# Credit Allocation and Macroeconomic Fluctuations

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**ABFER**

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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-Uribe, 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 (2021)** | **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**

# Related literature

**Macro-financial linkages**

<u>Credit and financial crises:</u>

Borio and Lowe (2002); Reinhart and Rogoff (2009); Gourinchas and Obstfeld (2012); Schularick and Taylor (2012); Jordà, Schularick, and Taylor (2016); Baron and Xiong (2017); López-Salido, Stein, Zakrajšek (2017); Krishnamurthy and Muir (2017); Mian, Sufi, and Verner (2017, 2020); Gorton and Ordoñez (2019); Brunnermeier, Palia, Karthik, and Sims (2020); Greenwood, Hanson, Shleifer, and Sørensen (2020); Giroud and Mueller (2020); Diebold and Richter (2021)

<u>Credit and economic growth:</u>

Goldsmith (1969); King and Levine (1993); Rajan and Zingales (1998); Levine, Loyaza, and Beck (2000); Beck et al. (2012); Bezemer, Grydaki, Zhang (2016)

**International macroeconomics**

Mendoza (2002); Schneider and Tornell (2004); Tornell and Westermann (2005); Mendoza and Terrones (2008); Benigno and Fornaro (2014); Schmitt-Grohé and Uribe (2016); Kalantzis (2015)

# A new database on sectoral credit

**> 600 sources, $^1/_3$ 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
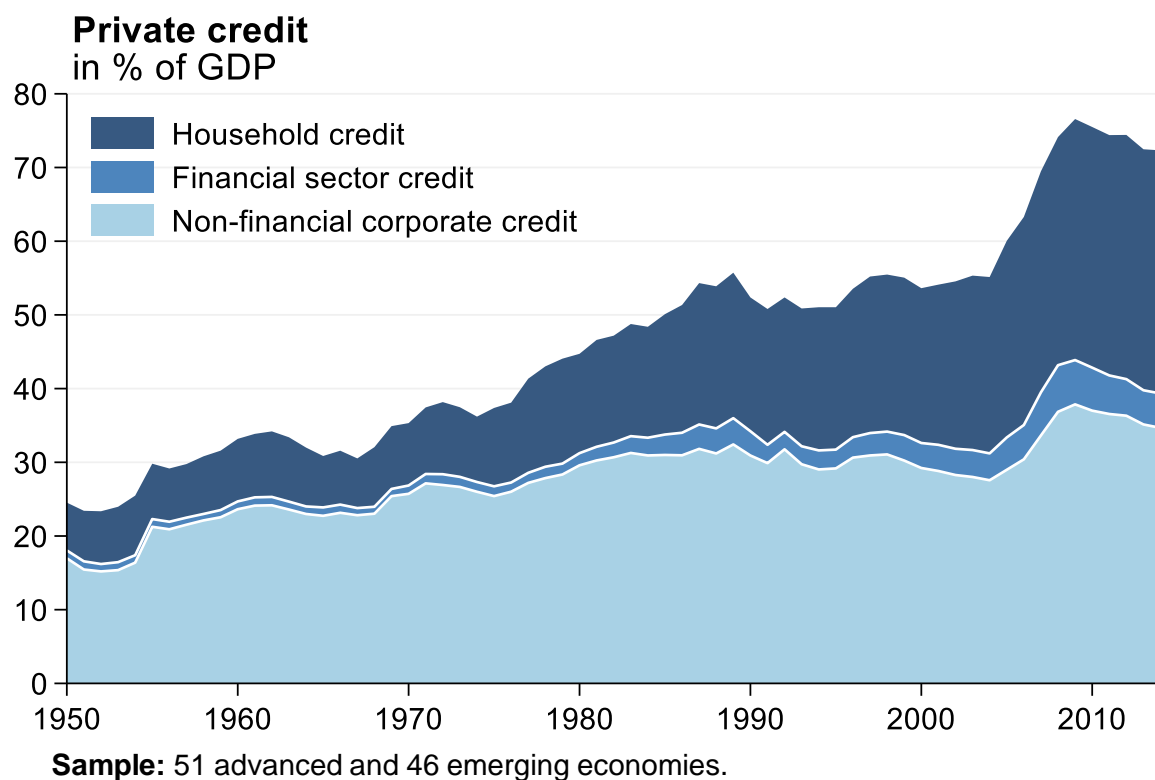Website to explore data
Data and code

# New facts about allocation of credit

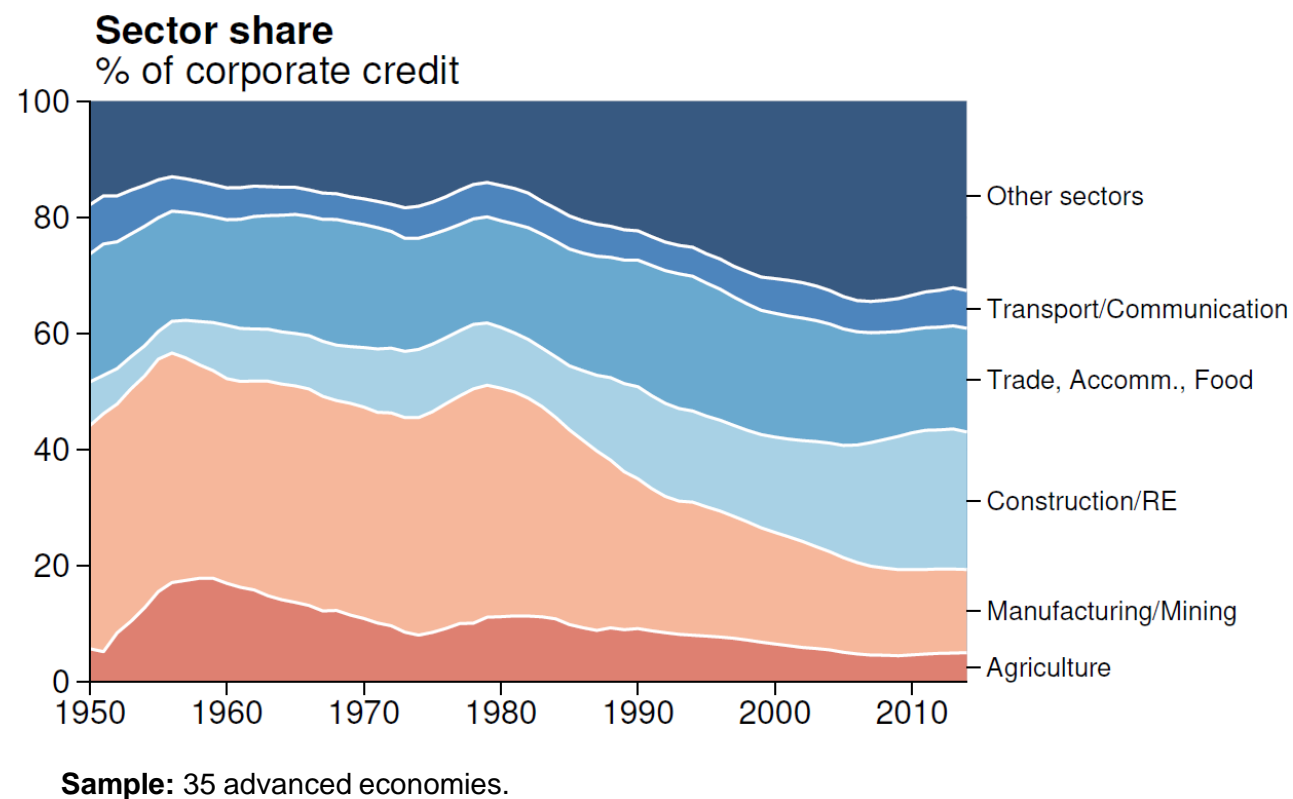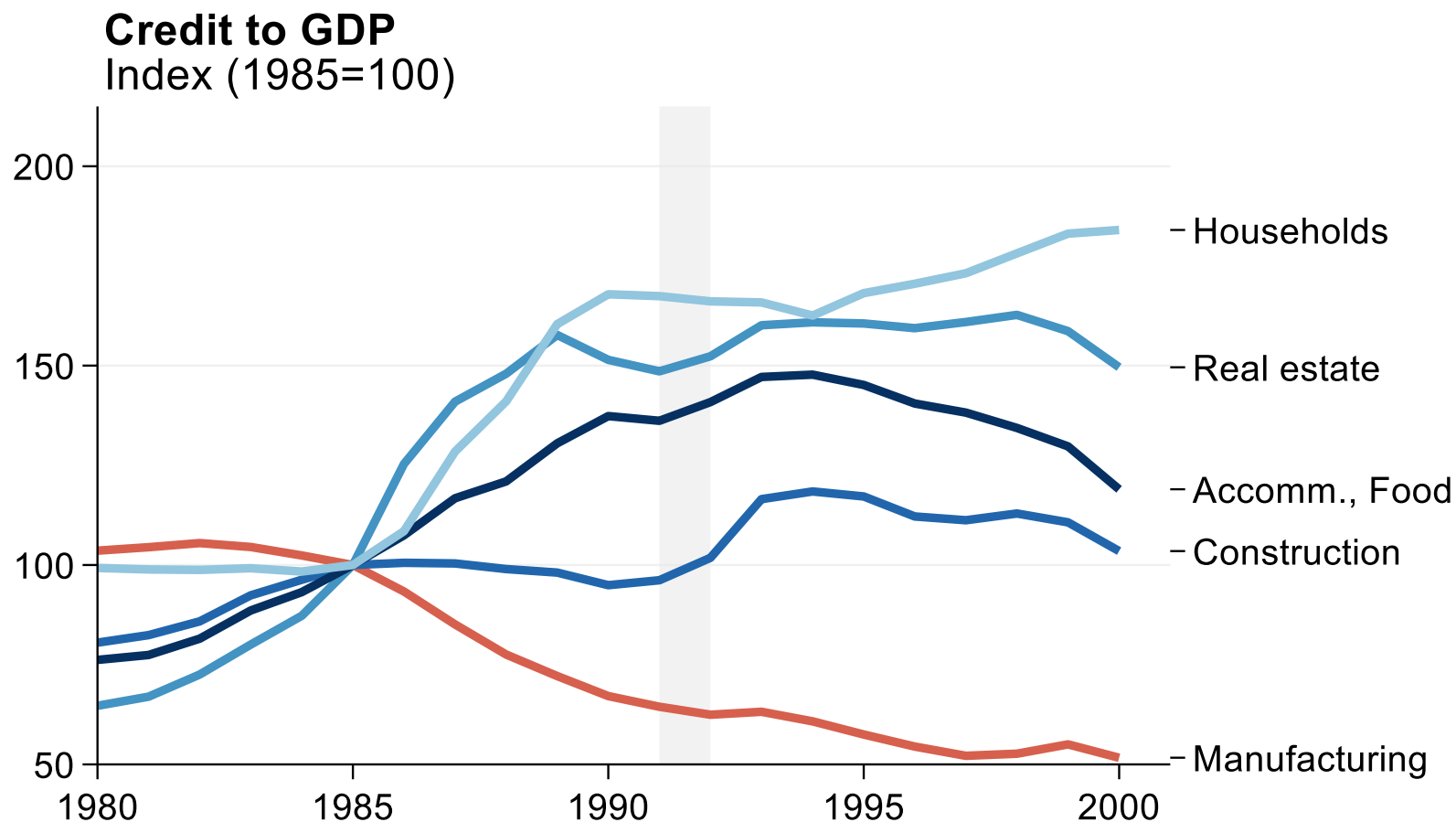**(a) Booming household, stalling firm credit**

**Private credit**
in % of GDP



**Sample:** 51 advanced and 46 emerging economies.

# New facts about allocation of credit

## (a) Booming household, stalling firm credit



**Private credit**
in % of GDP

- Household credit
- Financial sector credit
- Non-financial corporate credit

**Sample:** 51 advanced and 46 emerging economies.

## (b) Structural change in corporate credit



**Sector share**
% of corporate credit

- Other sectors
- Transport/Communication
- Trade, Accomm., Food
- Construction/RE
- Manufacturing/Mining
- Agriculture

**Sample:** 35 advanced economies.

# The 1980s credit boom in Japan



**Credit to GDP**
Index (1985=100)

- Households
- Real estate
- Accomm., Food
- Construction
- Manufacturing

**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 |
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| **1) Sensitivity to demand:** | | |
| Proximity to final demand | 0.15 | 0.36 |
| Exports/value added | 0.78 | 0.11 |

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| 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:**

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

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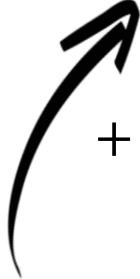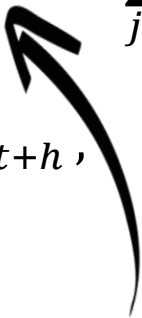
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$\boldsymbol{y}$ = Log(real GDP)

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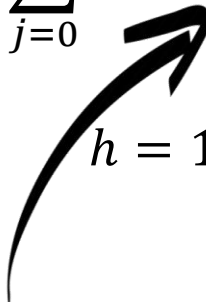
Country fixed effects

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

# Empirical framework

**Impulse responses from Jordà (2005) local projections:**

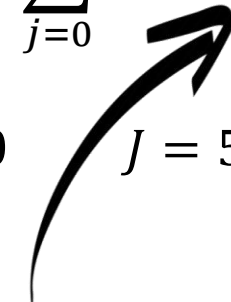$$\Delta_h y_{it+h} = \alpha_i^h + \sum_{j=0}^{J} \boldsymbol{\beta_{h,j}^{NT}} \Delta d_{it-j}^{NT} + \sum_{j=0}^{J} \boldsymbol{\beta_{h,j}^{T}} \Delta d_{it-j}^{T} + \sum_{j=0}^{J} \boldsymbol{\beta_{h,j}^{HH}} \Delta d_{it-j}^{HH}$$

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$\boldsymbol{d^T}$ = Credit to the tradable sector / GDP

# Empirical framework

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$\boldsymbol{d^{HH}}$ = Credit to households / GDP

# Empirical framework

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Prediction horizon: 10 years

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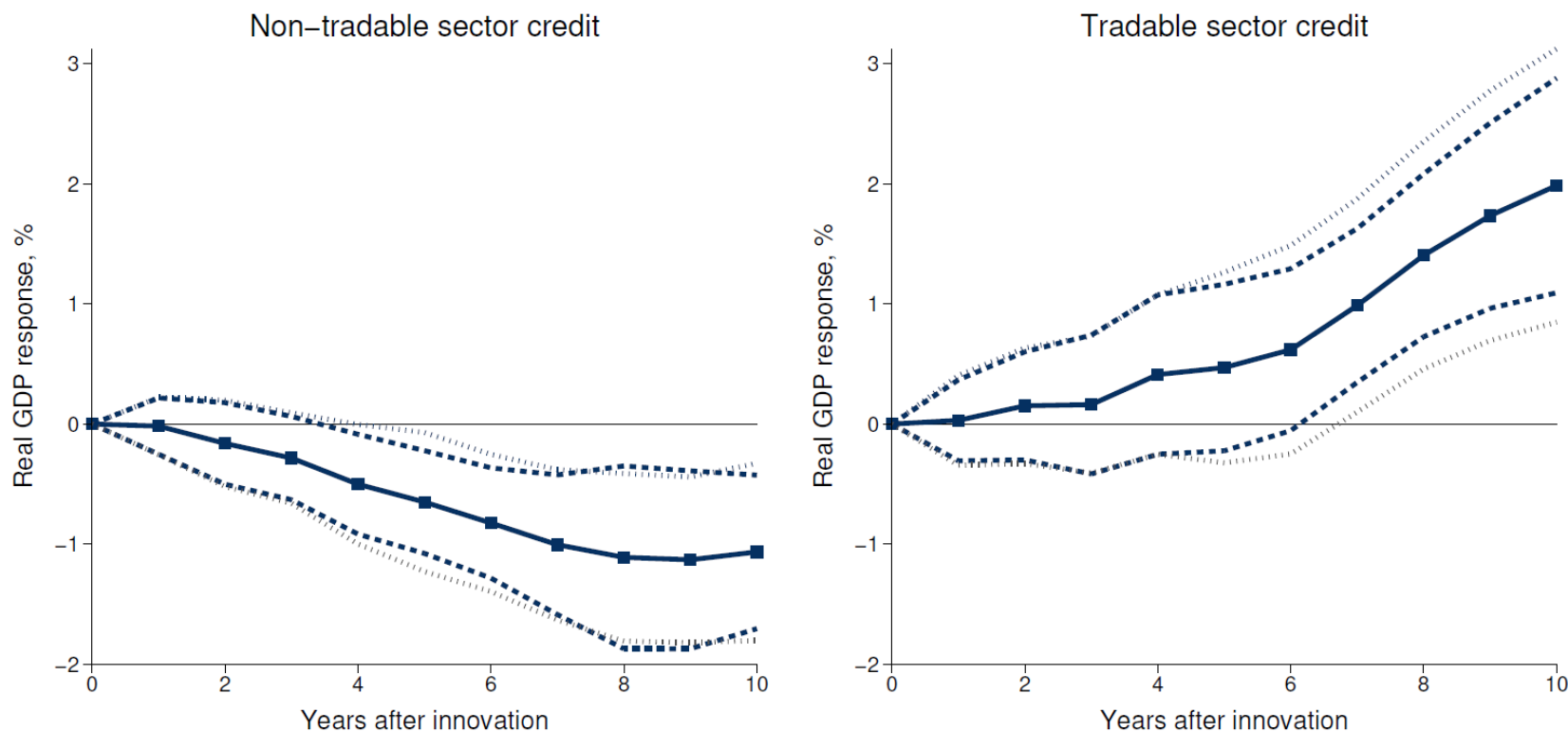$$+ \sum_{j=0}^{J} \gamma_{h,j} \Delta y_{it-j} + \epsilon_{it+h}, \qquad h = 1, \dots, 10 \qquad J = 5$$

Lag length: 5 years

# Empirical framework

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

**Note on interpretation:** Impulse responses ≠ causal effects

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

# Real GDP and T vs. NT sector firm credit expansions

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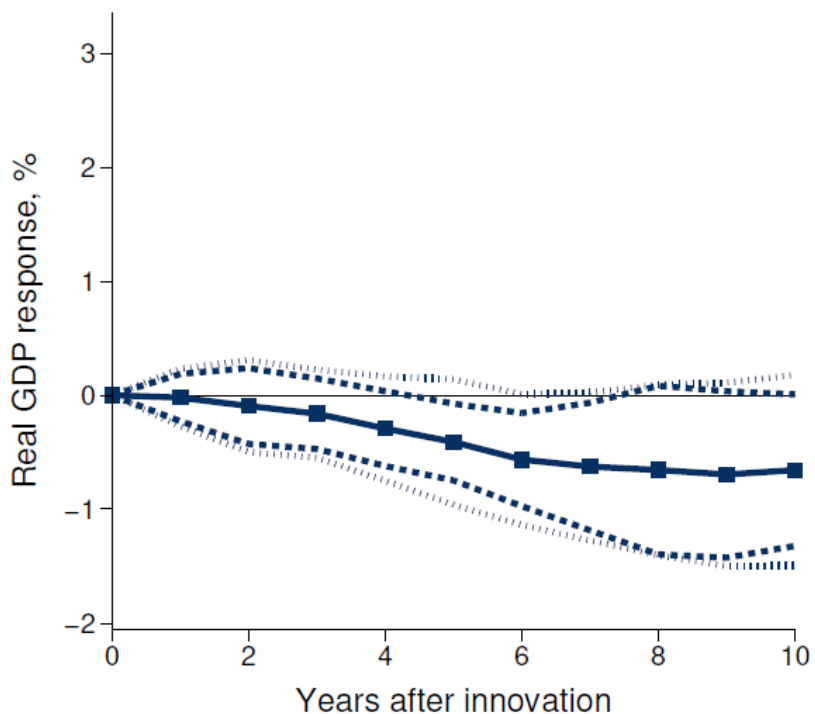


**In the paper, we show these patterns are robust and hold when controlling for output shares**
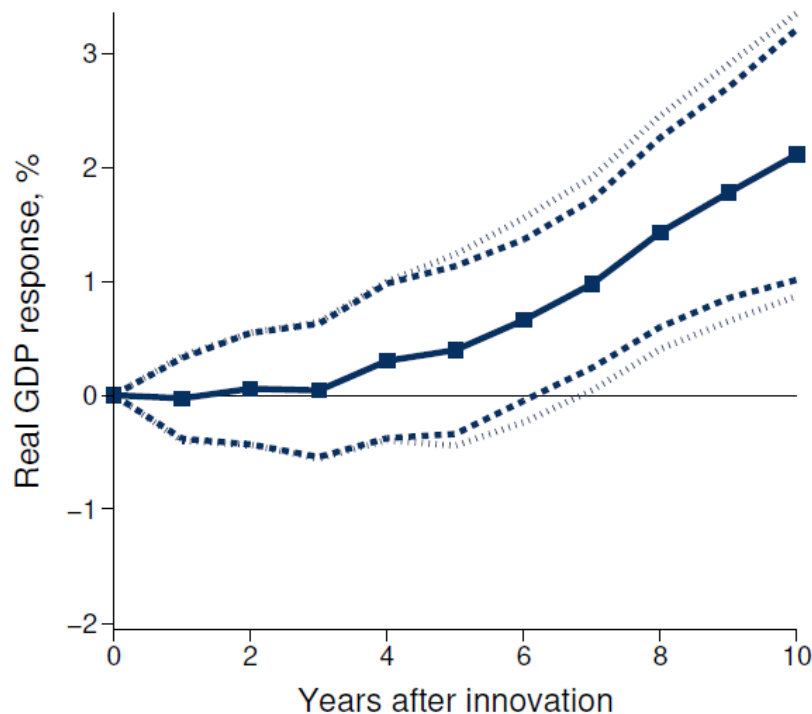
# Similar when controlling for household debt expansion

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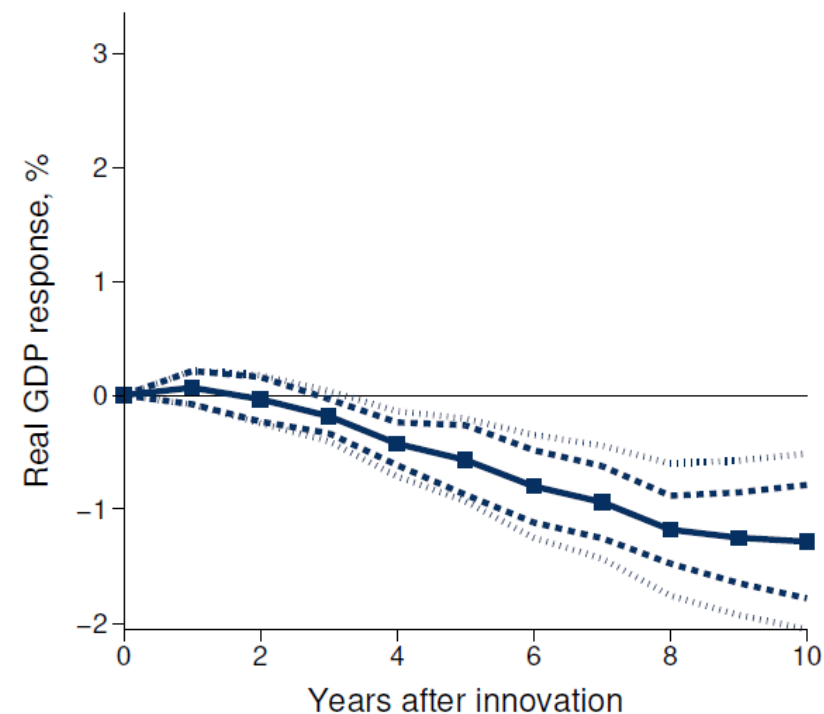


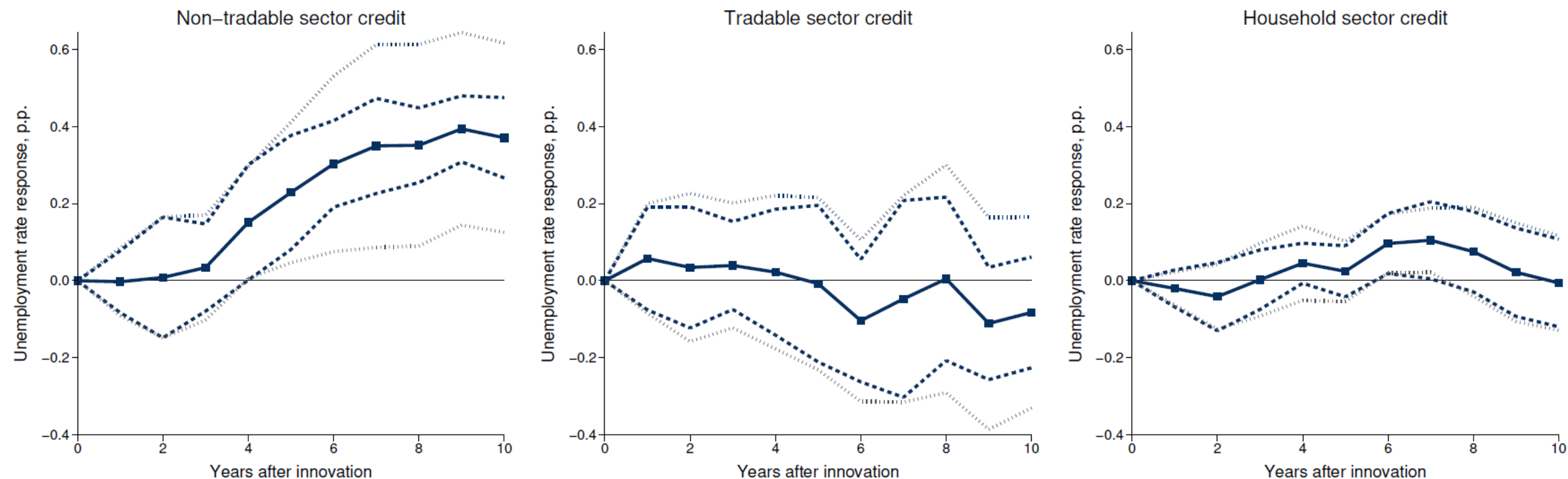Non-tradable sector credit      Tradable sector credit      Household sector credit

# Unemployment spikes following NT credit expansions

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

# 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-Uribe, 2016)**

   → NT/HH credit predict reallocation toward NT sector, real exchange rate appreciation (see paper)

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

   → NT/HH credit predict financial crises, sectoral losses (focus today)

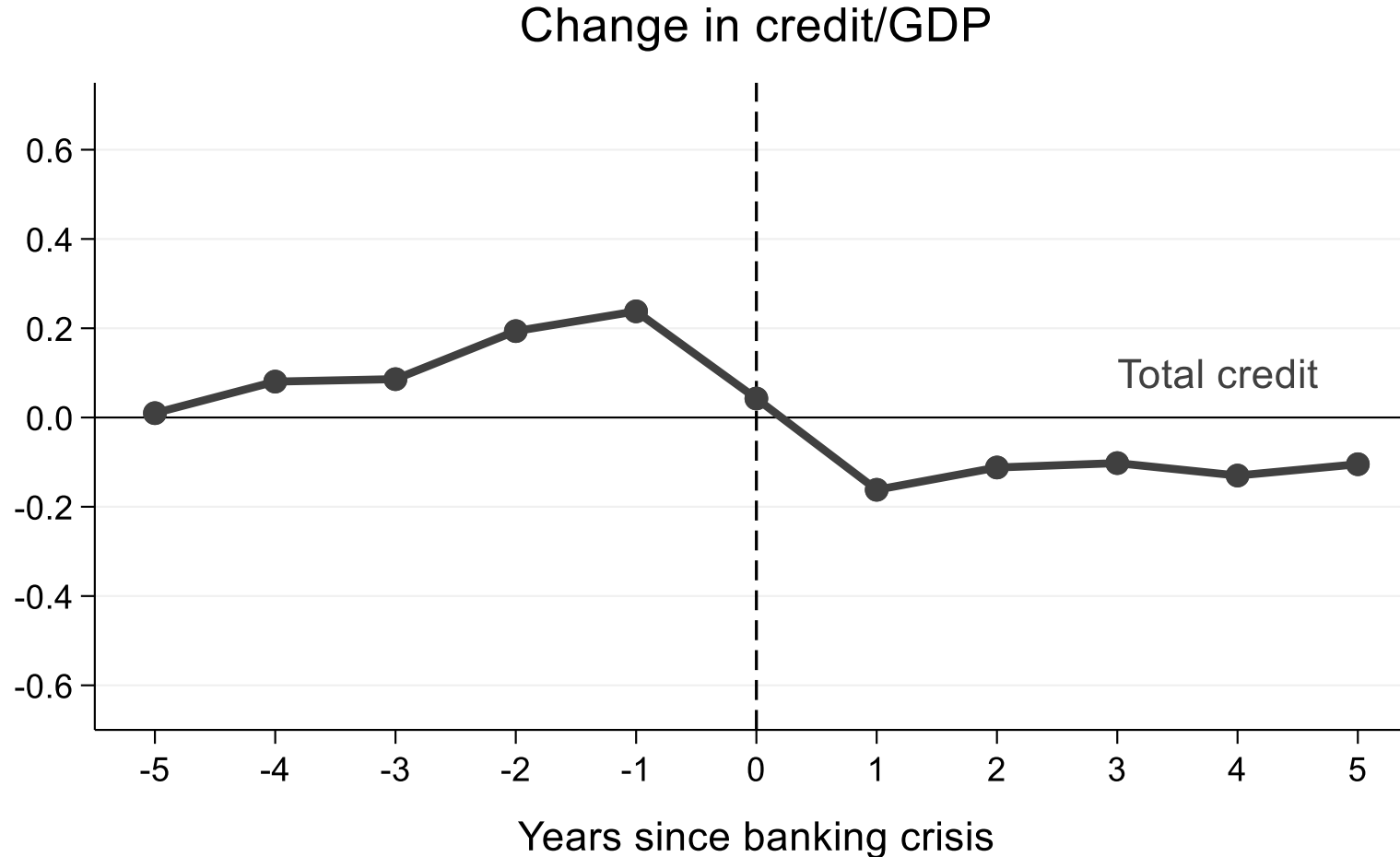3. **Lower productivity growth through misallocation across sectors (e.g. Reis, 2013)**

   → NT/HH credit predict sluggish productivity growth

   → T credit predicts higher productivity growth (see paper)
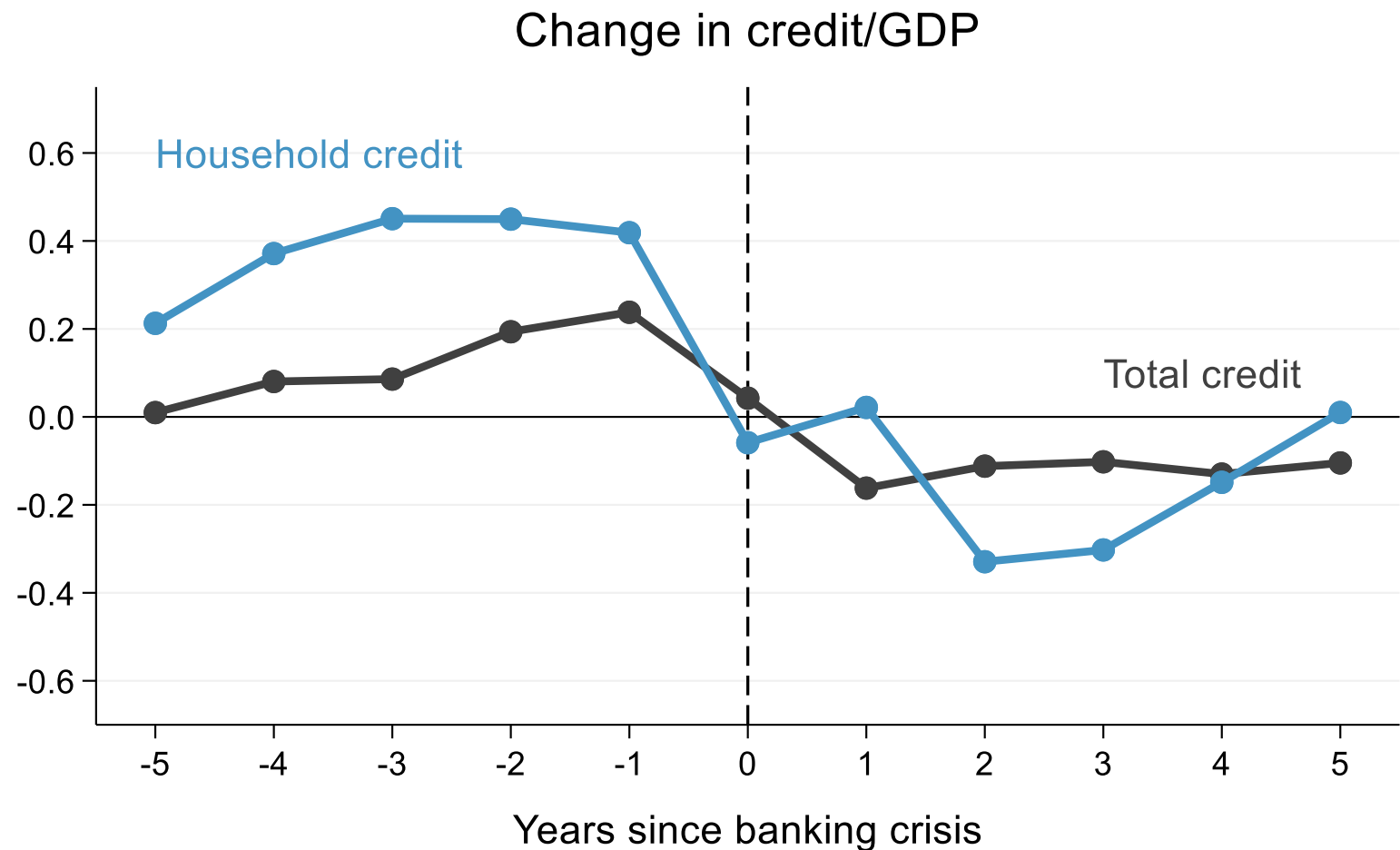
# Differences in financial fragility across sectors

**Established finding: total credit/GDP expands before crises**



Change in credit/GDP

Total credit

Years since banking crisis

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

# Differences in financial fragility across sectors

**Household debt expands earlier than firm debt**



Change in credit/GDP

Household credit

Total credit

Years since banking crisis

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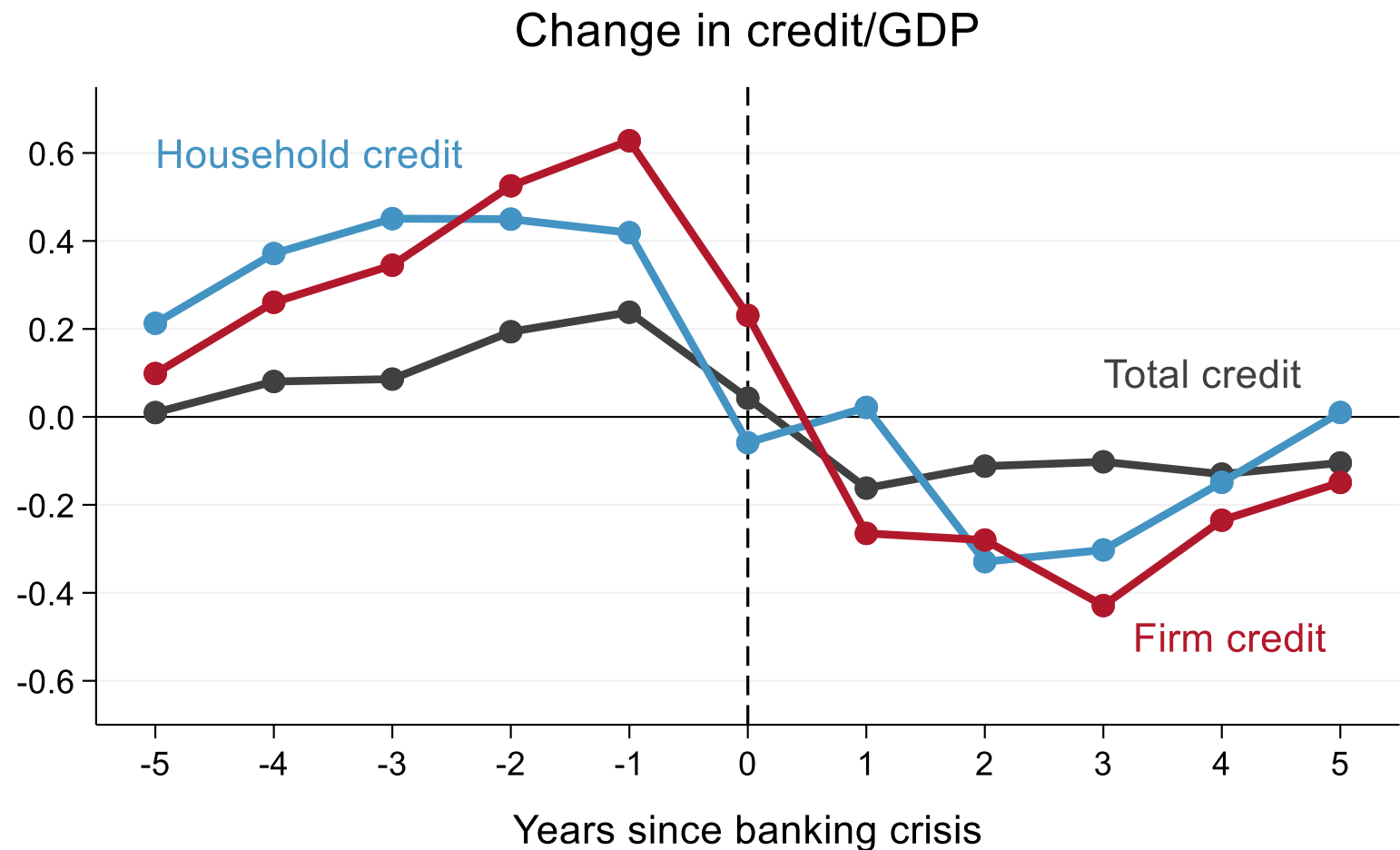
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# Differences in financial fragility across sectors

**Firm credit expansions mainly driven by NT sector**

### Change in credit/GDP



Firm credit

Years since banking crisis

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# Differences in financial fragility across sectors

**Firm credit expansions mainly driven by NT sector**



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# Differences in financial fragility across sectors

**NT sector expansions not only driven by housing**
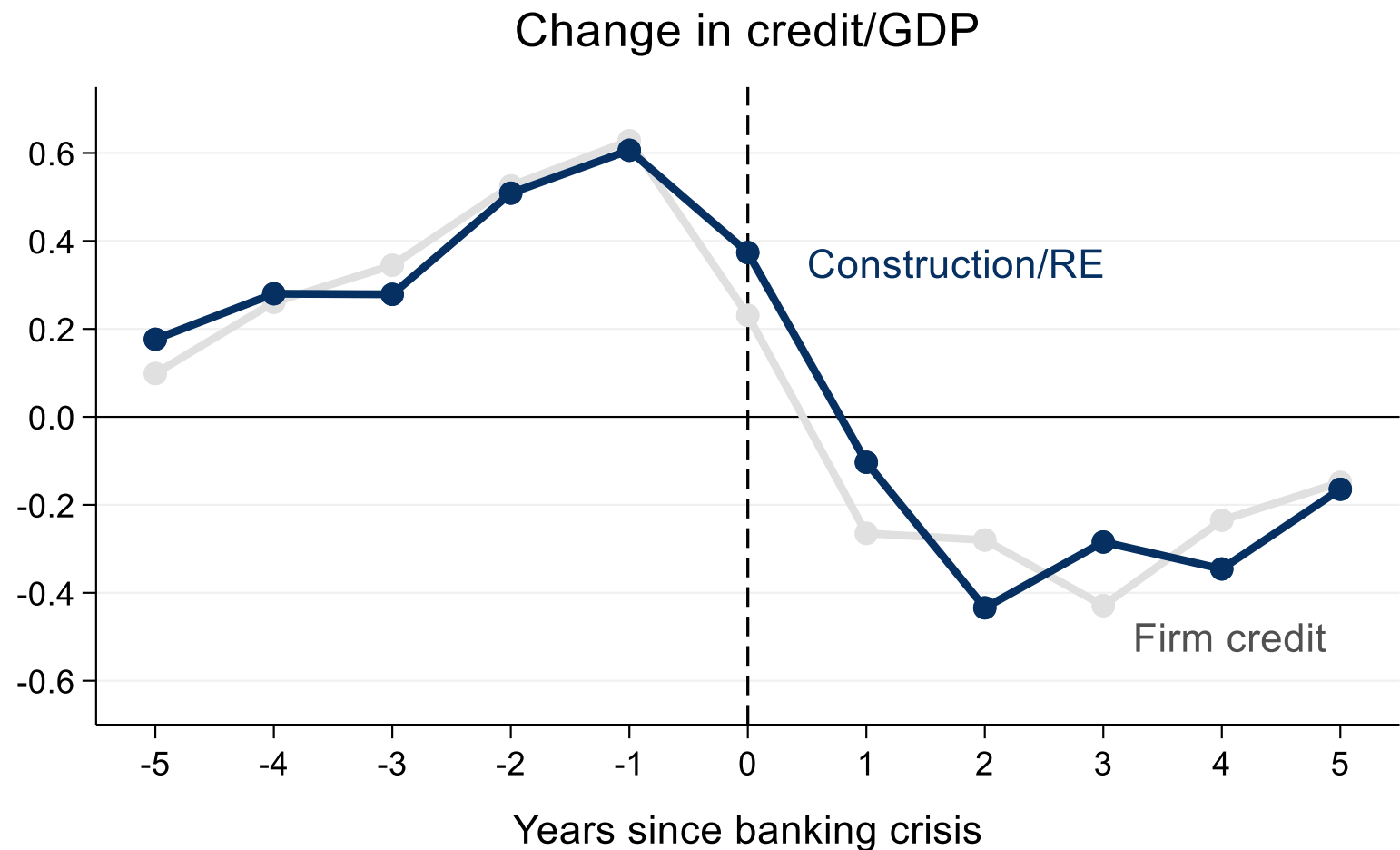


Change in credit/GDP

Construction/RE

Firm credit

Years since banking crisis

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# Differences in financial fragility across sectors

**NT sector expansions not only driven by housing**



Change in credit/GDP

Construction/RE

Transport, Comm.

Trade, Accomm., Food

Firm credit

Years since banking crisis

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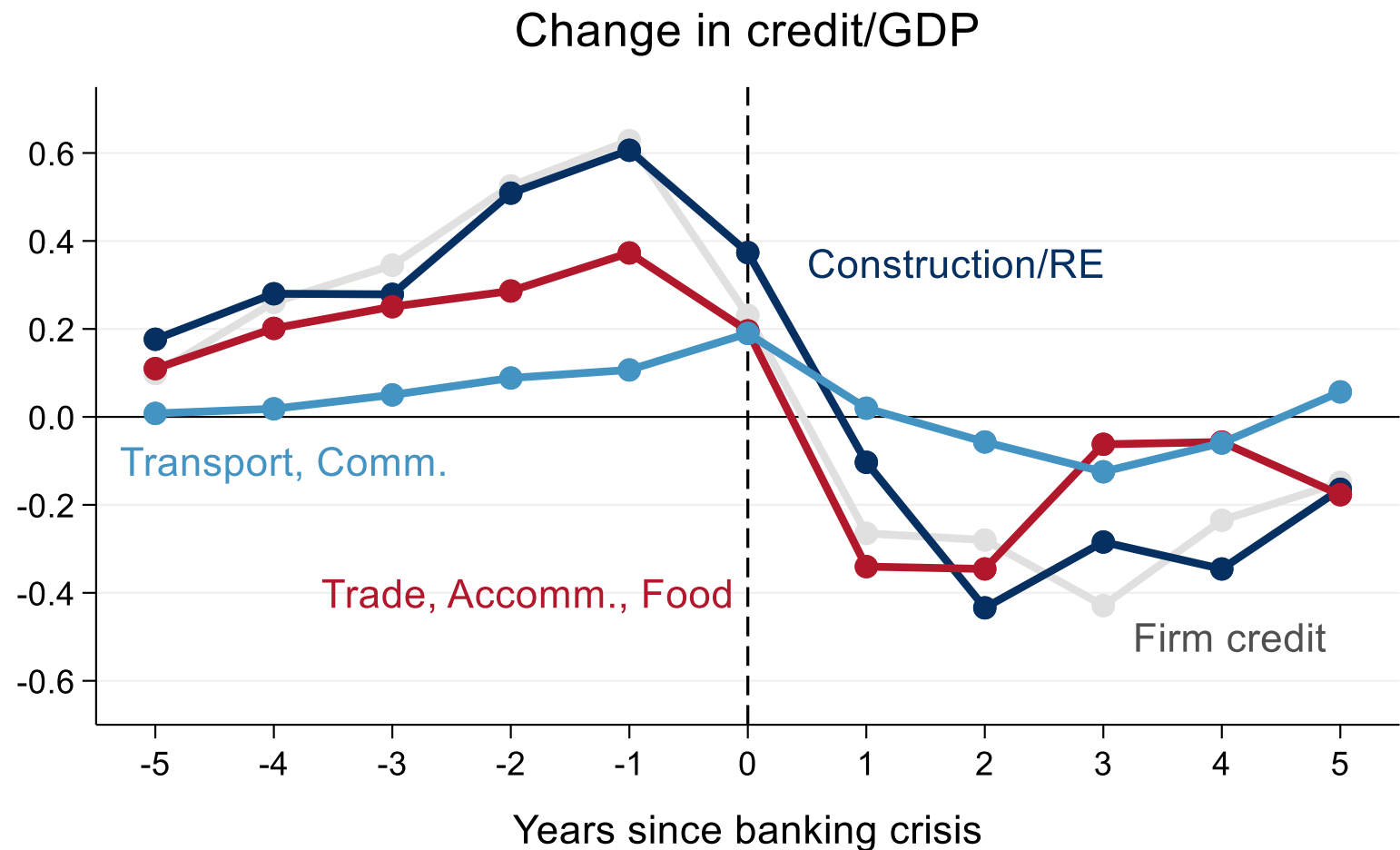
# Differences in financial fragility across sectors

**T sector credit growth muted before crises**



Change in credit/GDP

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# Differences in financial fragility across sectors

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

|  | Dependent variable: Crisis within... | | | |
|  | 1 year | 2 years | 3 years | 4 years |
| --- | --- | --- | --- | --- |
| Tradables | -0.006 | -0.009 | -0.008 | -0.005 |
|  | (0.004) | (0.005) | (0.005) | (0.005) |
| Non-tradables | 0.013** | 0.017** | 0.017** | 0.015** |
|  | (0.003) | (0.002) | (0.003) | (0.004) |
| Households | 0.006* | 0.009** | 0.011** | 0.013** |
|  | (0.003) | (0.003) | (0.003) | (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)

# Differences in financial fragility across sectors
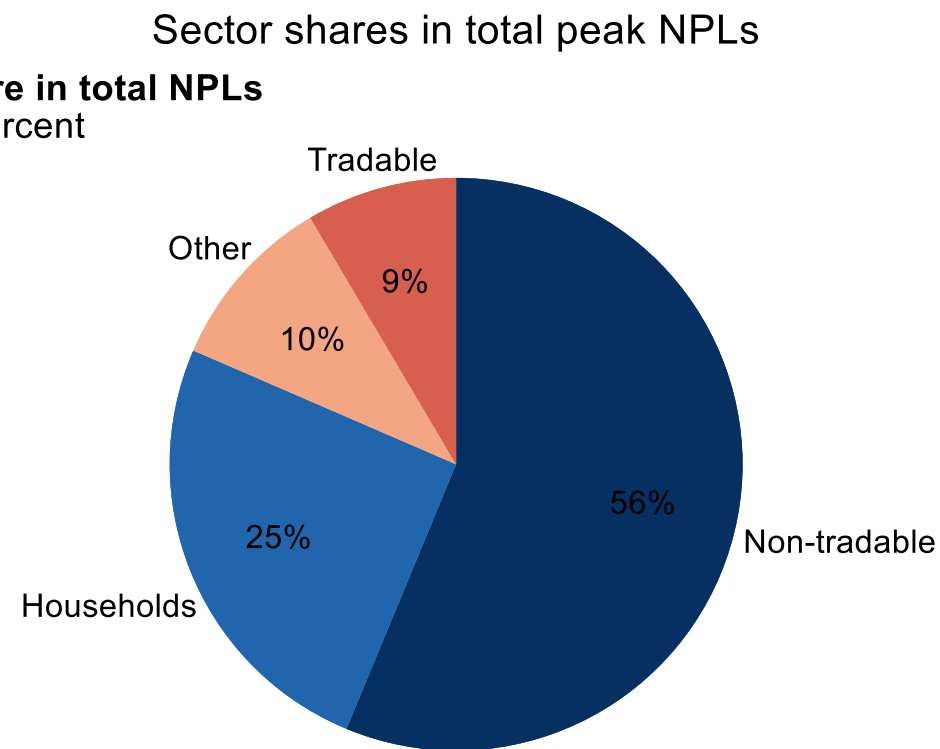
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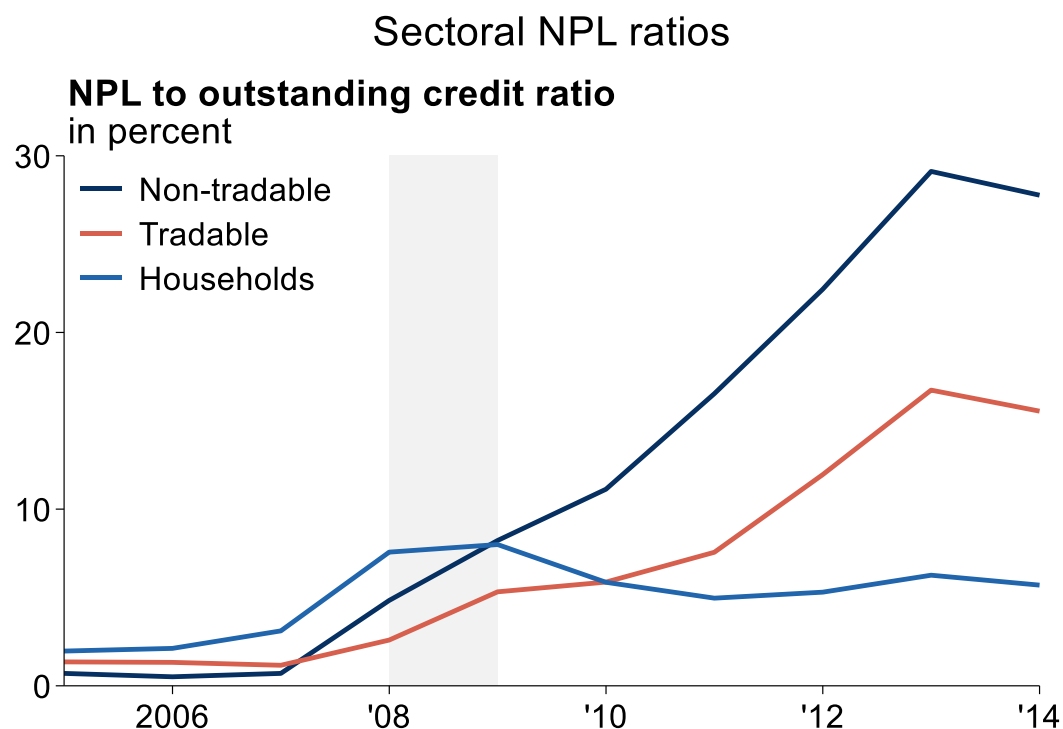
# Differences in financial fragility across sectors

**Sectoral losses in the Spanish 2008 banking crisis (similar for 9 other crises we have data for)**

Sectoral NPL ratios

**NPL to outstanding credit ratio**
in percent



Sector shares in total peak NPLs

**Share in total NPLs**
in percent



- Consistent with higher financial fragility of NT firms and households (e.g. Schneider-Tornell, 2004)

- Suggests sectoral losses are important for understanding systemic banking distress

# 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

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# Conclusion

**Sectoral allocation of credit** matters for understanding macro-financial linkages

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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 sectoral regulations (caveats apply)

# Credit Allocation and Macroeconomic Fluctuations

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