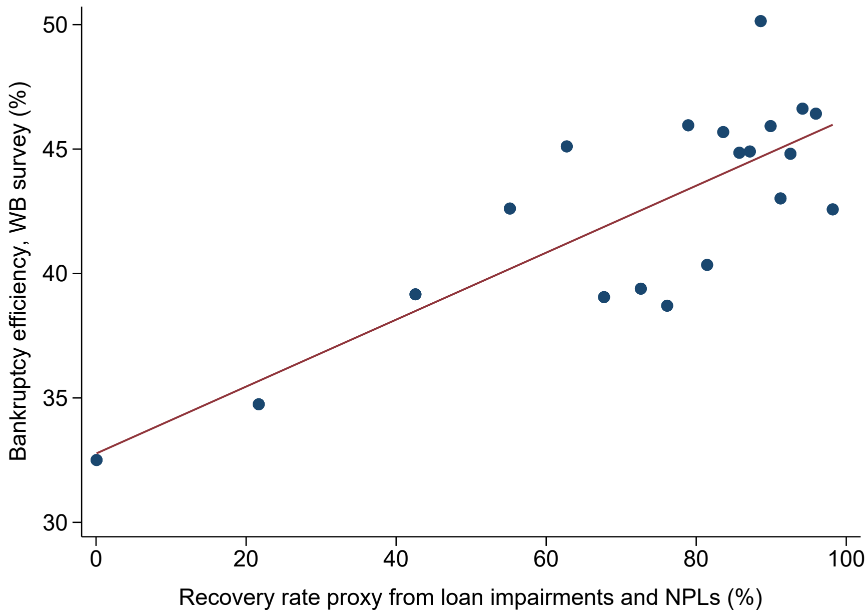
Bankruptcy Resolution and Credit Cycles, by Martin Kornejew, Chen Lian, Yueran Ma, Pablo Ottonello, Diego J. Perez, in NBER Macroeconomics Annual 2024, volume 39, edited by John V. Leahy, Martin S. Eichenbaum, and Valerie A. Ramey, University of Chicago Press, 2025.

Internet Appendix: For Online Publication

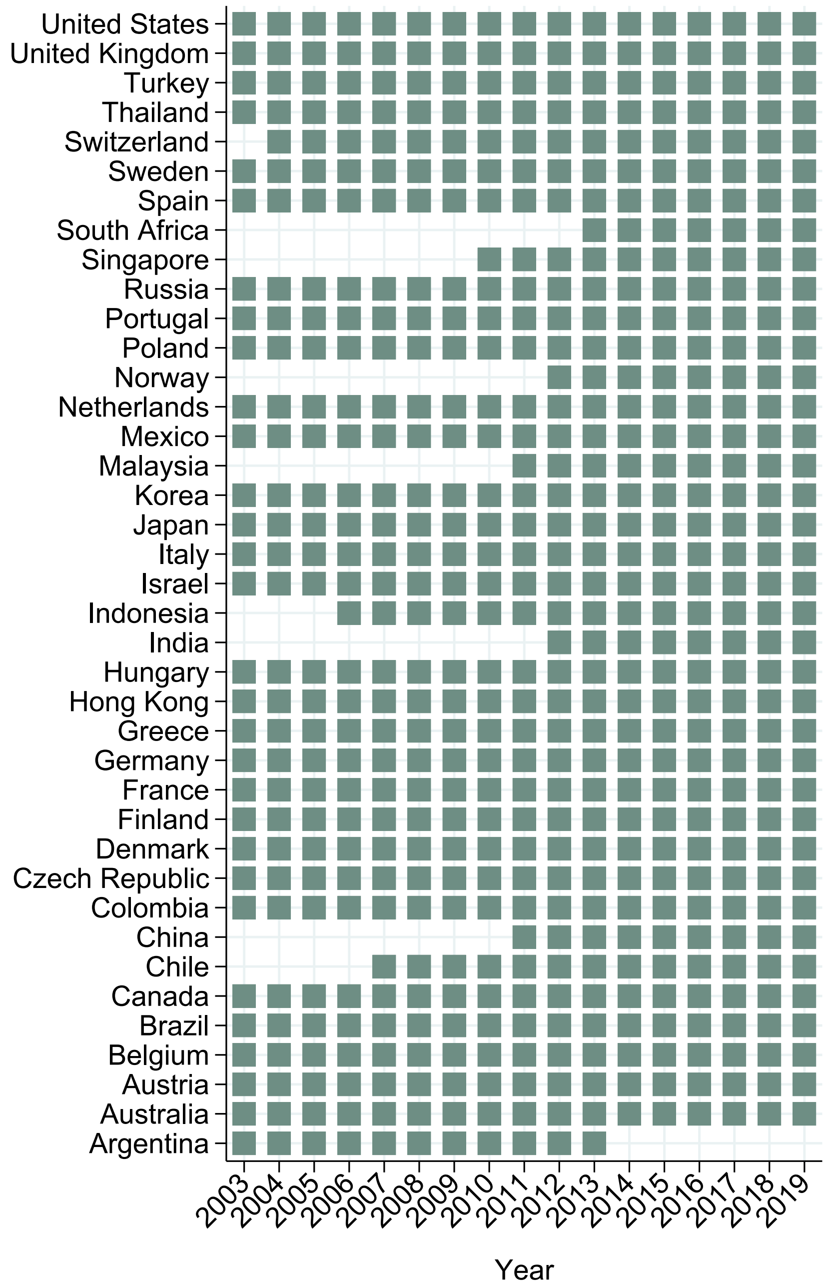
IA1 Additional Results

Figure IA1. Bankruptcy Efficiency and Imputed Realized Default Recovery Rate



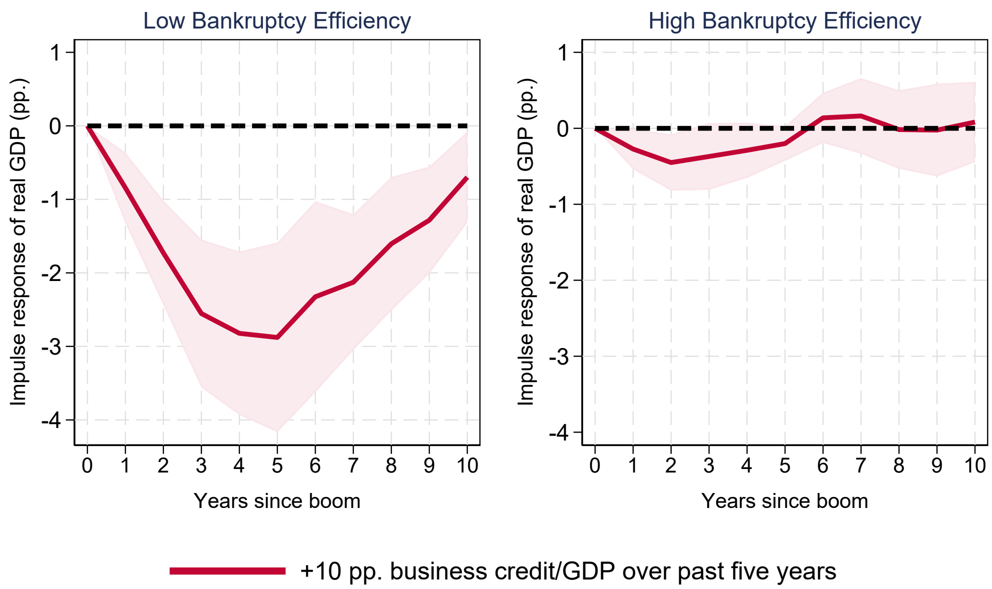
Notes: This figure shows a binned scatter plot of bankruptcy efficiency from World Bank (2020) against a proxy of realized default recovery rate. We construct the proxy as the difference between 100% and the ratio of loan impairments relative to nonperforming loans in a given year sourced from the BIS MiDAS Credit Loss Database introduced by Ong, Schmieder, and Wei (2023). The sample contains annual data from an unbalanced panel of 153 countries. The sample period is 2005 (the start of the MiDAS data) to 2019.

Figure IA2. Regression Sample



Notes: This figure shows the sample of countries and years covered in the baseline local projection regressions for GDP.

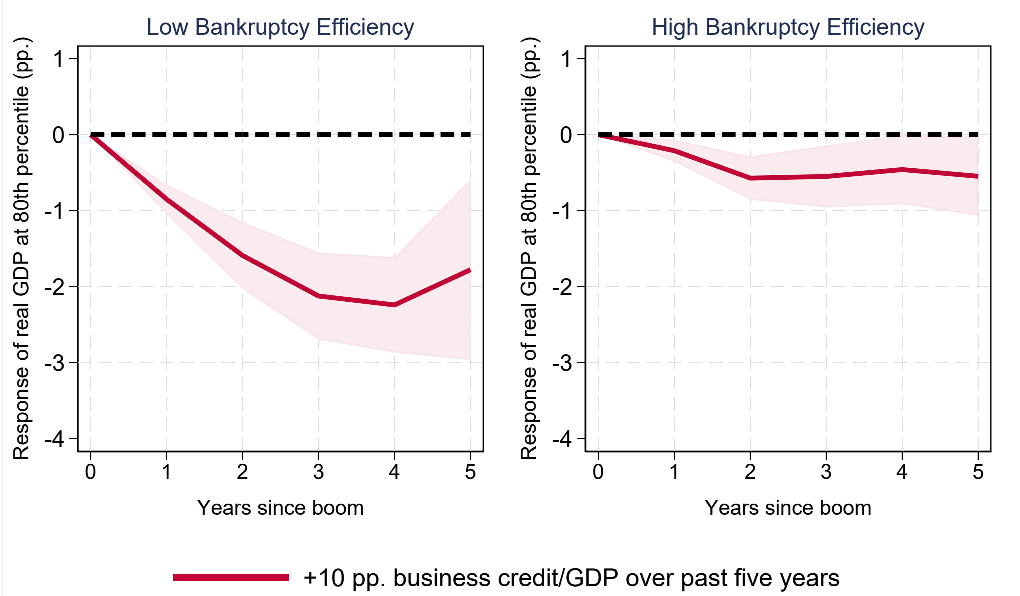
Figure IA3. GDP following Business Credit Booms in the Longer Term



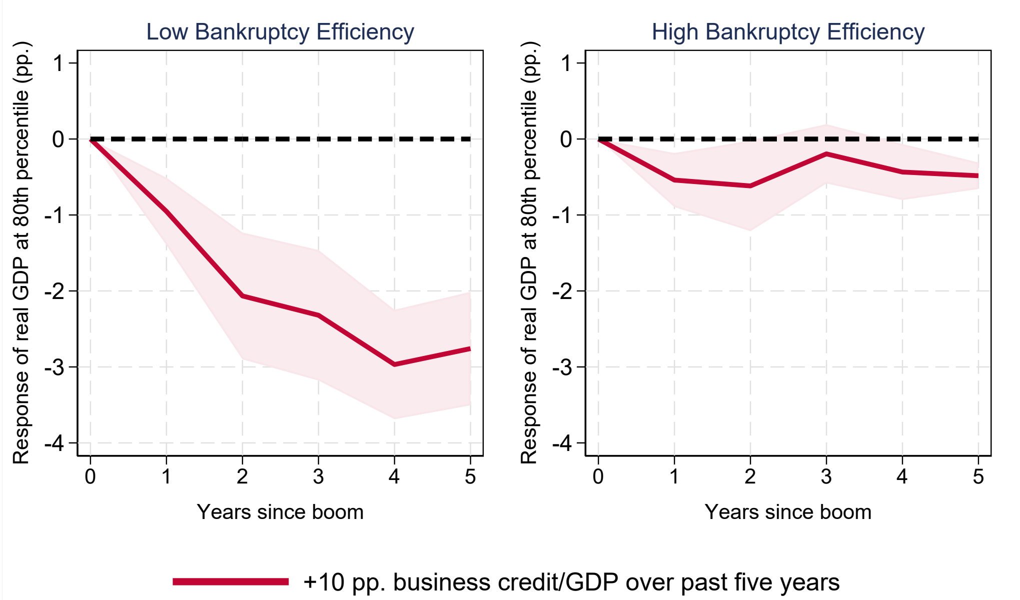
Notes: This figure shows the longer-term GDP trajectory following a 10 percentage point increase in the business credit-to-GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_i) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 10$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA4. GDP following Business Credit Booms: Quantile Regressions

Panel A. Response at the 80th Percentile

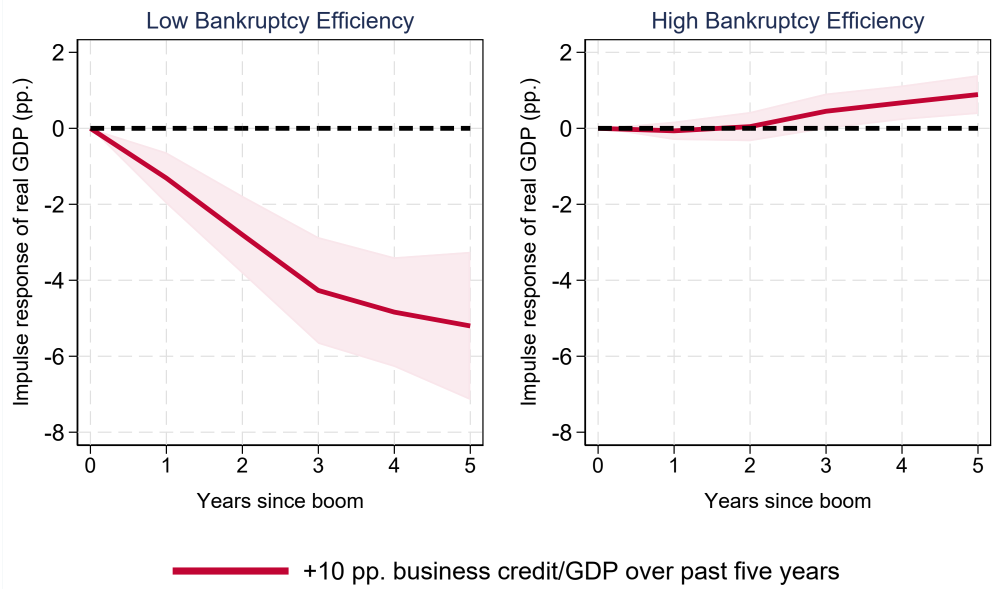


Panel B. Response at the 20th Percentile



Notes: The figure shows the trajectory of the 80th and 20th percentile of cumulative GDP growth following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent quantile local projections: $Q_{\Delta_h \log(\text{real GDP}_{i,t+h})}(q) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The target variable for the quantile function is the change in log real GDP in country i from year t to year $t+h$ evaluated at quantile $q \in [0.2, 0.8]$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panels evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

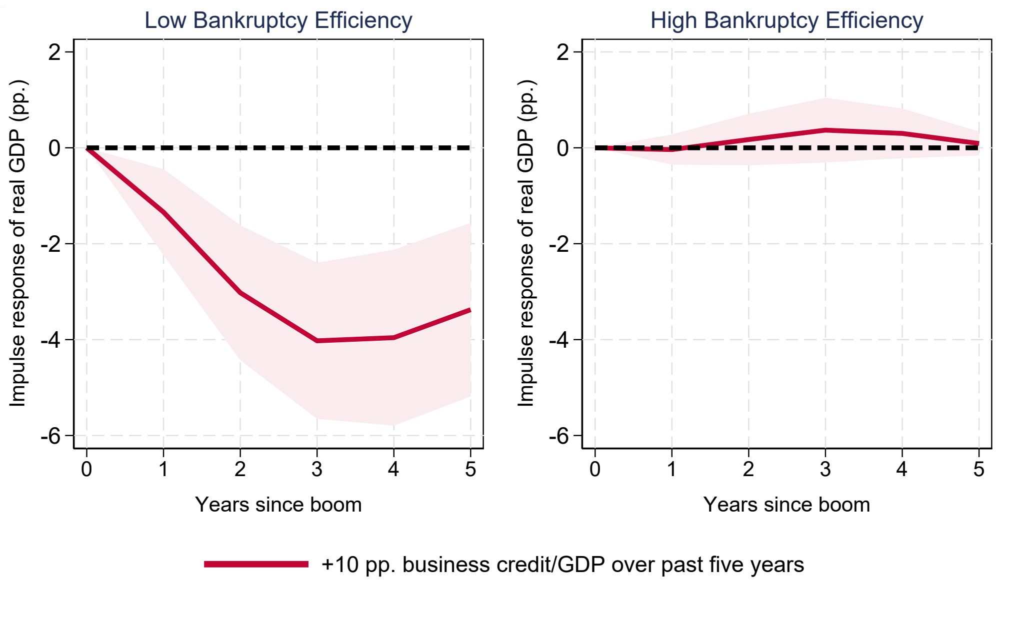
Figure IA5. GDP following Business Credit Booms with Fixed Bankruptcy Efficiency Measure



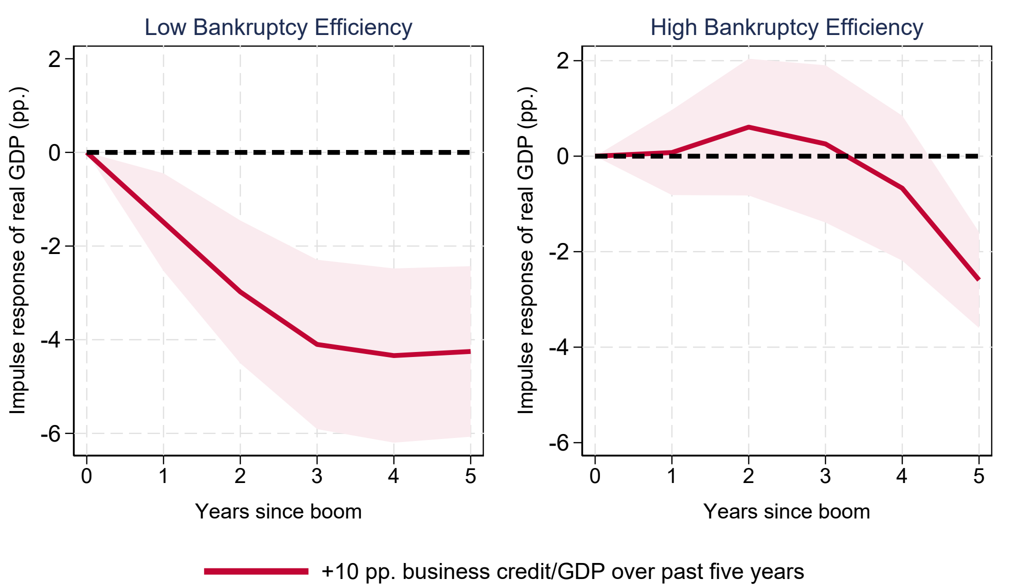
Notes: This figure shows the trajectory of GDP following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_i) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and B_i is bankruptcy efficiency measured at the start of the sample. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA6. GDP following Business Credit Booms, Instrumenting Bankruptcy Efficiency

Panel A. Baseline



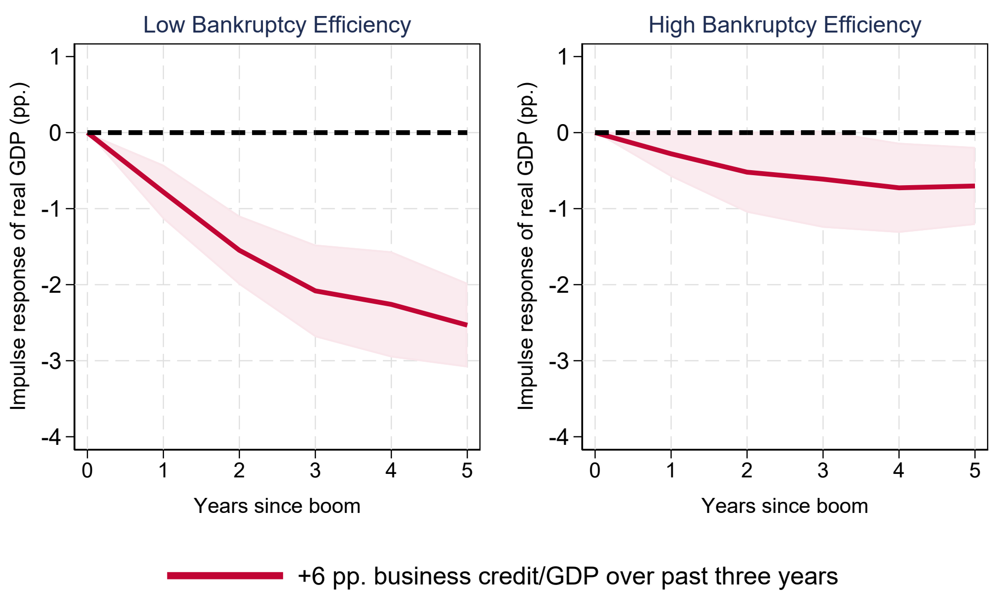
Panel B. Controlling for Rule of Law



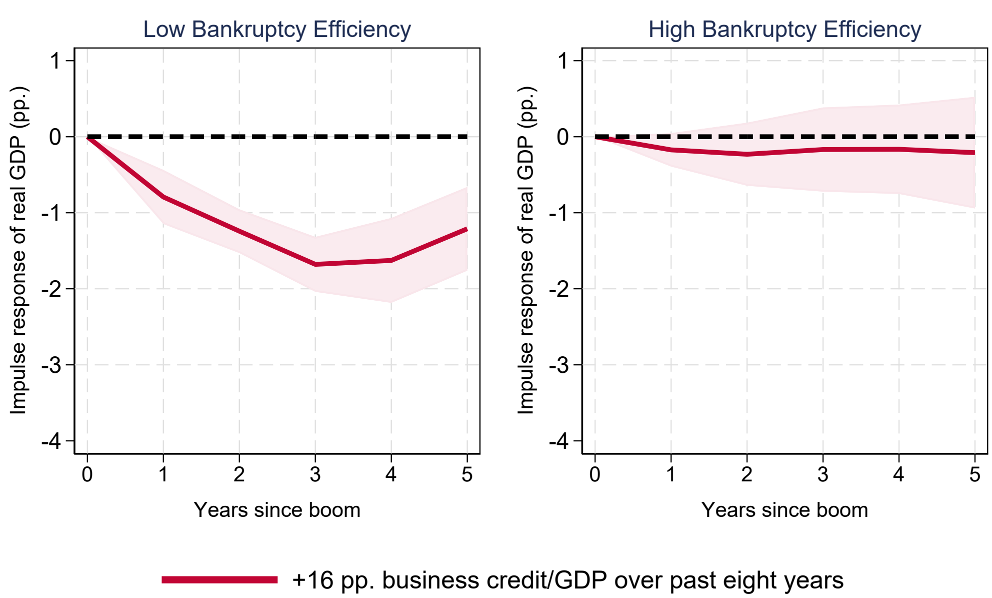
Notes: This figure shows the trajectory of GDP following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent instrumental variable local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\widehat{\Delta_5 c_{i,t} \times B_i}\right) + \beta_{3,h}\hat{B}_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t and $B_{i,t}$ is the bankruptcy efficiency measure, instrumented by 3 dummies indicating English, French, or German legal origin with Nordic legal origin as base category. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Panel B additionally controls for the rule of law index (Kaufmann and Kraay, 2023) and its interaction with business credit fluctuations $\Delta_5 c_{i,t}$. Since the legal origin instruments are time-invariant, we cannot identify the base coefficient $\beta_{3,h}$ for bankruptcy efficiency alongside country fixed effects. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA7. Measuring Credit Booms over Alternative Windows

Panel A. Change in Business Credit to GDP over Past 3 Years

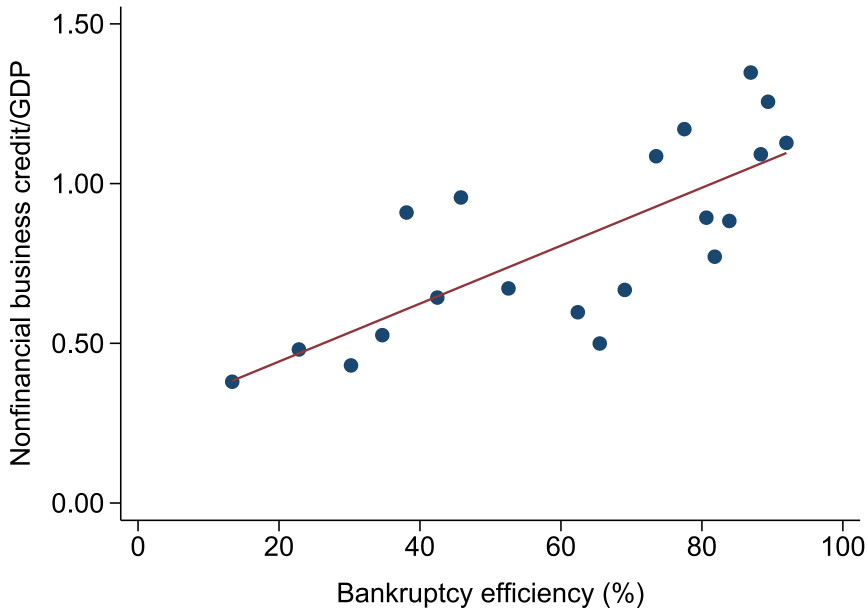


Panel B. Change in Business Credit to GDP over Past 8 Years



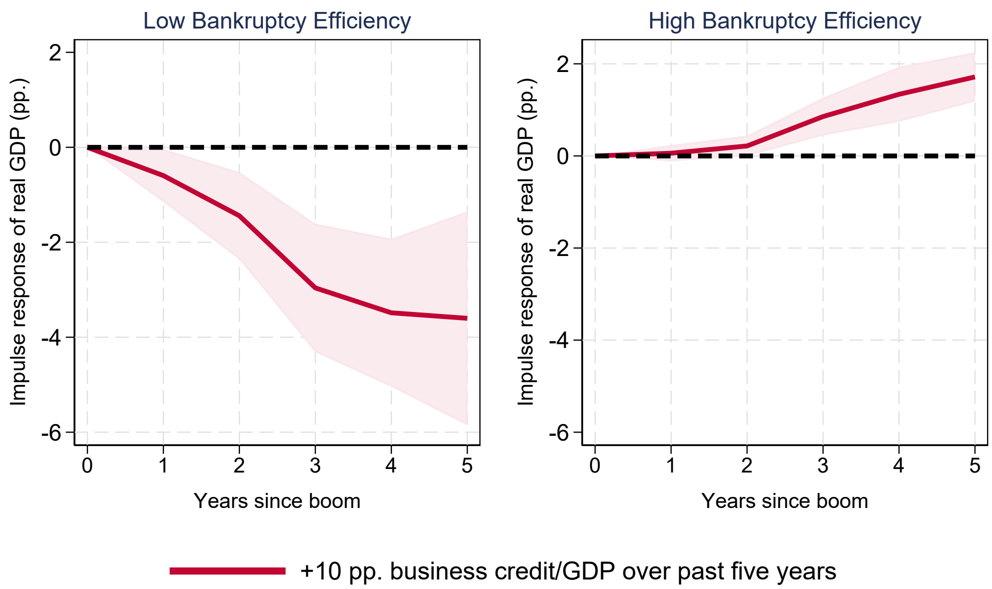
Notes: Panel A (B) shows the GDP trajectory following a 6 (16) percentage point increase in the business credit to GDP ratio over the past 3 (8) years. We normalize the change in business credit to GDP to 2 percentage points per year of the measurement window, following the baseline figures (10 percentage points over the past 5 years). We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_l c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - l$ to year t where $l \in \{3, 8\}$. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t - l$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panels evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA8. Bankruptcy Efficiency and Level of Business Credit/GDP



Notes: This figure shows a binned scatter plot for the relationship between bankruptcy efficiency and credit to nonfinancial businesses relative to GDP. The sample comprises data from 39 countries over the period of 2003 to 2019. The line represents the linear prediction.

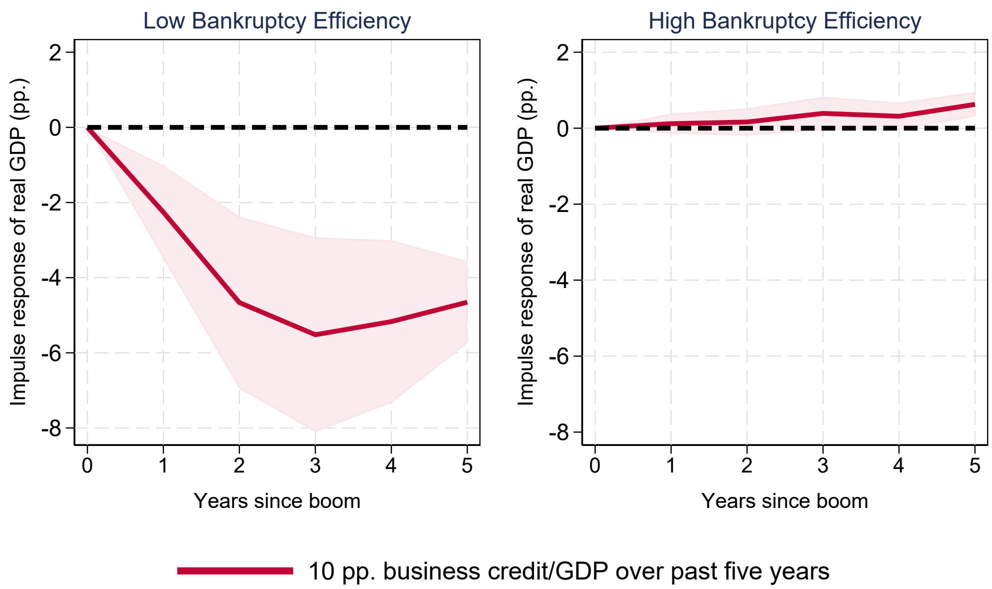
Figure IA9. Controlling for Debt Levels



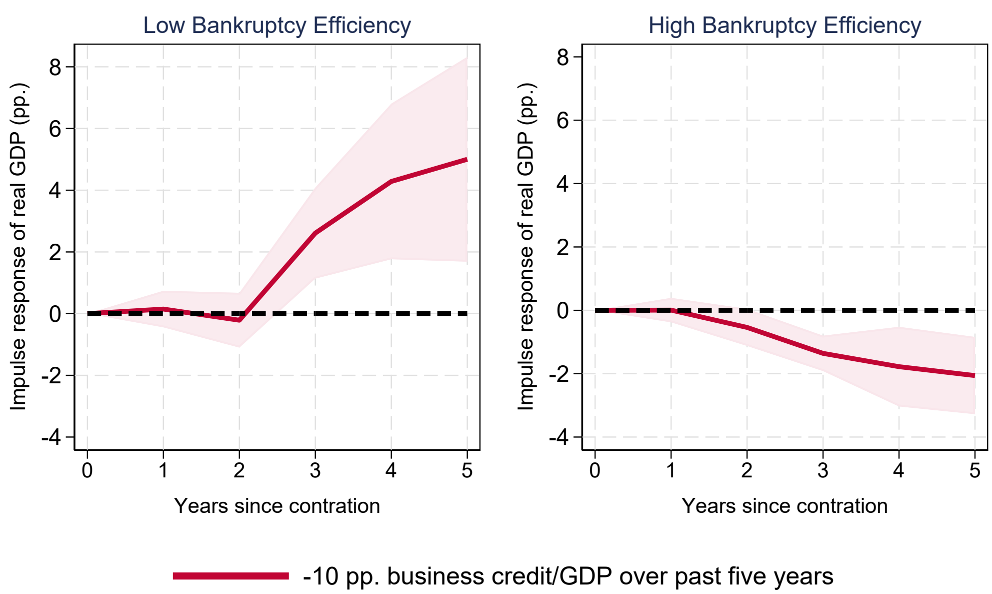
Notes: The figure shows the GDP trajectory following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}B_{i,t} + \beta_{4,h}c_{i,t} + \beta_{5,h}(c_{i,t} \times B_{i,t}) + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variables $c_{i,t}$ and $\Delta_5 c_{i,t}$ denote the level of business credit to GDP in country i in year t, and the change of business credit to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panels evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA10. GDP following Business Credit Expansions and Contractions

Panel A. Business Credit Expansions

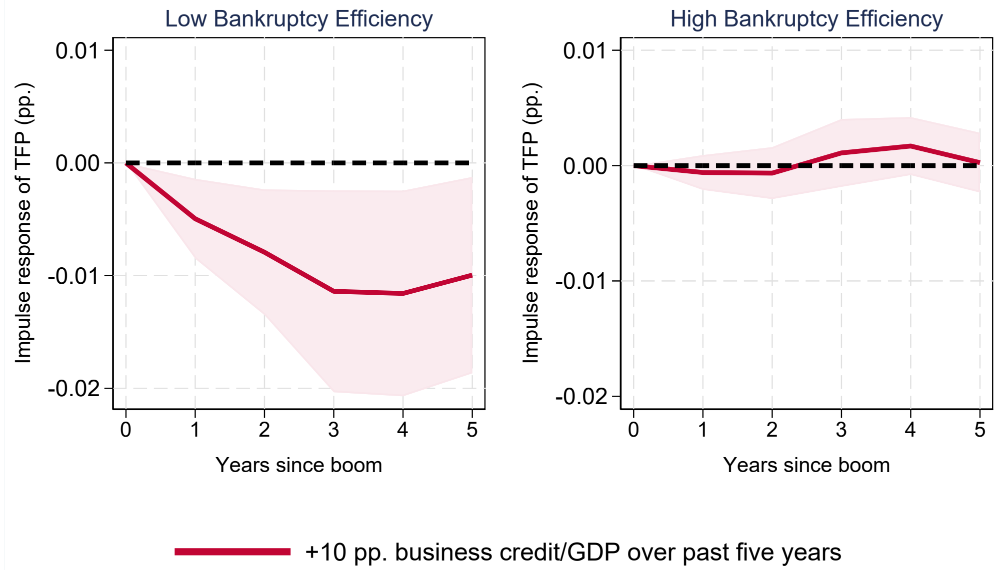


Panel B. Business Credit Contractions



Notes: Panel A (B) of this figure shows the GDP trajectory following a 10 percentage point increase (decrease) in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections implementing sign dependence following Ben Zeev, Ramey, and Zubairy (2023): $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \Delta^+\left[\beta^+_{1,h} B_{i,t} + \beta^+_{2,h}\Delta_5 c_{i,t} + \beta^+_{3,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \boldsymbol{\gamma}^+_h \boldsymbol{x}_{i,t}\right] + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The indicator variable Δ^+ takes value 1 if $\Delta_5 c_{i,t} > 0$, i.e., having a credit boom. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

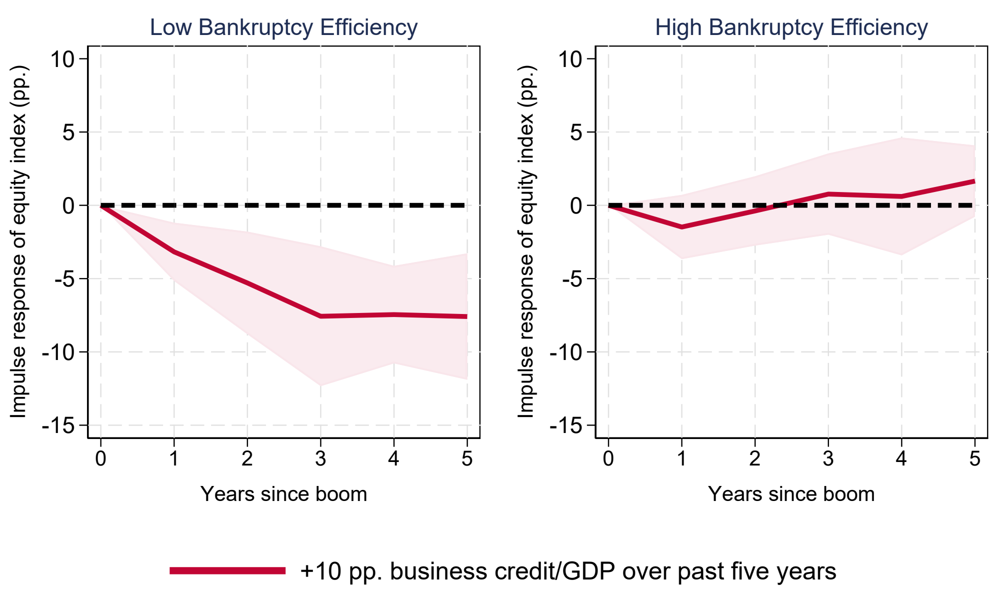
Figure IA11. Total Factor Productivity following Business Credit Booms



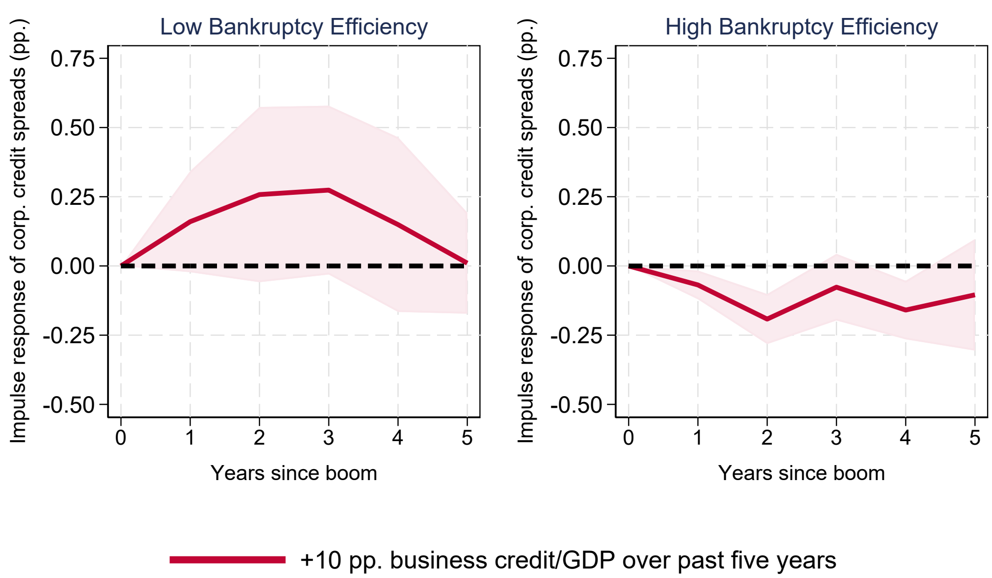
Notes: This figure shows the trajectory of total factor productivity (TFP) following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \log(\text{TFP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log TFP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and TFP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA12. Asset Prices following Business Credit Booms

Panel A. Stock Prices following Business Credit Booms

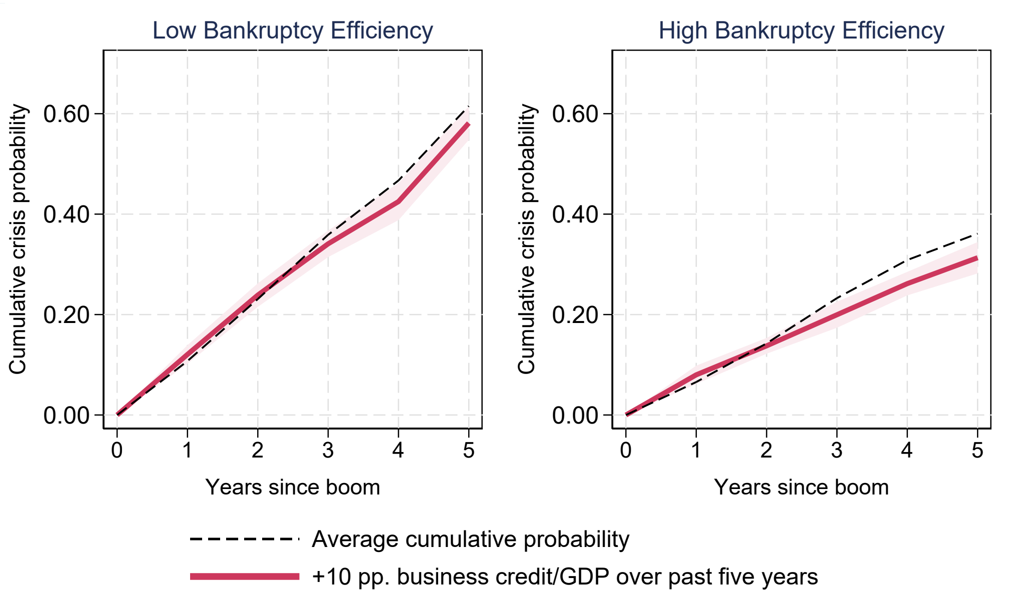


Panel B. Credit Spreads following Business Credit Booms



Notes: This figure shows the trajectory of real stock prices (Panel A) and credit spreads between long-term corporate and the government bonds (Panel B) following a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate state-dependent local projections: $\Delta_h \text{asset price}_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \gamma_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real stock price index (Panel A) and credit spread (Panel B) in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and the asset price change, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 36 advanced and emerging economies in Panel A, and 20 primarily advanced economies in Panel B. The sample period is 2003 to 2019. Shaded areas are 90% confidence intervals based on Driscoll-Kraay standard errors.

Figure IA13. Crisis Probability following Business Credit Booms



Notes: This figure shows the cumulative probability of a financial crisis with (solid red line) and without (dashed black line) a 10 percentage point increase in the business credit to GDP ratio over the past 5 years. We estimate linear probability models using state-dependent local projections: $\mathbb{1}(\text{crisis since } t)_{i,t+h} = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the occurrence of a financial crisis in country i from year t to year $t + h$ as chronicled by Baron, Verner, and Xiong (2021). The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and crisis indicators, as well as the cumulative change in household credit to GDP since $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The left (right) panel evaluates the impulse response using $B_{i,t}$ at the bottom (top) quartile, which is equal to 43% (83%). The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Shaded areas mark 90% confidence intervals based on Driscoll-Kraay standard errors.

Table IA1 – Change in Log Real GDP: Recessions and Non-Recessions

Panel A. Recessions

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.715***	1.239***	1.773***	1.779**	1.449**
	(0.129)	(0.281)	(0.530)	(0.590)	(0.639)
Δ_5 Business credit/GDP	-0.622***	-1.084***	-1.549***	-1.569**	-1.264**
	(0.119)	(0.255)	(0.449)	(0.505)	(0.548)
Bankruptcy efficiency	-0.400	1.962	14.077	26.695**	19.008**
	(3.828)	(7.142)	(9.056)	(10.130)	(6.731)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.39	0.50	0.59	0.64	0.69
Observations	85	82	82	78	71

Panel B. Non-Recessions

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.111***	0.250***	0.503***	0.631***	0.703***
	(0.037)	(0.067)	(0.098)	(0.111)	(0.142)
Δ_5 Business credit/GDP	-0.113**	-0.237***	-0.426***	-0.516***	-0.579***
	(0.042)	(0.067)	(0.096)	(0.107)	(0.127)
Bankruptcy efficiency	-0.542	-1.214	-1.700	-3.168	-5.417
	(1.473)	(2.090)	(3.842)	(4.323)	(4.156)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.12	0.14	0.18	0.22	0.25
Observations	475	440	402	368	337

Notes: This table shows results from state-dependent local projections for the sample of recession years in Panel A (i.e., negative real annual GDP growth at $h = 0$) and non-recessions in Panel B (i.e., positive real annual GDP growth at $h = 0$): $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA2 – Change in Log Real GDP: Quantile Regressions

Panel A. Response at the 80th Percentile

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.160***	0.255***	0.393***	0.445***	0.307
	(0.033)	(0.070)	(0.094)	(0.116)	(0.190)
Δ_5 Business credit/GDP	-0.154***	-0.269***	-0.382***	-0.416***	-0.310**
	(0.024)	(0.054)	(0.071)	(0.084)	(0.151)
Bankruptcy efficiency	-2.267**	-3.371	-7.449**	-5.300	-6.326
	(1.010)	(2.106)	(3.065)	(5.209)	(7.858)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2	0.42	0.52	0.60	0.66	0.71
Observations	560	522	484	446	408

Panel B. Response at the 20th Percentile

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.103	0.362**	0.531***	0.633***	0.569***
	(0.070)	(0.142)	(0.130)	(0.112)	(0.113)
Δ_5 Business credit/GDP	-0.140***	-0.362***	-0.460***	-0.569***	-0.520***
	(0.053)	(0.105)	(0.105)	(0.089)	(0.093)
Bankruptcy efficiency	-0.429	1.056	-0.540	-0.533	-4.973
	(1.479)	(5.392)	(4.051)	(3.292)	(5.556)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2	0.42	0.52	0.60	0.66	0.71
Observations	560	522	484	446	408

Notes: This table shows results for the 80th (Panel A) and 20th percentile (Panel B) of the cumulative GDP growth from state-dependent quantile local projections: $Q_{\Delta_h \log(\text{real GDP}_{i,t+h})}(q) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h} B_{i,t} + \gamma_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The target variable for the quantile function is the change in log real GDP in country i from year t to year $t+h$ evaluated at quantile $q \in [0.2, 0.8]$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth and real investment growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA3 – Change in Log Real GDP, Controlling for Development Status

Panel A. Binary Indicator for Development Status

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.176**	0.347***	0.487***	0.425**	0.293
	(0.075)	(0.116)	(0.154)	(0.183)	(0.195)
Δ_5 Business credit/GDP $\times$ Advanced economy	-0.058	-0.105	-0.064	0.028	0.123***
	(0.047)	(0.064)	(0.081)	(0.066)	(0.037)
Δ_5 Business credit/GDP	-0.115***	-0.227***	-0.377***	-0.411***	-0.393**
	(0.036)	(0.056)	(0.096)	(0.113)	(0.145)
Bankruptcy efficiency	-0.869	-0.863	0.743	2.989**	4.708*
	(0.907)	(1.206)	(1.007)	(1.103)	(2.240)
Advanced economy	-2.043*	-5.279**	-7.058**	-9.159***	-11.465***
	(0.968)	(1.977)	(2.350)	(2.942)	(3.275)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.16	0.19	0.22	0.25	0.29
Observations	560	522	484	446	408

Panel B. Log Real GDP per capita in USD

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.145***	0.300***	0.467***	0.560***	0.566***
	(0.041)	(0.064)	(0.089)	(0.090)	(0.093)
Δ_5 Business credit/GDP $\times$ Log real GDP p.c.	-0.017	-0.032	-0.026	-0.068	-0.082
	(0.020)	(0.049)	(0.069)	(0.081)	(0.080)
Δ_5 Business credit/GDP	0.048	0.080	-0.097	0.308	0.479
	(0.200)	(0.509)	(0.717)	(0.866)	(0.915)
Bankruptcy efficiency	3.776**	7.897***	13.533***	18.481***	23.422***
	(1.288)	(1.966)	(2.950)	(3.847)	(3.520)
Log real GDP per capita in USD	-8.324***	-17.853***	-28.636***	-40.664***	-52.362***
	(1.819)	(4.867)	(7.103)	(7.072)	(4.315)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.18	0.21	0.27	0.32	0.38
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B_{i,t}\right) + \beta_{3,h}\left(\Delta_5 c_{i,t} \times AE_{i,t}\right) + \beta_{4,h} B_{i,t} + \beta_{5,h} AE_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. In Panel A, the variable $AE_{i,t}$ is an indicator for high income countries. In Panel B, the variable $DM_{i,t}$ is log real GDP per capita in US Dollars. For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA4 – Change in Log Real GDP, Controlling for General GDP Volatility

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.117*	0.295**	0.493***	0.508**	0.431*
	(0.057)	(0.121)	(0.162)	(0.182)	(0.222)
Δ_5 Business credit/GDP $\times$ GDP volatility	-1.094	-1.045	-2.190	-5.088	-9.693**
	(1.392)	(3.049)	(4.330)	(3.960)	(4.058)
Δ_5 Business credit/GDP	-0.098	-0.264	-0.392*	-0.327	-0.147
	(0.068)	(0.157)	(0.217)	(0.233)	(0.273)
Bankruptcy efficiency	-0.956	-1.427	-0.820	-0.458	-0.317
	(0.953)	(1.261)	(2.133)	(3.012)	(3.081)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.18	0.22	0.27
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}\left(\Delta_5 c_{i,t} \times sd(\Delta \log(\text{real GDP})_{i,t})_i\right) + \beta_{4,h}B_{i,t} + \beta_{5,h} sd(\Delta \log(\text{real GDP})_{i,t})_i + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The variable $sd(\Delta \log(\text{real GDP})_{i,t})_i$ captures a country's standard deviation of real GDP growth. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA5 – Change in Log Real GDP, Controlling for Exchange Rate Regime

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.175**	0.427***	0.688***	0.763***	0.776***
	(0.063)	(0.106)	(0.144)	(0.168)	(0.189)
Δ_5 Business credit/GDP × Currency peg	-0.025	-0.088**	-0.118**	-0.111*	-0.096
	(0.021)	(0.038)	(0.053)	(0.062)	(0.054)
Δ_5 Business credit/GDP	-0.156***	-0.341***	-0.532***	-0.591***	-0.604***
	(0.049)	(0.077)	(0.107)	(0.123)	(0.146)
Bankruptcy efficiency	-1.514*	-2.748**	-2.746	-1.795	-0.928
	(0.841)	(1.106)	(1.873)	(2.733)	(3.101)
Currency peg	1.426	3.312*	5.528**	4.731*	2.852
	(0.813)	(1.580)	(2.242)	(2.440)	(2.010)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.16	0.19	0.22	0.25
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times \text{peg}_{i,t}) + \beta_{4,h}B_{i,t} + \beta_{5,h}\text{peg}_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The indicator variable $\text{peg}_{i,t}$ is 1 if the country has a fixed exchange rate, i.e., a value of 1 to 4 on the scale of foreign exchange regimes classified by Ilzetzki, Reinhart, and Rogoff (2019). The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA6 – Change in Log Real GDP, Controlling of Policy Countercyclicality

Panel A. Fiscal Policy Countercyclicality

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.127***	0.280***	0.481***	0.564***	0.598***
	(0.042)	(0.066)	(0.096)	(0.121)	(0.162)
Δ_5 Business credit/GDP $\times$ Fiscal cyclicality	-0.014	-0.058**	-0.102***	-0.128***	-0.151***
	(0.015)	(0.021)	(0.032)	(0.028)	(0.020)
Δ_5 Business credit/GDP	-0.142***	-0.304***	-0.480***	-0.548***	-0.576***
	(0.046)	(0.070)	(0.100)	(0.113)	(0.140)
Bankruptcy efficiency	-0.840	-1.092	-0.324	0.165	0.288
	(0.977)	(1.303)	(2.121)	(2.959)	(3.236)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.25
Observations	551	514	477	440	403

Panel B. Monetary Policy Countercyclicality

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	-0.009	0.110	0.332*	0.385**	0.454**
	(0.072)	(0.149)	(0.163)	(0.153)	(0.183)
Δ_5 Business credit/GDP $\times$ Monetary cyclicality	0.002***	0.003*	0.003*	0.004**	0.003*
	(0.001)	(0.002)	(0.002)	(0.001)	(0.002)
Δ_5 Business credit/GDP	-0.080*	-0.221***	-0.406***	-0.458***	-0.505***
	(0.040)	(0.074)	(0.077)	(0.084)	(0.123)
Bankruptcy efficiency	-4.805***	-9.253***	-12.254***	-13.471***	-13.939***
	(0.956)	(2.485)	(3.095)	(2.254)	(2.045)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.13	0.15	0.21	0.23	0.26
Observations	375	349	323	297	271

Notes: Both tables show results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times \text{cyc}_i) + \beta_{4,h} B_{i,t} + \beta_{5,h}\text{cyc}_i + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. In Panel A (Panel B), the variable cyc_i is the country specific coefficient of regressing changes in government spending to GDP (changes in the monetary policy rate) on contemporaneous real output growth. For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA7 – Change in Log Real GDP, Controlling for Rule of Law

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.065	0.208**	0.391***	0.435**	0.367*
	(0.051)	(0.088)	(0.122)	(0.143)	(0.196)
Δ_5 Business credit/GDP $\times$ Rule of law	0.037*	0.055*	0.079*	0.105**	0.160***
	(0.020)	(0.029)	(0.044)	(0.045)	(0.051)
Δ_5 Business credit/GDP	-0.105**	-0.253***	-0.411***	-0.455***	-0.424**
	(0.041)	(0.069)	(0.100)	(0.115)	(0.144)
Bankruptcy efficiency	-0.235	-0.203	1.610	3.621	6.223
	(0.957)	(1.222)	(2.311)	(3.702)	(4.390)
Rule of law	-0.184	-0.432	-1.827	-4.008*	-7.579*
	(0.872)	(1.120)	(1.423)	(2.149)	(4.084)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.26
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times R_{i,t}) + \beta_{4,h}B_{i,t} + \beta_{5,h}R_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The variable $R_{i,t}$ measures the strength of the rule of law (Kaufmann and Kraay, 2023). The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA8 – Change in Log Real GDP, Controlling for Institutional Quality (I)

Panel A. Government Effectiveness

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.038	0.144*	0.281**	0.315*	0.262
	(0.041)	(0.074)	(0.117)	(0.147)	(0.208)
Δ_5 Business credit/GDP $\times$ Government effectiveness	0.053***	0.088***	0.136**	0.165***	0.211***
	(0.015)	(0.027)	(0.045)	(0.050)	(0.052)
Δ_5 Business credit/GDP	-0.089**	-0.218***	-0.356***	-0.400***	-0.382**
	(0.039)	(0.060)	(0.092)	(0.106)	(0.138)
Bankruptcy efficiency	-0.120	-0.036	1.309	2.095	2.587
	(1.048)	(1.247)	(1.842)	(2.616)	(2.901)
Government effectiveness	-0.061	1.567	5.093	8.628	9.807
	(0.849)	(1.988)	(3.706)	(5.825)	(6.429)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.15	0.16	0.21	0.25	0.29
Observations	560	522	484	446	408

Panel B. Regulatory Quality

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.071	0.238***	0.415***	0.460***	0.431**
	(0.047)	(0.072)	(0.110)	(0.135)	(0.179)
Δ_5 Business credit/GDP $\times$ Regulatory quality	0.040*	0.045*	0.075**	0.101***	0.149***
	(0.022)	(0.024)	(0.029)	(0.033)	(0.037)
Δ_5 Business credit/GDP	-0.109**	-0.270***	-0.429***	-0.477***	-0.469***
	(0.040)	(0.063)	(0.098)	(0.115)	(0.139)
Bankruptcy efficiency	-0.641	-1.215	-0.747	-0.489	-0.057
	(1.101)	(1.491)	(2.779)	(4.302)	(4.755)
Regulatory quality	0.441	1.236	3.592	5.216	5.724
	(0.512)	(1.033)	(2.812)	(4.654)	(6.306)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.26
Observations	560	522	484	446	408

Notes: Both tables show results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times Q_{i,t}) + \beta_{4,h}B_{i,t} + \beta_{5,h}Q_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. In Panel A (Panel B), the variable $Q_{i,t}$ is government effectiveness (regulatory quality) measured by Kaufmann and Kraay (2023). For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t - 5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA9 – Change in Log Real GDP, Controlling for Institutional Quality (II)

Panel A. Time Required to Start a Business

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.119**	0.233**	0.367***	0.395***	0.367**
	(0.053)	(0.079)	(0.099)	(0.110)	(0.148)
Δ_5 Business credit/GDP × Time to start business	0.003	-0.011	-0.046**	-0.067**	-0.092***
	(0.014)	(0.018)	(0.019)	(0.023)	(0.018)
Δ_5 Business credit/GDP	-0.136**	-0.251***	-0.344***	-0.350***	-0.301**
	(0.055)	(0.075)	(0.092)	(0.094)	(0.116)
Bankruptcy efficiency	0.920	3.284**	6.916***	9.039***	10.427**
	(1.190)	(1.521)	(1.738)	(2.377)	(3.711)
Time to start business	1.370***	3.502***	5.623***	7.034***	7.978***
	(0.213)	(0.445)	(0.432)	(0.436)	(0.341)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.17	0.21	0.27	0.30	0.34
Observations	560	522	484	446	408

Panel B. Time of Contract Enforcement

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP × Bankruptcy efficiency	0.129***	0.286***	0.480***	0.545***	0.570***
	(0.038)	(0.060)	(0.090)	(0.095)	(0.124)
Δ_5 Business credit/GDP × Time to enforce contract	-0.001	-0.003	-0.007	-0.009	-0.011*
	(0.002)	(0.004)	(0.006)	(0.006)	(0.006)
Δ_5 Business credit/GDP	-0.120**	-0.239**	-0.332**	-0.332***	-0.327***
	(0.051)	(0.091)	(0.124)	(0.105)	(0.102)
Bankruptcy efficiency	-0.827	-1.269	-0.873	-1.511	-3.251
	(1.180)	(1.773)	(2.798)	(3.934)	(4.802)
Time to enforce contract	0.010	0.003	-0.068	-0.270**	-0.602***
	(0.034)	(0.069)	(0.095)	(0.111)	(0.154)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.19	0.22	0.27
Observations	560	522	484	446	408

Notes: Both tables show results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}(\Delta_5 c_{i,t} \times Q_{i,t}) + \beta_{4,h} B_{i,t} + \beta_{5,h} Q_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. In Panel A (Panel B), the variable $Q_{i,t}$ measures the months to start a business (enforce a contract) from the World Bank Doing Business database (World Bank, 2020). For both tables, the outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA10 – GDP following Business Credit Booms with Fixed Bankruptcy Efficiency Measure

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency (fixed)	0.125***	0.285***	0.472***	0.551***	0.609***
	(0.037)	(0.059)	(0.078)	(0.085)	(0.129)
Δ_5 Business credit/GDP	-0.131***	-0.280***	-0.427***	-0.484***	-0.520***
	(0.039)	(0.058)	(0.079)	(0.081)	(0.109)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.14	0.18	0.21	0.25
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_i) + \beta_{3,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, ..., 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and B_i is bankruptcy efficiency measured at the start of the sample. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA11 – Change in GDP, Instrumenting Bankruptcy Efficiency

Panel A. Baseline

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency (instr.)	0.217**	0.532***	0.732***	0.710***	0.578***
	(0.088)	(0.149)	(0.170)	(0.181)	(0.162)
Δ_5 Business credit/GDP	-0.199***	-0.462***	-0.622***	-0.609***	-0.511***
	(0.071)	(0.115)	(0.132)	(0.147)	(0.141)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
First stage F	24.77	21.95	17.94	14.58	13.98
R^2 (within)					
Observations	560	522	484	446	408

Panel B. Controlling for Rule of Law

	(1) $h = 1$	(2) $h = 2$	(3) $h = 3$	(4) $h = 4$	(5) $h = 5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency (instr.)	0.261*	0.598***	0.726***	0.611***	0.276*
	(0.141)	(0.216)	(0.209)	(0.214)	(0.150)
Δ_5 Business credit/GDP	-0.227**	-0.477***	-0.628***	-0.617***	-0.508***
	(0.093)	(0.138)	(0.145)	(0.151)	(0.133)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
First stage F	8.14	10.35	9.81	9.41	8.47
R^2 (within)					
Observations	560	522	484	446	408

Notes: This table shows state-dependent instrumented variable local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\widehat{\Delta_5 c_{i,t} \times B_i}\right) + \beta_{3,h}\hat{B}_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t + h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t - 5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure, instrumented by 3 indicator variables for English, French, or German legal origin (Nordic legal origin is the base category). The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t - 5$. Panel B additionally controls for the rule of law index (Kaufmann and Kraay, 2023) and its interaction with business credit fluctuations $\Delta_5 c_{i,t}$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. Since the legal origin instruments are time-invariant, we cannot identify the base coefficient $\beta_{3,h}$ for bankruptcy efficiency alongside country fixed effects. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA12 – Change in Log Real GDP and Efficiency of Liquidating Nonviable Firms

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Efficiency reorganizing viable firm	0.127	0.443**	0.656**	0.734**	0.802***
	(0.074)	(0.149)	(0.229)	(0.243)	(0.223)
Δ_5 Business credit/GDP $\times$ Efficiency liquidating nonviable firm	0.067	-0.141	-0.176	-0.167	-0.181
	(0.064)	(0.160)	(0.248)	(0.341)	(0.474)
Δ_5 Business credit/GDP	-0.201***	-0.316***	-0.470***	-0.539***	-0.576**
	(0.037)	(0.042)	(0.057)	(0.124)	(0.248)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.14	0.15	0.18	0.21	0.25
Observations	553	516	479	442	405

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}\left(\Delta_5 c_{i,t} \times B^V_{i,t}\right) + \beta_{3,h}\left(\Delta_5 c_{i,t} \times B^N_{i,t}\right) + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t. $B^V_{i,t}$ is the efficiency of resolving a viable firm, defined as the value preserved in bankruptcy (net of costs) relative to the full value from continuing operation. $B^N_{i,t}$ is the efficiency of liquidating a nonviable firm, defined as the realized liquidation value (net of bankruptcy costs) relative to the total liquidation value. Both measures are taken by Djankov et al. (2008a) for 2006 and are time invariant. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA13 – Change in Log Real GDP after Nontradable and Tradable Credit Booms

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Nontradable Credit/GDP $\times$ Bankruptcy efficiency	0.401	0.933*	1.436**	2.393***	2.138***
	(0.237)	(0.502)	(0.572)	(0.506)	(0.462)
Δ_5 Nontradable credit/GDP	-0.379**	-0.821**	-1.199**	-1.908***	-1.655***
	(0.172)	(0.367)	(0.440)	(0.418)	(0.382)
Δ_5 Tradable Credit/GDP $\times$ Bankruptcy efficiency	-0.439*	-1.034	-1.361	-2.877***	-2.472**
	(0.228)	(0.577)	(0.831)	(0.825)	(0.797)
Δ_5 Tradable credit/GDP	0.300	0.751	1.026	2.282***	1.967**
	(0.183)	(0.477)	(0.698)	(0.671)	(0.658)
Bankruptcy efficiency	-0.408	0.628	2.423	1.774	3.113
	(1.003)	(1.896)	(2.257)	(2.198)	(3.072)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.07	0.09	0.10	0.16	0.24
Observations	321	321	321	321	321

Notes: This table shows results from state-dependent local projections: $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c^N_{i,t} + \beta_{2,h}\Delta_5 c^T_{i,t} + \beta_{3,h}\left(\Delta_5 c^N_{i,t} \times B_{i,t}\right) + \beta_{4,h}\left(\Delta_5 c^T_{i,t} \times B_{i,t}\right) + \beta_{5,h} B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c^N_{i,t}$ ($\Delta_5 c^T_{i,t}$) denotes the change of debt of the nontradable (tradable) business sector relative to GDP in country i from year $t-5$ to year t. $B_{i,t}$ is the bankruptcy efficiency measure. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA14 – Bankruptcy Efficiency and Nontradable Credit Share

	(1) Nontradable share	(2) Share change	(3) Share change
Bankruptcy efficiency	0.205**	0.021	-0.002
	(0.071)	(0.024)	(0.033)
Δ_3 Business credit/GDP $\times$ Bankruptcy efficiency		0.097	
		(0.096)	
Δ_3 Business credit/GDP		-0.059	
		(0.055)	
Δ_3 Business loans/GDP $\times$ Bankruptcy efficiency			-0.098
			(0.127)
Δ_3 Business loans/GDP			0.098
			(0.111)
Country FE	Yes	Yes	Yes
R^2 (within)	0.038	0.003	0.003
Observations	721	339	670

Notes: This table shows estimates of panel regressions with different dependent variables. The outcome variable for the first three columns is the share of bank debt of the nontradable business sector relative to total business debt as measured by Müller and Verner (2023). The outcome variable in columns (2) and (3) is the change in this share between $t-3$ and t. Column (2) measures business credit using BIS data, which include both loans and bonds. Column (3) measures business credit using business loans from Müller and Verner (2023). All regressions control for country fixed effects. The sample in column (1) and (3) covers annual data from an unbalanced panel of 64 countries over the period 2003 to 2014. The sample in column (2) covers 34 countries over the period 2003 to 2014. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

Table IA15 – Change in Log Real GDP after Business Credit Expansions and Contractions

	(1) $h=1$	(2) $h=2$	(3) $h=3$	(4) $h=4$	(5) $h=5$
Δ_5 Business credit/GDP $\times$ Bankruptcy efficiency	0.014	0.033	0.397***	0.606**	0.706***
	(0.054)	(0.076)	(0.109)	(0.202)	(0.227)
$\Delta^+ \times \Delta_5$ Business credit/GDP $\times$ Bankruptcy efficiency	0.223**	0.450***	0.194	-0.058	-0.178
	(0.076)	(0.139)	(0.154)	(0.213)	(0.217)
Δ_5 Business credit/GDP	-0.015	0.021	-0.261***	-0.428**	-0.500**
	(0.034)	(0.050)	(0.083)	(0.141)	(0.185)
$\Delta^+ \times \Delta_5$ Business credit/GDP	-0.211***	-0.488***	-0.291**	-0.088	0.035
	(0.061)	(0.132)	(0.131)	(0.156)	(0.166)
$\Delta^+ \times$ Bankruptcy efficiency	-0.286	0.206	0.144	0.589	-0.322
	(0.509)	(0.997)	(1.106)	(1.003)	(1.671)
Bankruptcy efficiency	-2.273***	-3.634*	-1.246	0.014	0.786
	(0.761)	(1.912)	(3.013)	(4.447)	(4.847)
Country FE	Yes	Yes	Yes	Yes	Yes
Controls	Yes	Yes	Yes	Yes	Yes
R^2 (within)	0.20	0.21	0.23	0.25	0.29
Observations	560	522	484	446	408

Notes: This table shows results from state-dependent local projections with sign dependence following Ben Zeev, Ramey, and Zubairy (2023): $\Delta_h \log(\text{real GDP}_{i,t+h}) = \alpha_{i,h} + \beta_{1,h}\Delta_5 c_{i,t} + \beta_{2,h}(\Delta_5 c_{i,t} \times B_{i,t}) + \beta_{3,h}B_{i,t} + \boldsymbol{\gamma}_h \boldsymbol{x}_{i,t} + \Delta^+ \left[\beta^+_{1,h}\Delta_5 c_{i,t} + \beta^+_{2,h}(\Delta_5 c_{i,t} \times B_{i,t})\,\beta^+_{3,h}B_{i,t} + \boldsymbol{\gamma}^+_h \boldsymbol{x}_{i,t}\right] + \epsilon_{i,t}$ for $h = 1, \ldots, 5$. The outcome variable is the change in log real GDP in country i from year t to year $t+h$. The independent variable $\Delta_5 c_{i,t}$ denotes the change of business credit to GDP in country i from year $t-5$ to year t, and $B_{i,t}$ is the bankruptcy efficiency measure. The indicator variable Δ^+ takes value 1 if $\Delta_5 c_{i,t} > 0$, i.e., marking a credit boom. The controls $\boldsymbol{x}_{i,t}$ include contemporaneous and 5 lags of real GDP growth, as well as the cumulative change in household credit to GDP since year $t-5$. Horizon-specific country fixed effects $\alpha_{i,h}$ are included. The sample contains annual data from an unbalanced panel of 39 countries. The sample period is 2003 to 2019. Driscoll-Kraay standard errors in parentheses. *** $p < 0.01$, ** $p < 0.05$, * $p < 0.10$.

IA2 Proofs and Theoretical Extensions

IA2.1 Proof of Proposition 1

The firm's optimally chosen face value of debt $b^*(\beta, \beta_f, \xi)$ in (4) subject to (5) and (6) satisfies the first-order condition:[22]

$$\left.\frac{\partial\left(q_b(b,\beta,\xi)\cdot b\right)}{\partial b}\right|_{b=b^*\left(\beta,\beta_f,\xi\right)} = \beta_f \int_{b^*\left(\beta,\beta_f,\xi\right)}^{\bar{z}_j} \phi\left(z_j\right) dz_j = \beta_f\left(1-\Phi\left(b^*\left(\beta,\beta_f,\xi\right)\right)\right). \tag{IA1}$$

From (7) for the price schedule $q_b(b, \beta, \xi)$, we know that, for $b \in (\underline{z}, \bar{z})$,

$$q_b(b,\beta,\xi)\cdot b = \beta\left(b\left(1-\Phi(b)\right)+(1-\xi)\Phi(b)z^{\text{liq}}+\xi\int_{\underline{z}}^{b} z_j\phi(z_j)dz_j\right), \tag{IA2}$$

and

$$\frac{\partial(q_b(b,\beta,\xi)\cdot b)}{\partial b} = \beta\left(1-\Phi(b)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b)\right). \tag{IA3}$$

Together, the optimal face value of debt $b^*(\beta, \beta_f, \xi)$ satisfies:

$$\beta\left(1-\Phi(b^*(\beta,\beta_f,\xi))-(1-\xi)\left(b^*(\beta,\beta_f,\xi)-z^{\text{liq}}\right)\phi(b^*(\beta,\beta_f,\xi))\right) = \beta_f\left(1-\Phi(b^*(\beta,\beta_f,\xi))\right). \tag{IA4}$$

Note that z_j is drawn from a uniform distribution with a measure 1 support $[\underline{z}, \bar{z}]$ and $z^{\text{liq}} = \underline{z}$, then (IA4) becomes:

$$\beta_f(\bar{z}-b^*(\beta,\beta_f,\xi)) = \beta(\bar{z}-b^*(\beta,\beta_f,\xi)-(1-\xi)(b^*(\beta,\beta_f,\xi)-\underline{z})),$$

which means that:

$$b^*(\beta,\beta_f,\xi) = \bar{z}-\frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}} = \underline{z}+\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}. \tag{IA5}$$

Because $\xi \in (0,1)$ and $\beta_f < \beta$, we know that $0 < \frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}} < 1$, which means that $b^*(\beta, \beta_f, \xi) \in (\underline{z}, \bar{z})$. This means that the optimal face value of debt is interior to the interval $(\underline{z}, \bar{z})$, and there is a positive measure of firms both going bankrupt and not going bankrupt in the second period.

We still have to verify that the firm is willing to invest ($V_f > 0$):

$$V_f > 0 \iff \beta_f\mathbb{E}[\text{div}_2]+\beta\mathbb{E}\left[\mathbb{I}_{\{b^*(\beta,\beta_f,\xi)\le z_j\}}\cdot b^*(\beta,\beta_f,\xi)+\mathbb{I}_{\{b^*(\beta,\beta_f,\xi)>z_j\}}\cdot\left((1-\xi)z^{\text{liq}}+\xi z_j\right)\right] \ge I, \tag{IA6}$$

[22] (IA1) uses the fact that the optimal face value of debt $b^*\left(\beta, \beta_f, \xi\right) \in \left(\underline{z}, \bar{z}\right)$, which we verify below.

where we replace div_1 using (5) and replace $q_b(b, \beta, \xi)$ using (7). (IA6) is equivalent to:

$$\beta_f \int_{b^*}^{\bar{z}} (z_j - b^*)\phi(z_j)dz_j + \beta \left(b^*(1 - \Phi(b^*)) + (1-\xi)\Phi(b^*)z^{\text{liq}} + \xi \int_{\underline{z}}^{b^*} z_j \phi(z_j)dz_j \right) > I,$$

$$\iff \frac{\beta_f}{2}(\bar{z} - b^*)^2 + \beta \left(b^*(\bar{z} - b^*) + (1-\xi)(b^* - \underline{z})\underline{z} + \frac{\xi}{2}\left((b^*)^2 - (\underline{z})^2\right) \right) > I,$$

$$\iff \frac{\beta_f}{2}\left(\frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 + \beta\left(\left(1-\frac{\xi}{2}\right)\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}} + \frac{\xi}{2}\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}} + \underline{z}\right) > I,$$

$$\iff \frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right) + \beta\underline{z} > I,$$

where we condense the notation of $b^*(\beta, \beta_f, \xi)$ to b^* for simplicity. Hence by Assumption 1, the firm is willing to invest.

For the first part of Proposition 1, we take the derivative of $b^*(\beta, \beta_f, \xi)$ in (IA5) with respect to ξ:

$$\frac{\partial b^*(\beta, \beta_f, \xi)}{\partial \xi} = \frac{1-\frac{\beta_f}{\beta}}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} > 0,$$

where we use the fact that $\beta_f < \beta$.

For the second part, using the formula for output in (8) and the fact z_j that is drawn from a uniform distribution with a measure 1 support $[\underline{z}, \bar{z}]$, we know that, for $b \in (\underline{z}, \bar{z})$,

$$Y(b, \xi) = \underline{z} + \frac{1}{2} - \frac{1-\xi}{2}(b - \underline{z})^2.$$

Together with (10), the impact of the credit boom in the first period on aggregate output in the second period is given by:

$$\varepsilon(\beta, \beta_f, \xi) = \frac{\partial Y(b^*(\beta, \beta_f, \xi), \xi)}{\partial b} = -(1-\xi)\left(\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right) < 0.$$

Finally, note that

$$\frac{\partial \varepsilon(\beta, \beta_f, \xi)}{\partial \xi} = \frac{\left(1-\frac{\beta_f}{\beta}\right)\left(2-\xi-\frac{\beta_f}{\beta}\right) - (1-\xi)\left(1-\frac{\beta_f}{\beta}\right)}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} = \left[\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right]^2 > 0.$$

IA2.2 The Impact of Credit Booms Driven By Creditors' Beliefs

Here, we show that the results in Proposition 1 are robust to credit booms driven by creditors' beliefs. That is, higher bankruptcy efficiency still dampens the negative impact of credit booms when the booms are driven by shocks to creditors' beliefs (rather than by shocks to the discount rate), as modeled in Dávila and Walther (2023). Specifically, consider the environment in Section 5, but creditors' and firms' discount rates are fixed at a value $\beta > \beta_f$. Firms still have rational expectations, believing that z_j is drawn from the uniform distribution $[\underline{z}, \bar{z}]$. Creditors instead have irrational expectations, believing that z_j is drawn from the uniform distribution $[\underline{z} + \Delta, \bar{z} + \Delta]$, where Δ captures shocks to creditors' beliefs. For example, when $\Delta > 0$, creditors are overly optimistic about the potential cash flows from firms' investment opportunities, leading to a belief-driven increase in credit supply. We will keep $z^{\text{liq}} = \underline{z}$, and both firms and creditors believe so.

In this case, the price schedule $q_b(b, \xi, \Delta)$ is given by a variant of (7), where rational expectations are replaced with creditors' subjective expectations. That is, (IA2) becomes as follows. For $b \in (\underline{z} + \Delta, \bar{z} + \Delta)$,

$$q_b(b, \xi, \Delta) \cdot b = \beta \left(b\left(1 - \Phi(b - \Delta)\right) + (1 - \xi)\Phi(b - \Delta)z^{\text{liq}} + \xi \int_{\underline{z}}^{(b-\Delta)} (z_j + \Delta)\phi(z_j)dz_j \right), \quad \text{(IA7)}$$

where β is eliminated as an argument because it is fixed (similarly, we drop β_f as an argument below). Each firm optimally chooses the face value of debt $b^*(\Delta, \xi)$ in (4) subject to (5) and (6) and the price schedule $q_b(b, \xi, \Delta)$ here.

Here, credit booms are driven by shocks to creditors' belief Δ. A one-unit increase in total business credit results from a $1/\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}$ increase in unit increase in Δ. The impact of a one unit increase in total business credit on subsequent macroeconomic outcomes (e.g., aggregate output/GDP $Y^*(\Delta, \xi) \equiv Y(b^*(\Delta, \xi), \xi)$), is then given by:

$$\varepsilon(\Delta, \xi) = \frac{\frac{\partial Y^*(\Delta,\xi)}{\partial \Delta}}{\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}} = \frac{\partial Y(b^*(\Delta, \xi), \xi)}{\partial b}, \quad \text{(IA8)}$$

Now, we show that Proposition 1 is robust to credit booms driven by creditors' beliefs.

Proposition IA1. *Consider credit booms driven by creditors' beliefs. Under Assumption 1, there exists a* $\bar{\Delta} > 0$ *such that, for all* $|\Delta| < \bar{\Delta}$,

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*(\Delta,\xi)}{\partial \xi} > 0$.

2. The impact of credit booms on macroeconomic outcomes is negative: $\varepsilon(\Delta, \xi) < 0$. *Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the negative impact of credit booms on macroeconomic outcomes:* $\frac{\partial \varepsilon(\Delta,\xi)}{\partial \xi} > 0$.

Proof of Proposition IA1

The firm's optimally chosen face value of debt $b^*(\Delta, \xi)$ in (4) subject to (5) and (6) satisfies the first-order condition:[23]

$$\left.\frac{\partial(q_b(b,\xi,\Delta)\cdot b)}{\partial b}\right|_{b=b^*(\Delta,\xi)} = \beta_f \int_{b^*(\Delta,\xi)}^{\bar{z}_j} \phi(z_j)dz_j = \beta_f\left(1-\Phi(b^*(\Delta,\xi))\right).$$

From the price schedule (IA7), we know that, for $b \in (\underline{z}+\Delta, \bar{z}+\Delta)$,

$$\frac{\partial(q_b(b,\xi,\Delta)\cdot b)}{\partial b} = \beta\left(1-\Phi(b-\Delta)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b-\Delta)\right).$$

Combining everything and using the fact that $\Phi(\cdot)$ and $\phi(\cdot)$ are based on a uniform distribution with support $[\underline{z}, \bar{z}]$ and that $z^{\text{liq}} = \underline{z}$, the optimal face value of debt $b^*(\Delta, \xi)$ solves:[24]

$$\beta_f(\bar{z}-b^*(\Delta,\xi)) = \beta(\bar{z}+\Delta-b^*(\Delta,\xi)-(1-\xi)(b^*(\Delta,\xi)-\underline{z})),$$

which means that

$$b^*(\Delta,\xi) = \bar{z} - \frac{1-\xi-\Delta}{2-\xi-\frac{\beta_f}{\beta}} = \underline{z} + \frac{1-\frac{\beta_f}{\beta}+\Delta}{2-\xi-\frac{\beta_f}{\beta}}$$

is continuous in Δ and ξ. The condition such that the firm is willing to invest becomes:

$$\begin{aligned}
&\frac{\beta_f}{2}(\bar{z}-b^*)^2 + \beta\left(b^*(\bar{z}-b^*)+(1-\xi)(b^*-\underline{z})\underline{z}+\frac{\xi}{2}\left((b^*)^2-(\underline{z})^2\right)\right) \geq I,\\
\iff\ &\frac{\beta_f}{2}\left(\frac{1-\xi-\Delta}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 + \beta\left(\left(1-\frac{\xi}{2}\right)\frac{1-\frac{\beta_f}{\beta}+\Delta}{2-\xi-\frac{\beta_f}{\beta}}\frac{1-\xi-\Delta}{2-\xi-\frac{\beta_f}{\beta}}+\frac{\xi}{2}\frac{1-\frac{\beta_f}{\beta}+\Delta}{2-\xi-\frac{\beta_f}{\beta}}+\underline{z}\right) \geq I,\\
\iff\ &\frac{\beta}{2}\frac{1}{2-\xi-\frac{\beta_f}{\beta}}\left((1-\xi-\Delta)(1+\Delta)+\xi\left(1-\frac{\beta_f}{\beta}+\Delta\right)\right)+\beta\underline{z} \geq I,\\
\iff\ &\frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}-\Delta^2}{2-\xi-\frac{\beta_f}{\beta}}\right)+\beta\underline{z} \geq I,
\end{aligned} \tag{IA9}$$

where we condense the notation of $b^*(\Delta, \xi)$ to b^* for simplicity. If $\Delta = 0$, the condition becomes the restriction (IA6) in the proof of Proposition 1. That is, under Assumption 1, (IA9) holds with a strict inequality when $\Delta = 0$. Further note that from the left hand side of the above condition and $b^*(\Delta, \xi)$ being continuous in Δ, we know there exists a $\bar{\Delta} \in (0, 1-\frac{\beta_f}{\beta})$ such that for all $|\Delta| < \bar{\Delta}$, (IA9) holds under Assumption 1 and $b^*(\Delta, \xi) \in (\underline{z}, \bar{z}) \cap (\underline{z}+\Delta, \bar{z}+\Delta)$.

[23] Here we use the fact that the optimal face value of debt $b^*(\Delta, \xi) \in (\underline{z}, \bar{z})$, which is true because $b^*(0, \xi) \in (\underline{z}, \bar{z})$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta} > 0$ small enough.

[24] Here we use the fact that the optimal face value of debt $b^*(\Delta, \xi) \in (\underline{z}+\Delta, \bar{z}+\Delta)$, which is true because $b^*(0, \xi) \in (\underline{z}, \bar{z})$ as in Proposition 1, b^* is continuous in Δ as shown below, and we pick $\bar{\Delta} > 0$ small enough.

For the first result of Proposition IA1, take the derivative of $b^*(\Delta,\xi)$ with respect to ξ:

$$\frac{\partial b^*(\Delta,\xi)}{\partial \xi} = \frac{1-\frac{\beta_f}{\beta}+\Delta}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} > 0,$$

where we used the fact that $|\Delta| < \bar{\Delta} < 1-\frac{\beta_f}{\beta}$. For the second part, using the formula for output in (8) and the fact that z_j is drawn from a uniform distribution with a measure 1 support $[\underline{z},\bar{z}]$, we know that, for $b \in (\underline{z},\bar{z})$,

$$Y(b,\xi) = \underline{z} + \frac{1}{2} - \frac{1-\xi}{2}\left(b-\underline{z}\right)^2.$$

Together with (IA8), the impact of credit boom in the first period on aggregate output in the second period is given by:

$$\varepsilon(\Delta,\xi) = \frac{\partial Y\left(b^*\left(\Delta,\xi\right),\xi\right)}{\partial b} = -(1-\xi)\left(\frac{1-\frac{\beta_f}{\beta}+\Delta}{2-\xi-\frac{\beta_f}{\beta}}\right) < 0.$$

Finally, note that

$$\frac{\partial \varepsilon(\Delta,\xi)}{\partial \xi} = \left(1-\frac{\beta_f}{\beta}+\Delta\right)\frac{1-\frac{\beta_f}{\beta}}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} > 0,$$

where we again used the fact that $|\Delta| < \bar{\Delta} < 1-\frac{\beta_f}{\beta}$.

IA2.3 The Impact of Credit Booms Driven by Firms' Beliefs

Here, we show that the results in Proposition 1 are robust to credit booms driven by firms' beliefs. That is, higher bankruptcy efficiency still dampens the negative impact of credit booms when the booms are driven by shocks to firms' beliefs (rather than by shocks to the discount rate). Specifically, consider the environment in Section 5, but creditors and firms' discount rates are fixed at a value $\beta > \beta_f$. Creditors still have rational expectations, believing that z_j is drawn from the uniform distribution $[\underline{z},\bar{z}]$. Firms instead have biased expectations, believing that z_j is drawn from the uniform distribution $[\underline{z}+\Delta,\bar{z}+\Delta]$, where Δ captures shocks to firms' beliefs. For example, when $\Delta > 0$, firms are overly optimistic about the potential cash flows from their investment opportunities, leading to a belief-driven increase in credit demand. We will keep $z^{\text{liq}} = \underline{z}$, and both firms and creditors believe so.

In this case, the price schedule $q_b(b,\xi)$ is still determined by (7), where β is eliminated as an argument because it is fixed (similarly, we drop β_f as an argument below). Each firm optimally chooses the face value of debt $b^*(\Delta,\xi)$ in (4) subject to (5) and (6) and the price schedule $q_b(b,\xi)$, with rational expectations replaced with firms' subjective expectations.

Here, credit booms are driven by shocks to firms' beliefs Δ. A one-unit increase in total business credit results from a $1/\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}$ increase in Δ. The impact of a one unit increase in total business credit on subsequent macroeconomic outcomes (e.g., aggregate output/GDP $Y^*\left(\Delta,\xi\right) \equiv Y\left(b^*\left(\Delta,\xi\right),\xi\right)$), is then given by:

$$\varepsilon\left(\Delta,\xi\right)=\frac{\frac{\partial Y^{*}(\Delta,\xi)}{\partial\Delta}}{\frac{\partial b^{*}(\Delta,\xi)}{\partial\Delta}}=\frac{\partial Y\left(b^{*}\left(\Delta,\xi\right),\xi\right)}{\partial b},\tag{IA10}$$

Now, we show that Proposition 1 is robust to credit booms driven by firms' beliefs.

Proposition IA2. *Consider credit booms driven by firms' beliefs. Under Assumption 1, there exists a* $\bar{\Delta}>0$ *such that, for all* $|\Delta|<\bar{\Delta}$*,*

1. A more efficient bankruptcy system (a higher ξ*) is associated with a larger credit market:* $\frac{\partial b^{*}(\Delta,\xi)}{\partial\xi}>0$*.*

2. The impact of credit boom on macroeconomic outcomes is negative: $\varepsilon\left(\Delta,\xi\right)<0$*. Furthermore, a more efficient bankruptcy system (a higher* ξ*) dampens the negative impact of a credit boom on macroeconomic outcomes:* $\frac{\partial\varepsilon(\Delta,\xi)}{\partial\xi}>0$*.*

Proof of Proposition IA2

The firm's optimally chosen face value of debt $b^{*}(\Delta,\xi)$ in (4) subject to (5) and (6) satisfies the First-order Condition:[25]

$$\left.\frac{\partial(q_{b}(b,\xi,\Delta)\cdot b)}{\partial b}\right|_{b=b^{*}(\Delta,\xi)}=\beta_{f}\int_{(b^{*}(\Delta,\xi)-\Delta)}^{\bar{z}_{j}}\phi(z_{j})dz_{j}=\beta_{f}\left(1-\Phi(b^{*}(\Delta,\xi)-\Delta)\right).$$

From the price schedule (IA2), we know that, for $b\in(\underline{z},\bar{z})$,

$$\frac{\partial(q_{b}(b,\beta,\xi)\cdot b)}{\partial b}=\beta\left(1-\Phi(b)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b)\right).$$

Combining everything and using the fact that $\Phi(\cdot)$ and $\phi(\cdot)$ are based on a uniform distribution with support $[\underline{z},\bar{z}]$ and that $z^{\text{liq}}=\underline{z}$, the optimal face value of debt $b^{*}(\Delta,\xi)$ solves:[26]

$$\beta_{f}(\bar{z}+\Delta-b^{*}(\Delta,\xi))=\beta(\bar{z}-b^{*}(\Delta,\xi)-(1-\xi)(b^{*}(\Delta,\xi)-\underline{z})),$$

which means that

$$b^{*}(\Delta,\xi)=\bar{z}-\frac{1-\xi+\frac{\beta_{f}}{\beta}\Delta}{2-\xi-\frac{\beta_{f}}{\beta}}=\underline{z}+\frac{1-\frac{\beta_{f}}{\beta}(1+\Delta)}{2-\xi-\frac{\beta_{f}}{\beta}}.$$

[25] Here we use the fact that the optimal face of debt $b^{*}\left(\Delta,\xi\right)\in\left(\underline{z}+\Delta,\bar{z}+\Delta\right)$, which is true because $b^{*}\left(0,\xi\right)\in\left(\underline{z},\bar{z}\right)$ as in Proposition 1, b^{*} is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

[26] Here we use the fact that the optimal face of debt $b^{*}\left(\Delta,\xi\right)\in\left(\underline{z},\bar{z}\right)$, which is true because $b^{*}\left(0,\xi\right)\in\left(\underline{z},\bar{z}\right)$ as in Proposition 1, b^{*} is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

continuous in Δ and ξ. The condition such that the firm is willing to invest becomes:

$$\beta_f \int_{b^*}^{\bar{z}+\Delta} (z_j - b^*)\phi(z_j)dz_j + \beta \left(b^*(1-\Phi_f(b^*)) + (1-\xi)\Phi_f(b^*)z^{\text{liq}} + \xi \int_{\underline{z}+\Delta}^{b^*} z_j \phi(z_j)dz_j \right) \geq I,$$

$$\iff \frac{\beta_f}{2}(\bar{z}+\Delta-b^*)^2 + \beta\left(b^*(\bar{z}+\Delta-b^*) + (1-\xi)(b^*-\underline{z}-\Delta)\underline{z}\right) + \beta\left(\frac{\xi}{2}\left((b^*)^2-(\underline{z}+\Delta)^2\right)\right) \geq I,$$

where we condense the notation of $b^*(\delta,\xi)$ to b^* for simplicity. This condition reduces to:

$$\iff \frac{\beta_f}{2}\left(\frac{\Delta(2-\xi)+1-\xi}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 + \beta\left(\frac{(\Delta(2-\xi)+1-\xi)\left(1-\frac{\beta_f}{\beta}(1+\Delta)\right)}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2}\right)$$
$$+\beta\frac{\xi}{2}\left(\frac{1-\frac{\beta_f}{\beta}(1+\Delta)}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 + \beta\left(-\frac{\xi}{2}\Delta^2+\underline{z}\right) \geq I. \quad \text{(IA11)}$$

If $\Delta = 0$, the condition becomes the restriction (IA6) in the proof of Proposition 1. That is, under Assumption 1, (IA11) holds with a strict inequality when $\Delta = 0$. Further note that the LHS of the above condition and $b^*(\Delta,\xi)$ is continuous in Δ, we know there exists a $\bar{\Delta} \in (0, \frac{\beta}{\beta_f}-1)$ such that for all $|\Delta| < \bar{\Delta}$, (IA11) holds under Assumption 1 and $b^*(\Delta,\xi) \in (\underline{z},\bar{z}) \cap (\underline{z}+\Delta, \bar{z}+\Delta)$.

For the first result of Proposition IA2, take the derivative of $b^*(\Delta,\xi)$ with respect to ξ:

$$\frac{\partial b^*(\Delta,\xi)}{\partial \xi} = \frac{1-\frac{\beta_f}{\beta}(1+\Delta)}{(2-\xi-\frac{\beta_f}{\beta})^2} > 0.$$

where we used the fact that $|\Delta| < \bar{\Delta} < \frac{\beta}{\beta_f} - 1$.

For the second part, using the formula for output (8) and the fact z_j is drawn from a uniform distribution with a measure 1 support $[\underline{z},\bar{z}]$, we know that, for $b \in (\underline{z},\bar{z})$,

$$Y(b,\xi) = \underline{z} + \frac{1}{2} - \frac{1-\xi}{2}(b-\underline{z})^2.$$

Together with (IA10), the impact of credit boom in the first period on aggregate output in the second period is given by:

$$\varepsilon(\Delta,\xi) = \frac{\partial Y(b^*(\Delta,\xi),\xi)}{\partial b} = -(1-\xi)\frac{(1-\frac{\beta_f}{\beta}(1+\Delta))}{2-\xi-\frac{\beta_f}{\beta}} < 0.$$

We can then prove the second part of Proposition IA2:

$$\frac{\partial \varepsilon(\Delta,\xi)}{\partial \xi} = \left(1-\frac{\beta_f}{\beta}(1+\Delta)\right)\frac{(1-\frac{\beta_f}{\beta})}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} > 0.$$

where we again used the fact that $|\Delta| < \bar{\Delta} < \frac{\beta}{\beta_f} - 1$.

IA2.4 The Impact of Credit Booms Driven by Fundamentals

Here, we show that the second part of Proposition 1 can be different if we consider credit booms driven by rational expectations of firms' fundamentals. In particular, we consider credit booms driven by an increase in firms' productivity. The impact of such a fundamental-driven credit boom on macroeconomic outcomes (e.g., aggregate output) is now positive. However, we find opposite predictions of the impact of bankruptcy efficiency. A more efficient bankruptcy system now dampens the positive impact of a credit boom on macroeconomic outcomes.

Formally, each firm j's risky cash flow z_j is now drawn i.i.d. from the uniform distribution $[\underline{z}+\Delta, \bar{z}+\Delta]$, where Δ captures shocks to firms' future productivity. Both creditors and firms have rational expectations. Their discount rates are fixed at a value $\beta > \beta_f$. We will keep $z^{\text{liq}} = \underline{z}$.

In this case, the price schedule $q_b(b, \xi, \Delta)$ given by (IA2) becomes as follows. For $b \in (\underline{z} + \Delta, \bar{z} + \Delta)$,

$$q_b(b, \xi, \Delta) \cdot b = \beta \left(b\left(1 - \Phi(b - \Delta)\right) + (1 - \xi)\Phi(b - \Delta) z^{\text{liq}} + \xi \int_{\underline{z}}^{(b-\Delta)} (z_j + \Delta)\phi(z_j) dz_j \right), \quad \text{(IA12)}$$

where β is eliminated as an argument because it is fixed (similarly, we drop β_f as an argument below).

Each firm optimally chooses face value of debt $b^*(\Delta, \xi)$ in (4) subject to (5) and (6) and the price schedule $q_b(b, \xi, \Delta)$ here. Different from previous cases, aggregate output now directly depends on the productivity shock Δ, because it shifts the true distribution of z_j. That is, for $b \in [\underline{z} + \Delta, \bar{z} + \Delta]$, (8) becomes

$$Y\left(\Delta, b, \xi\right) = \int_{\underline{z}}^{\bar{z}} \left(z_j + \Delta\right) \phi\left(z_j\right) dz_j - \underbrace{\left(1 - \xi\right) \int_{\underline{z}}^{(b-\Delta)} \left(z_j + \Delta - z^{\text{liq}}\right) \phi\left(z_j\right) dz_j}_{\text{output loss from inefficient liquidation}}. \quad \text{(IA13)}$$

Define aggregate output/GDP $Y^*\left(\Delta, \xi\right) \equiv Y\left(\Delta, b^*\left(\Delta, \xi\right), \xi\right)$ based on the optimally chosen face value of debt $b^*(\Delta, \xi)$. We can see that the impact of productivity shock Δ on aggregate output is given by

$$\frac{\partial Y^*(\Delta, \xi)}{\partial \Delta} = \underbrace{\frac{\partial Y(\Delta, b^*(\Delta, \xi), \xi)}{\partial \Delta}}_{\text{direct productivity effect}} + \underbrace{\frac{\partial Y(\Delta, b^*(\Delta, \xi), \xi)}{\partial b} \cdot \frac{\partial b^*(\Delta, \xi)}{\partial \Delta}}_{\text{effect through credit changes}}.$$

Here, credit booms are driven by fundamental shocks to firms' productivity Δ. A one unit increase in total business credit, $b^*\left(\Delta, \xi\right)$, results from a $1/\frac{\partial b^*(\Delta,\xi)}{\partial \Delta}$ unit increase in Δ. The impact of a one unit increase in total business credit on subsequent macroeconomic outcomes is then given by:

$$\varepsilon\left(\Delta,\xi\right)=\frac{\frac{\partial Y^{*}(\Delta,\xi)}{\partial\Delta}}{\frac{\partial b^{*}(\Delta,\xi)}{\partial\Delta}}=\underbrace{\frac{\partial Y(\Delta,b^{*}(\Delta,\xi),\xi)}{\partial\Delta}\cdot\left(\frac{\partial b^{*}(\Delta,\xi)}{\partial\Delta}\right)^{-1}}_{\text{direct productivity effect, }>0}+\underbrace{\frac{\partial Y\left(\Delta,b^{*}\left(\Delta,\xi\right),\xi\right)}{\partial b}}_{\text{effect through credit changes, }<0}, \tag{IA14}$$

In fact, as proved below, the net impact of fundamental-driven credit boom $\varepsilon\left(\Delta,\xi\right)>0$ is positive, as the direct productivity effect dominates. In this case, Proposition 1 is overturned, as a more efficient bankruptcy system now dampens the positive impact of a credit boom on macroeconomic outcomes.

Proposition IA3. *Consider credit booms driven by fundamentals. Under Assumption 1, there exists a $\bar{\Delta}>0$ such that, for all $|\Delta|<\bar{\Delta}$,*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^{*}(\Delta,\xi)}{\partial\xi}>0$.

2. The impact of a fundamental credit boom on macroeconomic outcomes is now positive: $\varepsilon\left(\Delta,\xi\right)>0$. Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the positive impact of a credit boom on macroeconomic outcomes: $\frac{\partial\varepsilon(\Delta,\xi)}{\partial\xi}<0$.

Proof of Proposition IA3

The firm's optimally chosen face value of debt $b^{*}(\Delta,\xi)$ in (4) subject to (5) and (6) satisfies the first-order condition:[27]

$$\left.\frac{\partial(q_{b}(b,\xi,\Delta)\cdot b)}{\partial b}\right|_{b=b^{*}(\Delta,\xi)}=\beta_{f}\int_{(b^{*}(\Delta,\xi)-\Delta)}^{\bar{z}_{j}}\phi(z_{j})dz_{j}=\beta_{f}\left(1-\Phi(b^{*}(\Delta,\xi)-\Delta)\right). \tag{IA15}$$

From the price schedule (IA12), we know that, for $b\in(\underline{z}+\Delta,\bar{z}+\Delta)$,

$$\frac{\partial(q_{b}(b,\xi,\Delta)\cdot b)}{\partial b}=\beta\left(1-\Phi(b-\Delta)-(1-\xi)\left(b-z^{\text{liq}}\right)\phi(b-\Delta)\right).$$

Combining everything and using that z_j is drawn from a uniform distribution with support $[\underline{z}+\Delta,\bar{z}+\Delta]$ and that $z^{\text{liq}}=\underline{z}$, the optimal face value of debt $b^{*}(\Delta,\xi)$ solves:[28]

$$\beta_{f}(\bar{z}+\Delta-b^{*}(\Delta,\xi))=\beta(\bar{z}+\Delta-b^{*}(\Delta,\xi)-(1-\xi)(b^{*}(\Delta,\xi)-\underline{z})),$$

[27](IA15) uses the fact that the optimal face value of debt $b^{*}\left(\Delta,\xi\right)\in\left(\underline{z}+\Delta,\bar{z}+\Delta\right)$, which is true because $b^{*}\left(0,\xi\right)\in\left(\underline{z},\bar{z}\right)$ as in Proposition 1, b^{*} is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

[28]Here we use the fact that the optimal face value of debt $b^{*}\left(\Delta,\xi\right)\in\left(\underline{z}+\Delta,\bar{z}+\Delta\right)$, which is true because $b^{*}\left(0,\xi\right)\in\left(\underline{z},\bar{z}\right)$ as in Proposition 1, b^{*} is continuous in Δ as shown below, and we pick $\bar{\Delta}>0$ small enough.

which means that

$$b^*(\Delta,\xi) = \bar{z} - \frac{1-\xi-\Delta\left(1-\frac{\beta_f}{\beta}\right)}{2-\xi-\frac{\beta_f}{\beta}} = \underline{z} + \frac{(1-\frac{\beta_f}{\beta})(1+\Delta)}{2-\xi-\frac{\beta_f}{\beta}} \tag{IA16}$$

is continuous in Δ and ξ. The condition such that the firm is willing to invest reduces to:

$$\frac{\beta}{2}\left(\frac{(1+\Delta)(1-\frac{\beta_f}{\beta}\xi+(1-\xi)^2\Delta)}{2-\xi-\frac{\beta_f}{\beta}}\right) + \beta\left(\frac{\xi}{2}\Delta+\underline{z}\right) \geq I. \tag{IA17}$$

If $\Delta = 0$, the condition becomes the restriction (IA6) in the proof of Proposition 1. That is, under Assumption 1, (IA17) holds with a strict inequality when $\Delta = 0$. Further note that from the left hand side of the above condition and $b^*(\Delta,\xi)$ being continuous in Δ, we know there exists a $\bar{\Delta}_1 \in (0,1)$ such that for all $|\Delta| < \bar{\Delta}_1$, (IA17) holds under Assumption 1 and $b^*(\Delta,\xi) \in (\underline{z}+\Delta, \bar{z}+\Delta)$.

For the first part of Proposition IA3, we take the derivative of $b^*(\Delta,\xi)$ in (IA16) with respect to ξ:

$$\frac{\partial b^*(\Delta,\xi)}{\partial \xi} = \frac{\left(1-\frac{\beta_f}{\beta}\right)(1+\Delta)}{\left(2-\xi-\frac{\beta_f}{\beta}\right)^2} > 0,$$

where we used the fact that $|\Delta| < \bar{\Delta}_1 < 1$.

For the second part, by using the output formula in (IA13) and the fact z_j that is drawn from a uniform distribution with a measure 1 support $[\underline{z}+\Delta, \bar{z}+\Delta]$, we know that, for $b \in (\underline{z}+\Delta, \bar{z}+\Delta)$,

$$Y(\Delta,b,\xi) = \underline{z} + \frac{1}{2} + \Delta + \frac{(1-\xi)}{2}\Delta^2 - \frac{1-\xi}{2}(b-\underline{z})^2.$$

To apply (IA14), we note that

$$\frac{\partial b^*(\Delta,\xi)}{\partial \Delta} = \frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}} > 0,$$

$$\frac{\partial Y(\Delta,b^*(\Delta,\xi),\xi)}{\partial b} = -(1-\xi)\left[\frac{(1-\frac{\beta_f}{\beta})(1+\Delta)}{2-\xi-\frac{\beta_f}{\beta}}\right] < 0,$$

$$\frac{\partial Y(\Delta,b^*(\Delta,\xi),\xi)}{\partial \Delta} = 1 + (1-\xi)\Delta > 0,$$

where we used the fact that $|\Delta| < \bar{\Delta}_1 < 1$. As a result,

$$\varepsilon(\Delta,\xi) = \underbrace{\frac{\left(2-\xi-\frac{\beta_f}{\beta}\right)}{1-\frac{\beta_f}{\beta}} - (1-\xi)\frac{\left(1-\frac{\beta_f}{\beta}\right)}{2-\xi-\frac{\beta_f}{\beta}}}_{a_1} + \Delta\underbrace{\left[\frac{(1-\xi)\left(2-\xi-\frac{\beta_f}{\beta}\right)}{1-\frac{\beta_f}{\beta}} - (1-\xi)\frac{\left(1-\frac{\beta_f}{\beta}\right)}{2-\xi-\frac{\beta_f}{\beta}}\right]}_{a_2},$$

where $\varepsilon(\Delta, \xi)$ is a linear function on Δ. We now show that the intercept a_1 is positive:

$$
\begin{aligned}
a_1 > 0 \iff & \left(2 - \xi - \frac{\beta_f}{\beta}\right)^2 > (1-\xi)\left(1 - \frac{\beta_f}{\beta}\right)^2, \\
\iff & \left(1 - \frac{\beta_f}{\beta}\right)^2 + 2\left(1 - \frac{\beta_f}{\beta}\right)(1-\xi) + (1-\xi)^2 > (1-\xi)\left(1 - \frac{\beta_f}{\beta}\right)^2, \\
\iff & \xi\left(1 - \frac{\beta_f}{\beta}\right)^2 + 2\left(1 - \frac{\beta_f}{\beta}\right)(1-\xi) + (1-\xi)^2 > 0.
\end{aligned}
$$

As a result, there exists $\bar{\Delta}_2 \in \left(0, \bar{\Delta}_1\right)$ such that for all $|\Delta| < \bar{\Delta}_2$, $\varepsilon(\Delta, \xi) > 0$.

For the last part of Proposition IA3,

$$
\frac{\partial \varepsilon(\Delta, \xi)}{\partial \xi} = \underbrace{\left[\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}}\right]^2 - \frac{1}{1 - \frac{\beta_f}{\beta}}}_{a_3} + \Delta \underbrace{\left[\left(\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}}\right)^2 - \frac{3 - 2\xi - \frac{\beta_f}{\beta}}{1 - \frac{\beta_f}{\beta}}\right]}_{a_4}.
$$

This derivative is also a linear function of Δ. We now show that the intercept a_3 is negative:

$$
a_3 < 0 \iff \left(1 - \frac{\beta_f}{\beta}\right)^3 < \left(2 - \xi - \frac{\beta_f}{\beta}\right)^2,
$$

which is true because $\frac{\beta_f}{\beta}, \xi \in (0,1)$. As a result, there exists $\bar{\Delta} \in \left(0, \bar{\Delta}_2\right)$ such that for all $|\Delta| < \bar{\Delta}$, $\frac{\partial \varepsilon(\Delta,\xi)}{\partial \xi} < 0$. Together, we know that, for all $|\Delta| < \bar{\Delta}$, Proposition IA3 holds.

IA2.5 Generalizing the Cash Flow Distribution of the Risky Project.

Here, we show that Proposition 1 extends to settings where the cash flow of the risky project z_j is drawn from a general class of distributions, not limited to the uniform distribution case examined in the main analysis. Specifically, consider the environment in Section 5, but we relax the assumption that the stochastic cash flow is drawn from a uniform distribution.

Assumption IA1. *The cash flow of the risky project of each firm j, z_j, is drawn from a i.i.d. distribution with support $[\underline{z}, \bar{z}]$, where $\underline{z} \geq 0$. Define $f(z_j) = (z_j - \underline{z}) \frac{\phi(z_j)}{1-\Phi(z_j)}$, where $\phi(z_j)$ and $\Phi(z_j)$ are probability density function and cumulative distribution function. We assume that $\phi(z_j)$ is strictly positive and bounded in $z_j \in [\underline{z}, \bar{z}]$ and $f(z_j)$ strictly increases in $z_j \in [\underline{z}, \bar{z})$.*

Assumption IA1 holds under commonly studied distributions, such as the case of uniform distributions and the case of distributions with monotone hazard rates ($\frac{\phi(z_j)}{1-\Phi(z_j)}$ increases in $z_j \in [\underline{z}, \bar{z}]$). We also generalize Assumption 1, which guarantees that the firm prefers investing to not investing.

Assumption IA2. *The investment cost is such that:*

$$\begin{aligned} I < \beta_f \mathbb{E}\left[(z_j - b^*(\beta, \beta_f, \xi)) \cdot \mathbb{I}_{\{b^*(\beta,\beta_f,\xi) \leq z_j\}}\right] \\ + \beta \mathbb{E}\left[b^*(\beta, \beta_f, \xi) \cdot \mathbb{I}_{\{b^*(\beta,\beta_f,\xi) \leq z_j\}} + ((1-\xi)\underline{z} + \xi z_j) \cdot \mathbb{I}_{\{b^*(\beta,\beta_f,\xi) > z_j\}}\right] \end{aligned}$$

where $b^*(\beta, \beta_f, \xi)$ is firm's optimally chosen face value of debt.

We can show that Proposition 1 extends to this setting with a general class of distributions.

Proposition IA4. *Under Assumptions IA1 and IA2,*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*(\beta,\beta_f,\xi)}{\partial \xi} > 0$.

2. Nonfundamental credit booms have negative effects on macroeconomic outcomes: $\varepsilon(\beta, \beta_f, \xi) < 0$. Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the negative impact of nonfundamental credit booms on macroeconomic outcomes: $\frac{\partial \varepsilon(\beta,\beta_f,\xi)}{\partial \xi} > 0$.

Proof of Proposition IA4

The firm's optimally chosen face value of debt $b^*(\beta, \beta_f, \xi)$ satisfies the first-order condition:[29]

$$\left.\frac{\partial (q_b(b, \beta, \xi) \cdot b)}{\partial b}\right|_{b=b^*(\beta,\beta_f,\xi)} = \beta_f (1 - \Phi(b^*(\beta, \beta_f, \xi))). \tag{IA18}$$

From (7) for the price schedule $q_b(b, \beta, \xi)$, we know that, for $b \in (\underline{z}, \bar{z})$,

$$q_b(b, \beta, \xi) \cdot b = \beta \left(b(1 - \Phi(b)) + (1-\xi)\Phi(b) z^{\text{liq}} + \xi \int_{\underline{z}}^{b} z_j \phi(z_j) dz_j \right), \tag{IA19}$$

and

$$\frac{\partial (q_b(b, \beta, \xi) \cdot b)}{\partial b} = \beta \left(1 - \Phi(b) - (1-\xi)\left(b - z^{\text{liq}}\right) \phi(b)\right).$$

Together, the optimal face value of debt $b^*(\beta, \beta_f, \xi)$ satisfies:

$$\beta \left(1 - \Phi(b^*(\beta, \beta_f, \xi)) - (1-\xi)\left(b^*(\beta, \beta_f, \xi) - z^{\text{liq}}\right) \phi(b^*(\beta, \beta_f, \xi))\right) = \beta_f (1 - \Phi(b^*(\beta, \beta_f, \xi))), \tag{IA20}$$

[29](IA18) uses the fact that the optimal face value of debt $b^*(\beta, \beta_f, \xi) \in (\underline{z}, \bar{z})$, which we verify below.

which can be rewritten as

$$f\left(b^*(\beta,\beta_f,\xi)\right) = \left(b^*(\beta,\beta_f,\xi) - \underline{z}\right)\frac{\phi\left(b^*(\beta,\beta_f,\xi)\right)}{1-\Phi\left(b^*(\beta,\beta_f,\xi)\right)} = \frac{\beta-\beta_f}{\beta\left(1-\xi\right)}, \tag{IA21}$$

where $f\left(z\right) \equiv \left(z-\underline{z}\right)\frac{\phi(z)}{1-\Phi(z)}$. From Assumption IA1, we know that $f\left(\underline{z}\right)=0$, $f\left(z_j\right)$ strictly increases in $z_j \in [\underline{z},\bar{z})$, $\lim_{z_j\to\bar{z}} f\left(\bar{z}\right) = +\infty$. We know that there exists a unique $b^*(\beta,\beta_f,\xi) \in (\underline{z},\bar{z})$ that solves (IA20), which pins down $b^*(\beta,\beta_f,\xi)$. Moreover, $b^*(\beta,\beta_f,\xi)$ strictly increases in $\beta > \beta_f$ and ξ. The fact that the firm is willing to invest ($V_f > 0$) then follows directly from Assumption IA2. From (IA20), we know that

$$\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial \xi} = \frac{\left(b^*(\beta,\beta_f,\xi)-\underline{z}\right)}{\left(1-\xi\right)\frac{\phi'\left(b^*(\beta,\beta_f,\xi)\right)}{\phi\left(b^*(\beta,\beta_f,\xi)\right)}\left(b^*(\beta,\beta_f,\xi)-\underline{z}\right)+2-\frac{\beta_f}{\beta}-\xi}.$$

Because $b^*(\beta,\beta_f,\xi)$ strictly increases in ξ, we know that $\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial\xi} > 0$ and

$$\left(1-\xi\right)\frac{\phi'\left(b^*(\beta,\beta_f,\xi)\right)}{\phi\left(b^*(\beta,\beta_f,\xi)\right)}\left(b^*(\beta,\beta_f,\xi)-\underline{z}\right)+2-\frac{\beta_f}{\beta}-\xi > 0. \tag{IA22}$$

This finishes the proof of part 1 of Proposition IA4.

To prove Part 2 of Proposition IA4. Using the formula for output in (8), we know that, for $b \in (\underline{z},\bar{z})$,

$$\begin{aligned}
\frac{\partial Y\left(b,\xi\right)}{\partial b} &= -\left(1-\xi\right)\left(b-\underline{z}\right)\phi\left(b\right)\\
\frac{\partial^2 Y\left(b,\xi\right)}{\partial b\partial\xi} &= \left(b-\underline{z}\right)\phi\left(b\right)\\
\frac{\partial^2 Y\left(b,\xi\right)}{\partial b^2} &= -\left(1-\xi\right)\phi\left(b\right)-\left(1-\xi\right)\left(b-\underline{z}\right)\phi'\left(b\right).
\end{aligned}$$

Because $b^*(\beta,\beta_f,\xi) \in (\underline{z},\bar{z})$, we know that $\frac{\partial Y\left(b^*\left(\beta,\beta_f,\xi\right),\xi\right)}{\partial b} < 0$. Moreover, together with (11),

$$\begin{aligned}
\frac{\partial\varepsilon\left(\beta,\beta_f,\xi\right)}{\partial\xi} &= \frac{\partial^2 Y\left(b^*\left(\beta,\beta_f,\xi\right),\xi\right)}{\partial b\partial\xi}+\frac{\partial^2 Y\left(b^*\left(\beta,\beta_f,\xi\right),\xi\right)}{\partial b^2}\frac{\partial b^*\left(\beta,\beta_f,\xi\right)}{\partial\xi}\\
&= \frac{\left(1-\frac{\beta_f}{\beta}\right)\left(b^*\left(\beta,\beta_f,\xi\right)-\underline{z}\right)\phi\left(b^*\left(\beta,\beta_f,\xi\right)\right)}{\left(1-\xi\right)\frac{\phi'\left(b^*\left(\beta,\beta_f,\xi\right)\right)}{\phi\left(b^*\left(\beta,\beta_f,\xi\right)\right)}\left(b^*\left(\beta,\beta_f,\xi\right)-\underline{z}\right)+2-\frac{\beta_f}{\beta}-\xi} > 0,
\end{aligned}$$

where we use the fact that ϕ is strictly positive on $[\underline{z},\bar{z}]$ and (IA22).

IA2.6 Allowing $z^{\text{liq}} \in (\underline{z}, \bar{z})$ and the Possibility of Inefficient Continuing Operation.

In the main analysis, we set the value from liquidation $z^{\text{liq}} = \underline{z}$ to be the lowest realization of cash flow if the firm continues to operate. This assumption is in line with empirical evidence (Ramey and Shapiro, 2001; Kermani and Ma, 2023), but rules out the possibility of inefficient continuation. Here, we relax this assumption and consider the case that $z^{\text{liq}} \in (\underline{z}, \bar{z})$, which allows for the possibility of inefficient continuation. In this extension, the bankruptcy efficiency ξ captures the probability that the bankruptcy system correctly decides between liquidation and continuation. That is, following default, with probability $\xi \in (0,1)$, the project's cash flow is given by $\max\left\{z_j, z^{\text{liq}}\right\}$. With probability $1-\xi$, the project's cash flow is given by $\min\left\{z_j, z^{\text{liq}}\right\}$.[30]

In this case, the firm's optimally chosen face value of debt $b^*(\beta, \beta_f, \xi)$ is still given by (IA1). The debt price schedule is determined by the free entry of creditors to the lending market. Similar to (7) and (IA2), we know that, for $b \in (\underline{z}, \bar{z})$:

$$\begin{aligned} q(\beta, \beta_f, \xi) \cdot b &= \beta \mathbb{E}\left[\mathbb{I}_{b \le z_j} b + \mathbb{I}_{b > z_j}\left((1-\xi)\min\{z_j, z^{\text{liq}}\} + \xi \max\{z_j, z^{\text{liq}}\}\right)\right] \\ &= \beta\left(b\left(1-\Phi(b)\right) + (1-\xi)\int_{\underline{z}}^{b} \min\{z_j, z^{\text{liq}}\}\phi(z_j)dz_j + \xi \int_{\underline{z}}^{b} \max\{z_j, z^{\text{liq}}\}\phi(z_j)dz_j\right). \end{aligned} \tag{IA23}$$

Now we show that the main result Proposition 1 remains to be true under a generalization of Assumption 1.

Assumption IA3. *The investment cost I is such that:*

$$I < \frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)(\bar{z}-z^{liq})^2 + \beta z^{liq}(\bar{z}-z^{liq}) + \beta\left(\frac{1-\xi}{2}\left((z^{liq})^2 - (\underline{z})^2\right) + \xi(z^{liq}-\underline{z})z^{liq}\right).$$

Proposition IA5. *Consider the model described above. Under Assumption IA3:*

1. A more efficient bankruptcy system (a higher ξ) is associated with a larger credit market: $\frac{\partial b^*(\beta,\beta_f,\xi)}{\partial \xi} > 0$.

2. Nonfundamental credit booms have negative effects on macroeconomic outcomes: $\varepsilon(\beta, \beta_f, \xi) < 0$. Furthermore, a more efficient bankruptcy system (a higher ξ) dampens the negative impact of nonfundamental credit booms on macroeconomic outcomes: $\frac{\partial \varepsilon(\beta,\beta_f,\xi)}{\partial \xi} > 0$.

[30] When $z^{\text{liq}} = \underline{z}$, because $\max\left\{z_j, z^{\text{liq}}\right\} = z_j$, then bankruptcy efficiency ξ defined here is the same as the probability of continuing operating as defined in the main analysis.

Proof of Proposition IA5

For $b \in (z^{\text{liq}}, \bar{z})$, $\min\{b, z^{\text{liq}}\} = z^{\text{liq}}$ and $\max\{b, z^{\text{liq}}\}$. Hence, from (IA23):

$$\frac{\partial(q_b(b,\beta,\xi)\cdot b)}{\partial b} = \beta\left(1 - \Phi(b) - (1-\xi)\left(b - z^{\text{liq}}\right)\phi(b)\right). \tag{IA24}$$

Since (IA24) is equivalent to (IA3), the optimal value of debt $b^*(\beta, \beta_f, \xi)$ satisfies:

$$b^*(z^{\text{liq}}, \xi) = \bar{z} - \frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}}(\bar{z} - z^{\text{liq}}) = \underline{z} + \frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}} - \frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}}(\underline{z} - z^{\text{liq}}), \tag{IA25}$$

which can be rewritten as:

$$b^*(\beta, \beta_f, \xi) = z^{\text{liq}} + \frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}(\bar{z} - z^{\text{liq}}). \tag{IA26}$$

Because $\xi \in (0,1)$ and $\beta_f < \beta$, we know that $\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}} < 1$. Combined with the fact that $\bar{z} > z^{\text{liq}}$, we verify that $b^*(\beta, \beta_f, \xi) \in (z^{\text{liq}}, \bar{z})$. The condition such that the firm is willing to invest becomes:

$$\begin{aligned}
&\beta_f \int_{b^*}^{\bar{z}} (z_j - b^*)\phi(z_j)dz_j + \beta\Bigg(b\left(1-\Phi(b)\right) + (1-\xi)\left(\int_{\underline{z}}^{z^{\text{liq}}} z_j\phi(z_j)dz_j + \int_{z^{\text{liq}}}^{b} z^{\text{liq}}\phi(z_j)dz_j\right) \\
&\qquad + \xi\left(\int_{\underline{z}}^{z^{\text{liq}}} z^{\text{liq}}\phi(z_j)dz_j + \int_{z^{\text{liq}}}^{b} z_j\phi(z_j)dz_j\right)\Bigg) \geq I, \\
\iff\ & \frac{\beta_f}{2}(\bar{z} - b^*)^2 + \beta\Bigg(b^*(\bar{z} - b^*) + (1-\xi)(b^* - z^{\text{liq}})z^{\text{liq}} + \frac{\xi}{2}\left((b^*)^2 - (z^{\text{liq}})^2\right) \\
&\qquad + \frac{1-\xi}{2}\left((z^{\text{liq}})^2 - (\underline{z})^2\right) + \xi(z^{\text{liq}} - \underline{z})z^{\text{liq}}\Bigg) \geq I, \\
\iff\ & \frac{\beta_f}{2}\left(\frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}}\right)^2 (\bar{z} - z^{\text{liq}})^2 \\
&\qquad + \beta\left(\left(1-\frac{\xi}{2}\right)\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\frac{1-\xi}{2-\xi-\frac{\beta_f}{\beta}} + \frac{\xi}{2}\frac{1-\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)(\bar{z} - z^{\text{liq}})^2 \\
&\qquad + \beta\underline{z}(\bar{z} - z^{\text{liq}}) + \beta\left(\frac{1-\xi}{2}\left((z^{\text{liq}})^2 - (\underline{z})^2\right) + \xi(z^{\text{liq}} - \underline{z})z^{\text{liq}}\right) \geq I, \\
\iff\ & \frac{\beta}{2}\left(\frac{1-\xi\frac{\beta_f}{\beta}}{2-\xi-\frac{\beta_f}{\beta}}\right)(\bar{z} - z^{\text{liq}})^2 + \beta z^{\text{liq}}(\bar{z} - z^{\text{liq}}) \\
&\qquad + \beta\left(\frac{1-\xi}{2}\left((z^{\text{liq}})^2 - (\underline{z})^2\right) + \xi(z^{\text{liq}} - \underline{z})z^{\text{liq}}\right) \geq I,
\end{aligned} \tag{IA27}$$

where we condense the notation of $b^*(\beta, \beta_f, \xi)$ to b^* for simplicity. Hence by Assumption IA3, the firm is willing to invest. [31]

For the first part of Proposition IA5, take the derivative of $b^*(\beta, \beta_f, \xi)$ with respect to ξ:

$$\frac{\partial b^*\left(\beta, \beta_f, \xi\right)}{\partial \xi} = \frac{1 - \frac{\beta_f}{\beta}}{\left(2 - \xi - \frac{\beta_f}{\beta}\right)^2}(\bar{z} - z^{\text{liq}}) > 0.$$

For the second part, the formula for output in (8) now needs to be supplemented by a term that captures the gain in output that occurs when liquidation is efficient ($z^{\text{liq}} > z_j$):

$$\begin{aligned} Y\left(b, \xi\right) &= \mathbb{E}\left[z_j\right] - (1-\xi) \int_{z^{\text{liq}}}^{b} \left(z_j - z^{\text{liq}}\right) \phi\left(z_j\right) dz_j + \xi \int_{\underline{z}}^{z^{\text{liq}}} \left(z^{\text{liq}} - z_j\right) \phi\left(z_j\right) dz_j, \\ &= \underline{z} + \frac{1}{2} - \frac{1-\xi}{2}(b - z^{\text{liq}})^2 + \frac{\xi}{2}(z^{\text{liq}} - \underline{z})^2. \end{aligned}$$

Define aggregate output/GDP $Y^*\left(\beta, \beta_f, \xi\right) \equiv Y\left(b^*\left(\beta, \beta_f, \xi\right), \xi\right)$ based on the optimally chosen face value of debt $b^*\left(\beta, \beta_f, \xi\right)$. The impact of a nonfundamental credit boom is still given by (IA8), which means:

$$\varepsilon\left(\beta, \beta_f, \xi\right) = \frac{\partial Y\left(b^*\left(\beta, \beta_f, \xi\right), \xi\right)}{\partial b} = -(1-\xi)\left(\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}}\right)(\bar{z} - z^{\text{liq}}) < 0.$$

Finally, note that

$$\frac{\partial \varepsilon\left(\beta, \beta_f, \xi\right)}{\partial \xi} = \left[\frac{1 - \frac{\beta_f}{\beta}}{2 - \xi - \frac{\beta_f}{\beta}}\right]^2 (\bar{z} - z^{\text{liq}}) > 0.$$

[31] If $z^{\text{liq}} = \underline{z}$, Assumption IA3 becomes Assumption IA1 in the main text.