

Credit Allocation and Macroeconomic Fluctuations

Karsten Müller
NUS Business School

Emil Verner
MIT

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Motivation

Rapid credit expansions are often, *but not always*, followed by economic downturns (Schularick-Taylor, 2012; Mian et al. 2017; Greenwood et al., 2020)

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But how credit interacts with business cycles remains poorly understood

- Why do some credit expansions end badly, while others are linked to growth spurts?
- How can we tell apart “good” from “bad” booms (Gorton & Ordoñez, 2020)?
- Does it matter who gets the borrowed money during credit booms?

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This paper: role of **sectoral allocation of credit for understanding linkages between credit booms, macroeconomic fluctuations, and financial crises**

Why focus on the allocation of credit across sectors?

Motivated by models of credit cycles with sectoral heterogeneity (e.g. Schneider-Tornell, 2004)

- Main distinction: tradable (T) vs. non-tradable (NT) and household sectors
- Key frictions: (1) sensitivity to credit supply shocks; (2) sensitivity to household demand

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Channels linking NT and HH credit to economic downturns

- Fueling unsustainable demand booms (e.g. Schmitt-Grohé-Urbe, 2016; Mian-Sufi-Verner, 2020)
- Contributing to financial fragility (e.g. Schneider-Tornell, 2004; Kalantzis, 2015)
- Contributing to intersectoral misallocation (e.g. Reis, 2013; Benigno-Fornaro, 2014)

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Yet prominent theories of credit cycles do not emphasize borrower heterogeneity (e.g. Brunnermeier-Sannikov, 2014; Bordalo-Gennaioli-Shleifer, 2016)

- Whether the allocation of credit matters empirically is an open question

This paper

To test for a role of sectoral credit allocation, we construct a **new cross-country panel database** from more than 600 individual sources, many newly digitized

Comparison with Existing Data Sources on Private Credit

Dataset	Start	Countries	Sectors
BIS	1940	43	2
IMF GDD	1950	83	2
Jordà et al. (2016)	1870	17	3
Müller and Verner (2020)	1940	116	2–60 (mean=16)

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We use these data to study the link between sectoral credit, business cycles, and crises

Main results

1. Stark differences in macro outcomes across sectoral credit expansions

- Credit to non-tradable and household sectors predict slower medium-run growth
- Credit to tradable sector predicts stable or even stronger growth

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Takeaway: whether credit booms are “good” or “bad” depends on what credit is used for

- Distinguishing varieties of **firm credit expansions** is important

A new database on sectoral credit

> 600 sources, $\frac{1}{3}$ newly digitized

Mainly: statistical yearbooks, central banks

Previously unpublished data

provided by central banks and regulators

Systematic coding of classification changes

help from 150 employees of national authorities

Extensive documentation

data appendix, spreadsheets, code routines



Sectoral credit database

116 countries

1940-2014

Sector classification: ISIC Rev. 4

Covers all domestic credit

Forthcoming

More countries

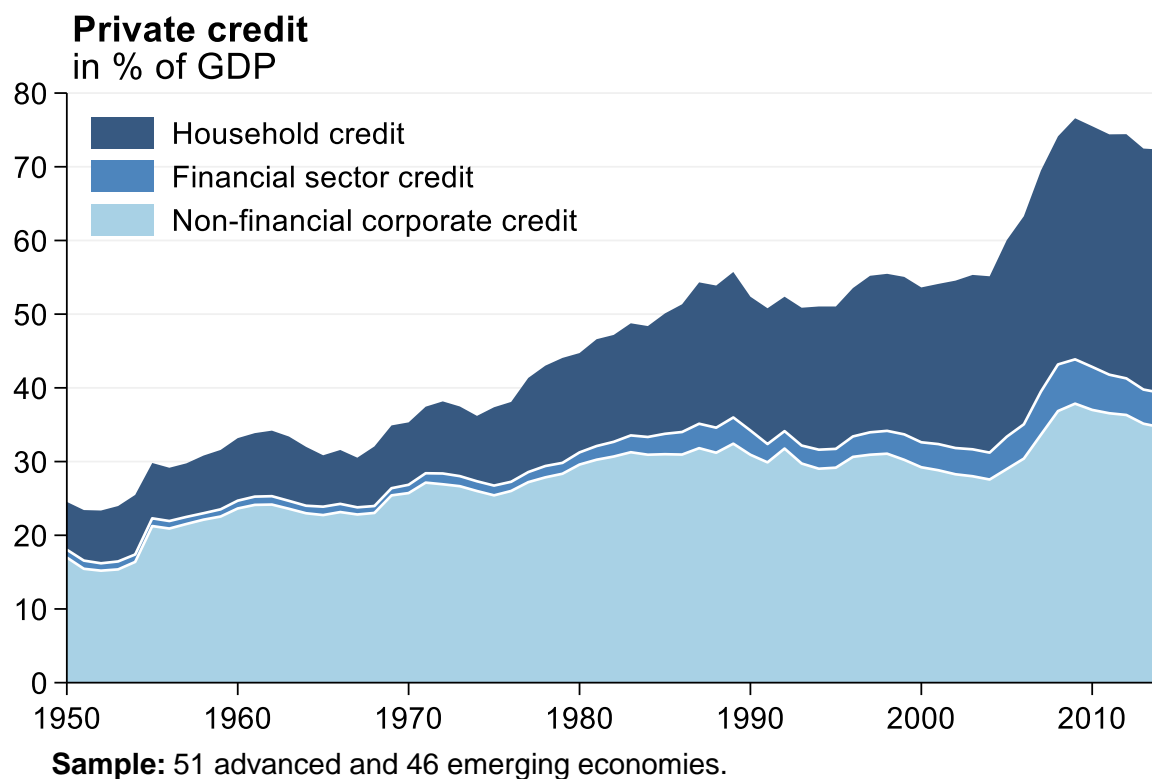
Update until 2021

Website to explore data

Data and code

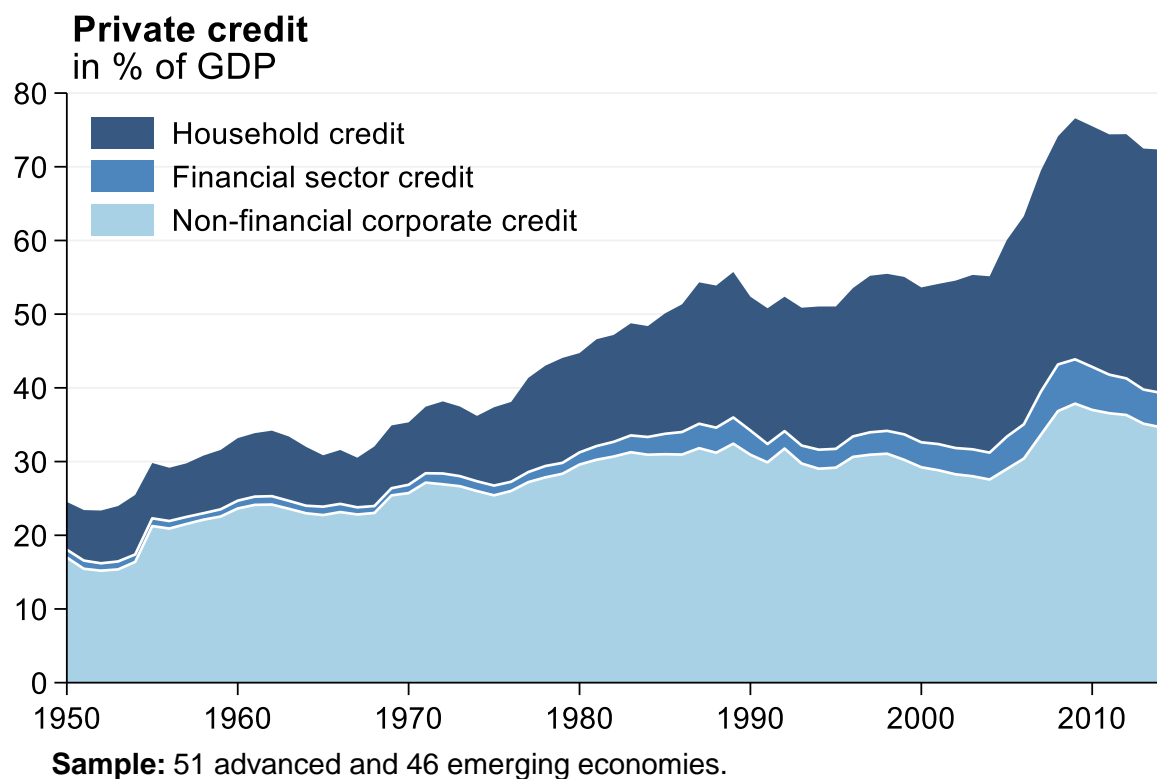
New facts about allocation of credit

(a) Booming household, stalling firm credit

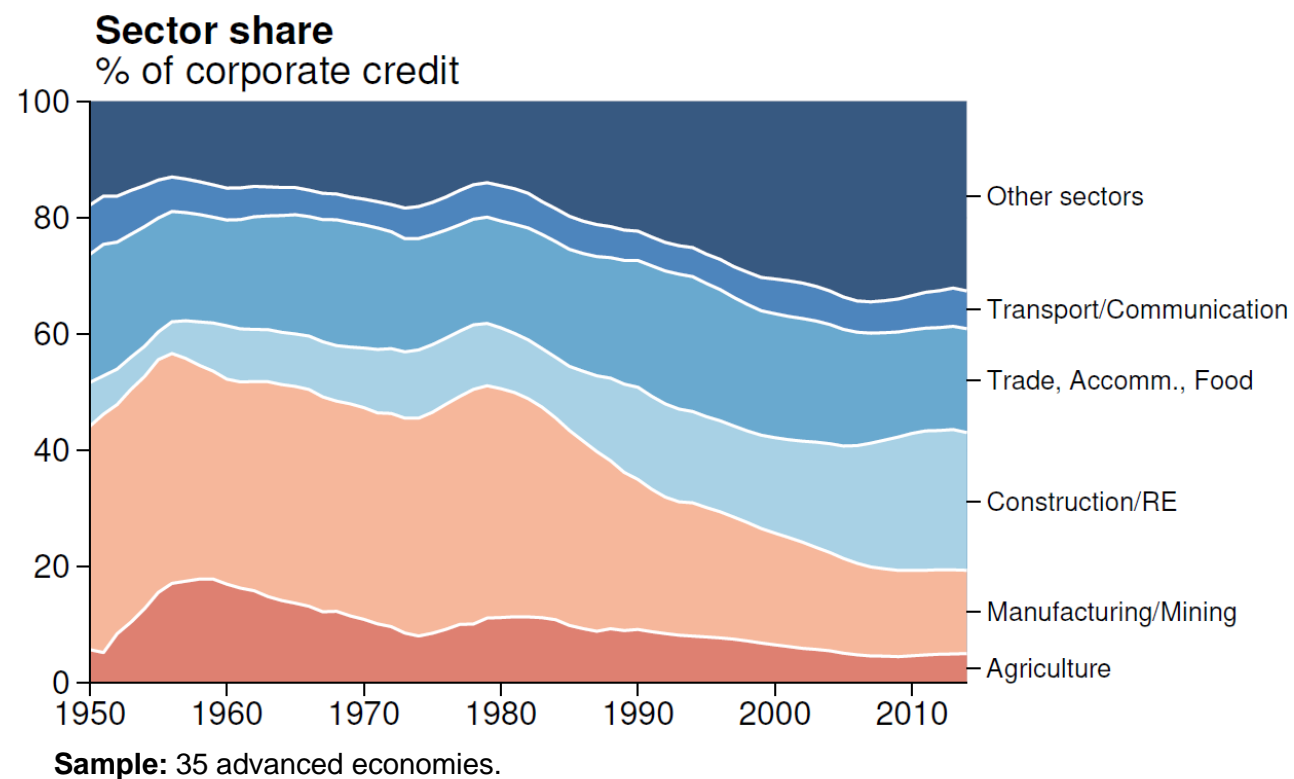


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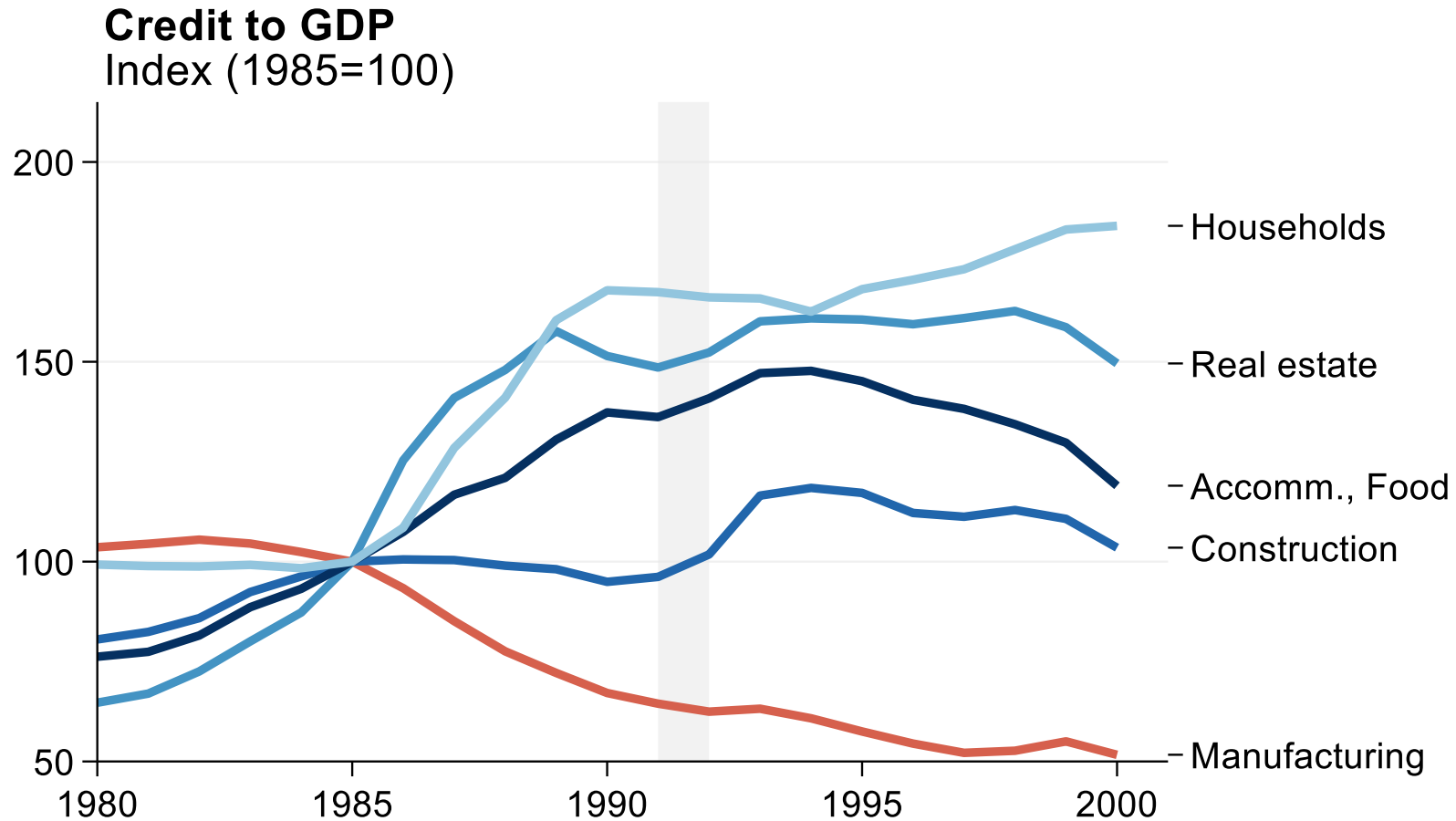
(a) Booming household, stalling firm credit



(b) Structural change in corporate credit



The 1980s credit boom in Japan



Similar pattern across most credit booms and crises in advanced and emerging economies

Empirical framework

Credit variables

- Tradable sector: agriculture; mining; manufacturing
- Non-tradable sector: construction/real estate; retail and wholesale trade/accom./food; transport/comm.
- Households

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What are key differences between T and NT sectors?

	Tradable	Non-tradable
1) Sensitivity to demand:		
Proximity to final demand	0.15	0.36
Exports/value added	0.78	0.11

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1) Sensitivity to demand:		
Proximity to final demand	0.15	0.36
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2) Financing constraints:		
Small firm share	0.79	0.90
Mortgage share	0.45	0.61

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Small firm share	0.79	0.90
Mortgage share	0.45	0.61
3) Productivity:		
Labor productivity	\$56,263	\$43,406
Labor productivity growth	3.2%	1.0%

Sources: WIOT, Eurostat, various central banks, Mano & Castillo (2015)


Empirical framework

Impulse responses from Jordà (2005) local projections:

$$\begin{aligned}\Delta_h y_{it+h} = & \alpha_i^h + \sum_{j=0}^J \beta_{h,j}^{NT} \Delta d_{it-j}^{NT} + \sum_{j=0}^J \beta_{h,j}^T \Delta d_{it-j}^T + \sum_{j=0}^J \beta_{h,j}^{HH} \Delta d_{it-j}^{HH} \\ & + \sum_{j=0}^J \gamma_{h,j} \Delta y_{it-j} + \epsilon_{it+h}, \quad h = 1, \dots, 10 \quad J = 5\end{aligned}$$

Empirical framework

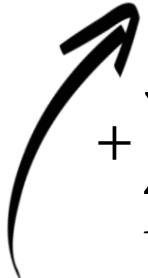
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$y = \text{Log}(\text{real GDP})$

Empirical framework

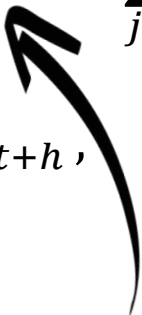
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Country fixed effects

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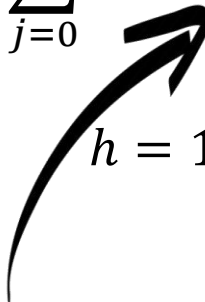
d^{NT} = Credit to the non-tradable sector / GDP

Empirical framework

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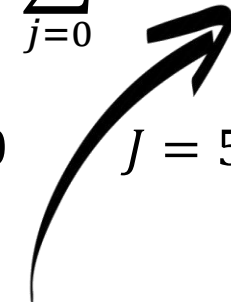
$h = 1, \dots, 10 \quad J = 5$



d^T = Credit to the tradable sector / GDP

Empirical framework

Impulse responses from Jordà (2005) local projections:

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$J = 5$

d^{HH} = Credit to households / GDP

Empirical framework

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Prediction horizon: 10 years



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Lag length: 5 years



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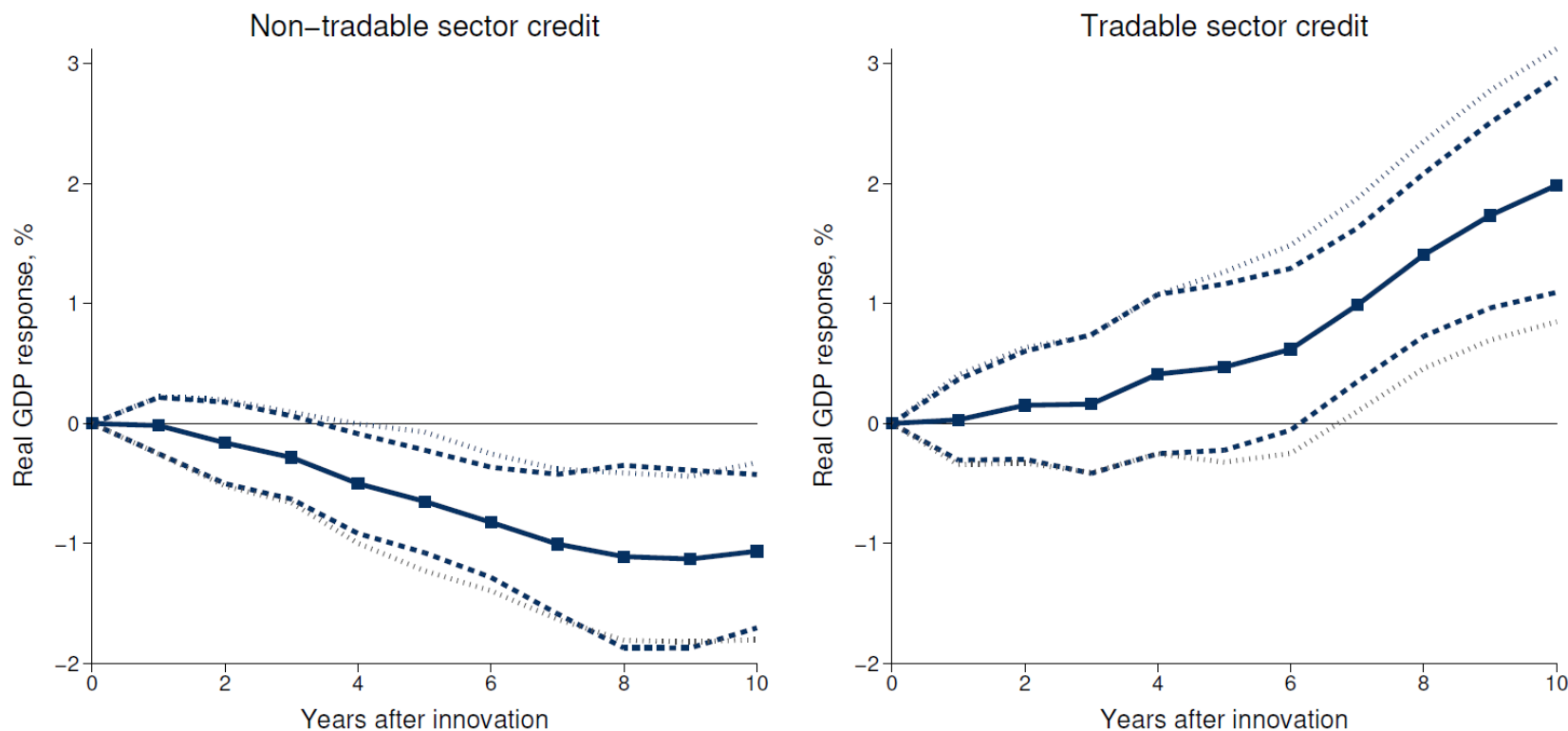
Inference: Driscoll-Kraay or two-way clustered standard errors (country and year)

Note on interpretation: Impulse responses \neq causal effects

- Conditional on seeing a credit expansion, what happens to GDP (on average)?

Real GDP and T vs. NT sector firm credit expansions

$$\Delta_h y_{it+h} = \alpha_i^h + \sum_{j=0}^5 \beta_{h,j}^{NT} \Delta d_{it-j}^{NT} + \sum_{j=0}^5 \beta_{h,j}^T \Delta d_{it-j}^T + \sum_{j=0}^5 \gamma_{h,j} \Delta y_{it-j} + \epsilon_{it+h}$$

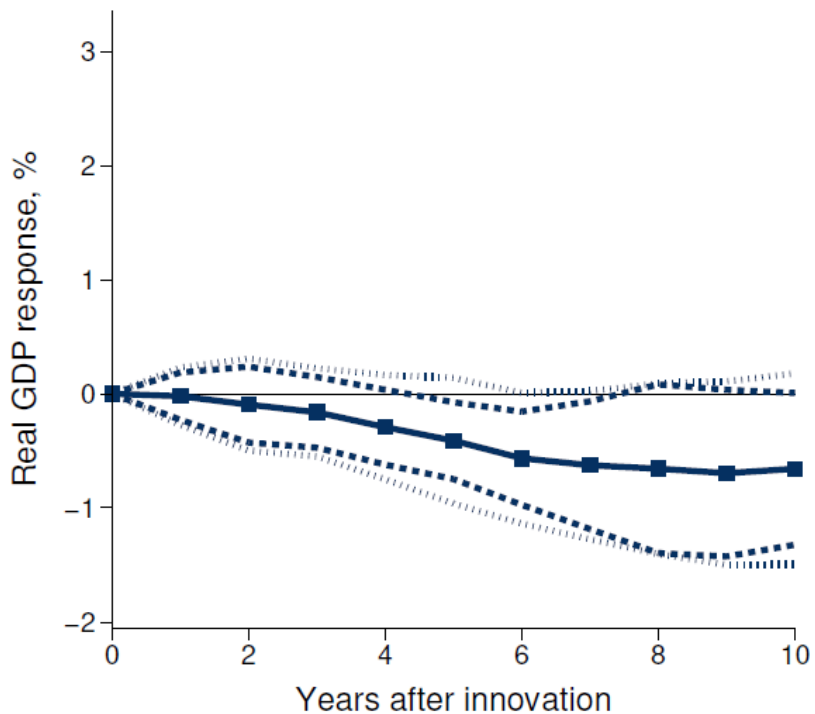


In the paper, we show these patterns are **robust** and hold when controlling for output shares

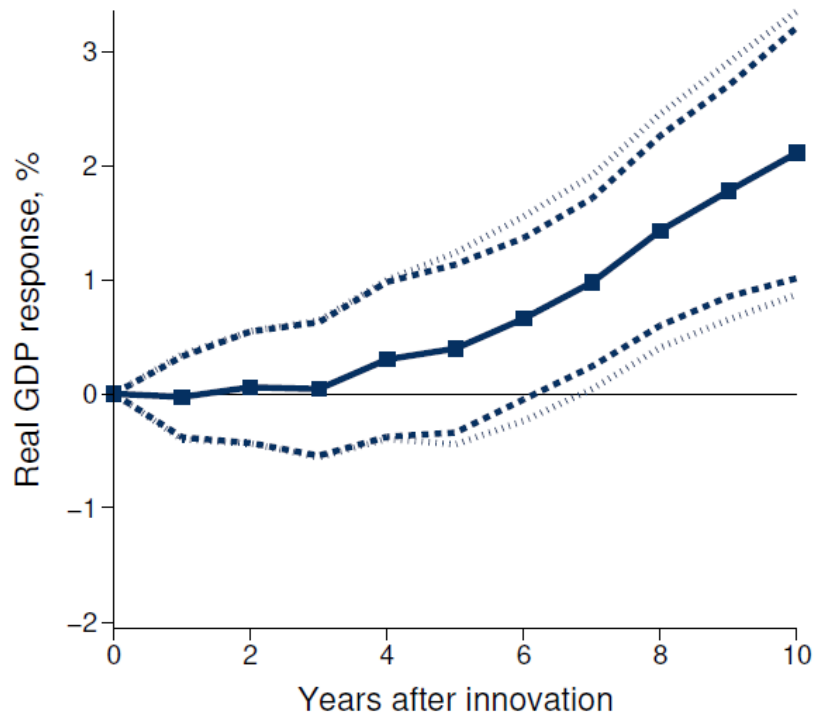
Similar when controlling for household debt expansion

$$\Delta_h y_{it+h} = \alpha_i^h + \sum_{j=0}^5 \beta_{h,j}^{NT} \Delta d_{it-j}^{NT} + \sum_{j=0}^5 \beta_{h,j}^T \Delta d_{it-j}^T + \sum_{j=0}^5 \beta_{h,j}^{HH} \Delta d_{it-j}^{HH} + \sum_{j=0}^5 \gamma_{h,j} \Delta y_{it-j} + \epsilon_{it+h}$$

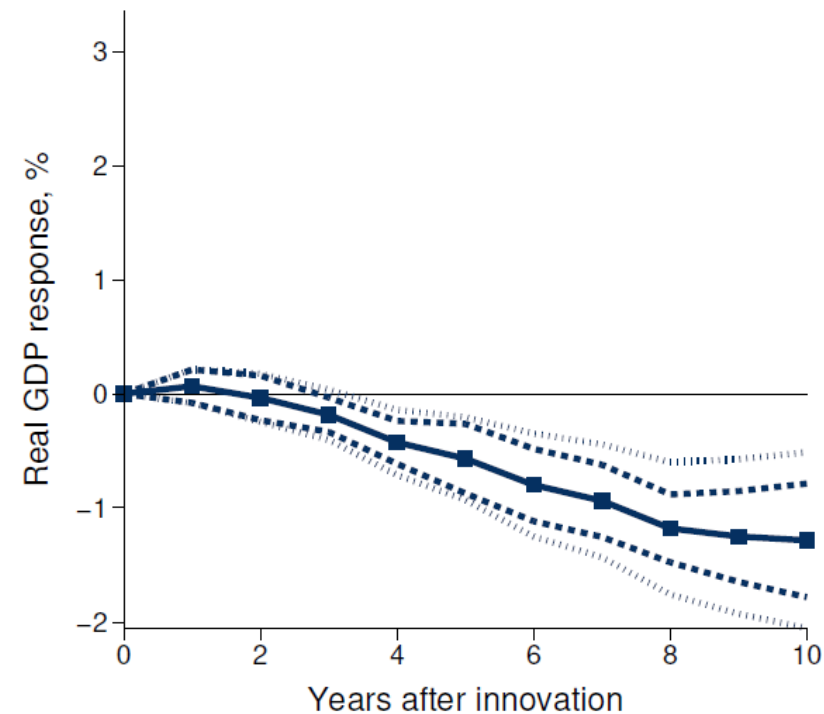
Non-tradable sector credit



Tradable sector credit

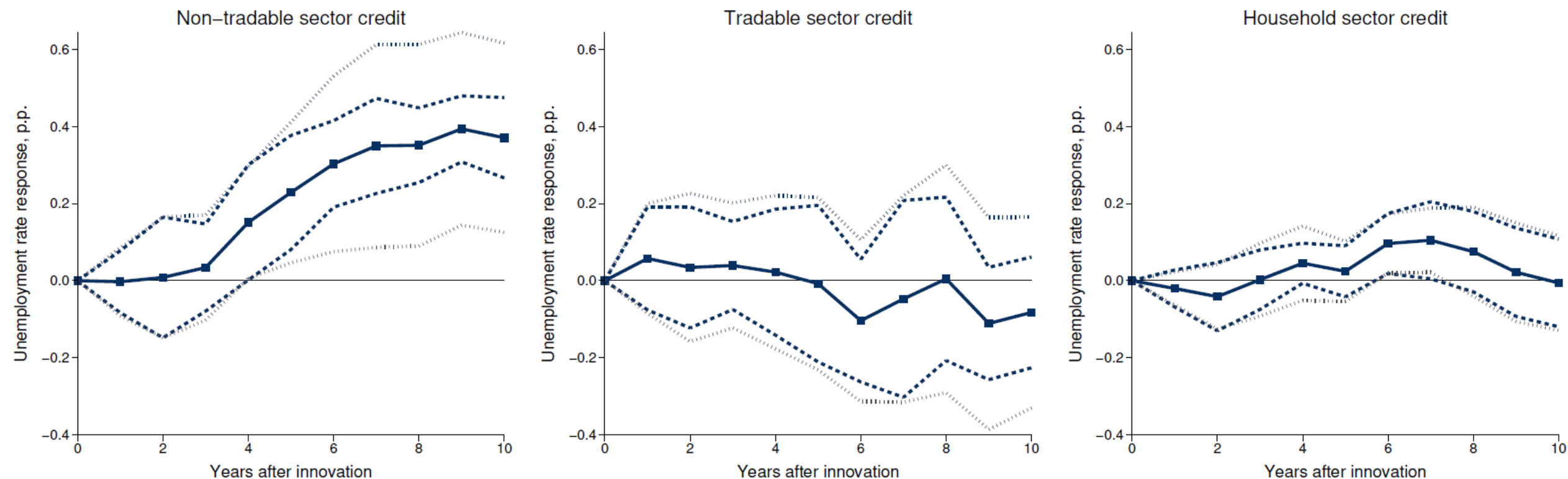


Household sector credit



Unemployment spikes following NT credit expansions

$$\Delta_h y_{it+h} = \alpha_i^h + \sum_{j=0}^5 \beta_{h,j}^{NT} \Delta d_{it-j}^{NT} + \sum_{j=0}^5 \beta_{h,j}^T \Delta d_{it-j}^T + \sum_{j=0}^5 \beta_{h,j}^{HH} \Delta d_{it-j}^{HH} + \sum_{j=0}^5 \gamma_{h,j} \Delta y_{it-j} + \epsilon_{it+h}$$



Splitting firm credit along sector characteristics

$$\Delta_3 y_{it+h} = \alpha_i^h + \beta_h^{HIGH} \Delta_3 d_{it}^{HIGH} + \beta_h^{LOW} \Delta_3 d_{it}^{LOW} + \epsilon_{it+h}, \quad h = 0, 1, \dots, 5$$

Dependent var.: GDP growth over...						
$\Delta_3 d_{it}^k$	(1) (t-3,t)	(2) (t-2,t+1)	(3) (t-1,t+2)	(4) (t,t+3)	(5) (t+1,t+4)	(6) (t+2,t+5)
Panel A: Sorting by proximity to household demand						
High proximity to HH	0.23* (0.100)	-0.0097 (0.11)	-0.23* (0.10)	-0.35** (0.083)	-0.39** (0.075)	-0.33** (0.077)
Low proximity to HH	0.39** (0.094)	0.30** (0.11)	0.20 (0.13)	0.19 (0.14)	0.22 (0.15)	0.26* (0.12)
Panel B: Sorting by small firm share						
High small firm share	0.21* (0.087)	-0.048 (0.099)	-0.27* (0.11)	-0.40** (0.13)	-0.43** (0.15)	-0.38* (0.15)
Low small firm share	0.38** (0.083)	0.29* (0.11)	0.17 (0.15)	0.16 (0.17)	0.15 (0.19)	0.17 (0.19)

Similar patterns when splitting along: export/VA, housing input share, or mortgage debt share

Mechanisms

Recap: potential channels linking NT and HH credit to lower medium-run growth

1. Credit-driven demand boom and bust (e.g. Schmitt-Grohé-Urbe, 2016)

→ NT/HH credit predict reallocation toward NT sector, real exchange rate appreciation

2. Differences in financial fragility across sectors (e.g. Schneider-Tornell, 2004)

→ NT/HH credit predict financial crises, sectoral losses

3. Lower productivity growth through misallocation across sectors (e.g. Reis, 2013)

→ NT/HH credit predict sluggish productivity growth

→ T credit predicts higher productivity growth

1. Sectoral credit and demand booms

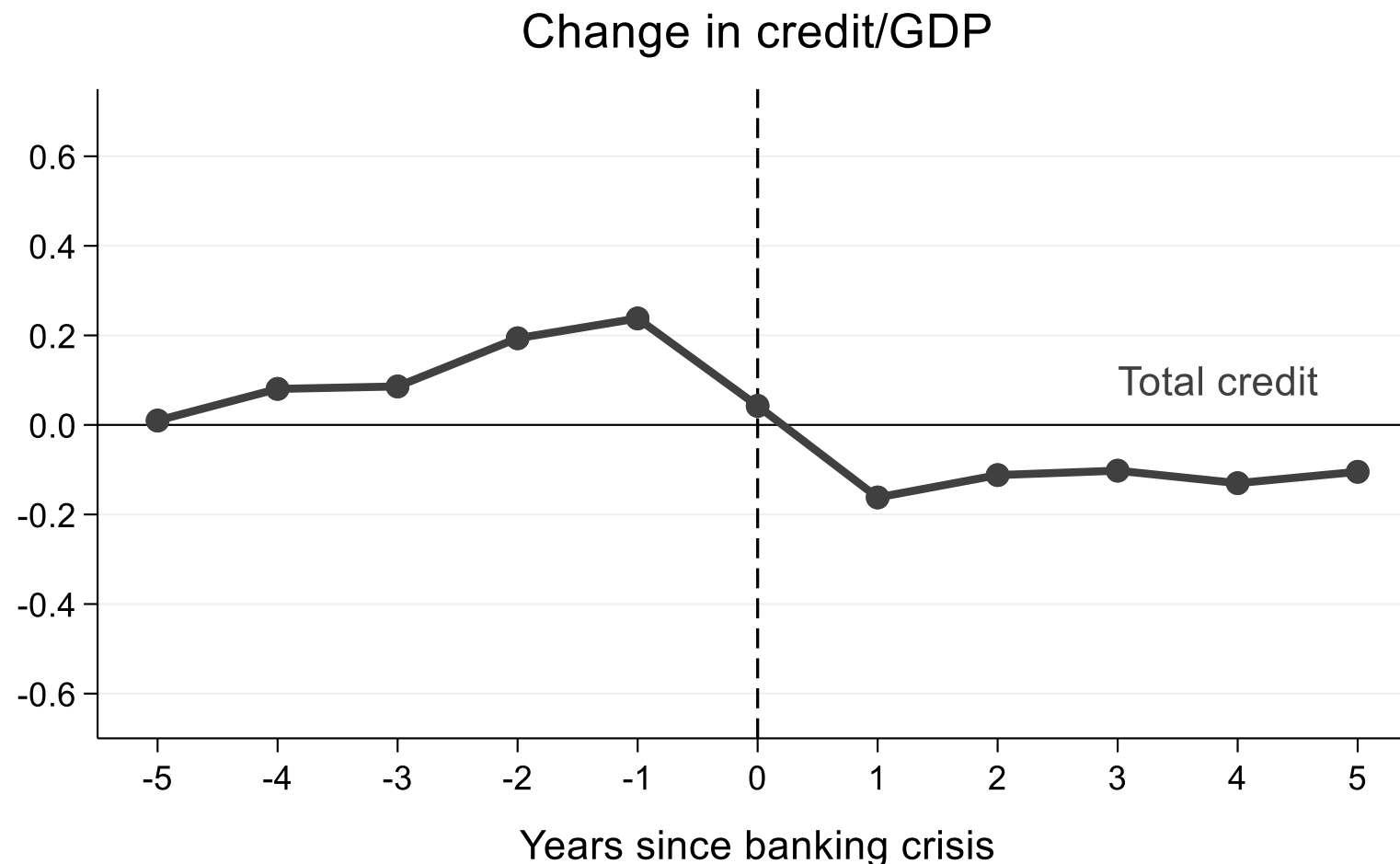
$$\Delta_3 y_{it} = \alpha_i^h + \beta_h^{NT} \Delta_3 d_{it}^{NT} + \beta_h^T \Delta_3 d_{it}^T + \beta_h^{HH} \Delta_3 d_{it}^{HH} + \epsilon_{it}$$

	$\Delta_3 \ln \left(\frac{E^{NT}}{E^T} \right)$	$\Delta_3 \ln (RER)$
$\Delta_3 d_{it}^k$	(1)	(2)
Tradables	-0.18 (0.16)	-0.27 (0.30)
Non-tradables	0.44** (0.073)	0.43+ (0.22)
Households	0.44** (0.048)	0.30* (0.12)
Observations	992	1,755
# Countries	45	73
R ²	0.14	0.03

- NT and HH sector credit associated with reallocation of real activity towards NT, real appreciation, boom-bust in housing prices: consistent with credit boosting demand (Mian-Sufi-Verner, 2020)

2. Differences in financial fragility across sectors

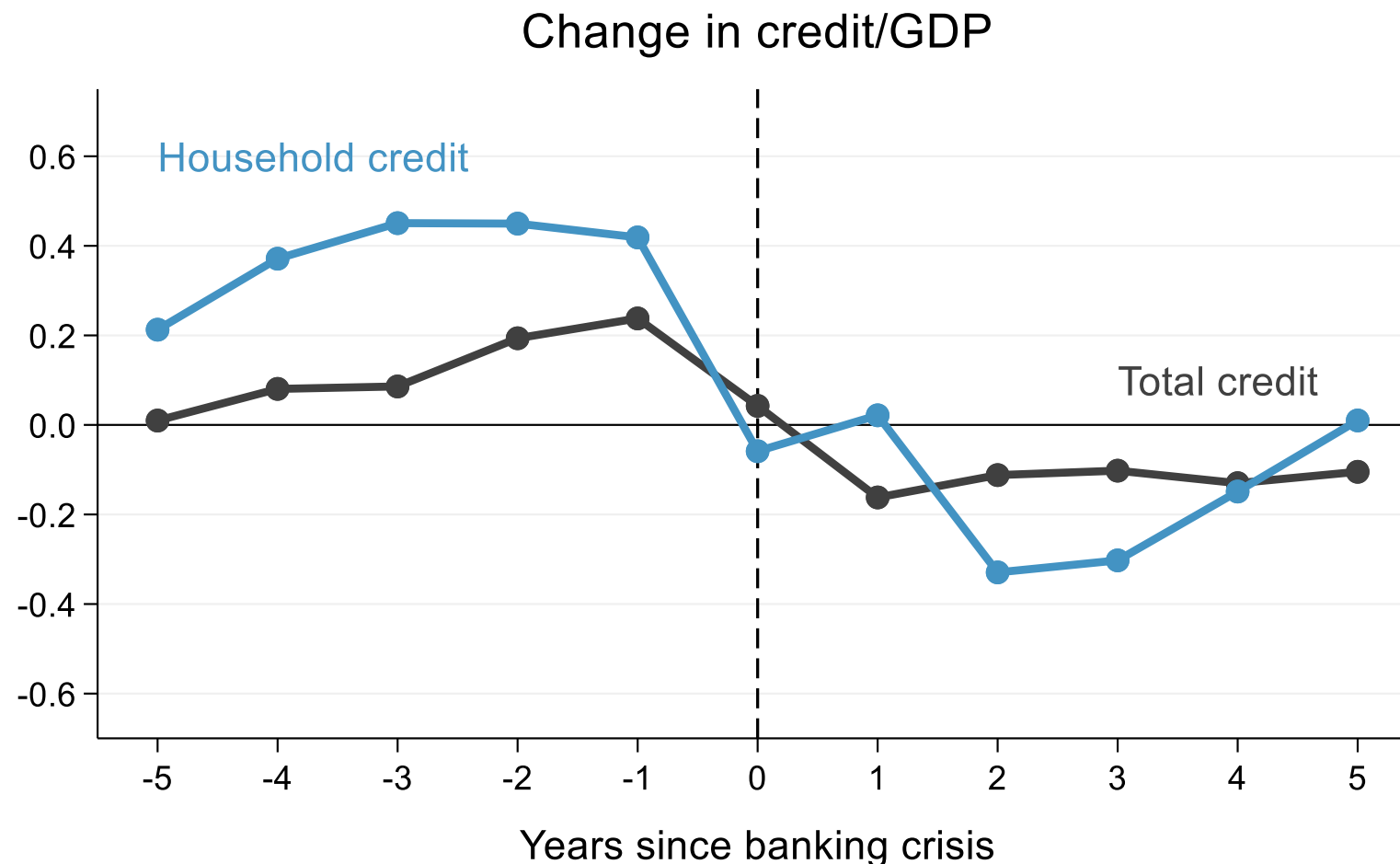
Established finding: total credit/GDP expands before crises



Note: Crisis dates from BVX (2020) and LV (2018).

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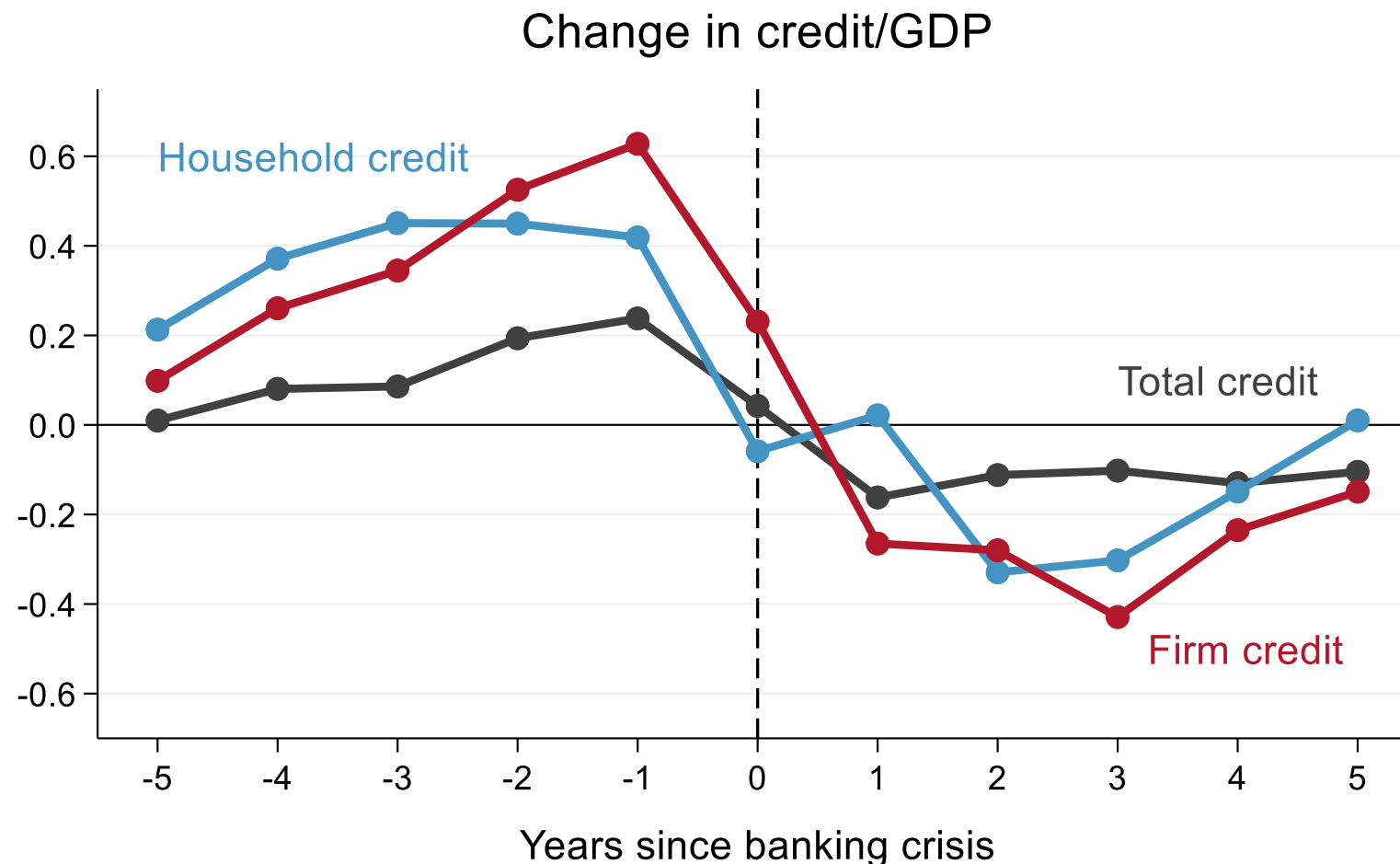
Household debt expands earlier than firm debt



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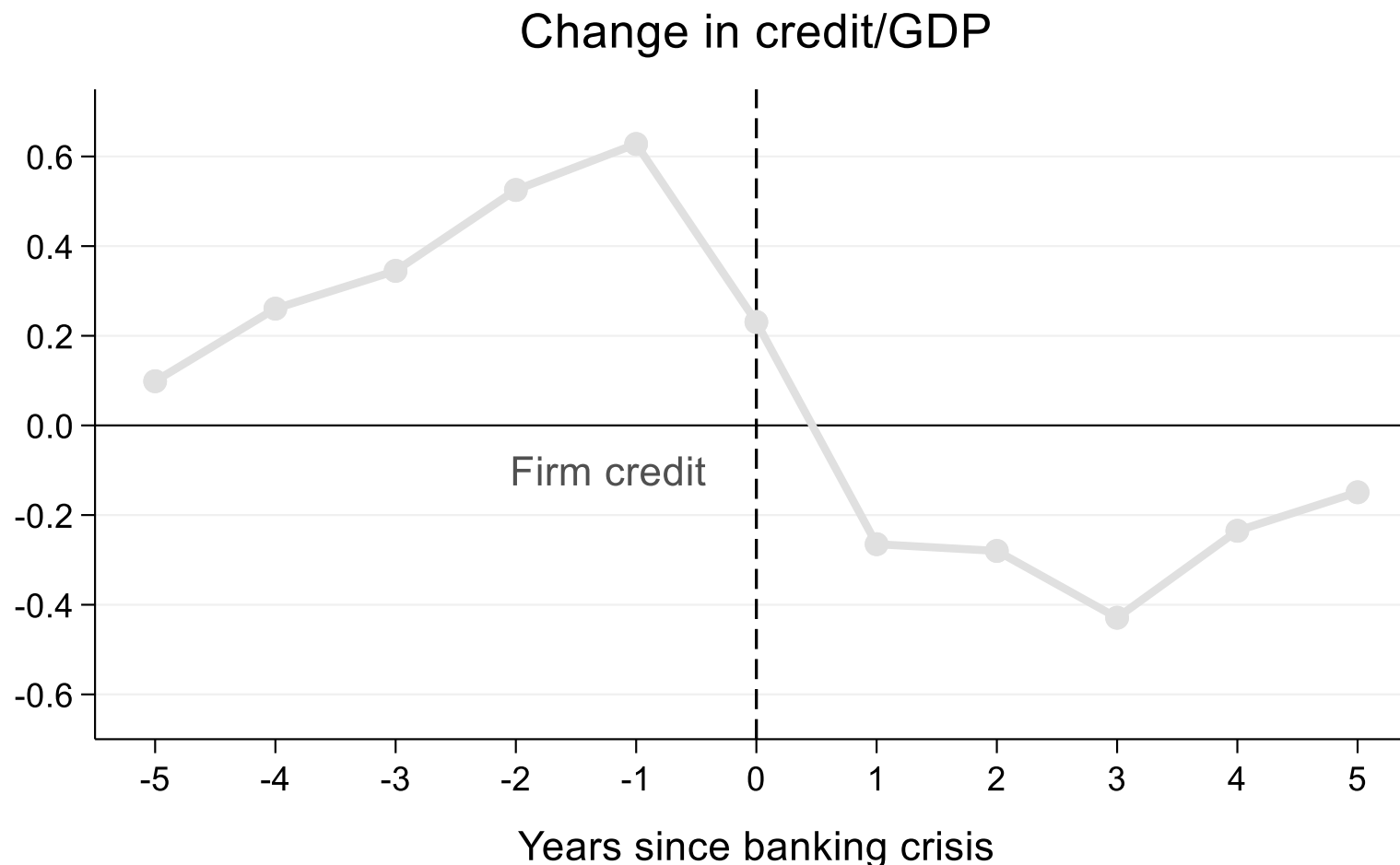
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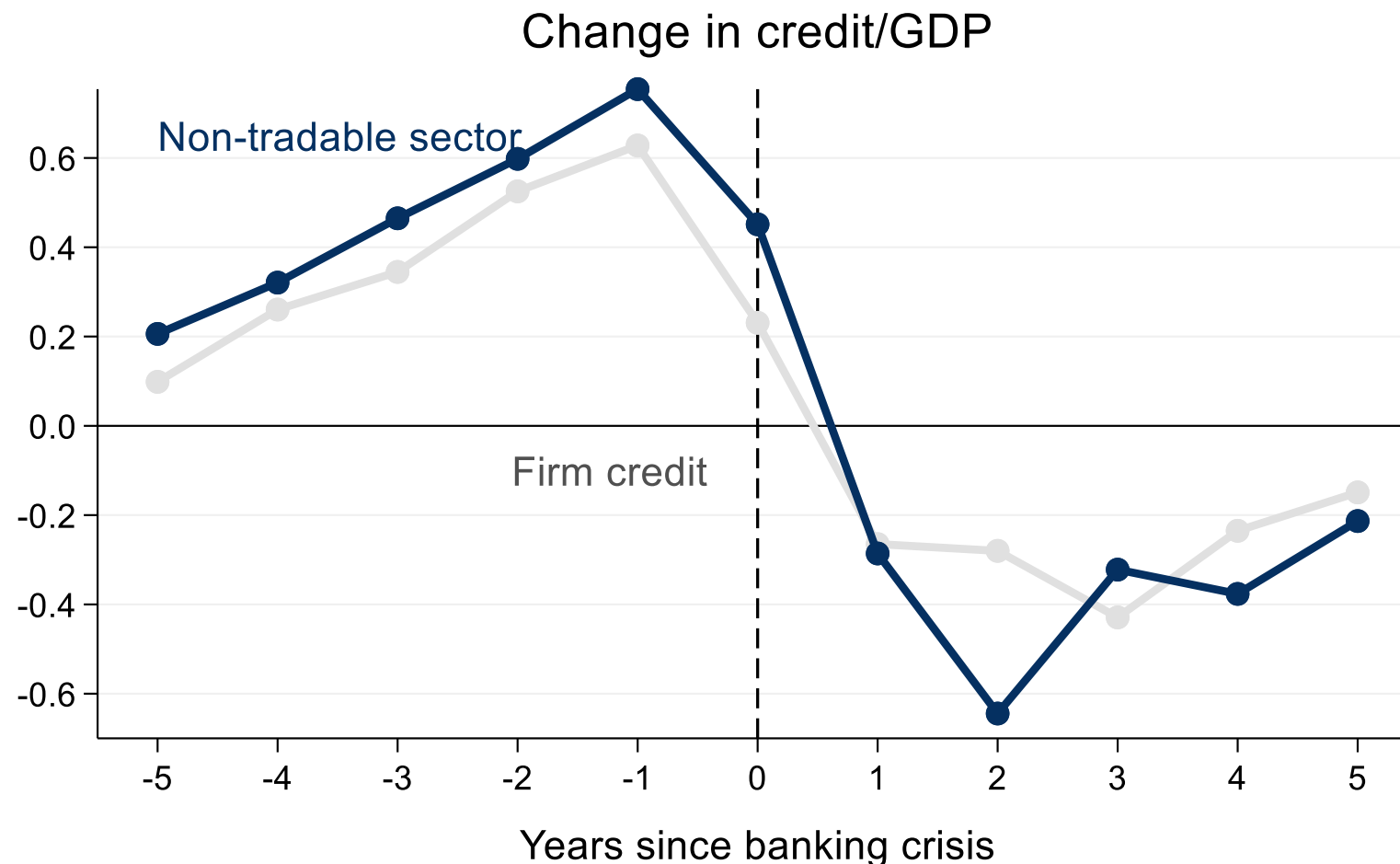
Firm credit expansions mainly driven by NT sector



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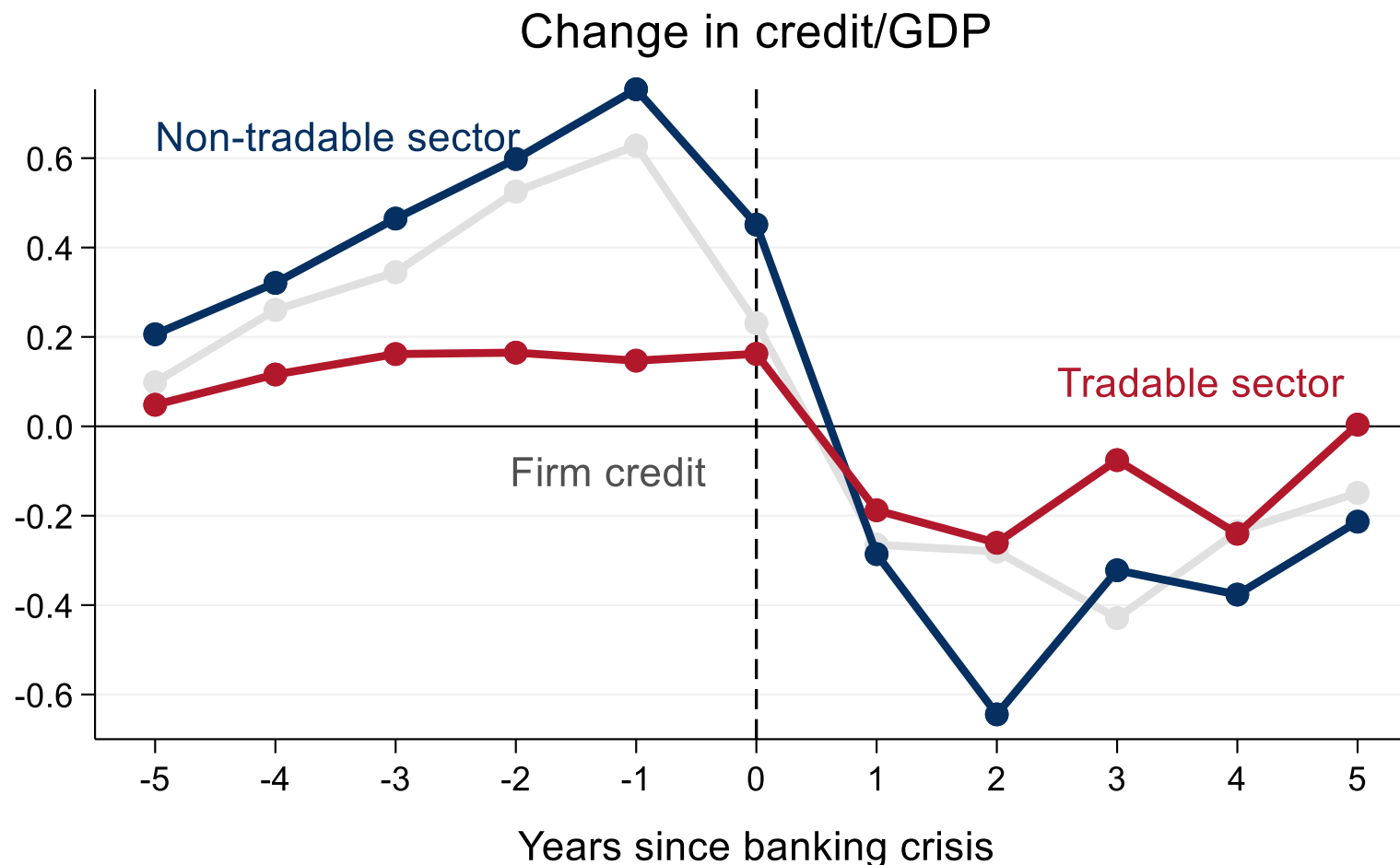
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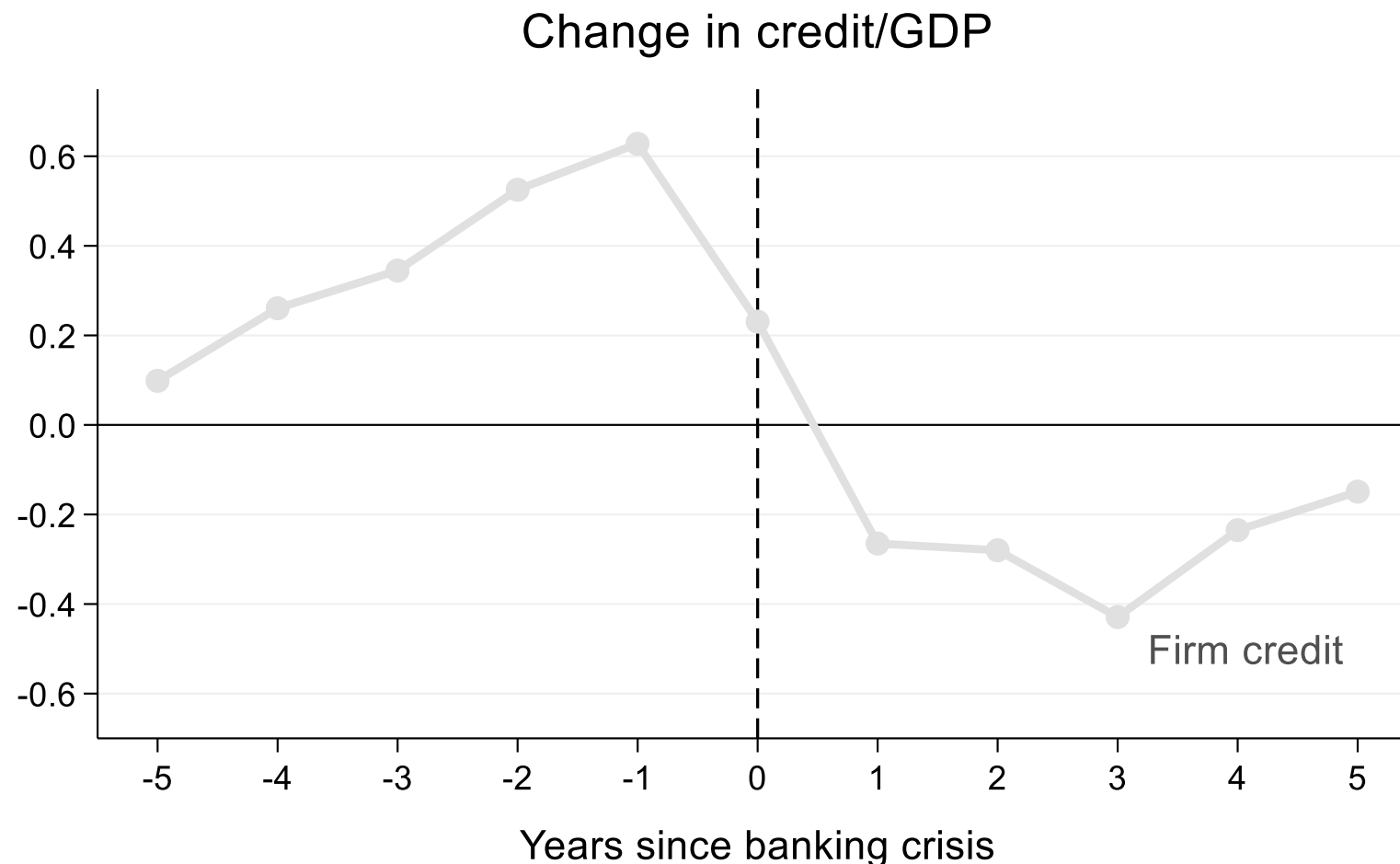
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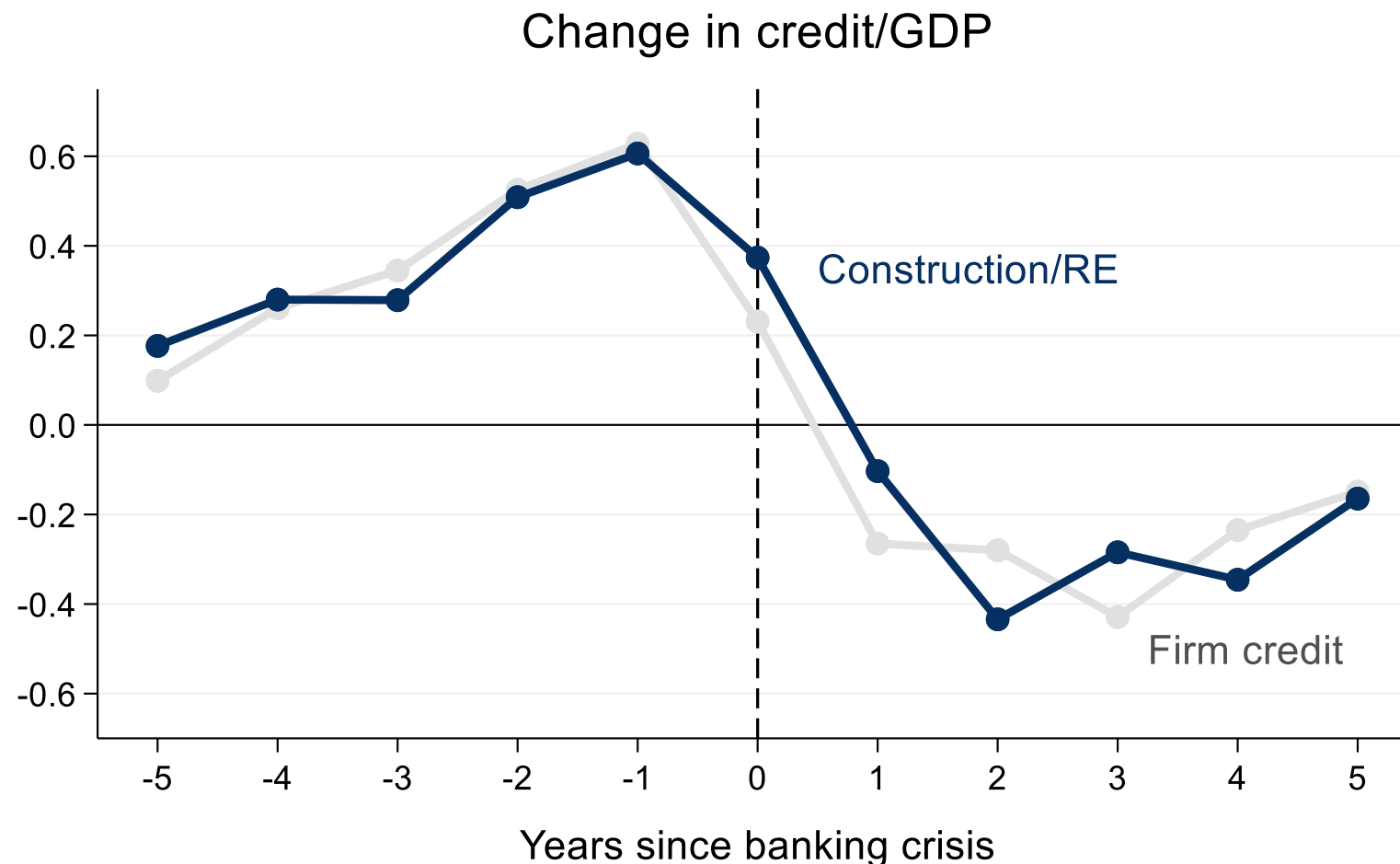
NT sector expansions not only driven by housing



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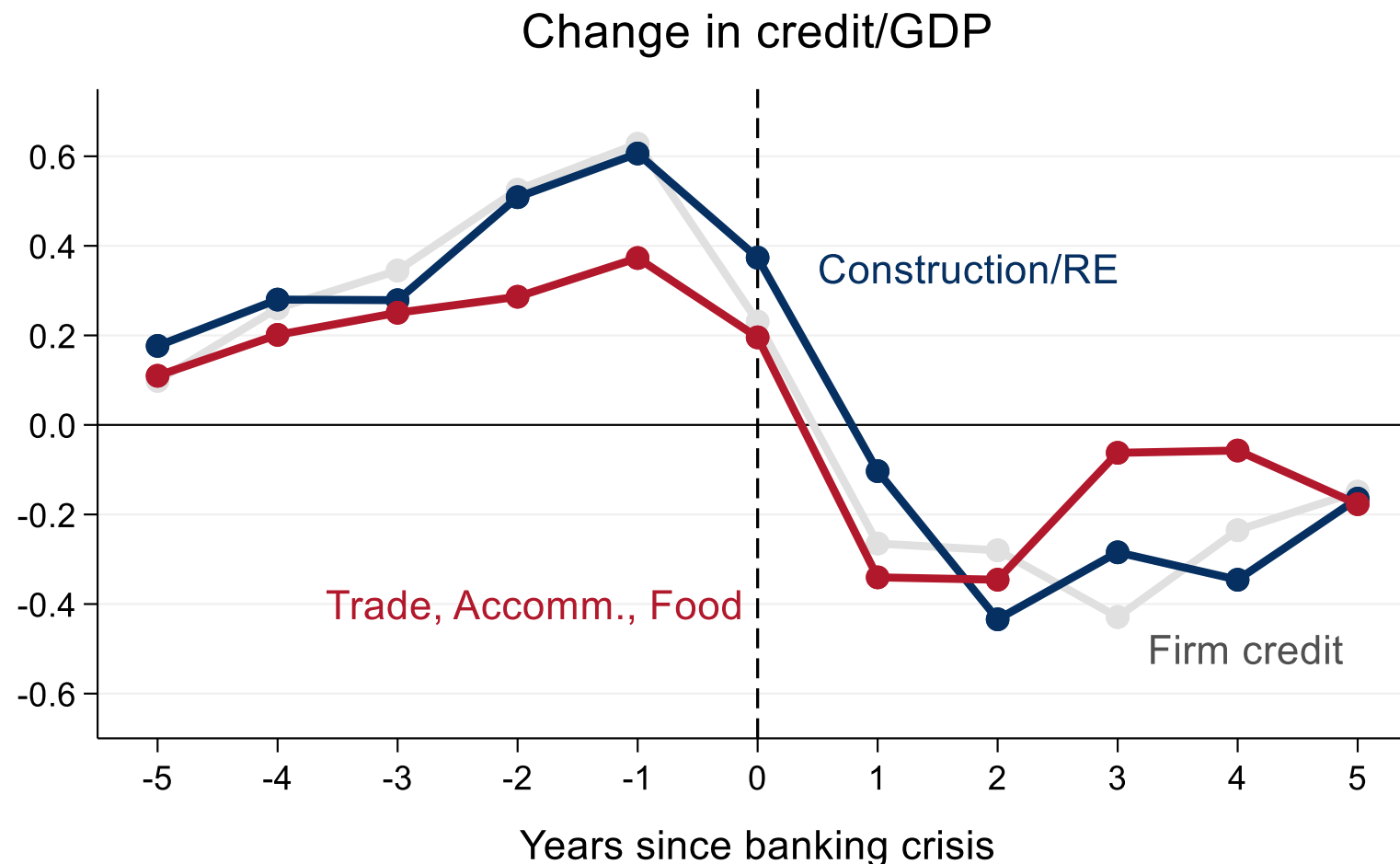
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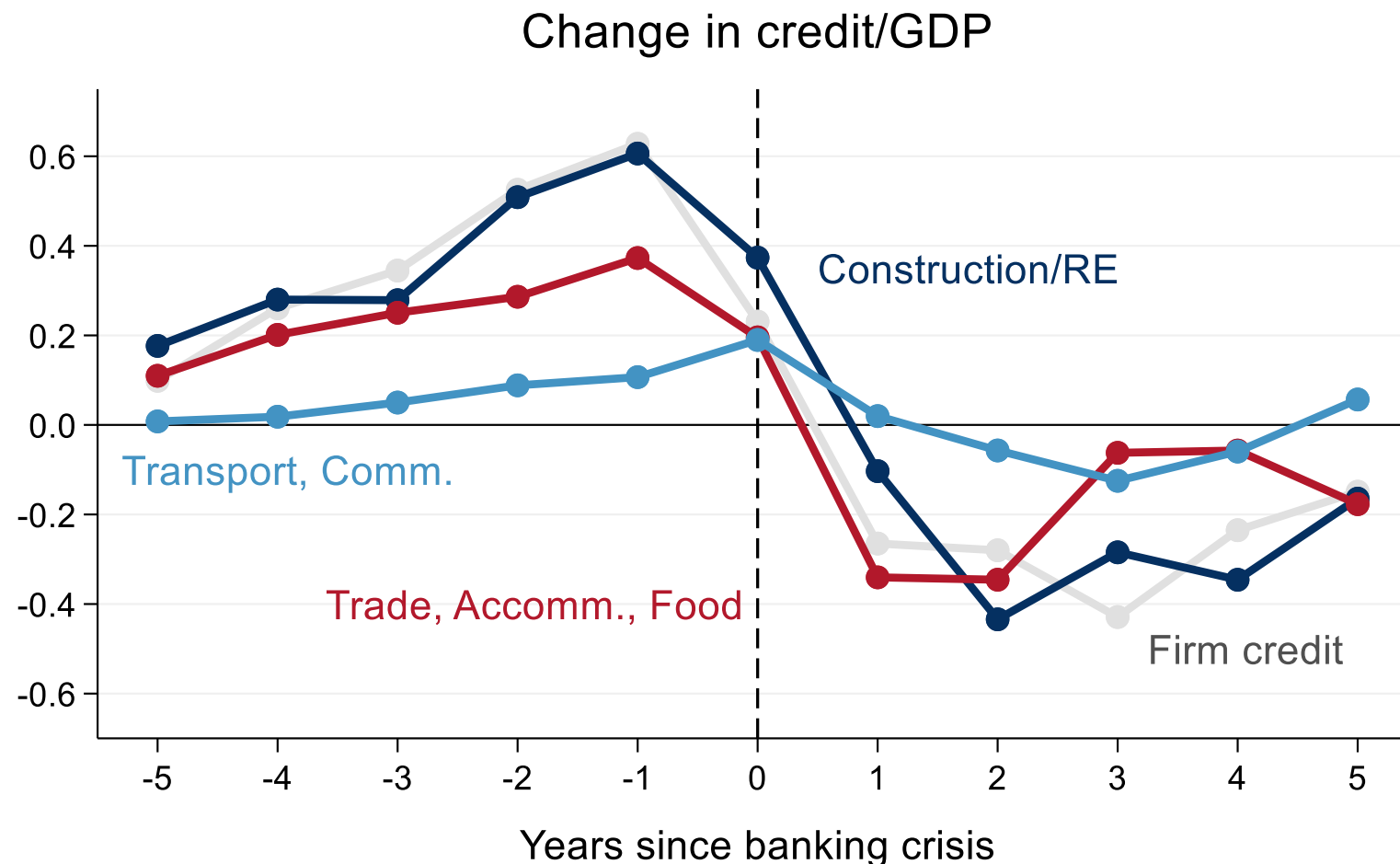
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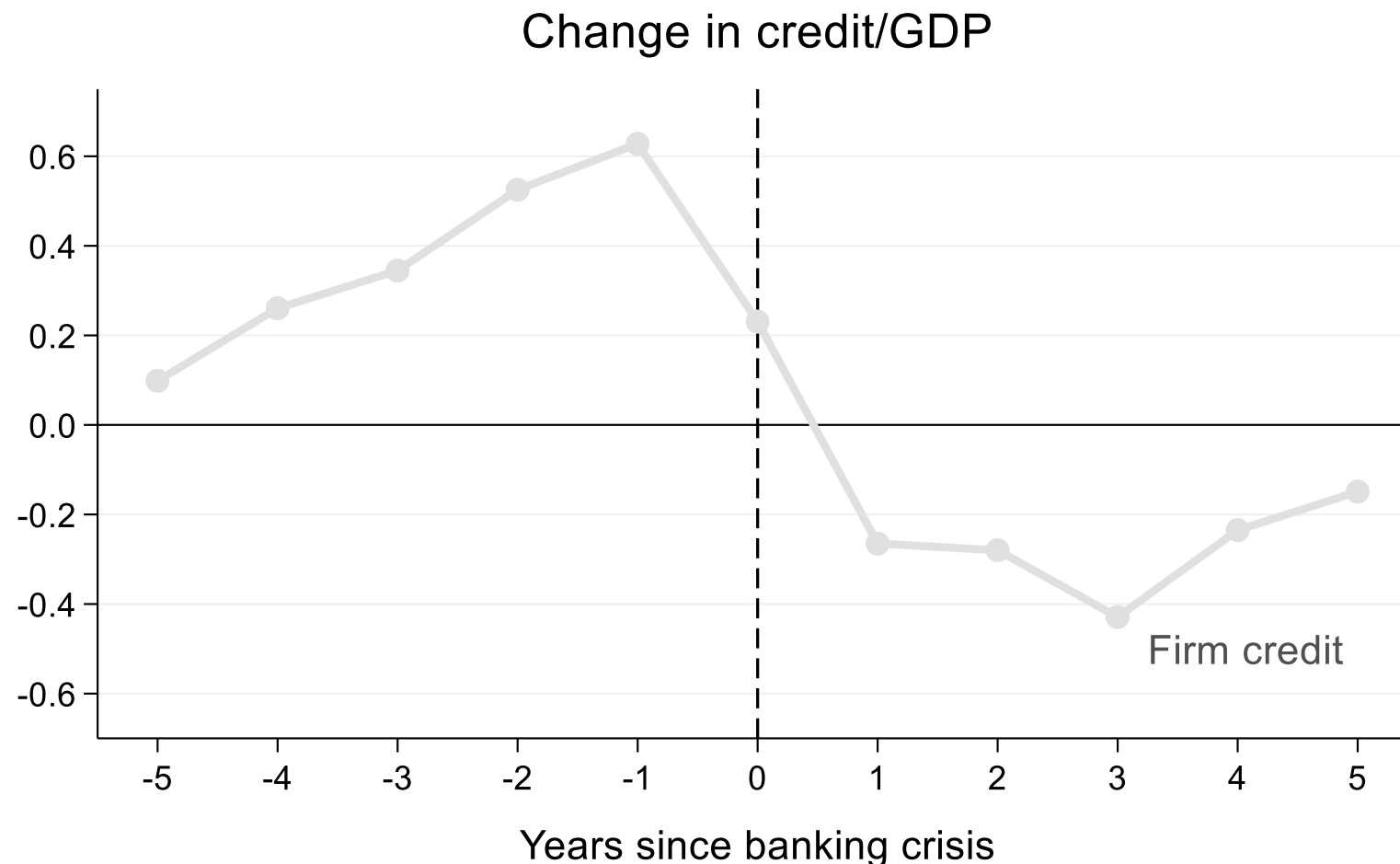
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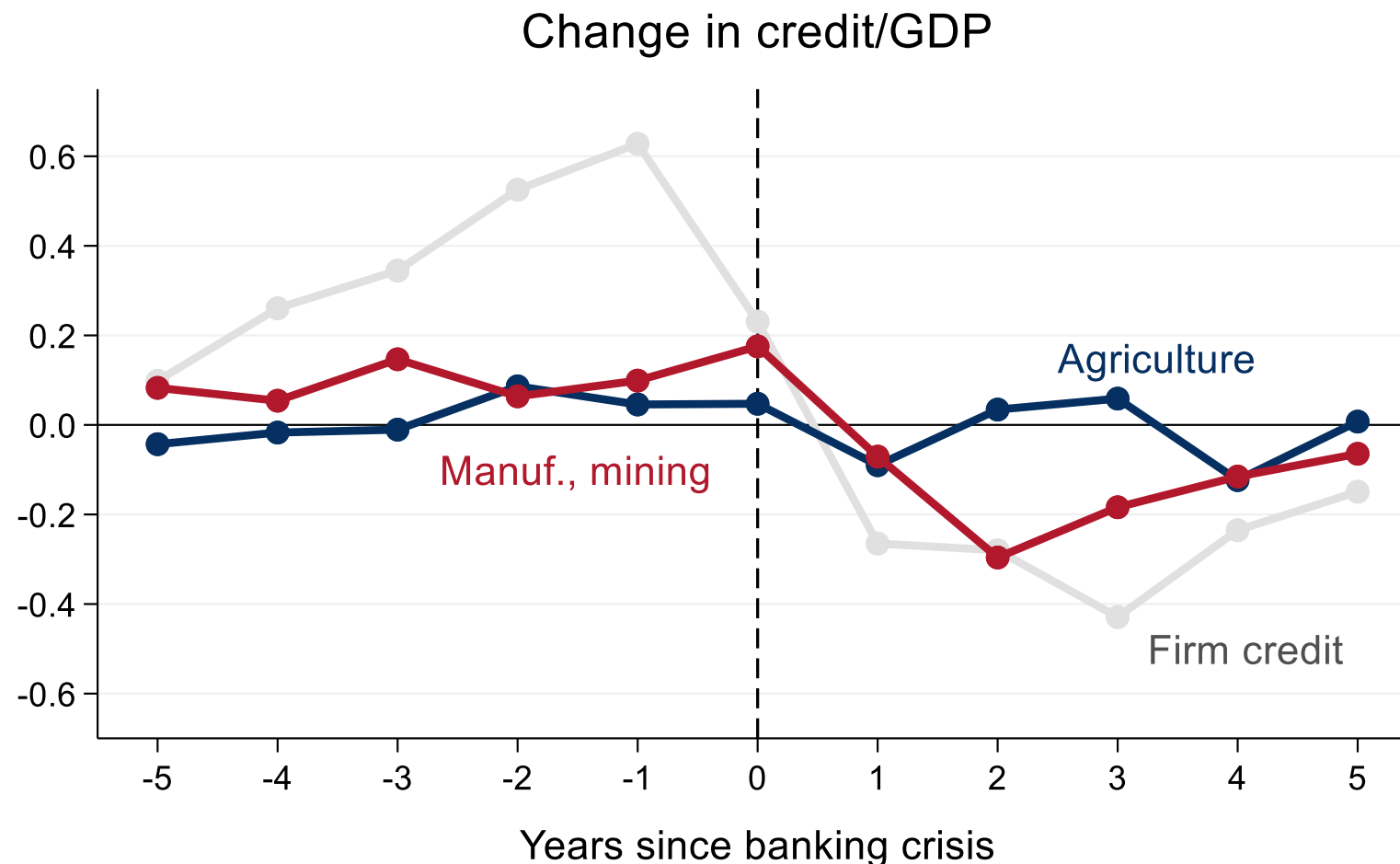
T sector credit growth muted before crises



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T sector credit growth muted before crises



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2. Differences in financial fragility across sectors

$$Crisis_{it \text{ to } it+h} = \alpha_i^h + \beta_h^{NT} \Delta_3 d_{it}^{NT} + \beta_h^T \Delta_3 d_{it}^T + \beta_h^{HH} \Delta_3 d_{it}^{HH} + \epsilon_{it+h}, \quad h = 1, \dots, 4$$

	<i>Dependent variable: Crisis within...</i>			
	1 year	2 years	3 years	4 years
Tradables	-0.006 (0.004)	-0.009 (0.005)	-0.008 (0.005)	-0.005 (0.005)
Non-tradables	0.013** (0.003)	0.017** (0.002)	0.017** (0.003)	0.015** (0.004)
Households	0.006* (0.003)	0.009** (0.003)	0.011** (0.003)	0.013** (0.003)
Observations	1,527	1,531	1,534	1,536
# Countries	70	70	70	70
# Crises	46	45	45	44
AUC	0.74	0.72	0.70	0.68
SE of AUC	0.03	0.03	0.02	0.02

- 1 SD higher non-tradable sector credit → crisis probability 0.063 pp higher (baseline: ≈0.03)

3. Lower productivity growth

$$\Delta_3 \text{Labor Productivity}_{it+h} = \alpha_i + \beta^{NT} \Delta_3 d_{it}^{NT} + \beta^T \Delta_3 d_{it}^T + \beta^{HH} \Delta_3 d_{it}^{HH} + \epsilon_{it}, \quad h = 0, \dots, 5$$

	<i>Dependent variable: Labor productivity growth over...</i>					
$\Delta_3 d_{it}^k$	(1) (t-3,t)	(2) (t-2,t+1)	(3) (t-1,t+2)	(4) (t,t+3)	(5) (t+1,t+4)	(6) (t+2,t+5)
Tradables	0.188 ⁺ (0.094)	0.177* (0.075)	0.216* (0.088)	0.219 ⁺ (0.119)	0.183 (0.148)	0.141 (0.169)
Non-tradables	0.098 (0.141)	-0.049 (0.127)	-0.162 ⁺ (0.090)	-0.146 ⁺ (0.075)	-0.073 (0.057)	0.002 (0.059)
Households	-0.137* (0.064)	-0.158* (0.066)	-0.191** (0.055)	-0.229** (0.061)	-0.291** (0.074)	-0.302** (0.067)
Observations	1,423	1,423	1,423	1,423	1,423	1,423
# Countries	67	67	67	67	67	67
R ²	0.01	0.01	0.02	0.03	0.03	0.03

- 1 SD higher NT credit growth → 0.5% lower productivity growth, similar for estimated TFP growth
- Could reflect misallocation of resources across sectors (e.g. Reis, 2013; Benigno-Fornaro, 2014)

Conclusion

Sectoral allocation of credit matters for understanding macro-financial linkages

- Credit to non-tradable/household sector → lower growth
- Credit to tradable sectors → stable/higher growth
- Channels: (1) credit-driven demand boom and bust; (2) financial fragility; (3) lower productivity

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New perspective on “finance-growth” and “credit booms gone bust” views

- What credit is used for matters for whether booms end badly

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Implications

- Heterogeneity in **firm credit** matters for understanding credit cycles
- Housing and household debt important but not the entire story; other firm sectors also important
- Taken at face value suggests role for stronger sectoral regulations (caveats apply)

Credit Allocation and Macroeconomic Fluctuations

Karsten Müller
NUS Business School

Emil Verner
MIT

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