The Role of Corporate Debt in Boom-Bust Cycles

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(ECB)

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Based on joint work with Victoria Ivashina (HBS), Karsten Müller (NSU), and Sebnem Kalemli-Özcan (UM)
Disclaimer: These are my own views and not those of the ECB or Eurosystem

Literature has focused on household debt

Since 2007-08 crisis, household debt seen as important from a macroeconomic perspective

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- US subprime crisis originated in mortgage market and household sector
- Micro evidence on household debt-fueled boom-bust cycles (e.g., Mian & Sufi, 2009, 2010)
- Complementary macro evidence (e.g., Mian, Sufi & Verner, 2015; Jordà et al., 2016)
- In macro, development of HANK models has focused on household heterogeneity (e.g. hand-to-mouth consumers; variable vs. fixed mortgage rates; etc.)
- Macroprudential policy has largely focused on regulating banks and households (e.g. LTVs, DTIs)

Does firm debt play a role in business cycles?

For corporate debt, abundant cross-sectional micro evidence on leverage and credit supply

- Investment (e.g., Whited, 1992; Ivashina & Scharfstein, 2010; Ottonello & Winberry, 2018)
- Job losses during busts (e.g., Chodorow-Reich, 2014; Kalemli-Özcan, Laeven & Moreno, 2022)
- Linked to misallocation during booms (e.g., Gopinath et al., 2017)

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Less well understood: macroeconomic role of corporate debt

- Empirical evidence is mixed (e.g., Giroud & Mueller, 2021; Jordà et al., 2022)
- Pressing policy issue against the global rise in interest rates (e.g., IMF, 2021; Boone et al. 2022; CGFS, 2022; ESRB, 2023)

Some quotes from the literature

Mian, Sufi & Verner (QJE, 2015)

“[A] rise in non-financial firm debt has only weak predictive power on subsequent GDP growth.”

Jordà, Kornejew, Schularick & Taylor (RFS, 2022)

“[T]here is no evidence that corporate debt booms result in deeper declines in investment or output.”

Greenwood, Hanson, Shleifer & Sorensen (JF, 2022)

“[B]oth nonfinancial business and household credit growth forecast the onset of a future crisis.”

Giroud & Mueller (JFE, 2021)

“An increase in listed firms’ leverage predicts lower future employment on the firm and regional level.”

Commercial Property Debt Creates More Bank Worries

Large number of office defaults could force banks to mark down value of these and other loans

Countries Should Act Now to Limit Rising Risks From Corporate Distress

Sharp rises in global interest rates could spark corporate distress and pose wider problems for many economies

This talk

What is the role of corporate debt in boom-bust cycles and financial crises at the macro-level?

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What is the role of corporate debt in boom-bust cycles and financial crises at the macro-level?

- Does firm debt matter for the incidence of crises?
- Once a crisis hits, are defaults among firms or households more damaging to bank balance sheets?
- Does firm debt matter for the depth of the ensuing recession?

Main messages

1 **Corporate debt accounts for the majority of credit growth before crises and NPLs thereafter**

- Firms account for 2/3 of credit growth before crises
- Firms account for 3/4 of non-performing loans after crises

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2. **Corporate debt, especially when secured by real estate collateral, predicts future crises**
   - Credit to non-bank financial sector highly predictive of crises
   - For non-financial firms, what matters most are industries relying on real estate collateral
   - Dispersion of credit growth across industries goes up during credit booms, predicts crises

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2. **Corporate debt, especially when secured by real estate collateral, predicts future crises**
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   - For non-financial firms, what matters most are industries relying on real estate collateral
   - Dispersion of credit growth across industries goes up during credit booms, predicts crises

3. **Corporate debt growth before the crisis shapes the post-crisis recovery**
   - Growth in firm debt secured by real estate collateral predicts GDP and non-performing loans
   - Matches stylized fact that default rates of real estate sector spike during crises

Roadmap

Roadmap

1 Data

A new database on sectoral credit

Dataset on sectoral credit exposures from the Global Credit Project

- Extends data used in Müller & Verner (ReStud, forthcoming)
- 115 countries, 1940-2014, overlaps with 90 banking crisis episodes
- Measures outstanding domestic credit by sector

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New:

- Novel time series on credit to non-bank financial corporations
- Extensive use of disaggregated credit to non-financial corporations by industry
- Hand-collected data on non-performing loans around 21 banking crises by sector

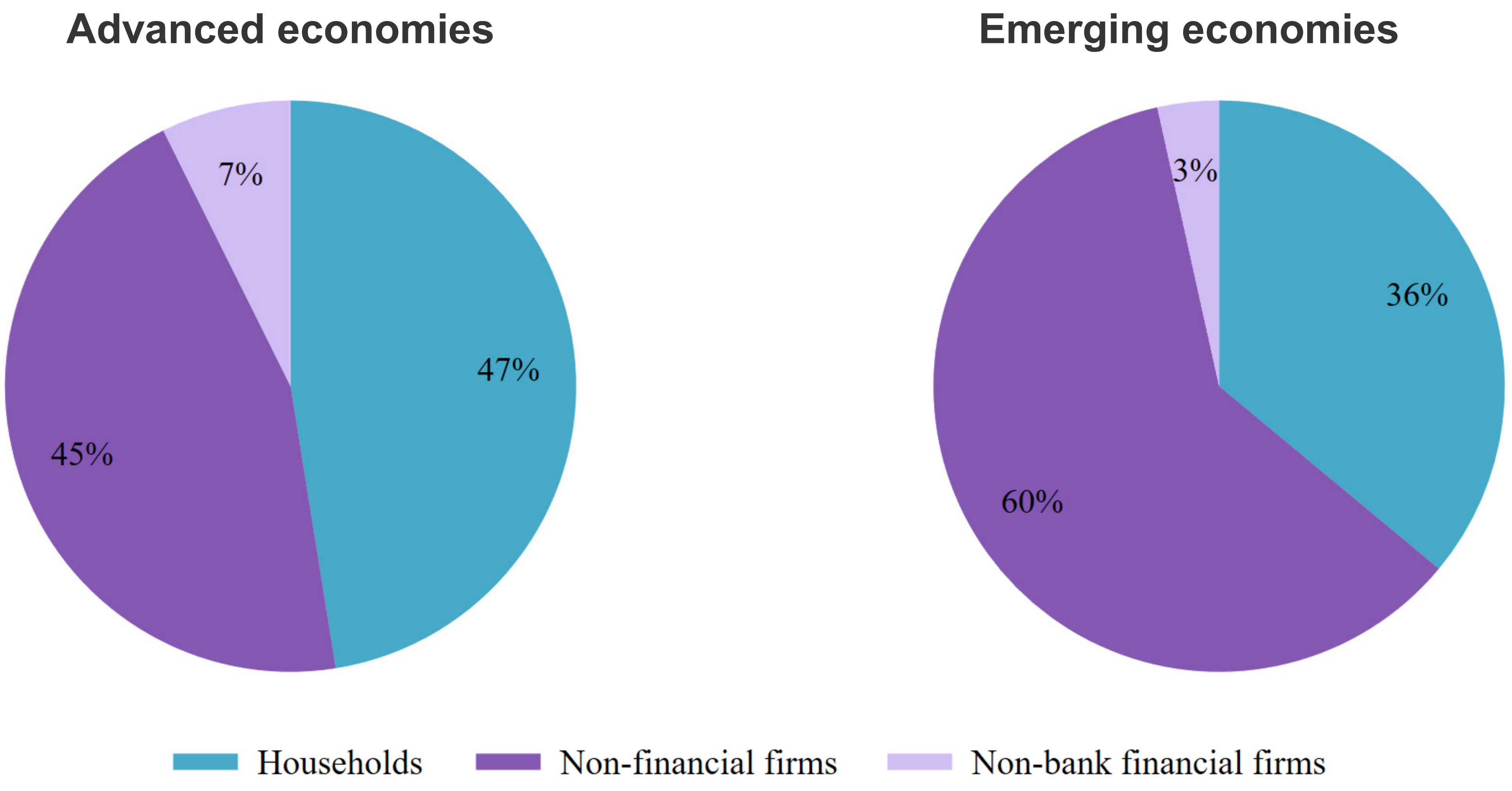
Example of data source: Canada Year Book

17.—Loans of Chartered Banks, according to Class, Outstanding at Sept. 30, 1950-52

NOTE.—The classification of chartered bank loans was revised in 1950; the figures in this table are, therefore, not comparable with those for 1947-49 in the 1951 Year Book, pp. 1043-1044.

Class of Loan	1950	1951	1952
	$'000	$'000	$'000
Government and Other Public Services—			
Provincial governments	23,600	24,859	6,349
Municipal governments and school districts	91,505	114,531	102,399
Religious, educational, health and welfare institutions	33,143	45,912	43,284
Totals, Government and Other Public Services	148,248	185,302	152,032
Financial—			
Investment dealers and brokers to the extent payable on call or within thirty days	101,177	107,091	135,173
Trust, loan, mortgage, investment and insurance companies and other financial institutions	85,983	91,720	107,519
Totals, Financial	187,160	198,811	242,692
Personal—			
Individuals, for other than business purposes, on the security of marketable stocks and bonds	243,370	255,605	274,324
Individuals, for other than business purposes, *n.e.s.*	218,201	211,303	227,992
Totals, Personal	461,571	466,908	502,316
Agricultural, Industrial and Commercial—			
Farmers	255,783	298,936	334,202
Industry—			
Chemical and rubber products	29,175	54,257	30,322
Electrical apparatus and supplies	14,310	41,388	22,886
Food, beverages and tobacco	122,514	171,968	168,366
Forest products	76,057	115,685	136,500
Furniture	16,188	19,776	14,363
Iron and steel products	53,389	97,509	95,641
Mining and mine products	26,015	33,381	47,991
Petroleum and products	22,914	31,055	32,813
Textiles, leather and clothing	138,862	213,377	157,963
Transportation equipment	30,102	46,437	52,810
Other products	55,180	63,118	53,156
Public utilities, transportation and communication companies	53,912	87,937	67,526
Construction contractors	122,736	151,774	158,643
Grain dealers and exporters	93,124	98,558	186,518
Instalment finance companies	96,476	100,830	149,397
Merchandisers	436,144	542,869	483,967
Other business	135,492	133,837	139,047
Totals, Agricultural, Industrial and Commercial	1,778,373	2,302,692	2,332,111
Grand Totals	**2,575,352**	**3,153,713**	**3,229,151**

Composition of credit to the private sector



Data on financial crises

Baron, Verner & Xiong (2021)

- 46 countries, 1870-2016
- 224 crises
- Dates based on narrative evidence + 30% cumulative bank equity decline

Laeven & Valencia (2020)

- 165 countries, 1970-2017
- 151 crises
- Dates based on narrative evidence

We use Baron, Verner & Xiong (2021) where available, otherwise Laeven & Valencia (2020)

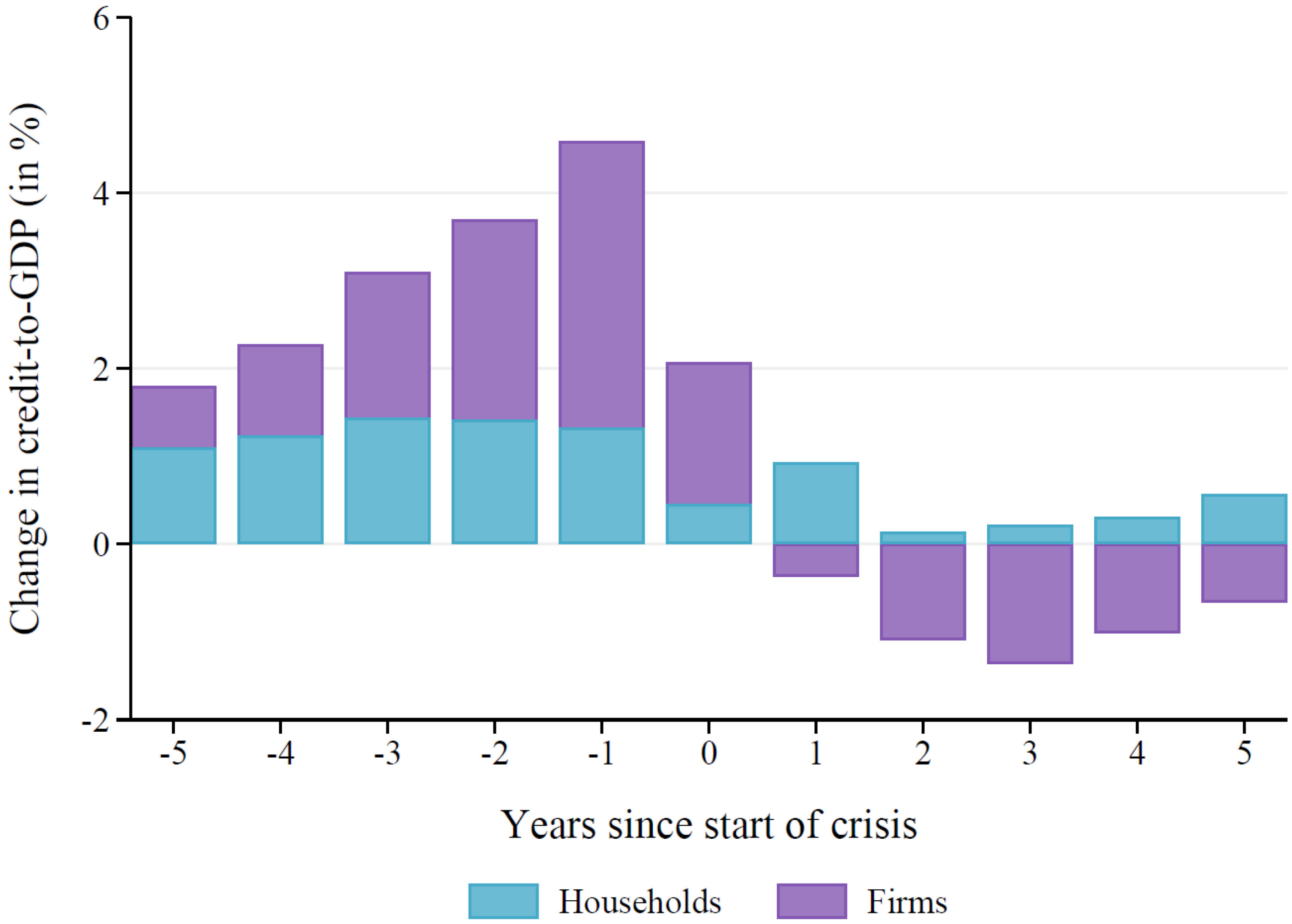
- Focus on systemic banking crises
- Overlap when requiring credit data on household and firm debt: 90 crises

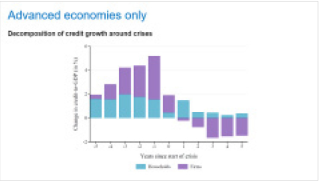
Roadmap

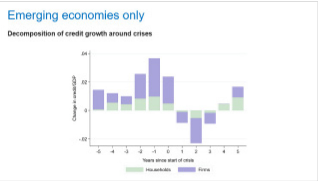
2 Corporate Debt and Financial Stability

Firm debt accounts for 2/3 of credit growth before crises

Decomposition of credit growth around 90 crises

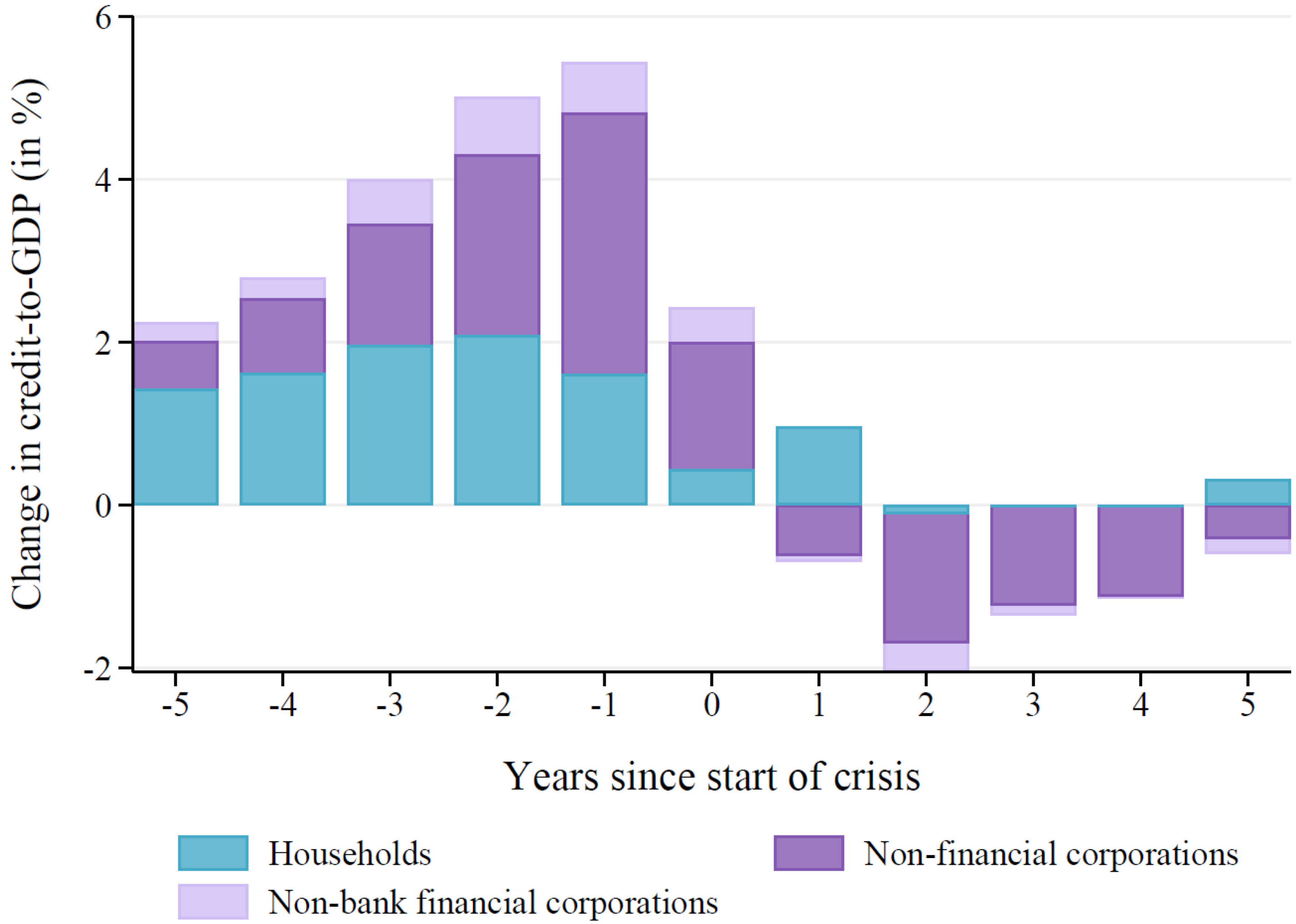


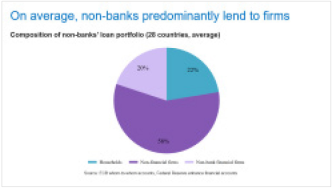




Both credit to non-financial and financial firms increases

Decomposition of credit growth around 62 crises





Predictive panel regressions

Methodology: linear probability model in the spirit of Jordà (2005)

$$P(Crisis)_{i,t+h} = \alpha_i + \sum_{k \in K} \beta^k \, \Delta_3 \mathrm{Credit}^{\mathrm{k}}/\mathrm{GDP}_{\mathrm{i,t}} + \varepsilon_{i,t}$$

$P(Crisis)_{i,t+h}$	Financial crisis starts within $t + h$ (BVX, 2021 or Laeven-Valencia, 2020)
$\Delta_3 \mathrm{Credit}/\mathrm{GDP}_{\mathrm{i,t}}$	Change in credit/GDP between t-3 and t **(standardized)**

Forecast horizon h 1, …, 5

Driscoll-Kraay standard errors with lag length $\mathrm{ceil}(1.5h)$

Note: We omit additional h subscripts for α_i, β, and $\varepsilon_{i,t}$ for clarity of exposition

Firm debt predicts crises similarly to household debt

$$P(Crisis)_{i,t+h} = \alpha_i + \sum_{k \in K} \beta^k \, \Delta_3 \mathrm{Credit}^k/\mathrm{GDP}_{i,t} + \varepsilon_{i,t}$$

	Dependent variable: Crisis within...				
	1 year	2 years	3 years	4 years	5 years
Observations	3,027	3,027	3,027	3,027	3,027
# Crises	84	84	84	84	84

Firm credit growth predicts crises **similarly** to household debt, stronger at 1-2 year horizon

1 SD higher firm credit growth $\rightarrow$ probability of a crisis within 3 years goes up by 3pp

Construction, trade, and non-bank finance matters most

	Dependent variable: Crisis within...				
	1 year	2 years	3 years	4 years	5 years
Agriculture	-0.001	-0.001	-0.005	-0.015	-0.025**
	(0.004)	(0.006)	(0.011)	(0.010)	(0.008)
Manufacturing, Mining	-0.010	-0.018+	-0.014	-0.008	-0.001
	(0.007)	(0.010)	(0.011)	(0.014)	(0.015)
Transport, communication	-0.001	-0.008*	-0.021**	-0.032**	-0.045**
	(0.004)	(0.004)	(0.007)	(0.012)	(0.013)
Other firm credit	0.001	0.003	-0.002	-0.002	-0.007
	(0.004)	(0.006)	(0.008)	(0.011)	(0.012)
Observations	1,217	1,217	1,217	1,217	1,217
# Crises	37	37	37	37	37
AUC	0.78	0.76	0.73	0.72	0.71

Credit quality during credit expansions

Non-performing loans (NPLs) vary by sector

- Bankruptcy provisions in most countries do not easily allow households to write off debt
- This could translate into higher NPLs coming from firms than households

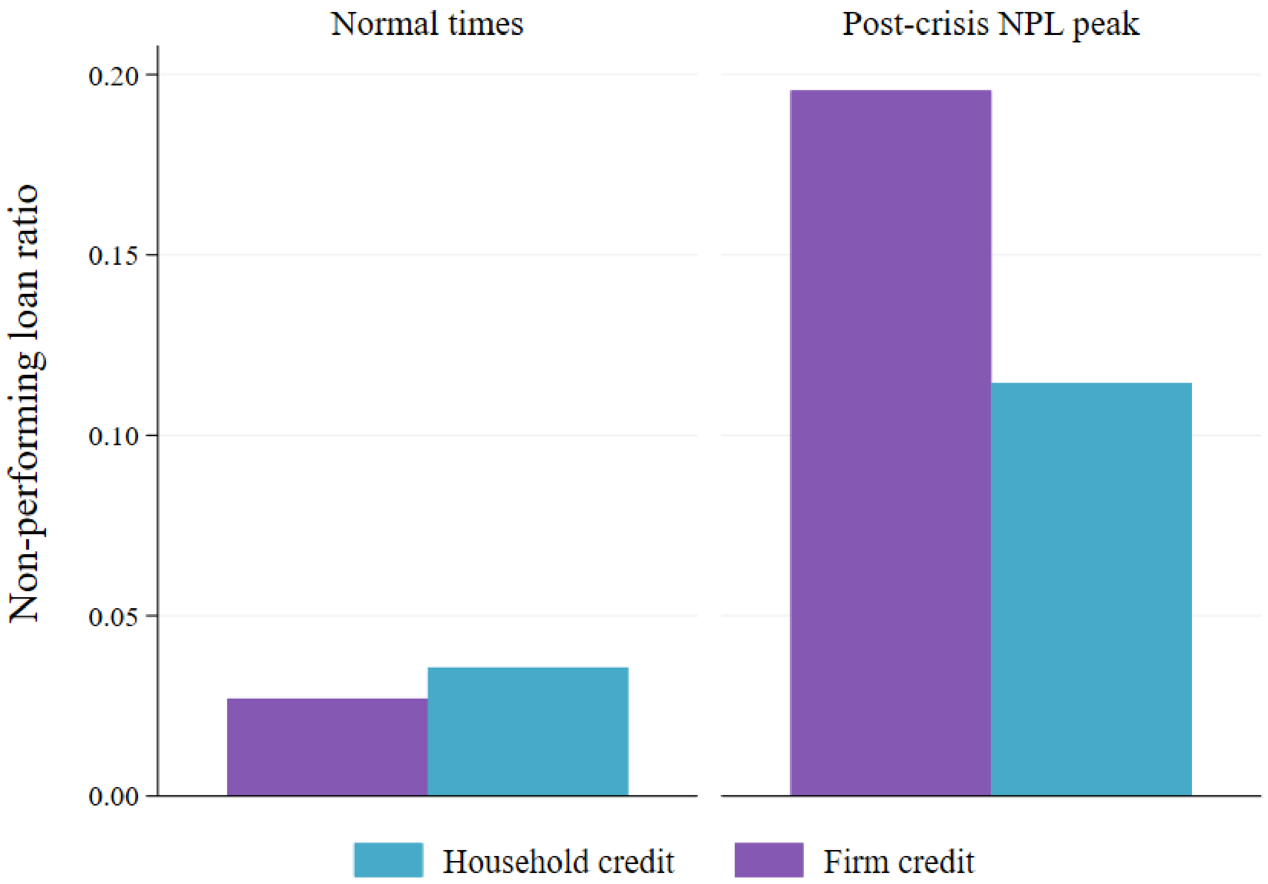
To the best of our knowledge, no existing evidence on “who defaults” during crises

- Existing evidence studies dynamics of aggregate NPLs around crises (Ari, Chen & Ratnovski, 2019)

We use newly collected data on NPLs by sector to shed light on this

During crises, firms default twice as much as households

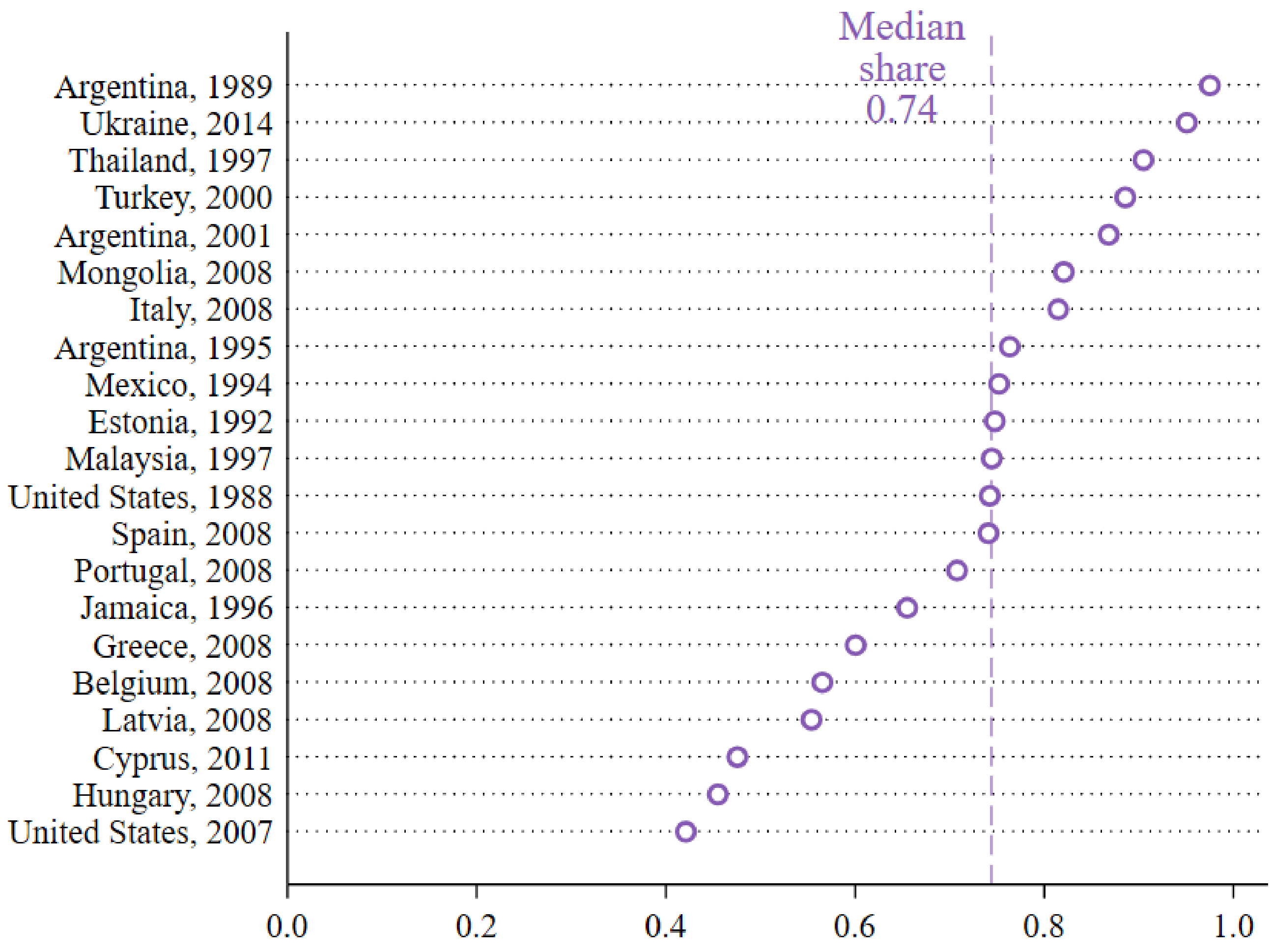
Ratio of non-performing loans (NPLs) by sector



Notes: Sample of 20 countries and 21 crises. NPL ratio = Non-performing loans / Outstanding loans.
“Post-crisis NPL peak” is when total NPL ratio is at its peak within 10 years post-crisis. Normal times are years not within 10 years after a crisis.

Firms account for vast majority of NPLs after crises

Share of firms in total non-performing loans (NPLs)



Note: Share of firms = NPLs of firms / Total NPLs.
Measured when total NPL ratio is at its peak within 10 years post-crisis.

Roadmap

3 Imbalances in Credit Growth

Imbalances in credit growth

Why does firm debt in some sectors matter more than in others? One interpretation is that bad credit booms are times when some sectors grow “out of whack.”

Existing literature has argued that lending standards deteriorate during credit booms (Asea and Brock, 1998; Ruckes, 2004; Dell’Ariccia and Marquez, 2006)

Implication: *dispersion* of credit matters

- Do risks come from some sectors being “out of whack”?
- **Our idea**: measure “imbalance” in credit growth using standard deviation of growth across sectors

Measuring imbalances in credit growth

We propose a simple measure based on sectoral data:

$$Dispersion_{i,t} = SD(\Delta_3 Credit/GDP_{i,k,t})$$

$\Delta_3 Credit/GDP_{i,k,t}$ Change in credit of sector *k* relative to GDP between *t-3* and *t*

Which sectors K ? Baseline: 5 non-financial industries + financial sector

Intuition: if some sectors grow disproportionately, dispersion goes up

Parallel misallocation literature: dispersion in firms' *marginal revenue product of capital* (e.g., Hsieh & Klenow, 2009)

Imbalanced credit growth predicts crises

$$P(Crisis)_{i,t+h} = \alpha_i + \beta_1 Dispersion_{i,t} + \beta_2 \Delta_3 \text{Total credit/GDP}_{\text{i,t}} + \varepsilon_{i,t+h}$$

	Dependent variable: Crisis within...					
	1 year		3 years		5 years	
	(1)	(2)	(3)	(4)	(5)	(6)
SD of credit growth	2.836+	1.874+	4.002**	2.217*	3.867**	2.367+
	(1.624)	(1.097)	(1.456)	(0.999)	(1.336)	(1.377)
Total credit growth		0.295**		0.547**		0.459**
		(0.110)		(0.114)		(0.085)
Observations	1,429	1,429	1,429	1,429	1,429	1,429
# Crises	42	42	42	42	42	42
AUC	0.66	0.73	0.62	0.69	0.60	0.65

Holds even after controlling for magnitude of the credit expansion

Roadmap

4 Credit Allocation and Crisis Recovery

Credit allocation and the recovery from recessions

Financial crises linked to deep recessions (e.g., Cerra & Saxena, 2008; Reinhart & Rogoff, 2009)

Pre-crisis credit growth matters for recovery dynamics

- Longer and deeper recessions (e.g., Jordà, Schularick & Taylor, 2013)
- Worse after booms in mortgage debt (e.g., Jordà, Schularick & Taylor, 2015, 2016)

Does firm debt matter relative to household debt?

- Existing work: only when bankruptcy frictions are high (Jordà, Kornejew, Schularick & Taylor, 2022)
- We study this question using a much broader sample and more granular data

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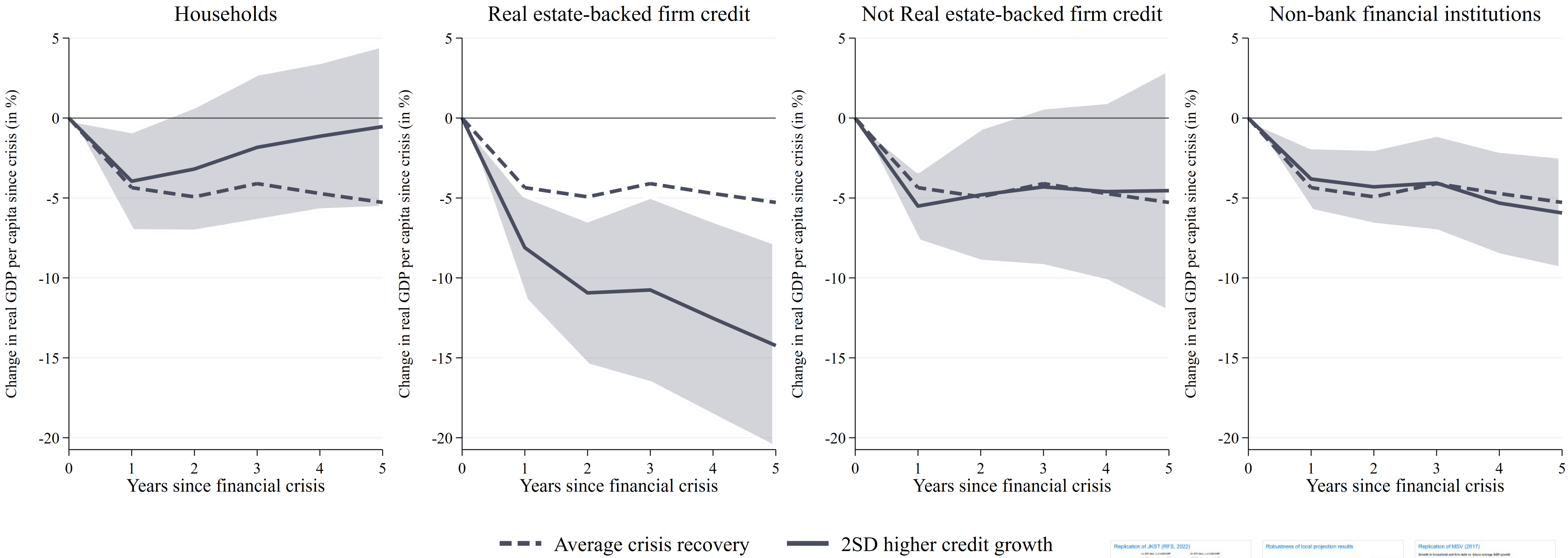
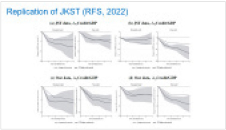
Methodology: Local projections

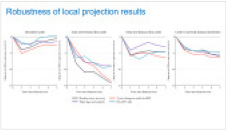
$$\Delta_h y_{i,t} = \alpha_i + \beta_1 Crisis_{i,t} + \beta_2 \Delta_3 \mathrm{Credit/GDP}_{\mathrm{i,t}} + \beta_3\ Crisis_{i,t} \times \Delta_3 \mathrm{Credit/GDP}_{\mathrm{i,t}} + \varepsilon_{i,t}$$

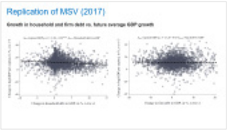
Firm debt backed by real estate predicts slow recoveries

$$\Delta_h \log(real\ GDP\ p.c.)_{i,t} = \alpha_i + \beta_1 Crisis_{i,t} + \beta_2 \Delta_3 \mathrm{Credit/GDP}_{\mathrm{i,t}} + \beta_3\ Crisis_{i,t} \times \Delta_3 \mathrm{Credit/GDP}_{\mathrm{i,t}} + \varepsilon_{i,t}$$



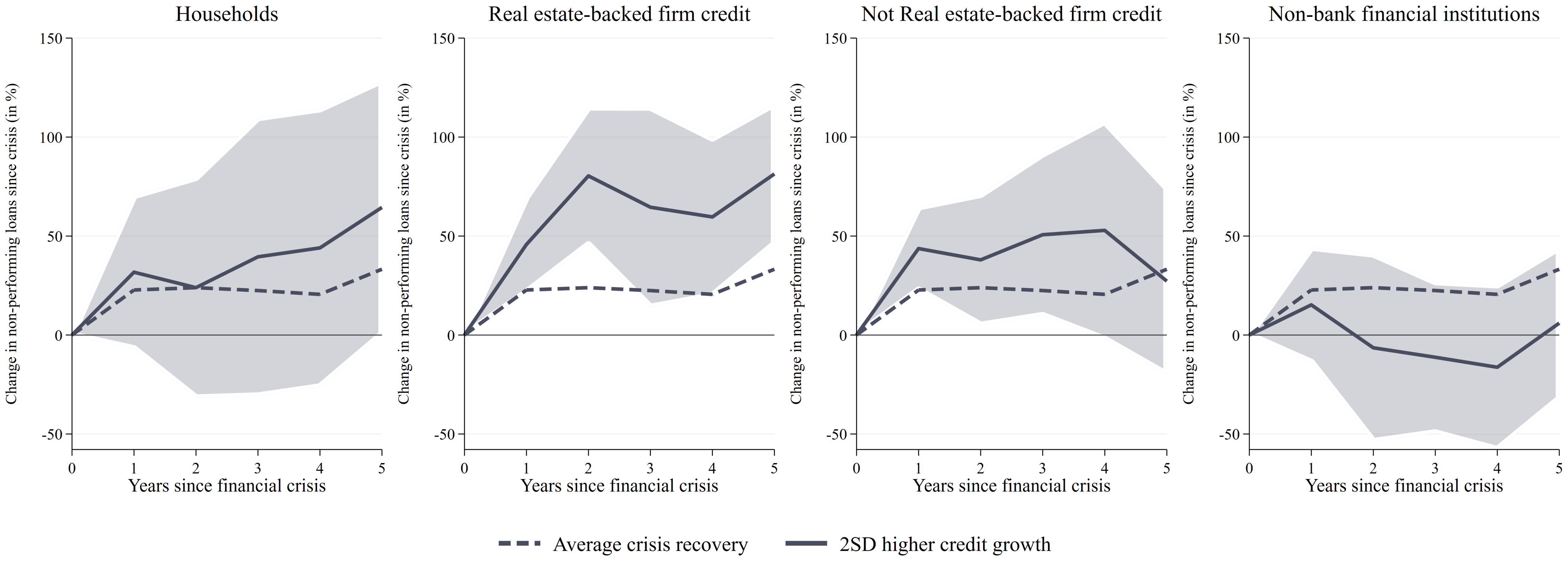






Real estate collateral predicts spikes in NPLs

$$\Delta_h \log(NPL\ ratio)_{i,t} = \alpha_i + \beta_1 Crisis_{i,t} + \beta_2 \Delta_3 \mathrm{Credit/GDP_{i,t}} + \beta_3\ Crisis_{i,t} \times \Delta_3 \mathrm{Credit/GDP_{i,t}} + \varepsilon_{i,t}$$



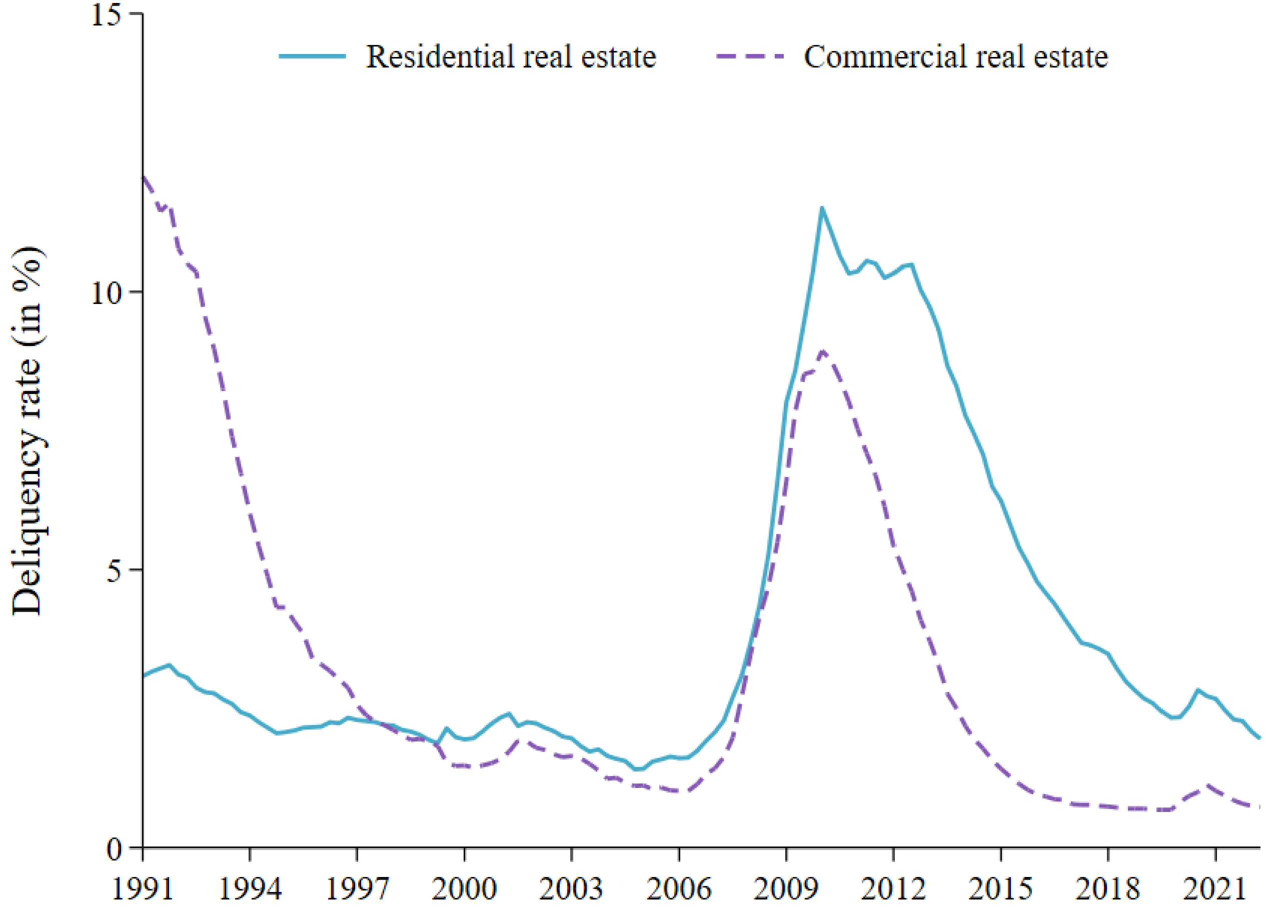
Note: Data on NPL ratios is from the World Bank. Caveat: essentially only covers crises around 2007/08.

Roadmap

5 The Role of Real Estate Collateral

Motivating evidence: CRE defaults during US recessions

Delinquency rates of residential and commercial real estate loans



Source: Federal Reserve H.8

The role of firm debt backed by real estate collateral

Clear theoretical link between collateral values and business cycle fluctuations

(e.g., Kiyotaki & Moore, 1997; Bernanke et al., 1999; Jermann & Quadrini, 2012)

Firm-level evidence: real estate values affect firm borrowing, investment, and employment

(e.g., Chaney, Sraer & Tesmar, 2012; Bahaj, Foulis & Pinter, 2020)

Do boom-bust cycles in firm debt depend on whether it is secured by real estate collateral?

- We test this empirically using novel data on **collateral types** used across industries

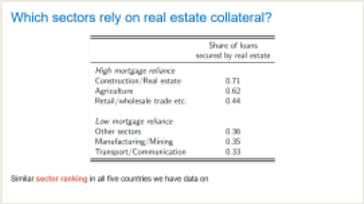
Testing for a role of real estate collateral in crises

Systematic cross-country data on collateral types by sector not available before 2005

Our approach: treat a sector’s reliance on real estate collateral as fixed (Rajan & Zingales, 1998)

We classify sectors based on the share of outstanding credit secured by real estate

- Data for the US, Denmark, Switzerland, Latvia, Taiwan, taken from Müller & Verner (forthcoming)
- For each sector, we calculate the average across countries
- Then, we calculate credit growth for sectors with “high” and “low” reliance on real estate collateral
- Similar results: calculate real estate reliance using Federal Reserve’s Y-14



Which sectors rely on real estate collateral?

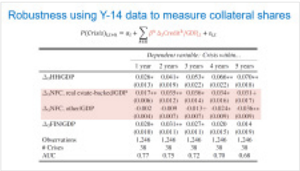
	Share of loans secured by real estate
High mortgage reliance	
Construction/Real estate	0.71
Agriculture	0.62
Retail/wholesale trade etc.	0.44
Low mortgage reliance	
Other sectors	0.36
Manufacturing/Mining	0.35
Transport/Communication	0.33

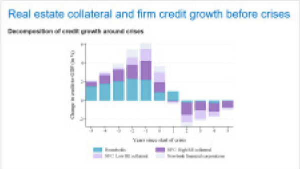
Similar sector ranking in all five countries we have data on

Real estate collateral among firms matters for crises

$$P(Crisis)_{i,t+h} = \alpha_i + \sum_{k \in K} \beta^k \, \Delta_3 \mathrm{Credit}^k / \mathrm{GDP}_{i,t} + \varepsilon_{i,t}$$

	Dependent variable: Crisis within...				
	1 year	2 years	3 years	4 years	5 years
Households	0.023+	0.037*	0.046*	0.060**	0.065**
	(0.012)	(0.018)	(0.020)	(0.021)	(0.019)
Finance (excl. interbank)	0.021*	0.035**	0.038**	0.035**	0.034*
	(0.011)	(0.012)	(0.011)	(0.012)	(0.014)
Observations	1,217	1,217	1,217	1,217	1,217
# Crises	37	37	37	37	37
AUC	0.77	0.74	0.71	0.69	0.67





Roadmap

6 Conclusion

Conclusion

Firm debt plays a key role in boom-bust cycles

- Explains most of credit growth before financial crises
- Predicts path of post-crisis recovery and defaults
- Inconsistent with view of firm debt as relatively benign for the macroeconomy

Important role for firm debt secured by real estate

- Highly predictive of crises and the depth of post-crisis recessions
- Distinct and separate from residential mortgages

Implications

- Current CRE woes could have macroeconomic consequences
- Financial stability policy: focus on household debt not necessarily warranted
- Macro models of firm leverage remain relevant, but need to explain sectoral differences

THANK YOU!

Corporate Debt, Boom-Bust Cycles, and Financial Crises

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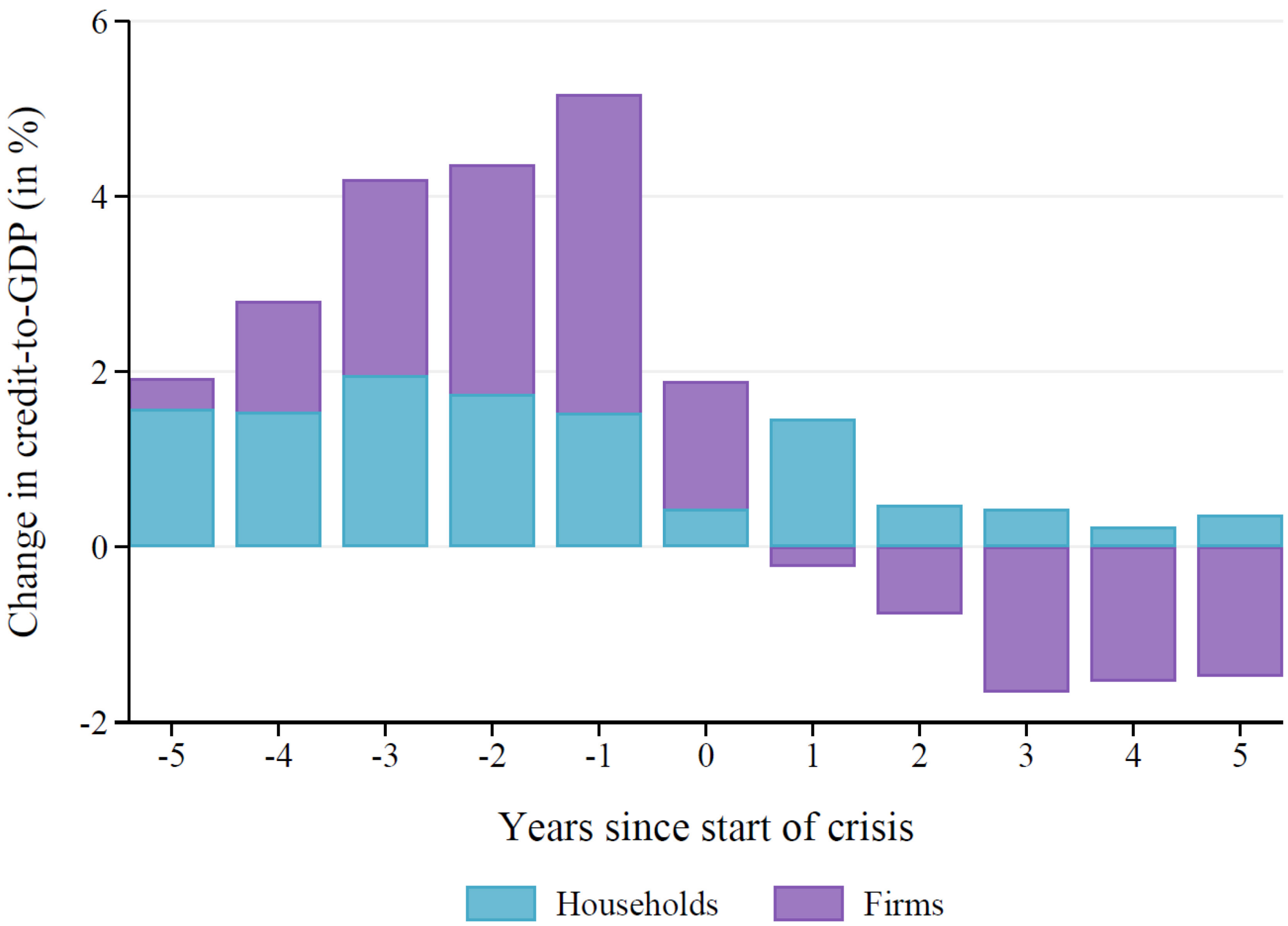
Advanced economies only

Decomposition of credit growth around crises



Emerging economies only

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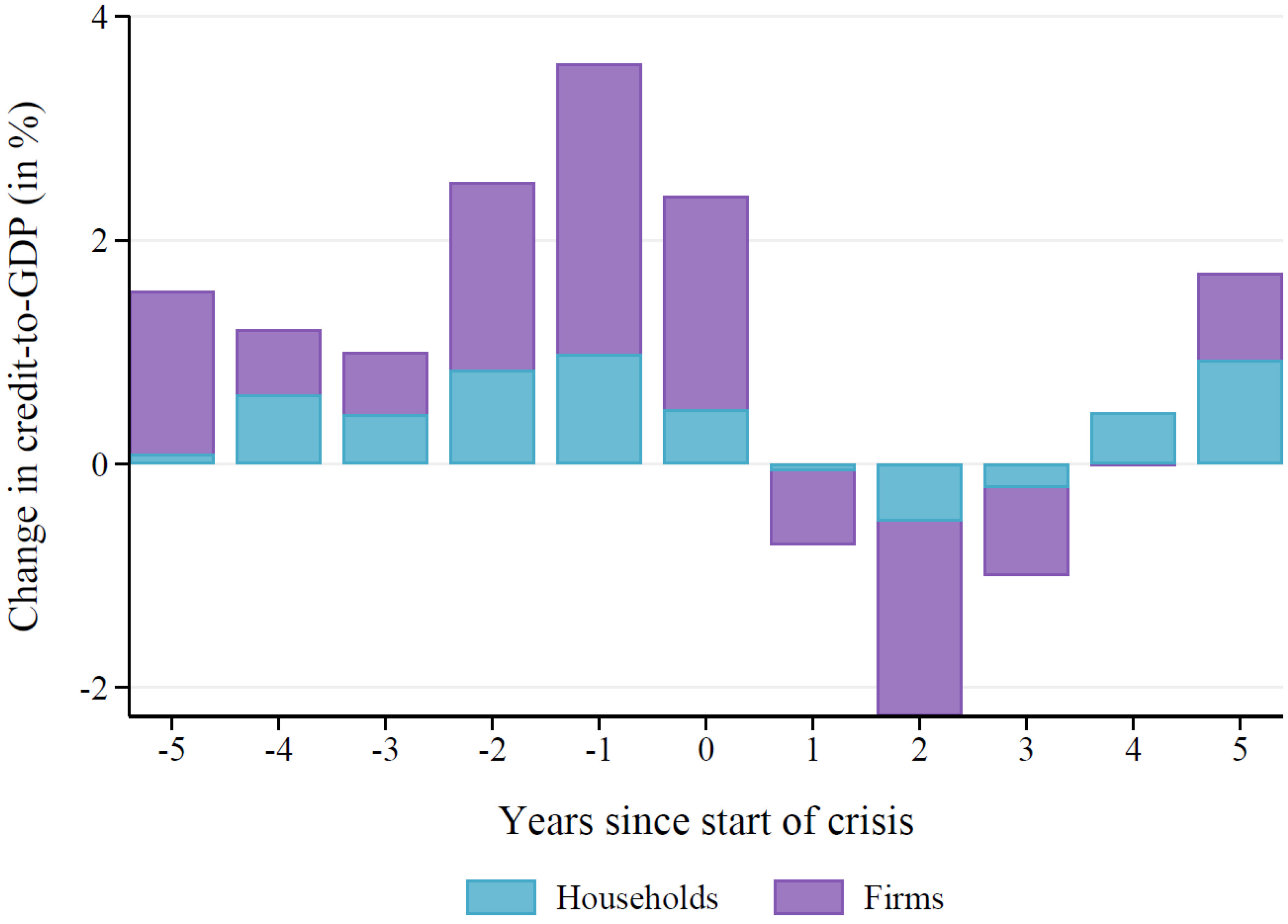
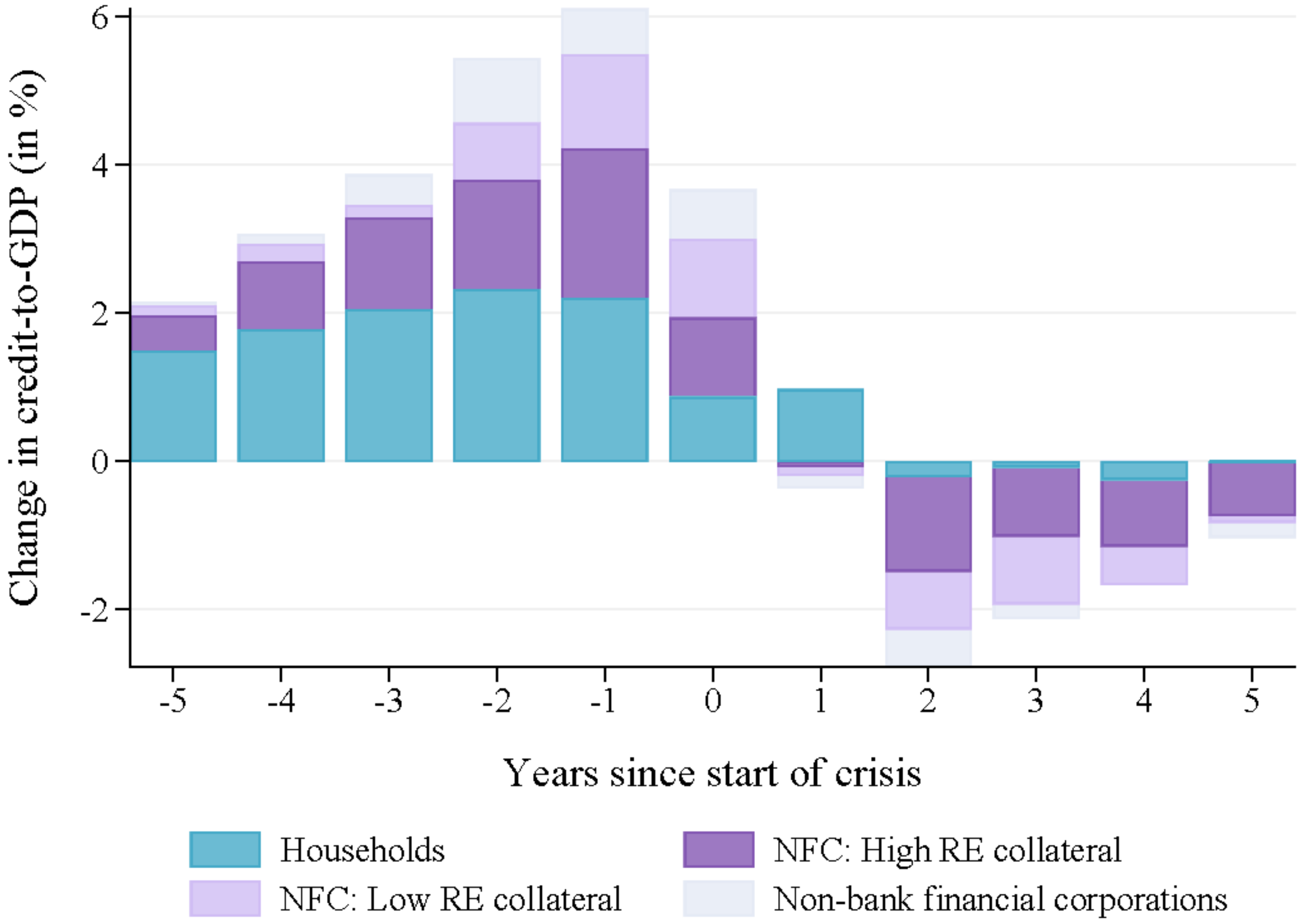


Real estate collateral and firm credit growth before crises

Decomposition of credit growth around crises



Firm credit expansions and crises

Advanced vs. emerging economies

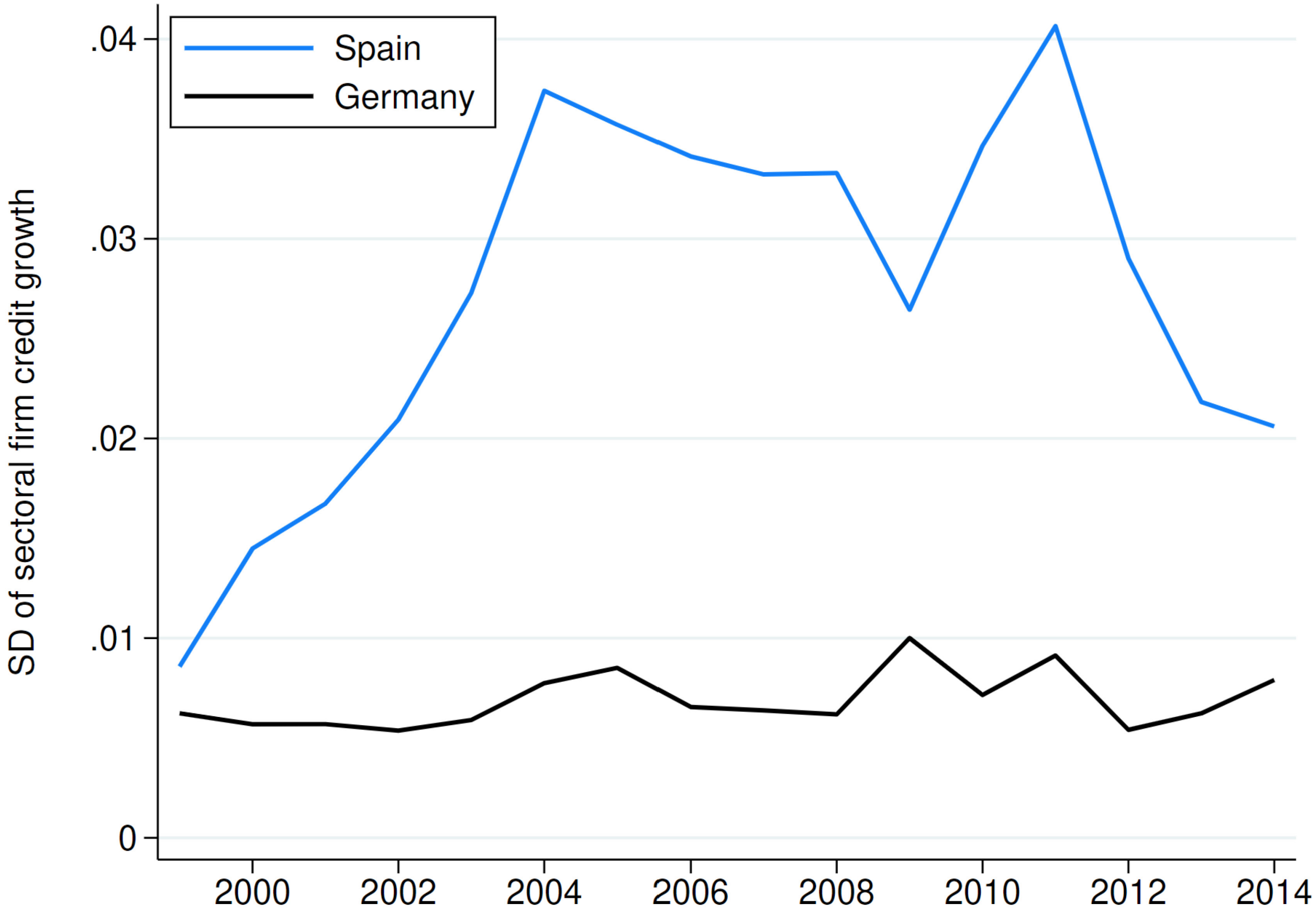
	Dependent variable: Crisis within...				
	1 year	2 years	3 years	4 years	5 years
Panel A: Advanced economies					
Δ_3HH/GDP	0.013+	0.029+	0.049*	0.067*	0.082**
	(0.008)	(0.016)	(0.023)	(0.028)	(0.028)
Δ_3FIRM/GDP	0.019*	0.030**	0.031**	0.021+	0.005
	(0.008)	(0.009)	(0.009)	(0.012)	(0.013)
Observations	1,915	1,915	1,915	1,915	1,915
# Crises	50	50	50	50	50
AUC	0.69	0.68	0.68	0.69	0.68
Panel B: Emerging economies					
Δ_3HH/GDP	0.010	0.015	0.015	0.012	0.005
	(0.009)	(0.014)	(0.018)	(0.022)	(0.024)
Δ_3FIRM/GDP	0.011	0.021	0.026*	0.035**	0.047**
	(0.009)	(0.013)	(0.011)	(0.012)	(0.011)
Observations	1,155	1,155	1,155	1,155	1,155
# Crises	34	34	34	34	34
AUC	0.64	0.63	0.61	0.62	0.63

Firm credit expansions and crises

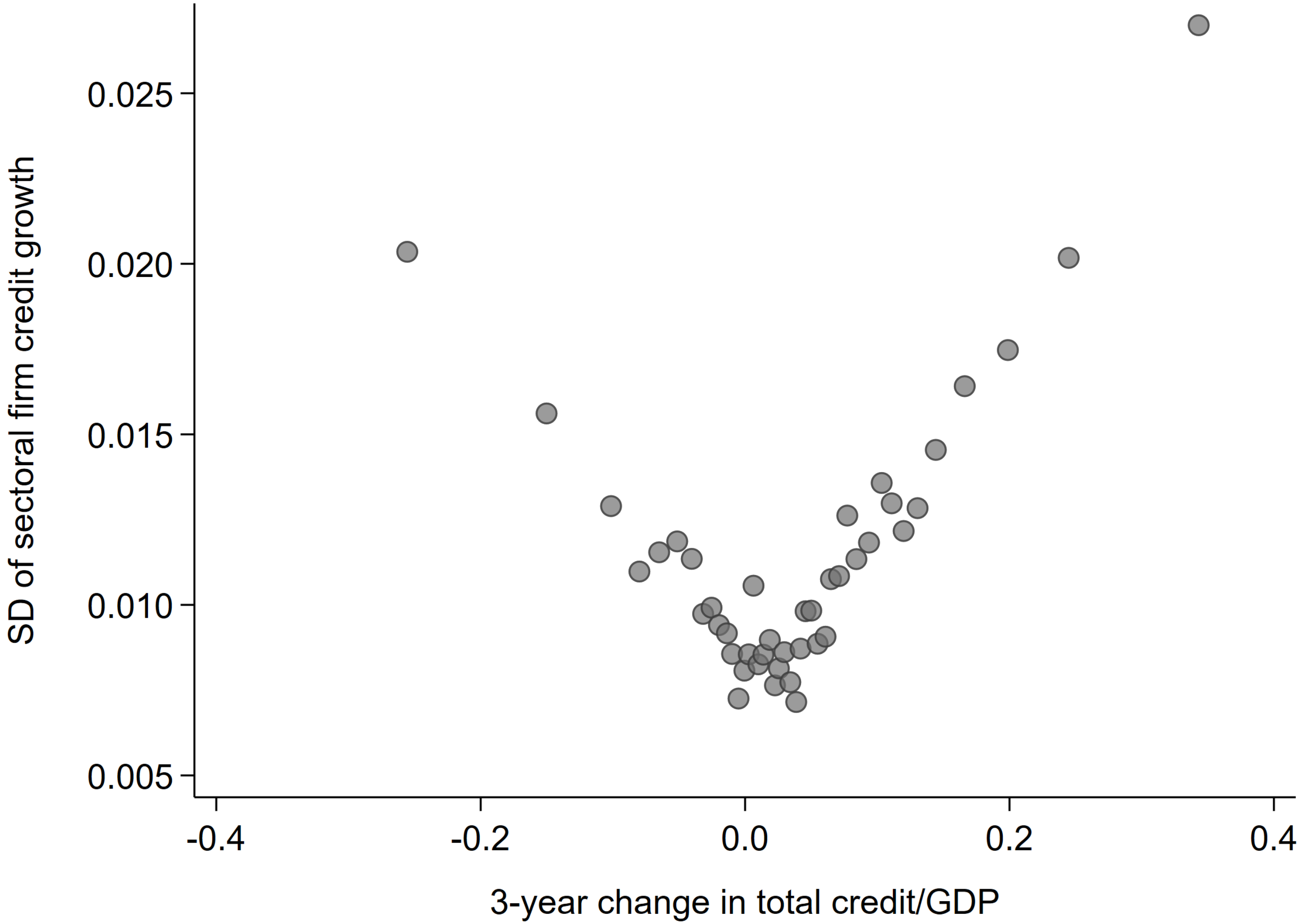
Robustness

		Obs.	Countries	Crises	AUC	Households β	Households $[t]$	Firms β	Firms $[t]$
(1)	Baseline (LPM, country FE)	3,070	114	84	0.66	2.54	1.92+	2.68	3.83**
(2)	LPM, country + year FE	3,069	113	84	0.66	1.49	1.99+	2.83	3.70**
(3)	Logit	3,070	114	84	0.66	1.39	3.16**	2.33	4.80**
(4)	Logit, country FE	2,216	58	83	0.65	9.56	3.30**	9.77	4.41**
(5)	Boom (>= Mean + 2 × SD)	3,070	114	84	0.59	8.06	1.71+	18.69	3.68**
(6)	Boom (>= 80th percentile)	3,070	114	84	0.66	6.87	2.16*	5.75	3.63**
(7)	Boom (>= 80th percentile, OOS)	3,070	114	84	0.66	4.25	2.09*	5.47	3.60**
(8)	RR crisis dates	2,181	62	68	0.64	2.67	2.23*	2.68	3.30**
(9)	LV crisis dates only	2,584	113	82	0.64	2.67	1.96+	1.53	1.94+
(10)	Pre-2000 only	2,068	86	54	0.59	1.21	1.48	2.84	3.14**
(11)	Post-1970 only	2,588	114	84	0.65	2.11	1.58	3.06	3.75**
(12)	Advanced economies	1,915	47	50	0.68	2.66	1.81+	2.99	3.40**
(13)	Emerging economies	1,155	67	34	0.63	1.93	1.11	2.20	1.66+
(14)	3 lags of annual Δ credit/GDP	2,717	108	79	0.65	1.93	1.11	0.02	2.29*
(15)	5-year change in credit/GDP	2,859	111	81	0.66	3.55	2.12*	1.51	2.06*
(16)	3-year MA of Δ credit/GDP	2,833	111	81	0.66	2.93	2.13*	2.85	4.13**
(17)	Hamilton-filtered Δ credit/GDP	2,051	56	64	0.69	2.52	2.28*	3.46	3.53**

Eurozone case study: Spain vs. Germany

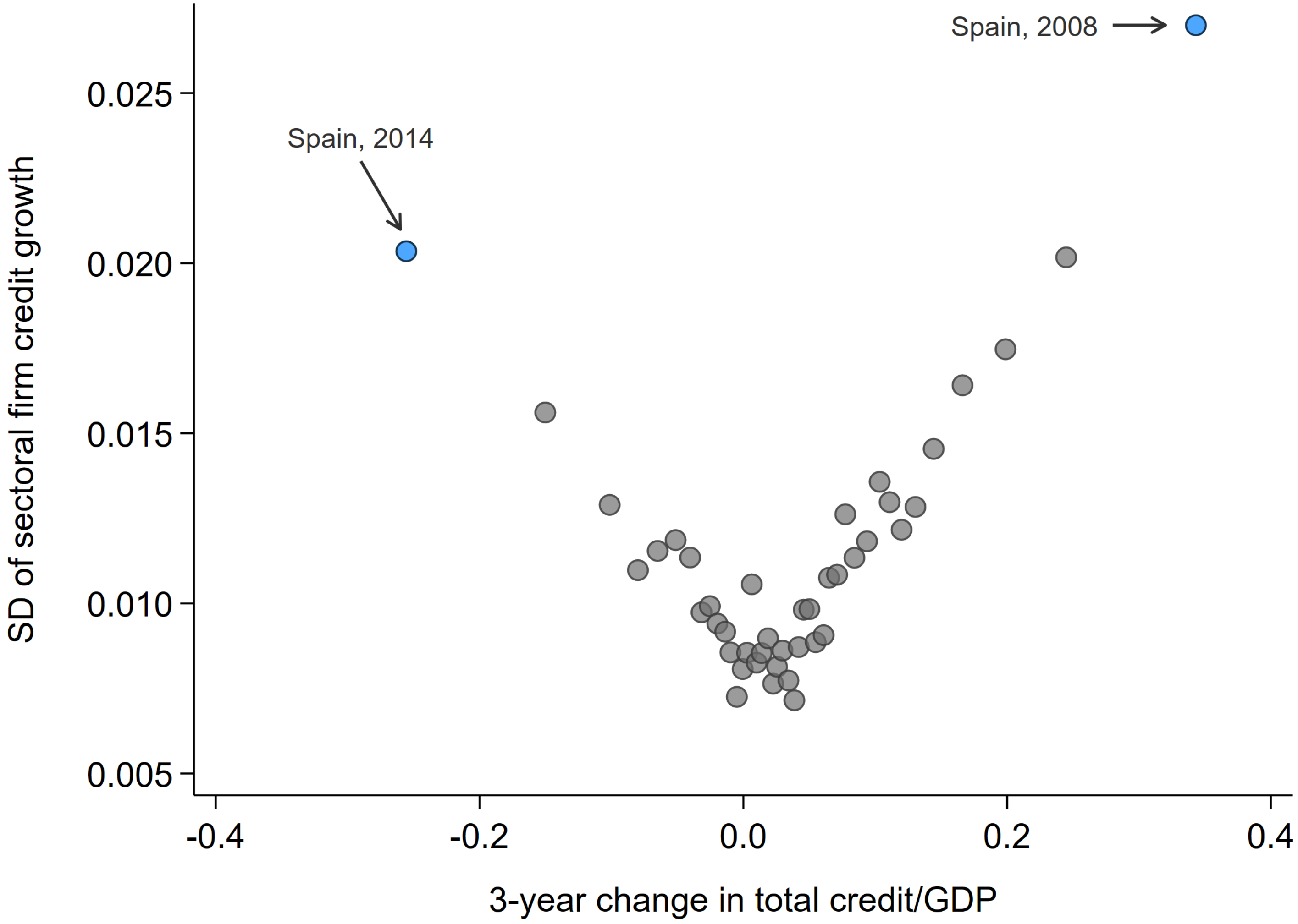


Dispersion goes up during credit booms and crunches



Dispersion goes up during credit booms and crunches

Example: Spanish credit boom in the 2000s



On average, dispersion is procyclical

$$Dispersion_{i,t+h} = \alpha_i + \beta \Delta_3 \text{Total credit/GDP}_{\text{i,t}} + \varepsilon_{i,t+h}$$

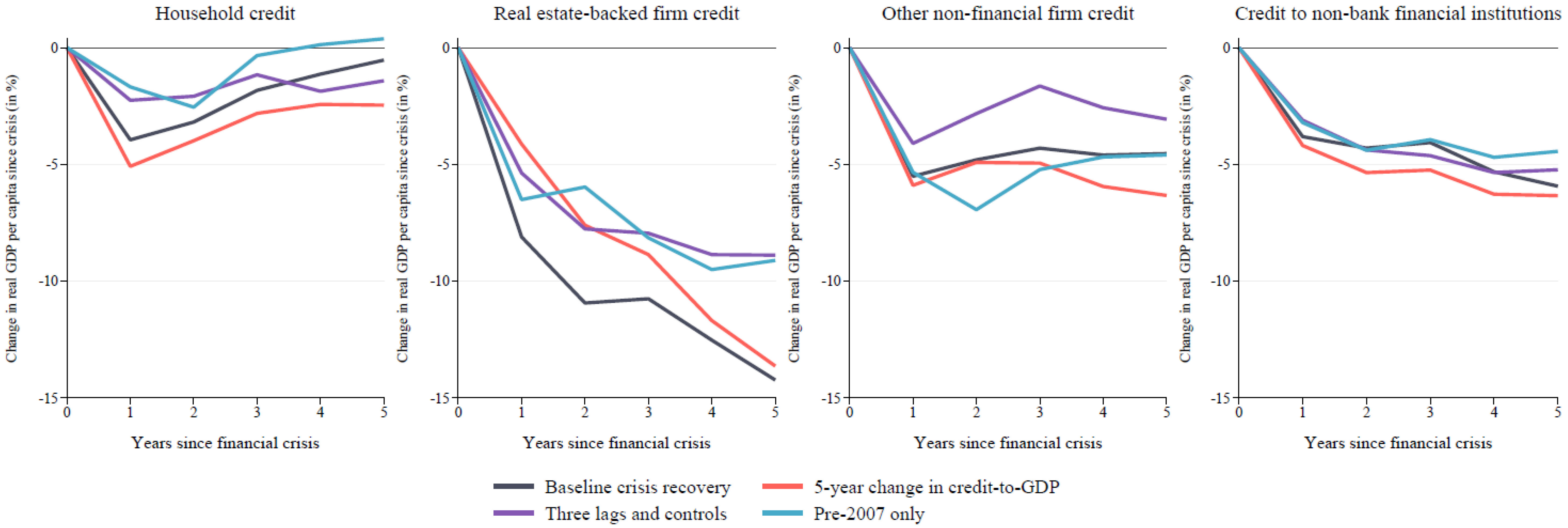
	Dep. var.: Dispersion of credit growth in...				
	1 year	2 years	3 years	4 years	5 years
Total credit growth	0.020**	0.021**	0.022**	0.021**	0.018**
	(0.006)	(0.004)	(0.002)	(0.002)	(0.002)
Observations	1,604	1,599	1,593	1,585	1,574
Within-R^2	0.07	0.07	0.08	0.07	0.05

Dispersion predicts crises over and above credit growth

$$P(Crisis)_{i,t+h} = \alpha_i + \beta_1 Dispersion_{i,t} + \beta_2 \Delta_3 \text{Total credit/GDP}_{\text{i,t}} + \varepsilon_{i,t+h}$$

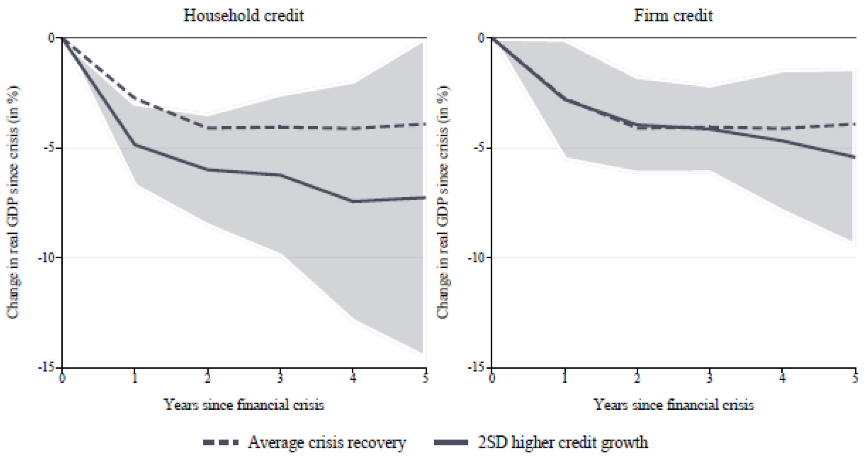
	Dependent variable: Crisis within...					
	1 year		3 years		5 years	
	(1)	(2)	(3)	(4)	(5)	(6)
SD of credit growth	2.836+	1.874+	4.002**	2.217*	3.867**	2.367+
	(1.624)	(1.097)	(1.456)	(0.999)	(1.336)	(1.377)
Total credit growth		0.295**		0.547**		0.459**
		(0.110)		(0.114)		(0.085)
Observations	1,429	1,429	1,429	1,429	1,429	1,429
# Crises	42	42	42	42	42	42
AUC	0.66	0.73	0.62	0.69	0.60	0.65

Robustness of local projection results

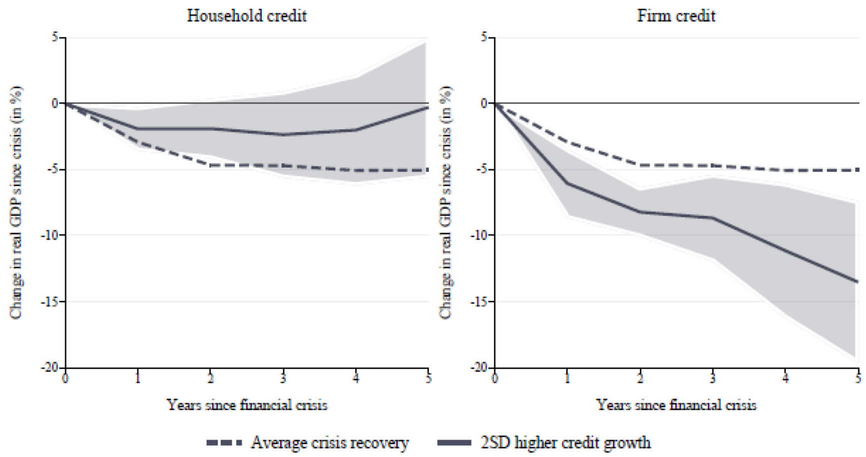


Replication of JKST (RFS, 2022)

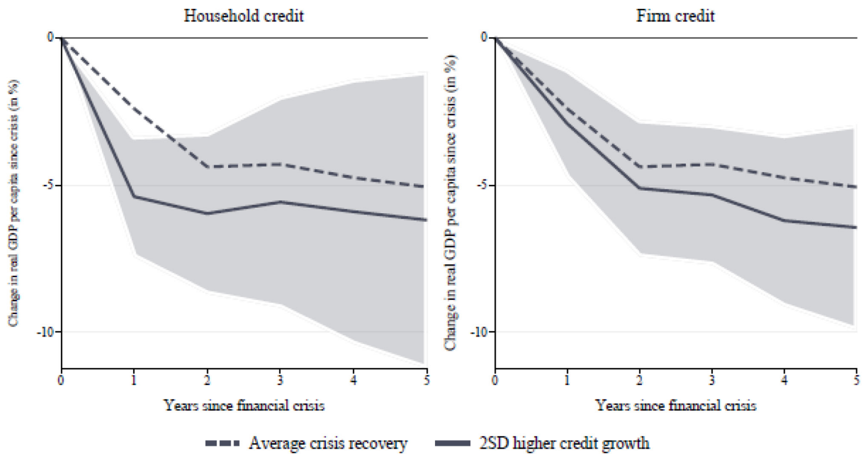
(a) JST data, Δ_5Credit/GDP



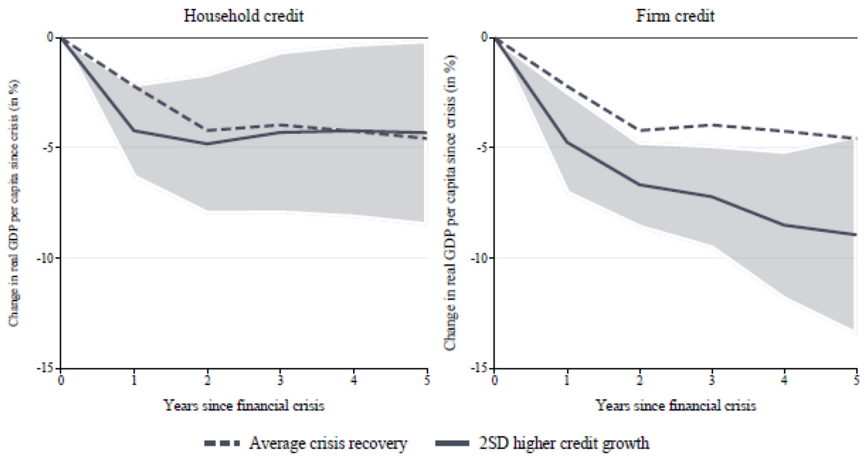
(b) JST data, Δ_3Credit/GDP



(c) Our data, Δ_5Credit/GDP

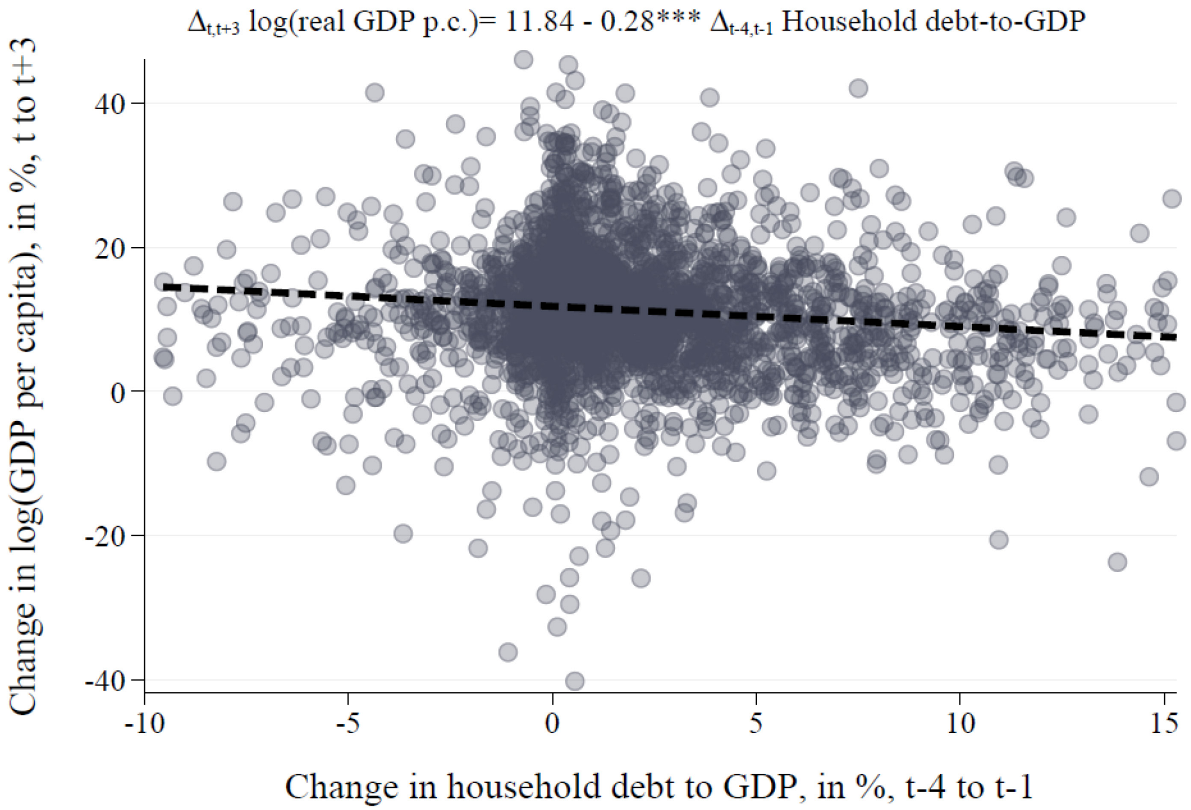


(d) Our data, Δ_3Credit/GDP



Replication of Mian, Sufi & Verner (2017)

Growth in household and firm debt vs. future average GDP growth



Which sectors rely on real estate collateral?

	Share of loans secured by real estate
High mortgage reliance	
Construction/Real estate	0.71
Agriculture	0.62
Retail/wholesale trade etc.	0.44
Low mortgage reliance	
Other sectors	0.36
Manufacturing/Mining	0.35
Transport/Communication	0.33

Similar **sector ranking** in all five countries we have data on

Sanity check: total credit growth predicts crises

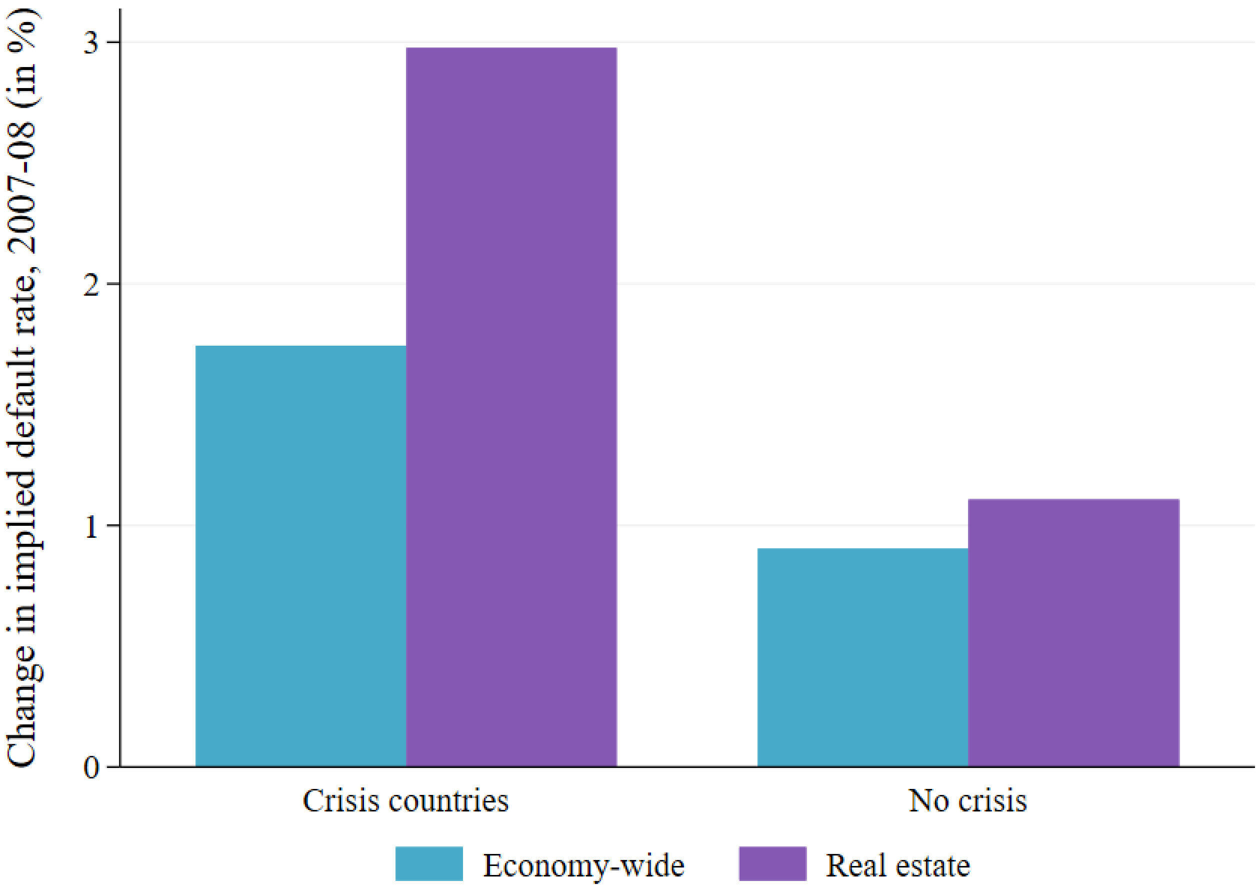
$$P(Crisis)_{i,t+h} = \alpha_i + \beta\Delta_3\text{Credit/GDP}_{\text{i,t}} + \varepsilon_{i,t}$$

	Dependent variable: Crisis within...				
	1 year	2 years	3 years	4 years	5 years
Total credit	0.011+	0.019*	0.022*	0.024*	0.025*
	(0.005)	(0.008)	(0.010)	(0.010)	(0.010)
Observations	6,226	6,226	6,226	6,226	6,226
# Crises	153	153	153	153	153
AUC	0.57	0.57	0.56	0.55	0.55

- 1 SD higher credit growth → probability of a crisis within 3 years goes from 7.2 to 9.7 percent
- Consistent with Schularick & Taylor (2012), Gourinchas & Obstfeld (2012), and many others.

Global evidence on corporate real estate defaults

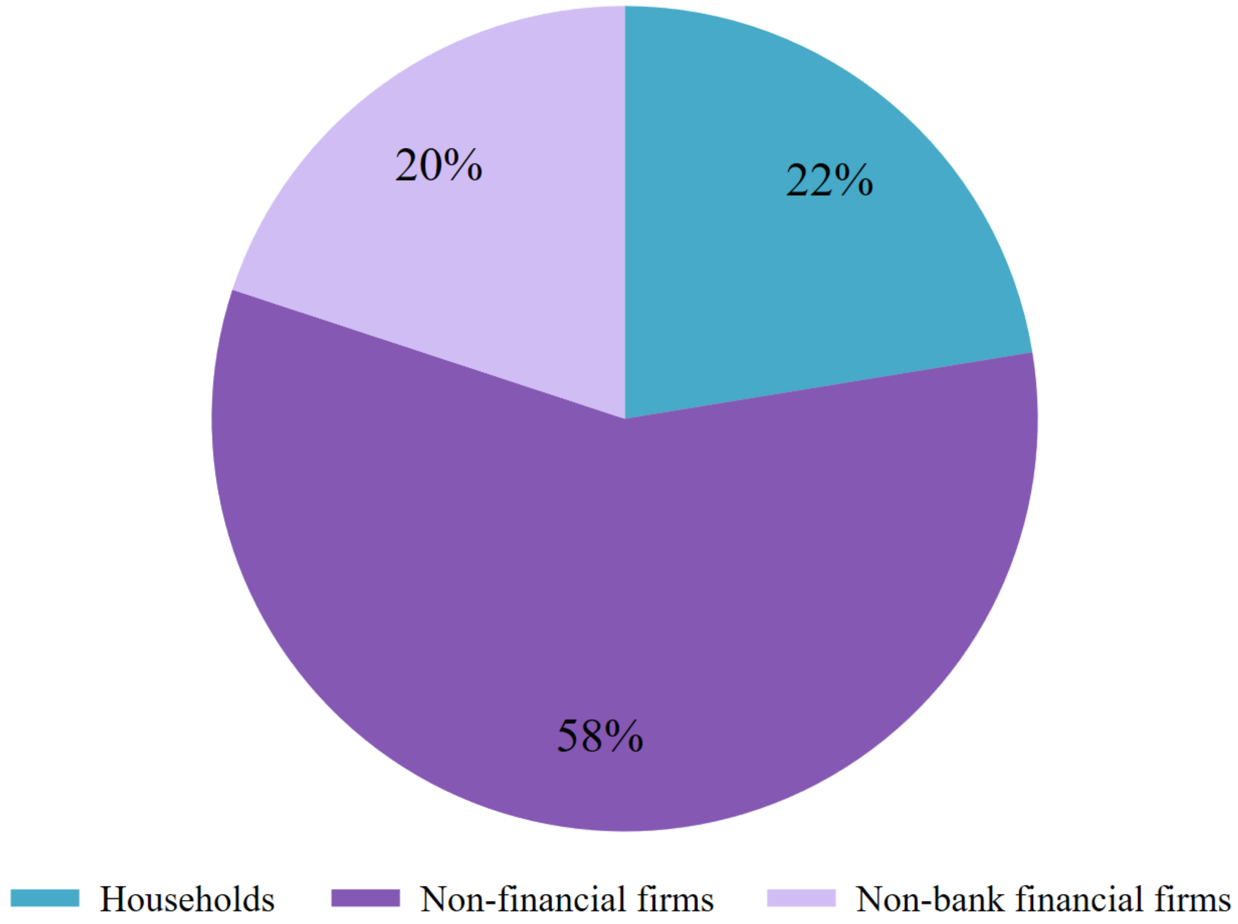
Default rates in real estate sector vs. other firms in 2007-08



Source: Amro Asia

On average, non-banks predominantly lend to firms

Composition of non-banks' loan portfolio (28 countries, average)



Source: ECB whom-to-whom accounts, Federal Reserve enhance financial accounts

Robustness using Y-14 data to measure collateral shares

$$P(Crisis)_{i,t+h} = \alpha_i + \sum_{k \in K} \beta^k \, \Delta_3 \mathrm{Credit}^k / \mathrm{GDP}_{i,t} + \varepsilon_{i,t}$$

	Dependent variable: Crisis within...				
	1 year	2 years	3 years	4 years	5 years
Δ_3HH/GDP	0.026∗	0.041∗	0.053∗	0.066∗∗	0.070∗∗
	(0.013)	(0.019)	(0.022)	(0.022)	(0.018)
Δ_3FIN/GDP	0.020∗	0.031∗∗	0.027∗	0.020	0.014
	(0.010)	(0.011)	(0.011)	(0.015)	(0.019)
Observations	1,246	1,246	1,246	1,246	1,246
# Crises	38	38	38	38	38
AUC	0.77	0.75	0.72	0.70	0.68