Does Mortgage Credit Crowd Out Productive Investment?

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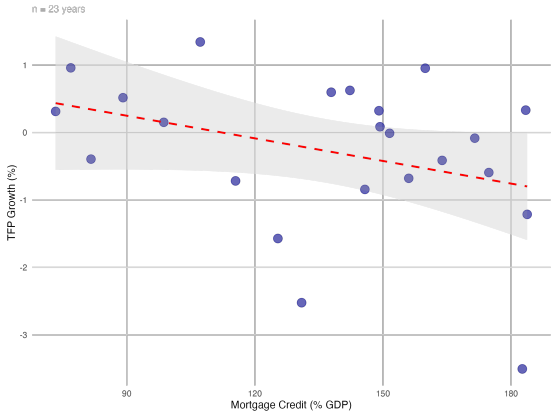
"The share of mortgages on banks' balance sheets **doubled** *over the twentieth century — from 30% to 60%."*

— Jordà, Schularick & Taylor (2016)

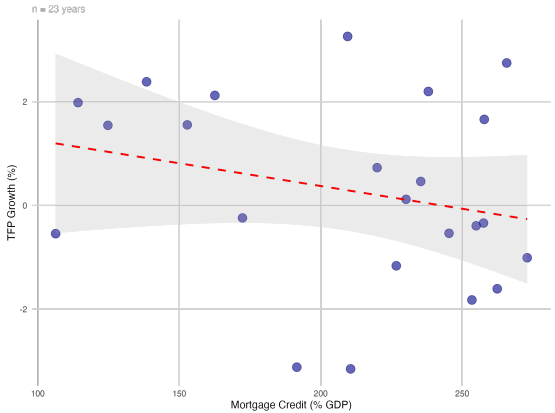
If banks are lending more for **houses**,
are they lending less for **firms**?

Motivating Evidence: Mortgage Credit and Productivity

France: Mortgage Credit % GDP vs. TFP Growth



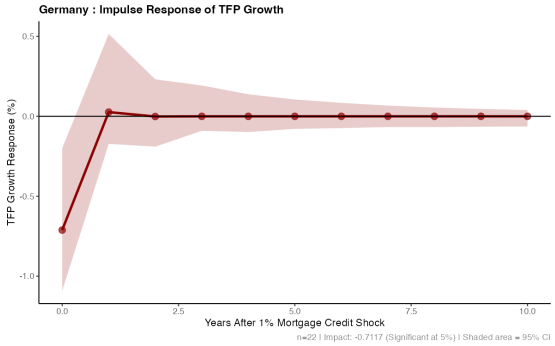
Sweden: Mortgage Credit % GDP vs. TFP Growth



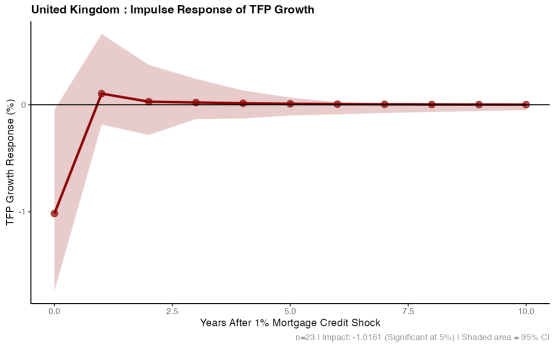
Negative relationship in the majority of 13 OECD countries.

Motivating Evidence: Granger-Causal Impulse Responses

Germany



United Kingdom



Response of TFP growth to a 1% mortgage credit shock.
Negative on impact in 10 out of 13 countries

Existing Literature

Chakraborty, Goldstein & MacKinlay (2018, RFS):

- Banks in strong housing markets increase mortgage lending and **decrease commercial lending**
- Firms borrowing from affected banks invest **10.3 pp less**

Supporting evidence:

- Mian, Sufi & Verner (2020): Credit expansion fuels household demand, **not productive capacity**
- Borio et al. (2015): Credit booms shift labour to **low-productivity sectors**
- Gopinath et al. (2017): Capital flows to high-collateral firms, **not high-productivity** firms

But no structural model explains the mechanism in general equilibrium.

The Gap in the Literature

What exists:

- Iacoviello (2005): Housing + collateral DSGE
  → No bank portfolio allocation
- Gerali et al. (2010): Banking sector DSGE
  → No crowding-out analysis
- Chakraborty et al. (2018): Micro evidence
  → No structural GE model

What's missing:

- A structural model that **endogenously generates** crowding out through bank balance sheets
- **Quantification** of the aggregate investment loss
- **Policy evaluation**: Which macroprudential tool best addresses it?

This Paper

Contribution: A DSGE model with an endogenous bank portfolio allocation mechanism that generates crowding out of business investment during housing booms.

Key ingredients:

1. Patient households (savers) and impatient households (mortgage borrowers)
2. Entrepreneurs who borrow to finance productive investment
3. A **banking sector** with scarce equity that must allocate between mortgage and business lending
4. When mortgage lending expands $\rightarrow$ bank capital stretched $\rightarrow$ business loan rate rises $\rightarrow$ investment falls

Building on: Iacoviello (2005) for household/collateral structure; Gerali et al. (2010) for the banking sector

Model Overview

Patient Households (Savers)

$$\max \sum \beta_P^t \left[\ln c_P + j \ln h_P - \frac{\psi \, n_P^{1+\eta}}{1+\eta} \right]$$

$$c_P + q \, \Delta h_P + d_t = w \, n_P + R \, d_{t-1}$$

Save via bank deposits

Impatient Households (Borrowers)

$$\max \sum \beta_I^t \left[\ln c_I + j \ln h_I - \frac{\psi \, n_I^{1+\eta}}{1+\eta} \right]$$

$$c_I + q \, \Delta h_I + R_m l_{M,t-1} = w \, n_I + l_M$$

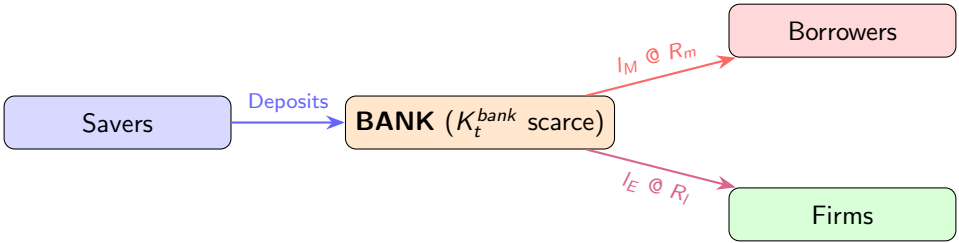
s.t. $l_M \leq m^H \, q \, h_I$

Entrepreneurs (Firms)

$$Y = A \, K_{t-1}^{\alpha} \, N^{1-\alpha}$$

$$Y + l_E = w \, N + I + R_l \, l_{E,t-1}$$

s.t. $l_E \leq m^E \, q_K \, K$



The Bank's Problem

The bank maximises profits subject to a **capital adequacy cost**:

$$\max_{\{l_{M,t},\, l_{E,t}\}} \left(R_{m,t} - R_t\right) l_{M,t} + \left(R_{l,t} - R_t\right) l_{E,t} - \frac{\kappa_{Kb}}{2} \left(\frac{K_t^{bank}}{RWA_t} - \bar{\nu} \right)^2$$

where risk-weighted assets are:

$$RWA_t = \omega^M \cdot l_{M,t} + \omega^E \cdot l_{E,t}$$

Key features:

- Quadratic penalty when capital ratio K^{bank}/RWA deviates from target $\bar{\nu}$
- Risk weights: $\omega^M < \omega^E$ (mortgages cheaper in capital terms, as in Basel)
- κ_{Kb} controls the strength of the crowding-out channel

The Key Equations: Bank FOCs

First-order conditions yield the loan rate equations:

Mortgage Rate

$$R_{m,t} = R_t + \kappa_{Kb}\,\omega^M \cdot \frac{K_t^{bank}}{(RWA_t)^2} \cdot \left(\bar{\nu} - \frac{K_t^{bank}}{RWA_t}\right)$$

Business Loan Rate

$$R_{l,t} = R_t + \kappa_{Kb}\,\omega^E \cdot \frac{K_t^{bank}}{(RWA_t)^2} \cdot \left(\bar{\nu} - \frac{K_t^{bank}}{RWA_t}\right)$$

Both rates depend on the same capital ratio K_t^{bank}/RWA_t, which includes **both** loan types. More mortgage lending $\rightarrow$ higher $RWA \rightarrow R_l$ rises.

The Crowding-Out Mechanism in Four Steps

Step 1: Housing boom or lending standards loosen ($j \uparrow$ or $m^H \uparrow$) $\rightarrow$ Mortgage demand rises

$\downarrow$

Step 2: Mortgage demand $I_M \uparrow$ $\rightarrow$ Risk-weighted assets $RWA \uparrow$

$\downarrow$

Step 3: Bank capital ratio K^{bank}/RWA falls below target $\bar{\nu}$ $\rightarrow$ $R_m \uparrow$ and $R_l \uparrow$

$\downarrow$

Step 4: Higher R_l $\rightarrow$ Firms invest less $\rightarrow$ $I \downarrow$, $K \downarrow$, $Y \downarrow$

When $\kappa_{Kb} = 0$: no bank friction, no crowding out.
When $\kappa_{Kb} > 0$: mortgage expansion raises business borrowing costs.

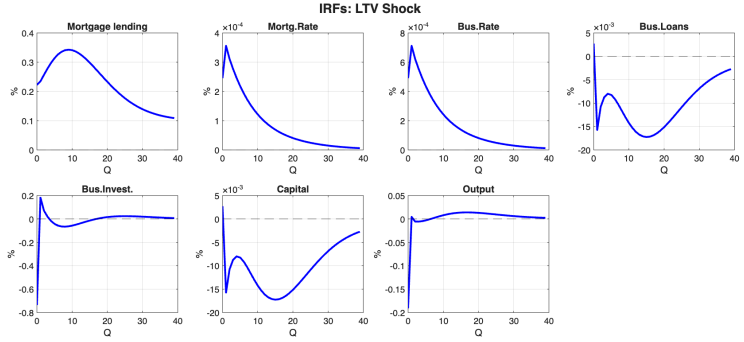
Calibration

Parameter	Symbol	Value
Patient discount	β_P	0.99
Impatient discount	β_I	0.95
Entrepreneur discount	β_E	0.97
Capital share	α	0.33
Capital depreciation	δ_K	0.025
Housing depreciation	δ_H	0.01
Mortgage LTV	m^H	0.75
Business LTV	m^E	0.60

Parameter	Symbol	Value
Mortgage risk weight	ω^M	0.04
Business risk weight	ω^E	0.08
Capital adj. cost	κ_{Kb}	**10.0**
Bank dividend rate	δ_{Kb}	0.05
Capital ratio target	$\bar{\nu}$	0.09
Patient HH share	ω_P	0.64
Shock persistence	ρ	0.90

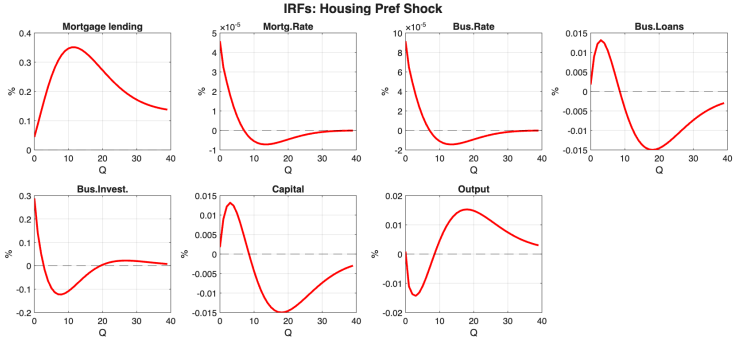
- Household/firm parameters from Iacoviello (2005)
- Banking parameters from Gerali et al. (2010) and Basel framework
- κ_{Kb} calibrated to match Chakraborty et al. (2018) investment response

Impulse Responses: Loosening of Lending Standards



LTV shock ($m^H \uparrow$): Mortgages expand $\rightarrow$ bank rates rise $\rightarrow$ business investment and loans fall $\rightarrow$ capital stock declines.

Impulse Responses: Housing Boom



Housing preference shock ($j \uparrow$): Housing demand rises $\rightarrow$ mortgages expand $\rightarrow$ bank rates rise $\rightarrow$ business investment falls. Same mechanism, different trigger.

Key Results from the IRFs

The mechanism works:

- Mortgage loans ↑ 0.35%
- Mortgage rate ↑ (bank capital stretched)
- Business loan rate ↑ (crowding out!)
- Business investment ↓ 0.8%
- Business loans ↓ 0.02%
- Capital stock ↓ persistently

Additional dynamics:

- House prices ↑ (collateral effect)
- Output: initial boost from consumption, then drag from lower investment

Key insight: The business loan rate rises even though *nothing has changed about firms*. The spillover is entirely through the bank's balance sheet.

Model vs Data: Consistency Check

Model predictions:

- Mortgage expansion $\rightarrow$ bank capital stretched $\rightarrow$ business loan rate $\uparrow$
- Business investment $\downarrow$ 0.8% per 1% LTV shock
- Lower investment $\rightarrow$ lower capital stock $\rightarrow$ lower output and productivity
- Effect is persistent (10+ quarters)

Empirical findings:

- Panel: 1 pp more mortgage credit $\rightarrow$ TFP growth falls by 0.013 pp
- Granger IRFs: negative impact in 10/13 countries
- Effect concentrated on impact, fades within 2–3 years

Both the model and the data point in the same direction: mortgage credit expansion reduces productive capacity.

What This Paper Contributes

1. **Microfounds** the Chakraborty et al. (2018) finding in general equilibrium
   - Crowding out emerges *endogenously* from the bank's optimisation
2. **Identifies the transmission channel:** bank capital constraint links mortgage and business credit markets
   - The business loan rate depends on mortgage lending through shared risk-weighted assets
3. **Quantifies** the investment loss from a mortgage-driven credit expansion
   - A 1% LTV loosening reduces business investment by $\sim$0.8%

Conclusion

- Mortgage credit expansion crowds out productive investment through the bank balance sheet channel
- The mechanism is quantitatively significant and operates through *price rationing* (higher R_l), not quantity rationing
- Macroprudential tools that target bank capital allocation (sectoral risk weights) can mitigate the externality

Thank you!