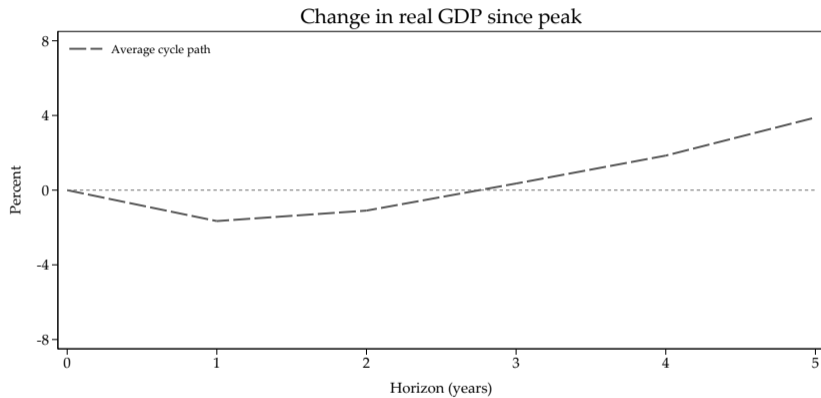
Local projections

$$\Delta_h y_{it(p)+h} = \alpha_h + \alpha_{hi} + \beta_h^B \Delta_5 x_{it(p)}^B + \beta_h^H \Delta_5 x_{it(p)}^H + \gamma_h \mathbf{w}_{it(p)} + \epsilon_{it(p)}, \quad h = 1, \ldots, 5$$

α_h Average recession path

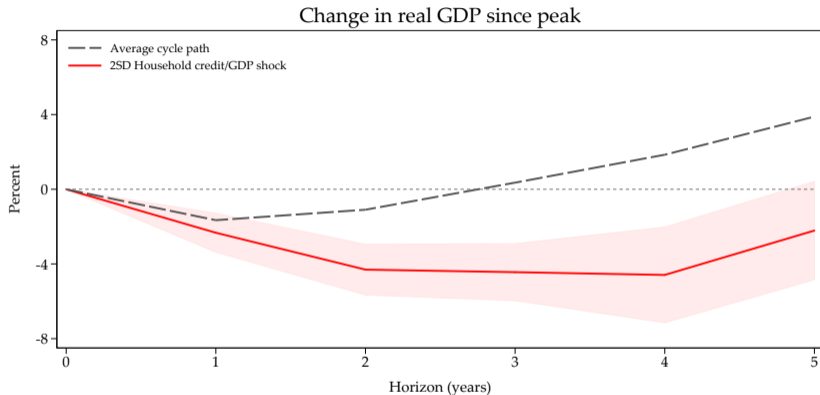α_{hi} Country fixed effects, summing to zero

$\alpha_h + \beta_h^j \Delta_5 x_{it(p)}^j$ Recession/recovery path for given $\Delta_5 x_{it(p)}^j, j = B, H$

Debt booms and their aftermath

Change in real GDP since peak

Notes: Average recession trajectory following a business cycle peak at t = 0.

Household debt booms

Change in real GDP since peak

Notes: Predictive effects on growth of a two-SD credit expansion in the five years preceding the recession for business credit booms and household credit booms. Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Corporate debt booms
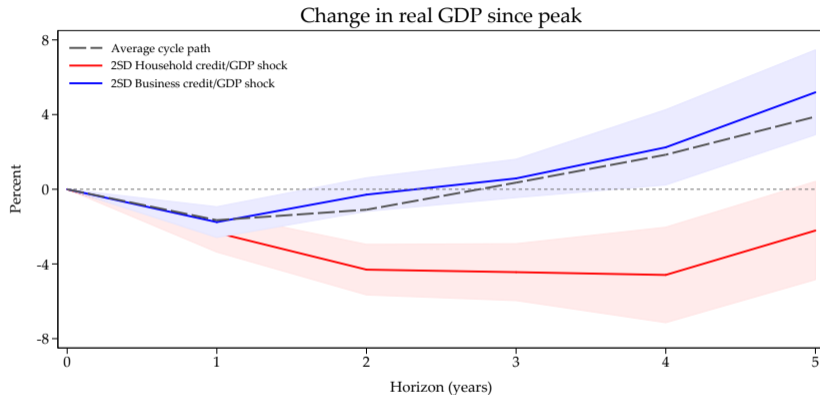
Change in real GDP since peak

Notes: Predictive effects on growth of a two-SD credit expansion in the five years preceding the recession for business credit booms and household credit booms. Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Coefficient estimates

|	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Average cycle α_h	-1.66***	-1.09***	0.36**	1.88***	3.95***
	(0.08)	(0.14)	(0.17)	(0.24)	(0.34)
Business credit/GDP expansion $\Delta_5 x_{it(p)}^B$	0.25	2.14	-0.68	0.17	2.75
	(1.13)	(1.56)	(2.38)	(3.81)	(4.21)
Household credit/GDP expansion $\Delta_5 x_{it(p)}^H$	-5.05	-22.04***	-32.90***	-43.60***	-40.99***
	(3.97)	(4.73)	(5.55)	(8.80)	(9.05)
Macro controls	Yes	Yes	Yes	Yes	Yes
$\beta_h^B = \beta_h^H$ (p-value)	0.213	0.000	0.000	0.000	0.000
R^2	0.15	0.35	0.41	0.44	0.48
Cycles	150	150	150	150	149

Notes: Within-estimator, standard errors clustered on countries in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.1$. Credit expansion denotes past 5-year change in credit/GDP ratio.

Interpretation and magnitudes

- Aftermath of business debt booms different from household debt booms
  - $H_0: \beta_h^B = \beta_h^H$ rejected for $h = 2, \ldots 5$
- With credit growth at the mean:
  $\Rightarrow$ GDP recovers after three years and exceeds pre-recession peak +4% by year 5
- If +10 pp. *business* credit/GDP above mean trend:
  $\Rightarrow$ GDP +4.2% above peak by year 5, virtually the same
- If +10 pp. *household* credit/GDP above mean trend:
  $\Rightarrow$ GDP still -0.1% **below** peak by year 5, overall difference of 4pp.

Normal recessions vs. financial crises
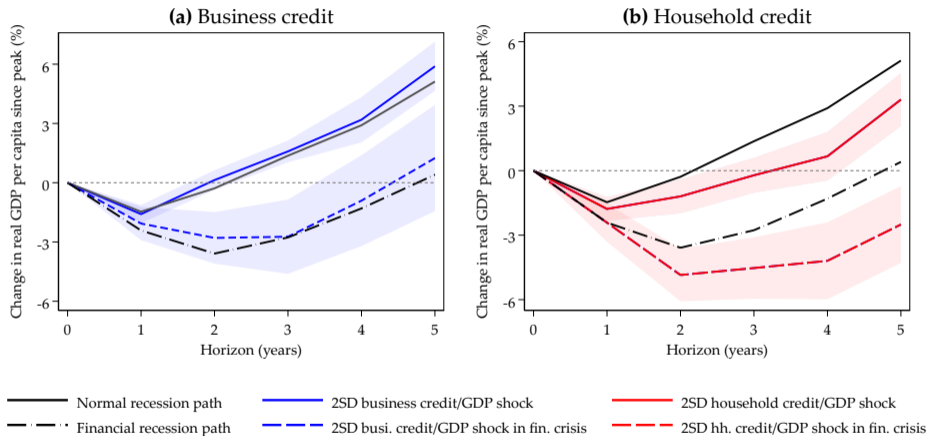
(a) Business credit   **(b) Household credit**

Notes: Predictive effects on growth of a two-SD credit expansion in the five years preceding the normal (financial) recession for business credit booms and household credit booms. Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Effects on other macroeconomic aggregates

- ▸ Real consumption

- ▸ Real investment

- ▸ Unemployment

- ▸ Inflation

- ▸ Real business credit

- ▸ Real household credit

- ▸ Real stock prices

- ▸ Real house prices

Robustness checks

- Interaction of credit expansion with levels of credit/GDP.

- Including linear and quadratic time trends.

- Restricting sample to post 1950.

- Excluding the Global Financial Crisis.

- Using real credit growth instead of changes in credit/GDP.

Does business credit increase tail risks?

- Adrian, Grinberg, Liang and Malik (2018):
  - Loose financial conditions can amplify GDP risk, depending on horizon

- Adrian, Boyarchenko and Giannone (2019):
  - Bad financial conditions increase conditional volatility and reduce conditional mean of GDP

- Do corporate debt booms move tails of the distribution and make severe recessions worse?

$\Rightarrow$ Quantile local projections.

▸ Details: Quantile LPs

Quantile local projections: responses at the 20th percentile

Change in real GDP per capita, t to t+h
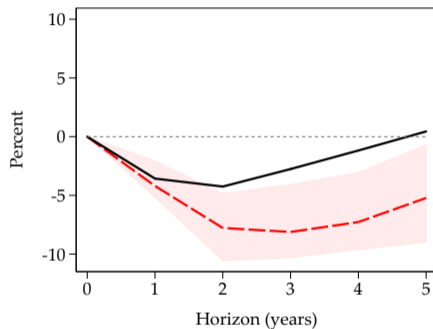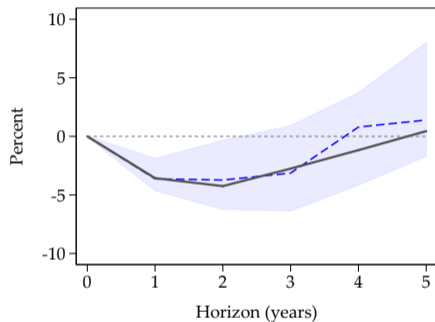
Notes: Predictive effects on GDP of a two-SD 5-year business (household) credit buildup preceding the recession. LP series of quantile regressions. Shaded areas denote the 95% confidence interval based on bootstrap replications.

Why different aftermath of household and business credit booms?

- Business liabilities limited by firm assets, shielding private wealth of owners: swifter liquidation.

- Going concern value aligns incentives for owners and creditors: easier renegotiation

- But frictions (hold-outs, asymmetric information, weak contract enforcement) can throw sand in the wheels of corporate debt work-outs.

- Does variation in restructuring efficiency affects the economic costs of corporate debt build-ups?

Measuring frictions

1978–2003 Djankov, McLiesh and Shleifer (2007): Index of *creditor rights*
- Strong creditor rights...
- ... reduce liquidation costs
- ... induce owners to renegotiate

2003–2019 World Bank, based on Djankov, Hart, McLiesh and Shleifer (2008)
- High "Recovery rate" ...
- ... indicates low-cost liquidation
- ... indicates swifter restructuring

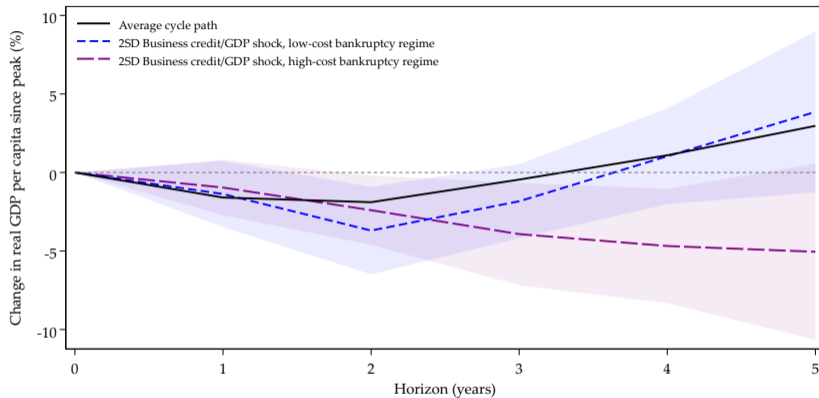Construct joint "legal efficiency" index L_{it} based on deciles of each sub-index

Augment LP regressions

Interaction of legal friction index with business credit:

$$\Delta_h y_{it(p)+h} = \alpha_h + \alpha_{hi} + \beta_h^H \Delta_5 x_{it(p)}^H + \beta_h^B \Delta_5 x_{it(p)}^B + \beta_h^{BL} \Delta_5 x_{it}^B \times L_{it} + \gamma_h w_{it(p)} + e_{it(p)}$$

- $L_{it} \in \{1, 2, \ldots 10\}$ index of legal frictions to restructuring or liquidation.

- Otherwise same setup as before.
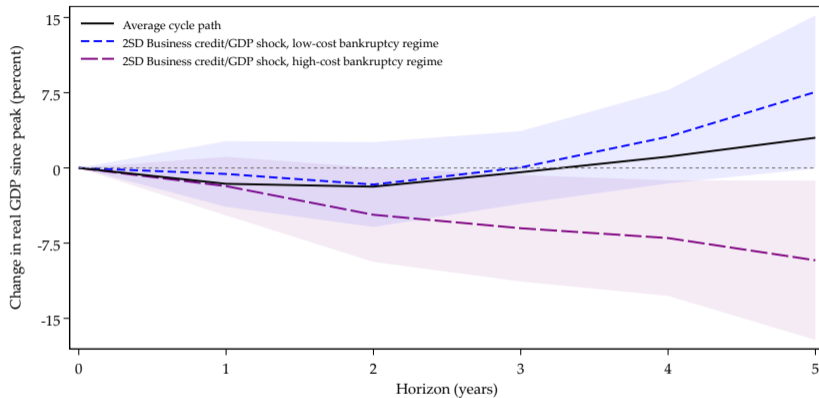
Recessions and reorganization frictions

Notes: Predictive effects on GDP of a two-SD quinquennial business credit build-up preceding the recession. In low (high) friction bankruptcy regimes. LP series of quantile regressions. Shaded areas denote the 95% confidence interval based on bootstrap replications.

▸ Placebo

Are these effects causal?

- Legal origins exogenous to today's business cycle shocks

- Civil law vs. common law traditions

- Key difference: civil law bankruptcy proceedings often rely on frequent appeals to courts, making restructuring and liquidation more costly.

- **Instrument:** Civil law origin $z_i \in \{0, 1\}$.

- Strong and significant negative link to bankruptcy efficiency (first stage)

Legal origin IV: growth effects

Notes: Predictive effects on GDP of a two-SD quinquennial business credit build-up preceding the recession. In low (high) friction bankruptcy regimes, instrumented by legal origin. LP series of quantile regressions. Shaded areas denote the 95% confidence interval based on bootstrap replications.

▸ Placebo

Legal origin IV: investment effects
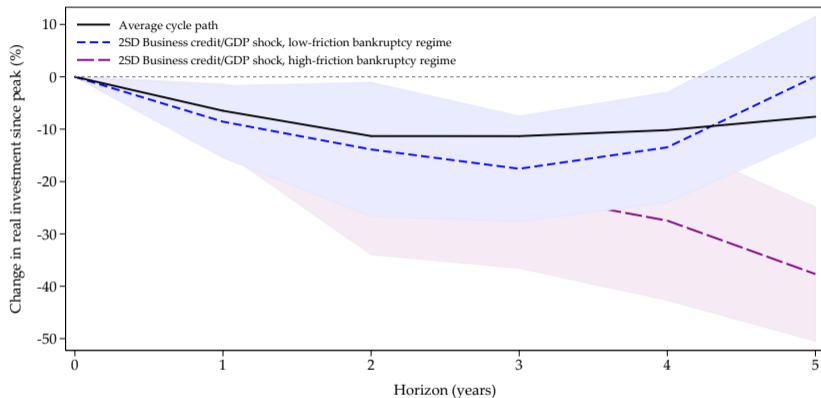
Notes: Predictive effects on real investment of a two-SD quinquennial business credit build-up preceding the recession. In low (high) friction bankruptcy regimes. Shaded areas denote the 95% confidence interval.

Conclusion

- Corporate debt has little predictive power for recession severity and recovery speed (while household credit does).

- Core argument: debt reorganization is easier for corporate debt.

- Evidence that legal frictions shape real economic costs of corporate debt booms.

- Policy implication: focus on restructuring/liquidation efficiency and move on.

Controls: contemporaneous plus 2 lags of

- real GDP growth

- inflation

- real investment growth

- short-term interest rates on government debt

- real household credit growth

- real business credit growth

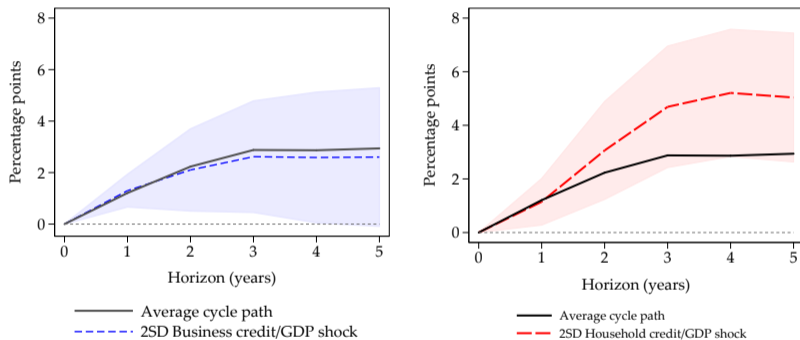# Effects on other macroeconomic aggregates

Change in real consumption p.c.
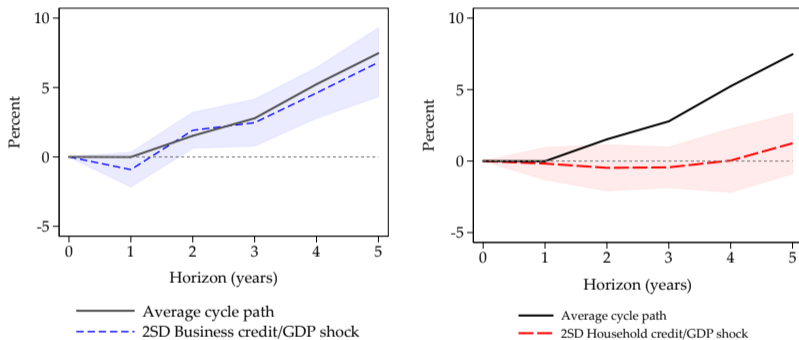
Notes: Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Effects on other macroeconomic aggregates

Change in real investment p.c.
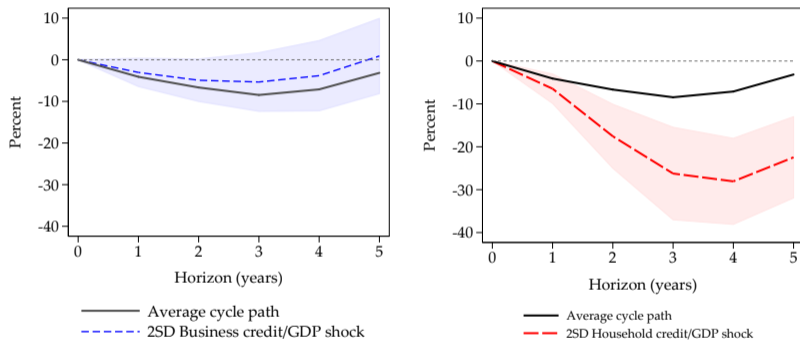
Notes: Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

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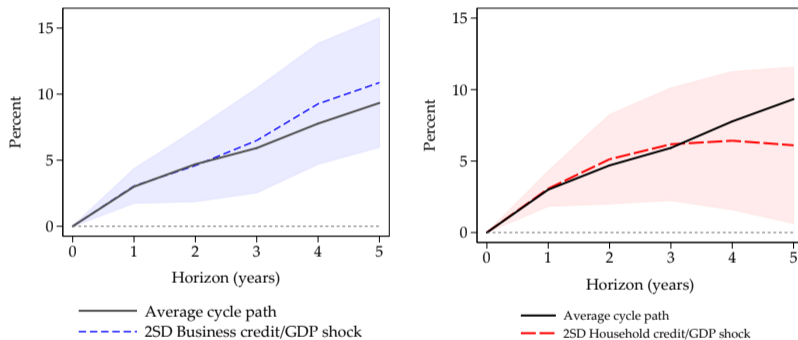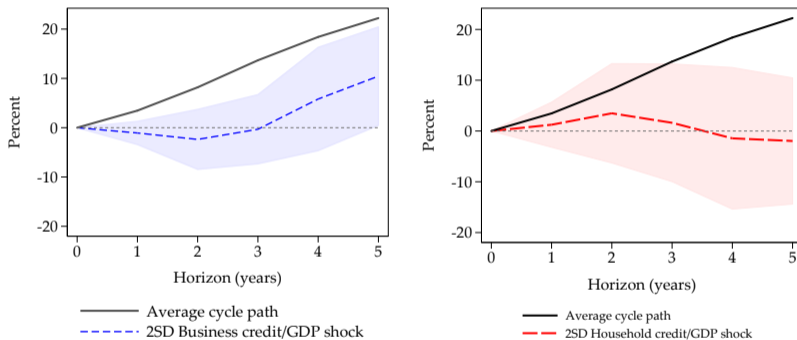# Effects on other macroeconomic aggregates

Change in unemployment

Notes: Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Effects on other macroeconomic aggregates

Change in CPI

Notes: Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Effects on other macroeconomic aggregates

Change in real household credit

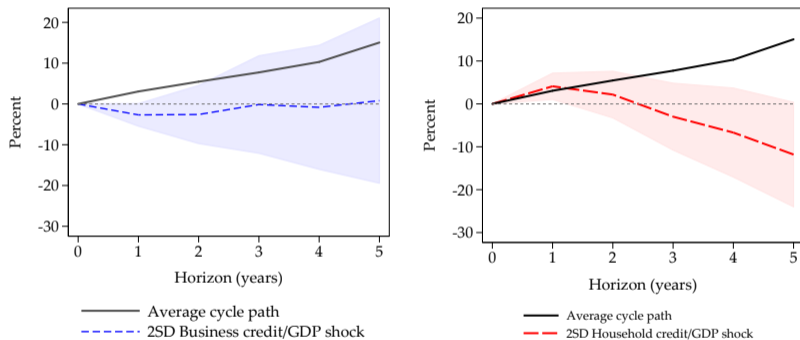*Notes:* Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Effects on other macroeconomic aggregates

Change in real business credit

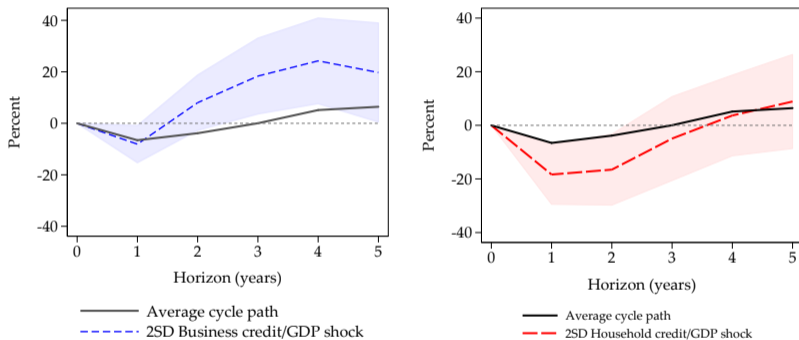*Notes:* Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

Effects on other macroeconomic aggregates

Change in real stock prices

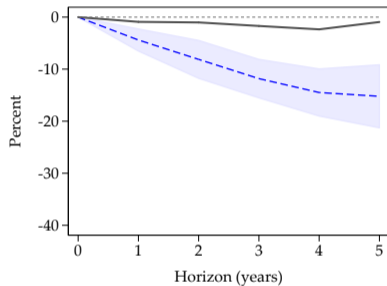*Notes:* Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.
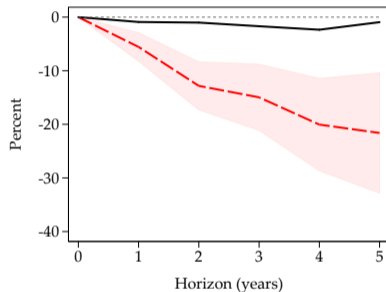
Effects on other macroeconomic aggregates

Change in real house prices

Notes: Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

▸ Back

Business cycle peaks followed by normal recessions

Australia	1961, 1973, 1976, 1981, 2008
Belgium	1957, 1974, 1980, 1992, 2011
Canada	1891, 1894, 1903, 1928, 1953, 1956, 1981, 1989, 2007
Denmark	1880, 1887, 1931, 1962, 1973, 1979, 1992, 2011
Finland	1957, 1975, 2008, 2011
France	1905, 1907, 1926, 1933, 1974, 1992, 2011
Germany	1898, 1905, 1908, 1966, 1974, 1980, 1992, 2001
Ireland	1955, 1974, 1982
Italy	1974, 2002, 2011
Japan	1973, 2001, 2007
Netherlands	1957, 1974, 1980, 2001, 2011
Norway	1876, 1881, 1885, 1893, 1902, 1957, 1981, 2007, 2012
Portugal	1973, 1982, 1992, 2002, 2010
Spain	1927, 1952, 1958, 1980, 1992
Sweden	1876, 1881, 1883, 1885, 1888, 1890, 1899, 1901, 1904, 1924, 1980, 2011
Switzerland	1875, 1880, 1886, 1890, 1893, 1899, 1902, 1906, 1933, 1951, 1957, 1974, 1981, 1994, 2001, 2011
UK	1896, 1899, 1902, 1907, 1925, 1929, 1951, 1957, 1979
USA	1926, 1953, 1957, 1969, 1973, 1979, 1981, 1990, 2000

Business cycle peaks followed by financial recessions

Australia	1989
Belgium	2007
Canada	1907
Denmark	1883, 1987, 2007
Finland	1989
France	1929, 2007
Germany	1890, 2008
Ireland	2007, 2010
Italy	1992, 2007
Japan	1997
Netherlands	2008
Norway	1897, 1930, 1987
Portugal	2008
Spain	1925, 1929, 2007
Sweden	1879, 1907, 1930, 1990, 2007
Switzerland	1929, 1990, 2008
UK	1889, 1973, 1990, 2007
USA	1929, 2007

Quantile local projections
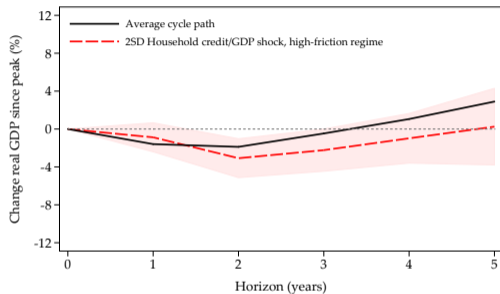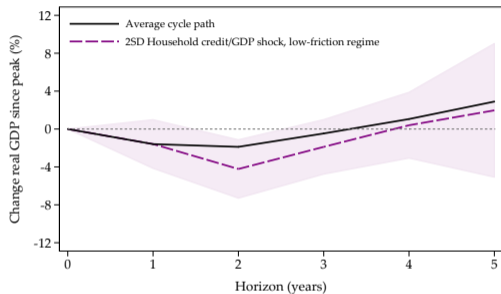
Let a quantile $\tau \in [0, 1]$ of $\Delta_h y_{it(p)+h}$ conditional on $\boldsymbol{X}_{it(p)}$ be given by

$$Q\left(\Delta_h y_{it(p)+h} | \boldsymbol{X}_{it(p)}\right) = \boldsymbol{X}_{it(p)} \boldsymbol{\theta}_{h,\tau}$$

Quantile regression consistently estimates $\boldsymbol{\theta}_{h,\tau}$ by weighting residuals asymmetrically, depending on which quantile is targeted:

$$\hat{\boldsymbol{\theta}}_{h,\tau} = \underset{\boldsymbol{\theta}_{h,\tau}}{\operatorname{argmin}} \sum \Big(\tau \mathbf{1}(\Delta_h y_{it(p)+h} \geq \boldsymbol{X}_{it(p)} \boldsymbol{\theta}_{h,\tau}) |\Delta_h y_{it(p)+h} - \boldsymbol{X}_{it(p)} \boldsymbol{\theta}_{h,\tau}|$$

$$+ (1 - \tau) \mathbf{1}(\Delta_h y_{it(p)+h} < \boldsymbol{X}_{it(p)} \boldsymbol{\theta}_{h,\tau}) |\Delta_h y_{it(p)+h} - \boldsymbol{X}_{it(p)} \boldsymbol{\theta}_{h,\tau}| \Big)$$
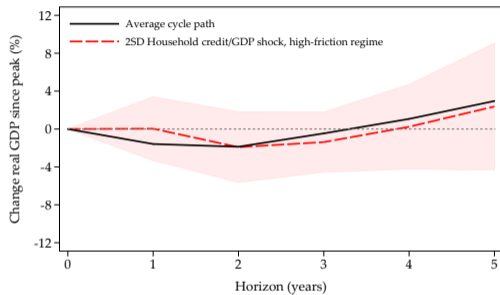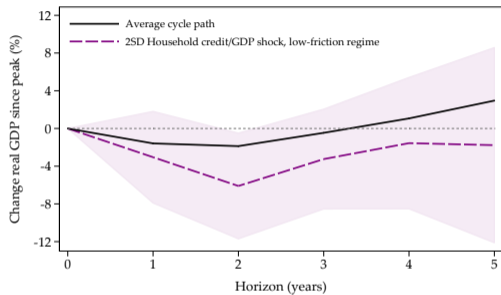
Legal regime placebo with household credit

Notes: Household credit/GDP changes interacted with business bankruptcy regime indicator. Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

▸ Back

Legal regime placebo with household credit: IV

Notes: Household credit/GDP changes interacted with business bankruptcy regime indicator. Legal indicator instrumented by legal origin. Standard errors clustered on countries. Shaded areas denote 95% confidence intervals.

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