# Firm Heterogeneity and Monetary Policy Transmission: the Case of High-Growth Firms

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Prepared in April 2022 and presented at the ECB Forum on Central Banking in June 2022

## Investigate investment transmission of monetary policy to an important group of firms through use of micro data

Motivation

- **Interest rate sensitivity of investments** varies across firms (e.g. Crouzet, 2017 [1]; Ottonello & Winberry, 2020 [2]; Winberry, 2021 [3])
- **High-growth firms matter for economy** through *(i)* employment stabilization along business cycle and *(ii)* long-term innovation

**This paper**

- Shed light on monetary policy (MP) transmission to high-growth firms
- Micro-to-macro: use firm-level data to learn about macro effects

**Research question: How does monetary policy affect the investment behavior of high-growth firms?**

[1] Crouzet (2017) Aggregate implications of corporate debt choices. Review of Economic Studies 85(3), 1635–1682.
[2] Ottonello & Winberry (2020) Financial heterogeneity and the investment channel of monetary policy. Econometrica 88(6), 2473–2520.
[3] Winberry (2021) Lumpy investment, business cycles, and stimulus policy. The American Economic Review 111(1), 365–396.

**Broad firm-level data and high-frequency surprises**

Micro data

- Orbis: panel of **private and public firms**
- Sample: 8.4 mil. non-financial firms; ten €-area countries, 1999-2018
- Coverage high; firm **size distribution representative**

Identification of monetary policy shocks

- **High-frequency surprises** in short-term rate around Governing Council meetings **(**EA-MPD by Altavilla et al., 2019) [4]
- Identification assumption: $\Delta i$ only driven by policy
- $\mathrm{MP\ shock} \equiv \mathrm{corr}(\Delta \mathrm{i}, \Delta \mathrm{stock}) < 0$ (Jarociński & Karadi, 2020) [5]

[4] Altavilla et al. (2019) Measuring euro area monetary policy. Journal of Monetary Economics 108, 162–179.
[5] Jarociński & Karadi (2020) Deconstructing monetary policy surprises – the role of information shocks. AEJ: Macroeconomics 12(2), 1–43.

## Empirical analysis: identify relevant firm characteristics and estimate transmission differences across groups

Step 1: Estimate **firm-level investment elasticities**

$$\Delta \mathrm{Y}_{\mathrm{i,t+h}} = \alpha_{\mathrm{i,h}} + \beta_{\mathrm{i,h}} \mathrm{shock}_{\mathrm{t}}^{\mathrm{MP}} + \Gamma'_{\mathrm{i,h}} \mathrm{X}_{\mathrm{t-1}} + \mathrm{v}_{\mathrm{i,t+h}}$$

- $\Delta \mathrm{Y}_{\mathrm{i,t+h}} = \left( \frac{\mathrm{TFAS}_{\mathrm{i,t+h}} - \mathrm{TFAS}_{\mathrm{i,t-1}}}{\mathrm{TFAS}_{\mathrm{i,t-1}}} \right)$ , where $\mathrm{TFAS} = \text{total fixed assets}$
- $\hat{\beta}_{\mathrm{i,h}}$ investment elasticity to change in monetary policy

Step 2: Use **Random Forest** to **identify drivers of differences in $\hat{\beta}_{\mathrm{i,h}}$**

- Agnostic data-driven approach
- Identify sample splits that create largest variation in outcome
- **No issue of multiple hypotheses** testing; allows for **non-linearities**

➡ Age & size are more important for investments of high-elasticity firms

- **High-growth firms often young and small**; How are they affected?

Step 3: **Quantify transmission** via local projections (Jordà, 2005) [6]

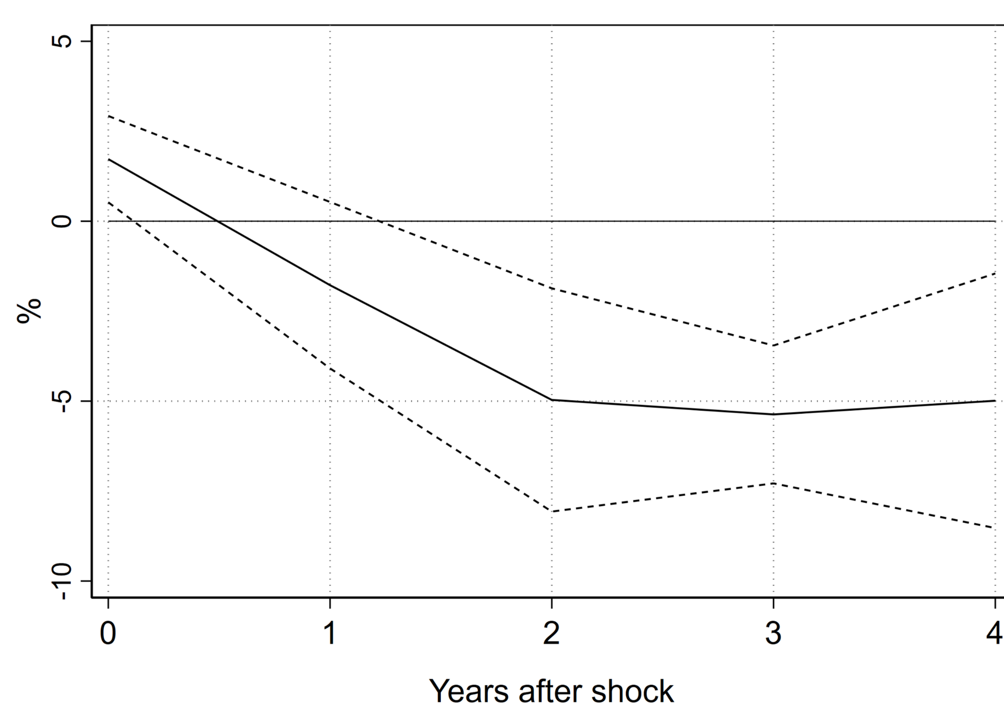
$$\Delta \mathrm{Y}_{\mathrm{i,t+h}} = \alpha_{\mathrm{i,h}} + \sum_{g=1}^{G} \alpha_{\mathrm{g,h}} \mathbb{I}\left[Z_{i,t} \in g\right] + \sum_{g=1}^{G} \beta_{\mathrm{g,h}} \mathbb{I}\left[Z_{i,t} \in g\right] \mathrm{shock}_{\mathrm{t}}^{\mathrm{MP}}$$
$$+ \Gamma'_{1,h} \mathrm{X}_{i,\mathrm{t-1}} + \Gamma'_{2,h} \mathrm{X}_{\mathrm{t-1}} + \epsilon_{\mathrm{i,t+h}}$$

- IRFs: $\hat{\beta}_{\mathrm{i,h}}$ along projection horizons *h*; Driscoll-Kraay [7] standard errors
- Average response: $G_{avg.} \in \{g\colon \forall\, i, t\}$
- Age: $G_{age} \in \{g_1 : \text{young} \equiv \text{age} \leq 15,\ g_2 : \text{mature} \equiv \text{age} > 15\}$
- Size: $G_{size} \in \{g_1 : \text{SME} \equiv \text{assets} \leq 35\ \text{m€},\ g_2 : \text{large} \equiv \text{assets} > 35\ \text{m€}\}$
- High-growth: $G_{HG} \in \left\{ g\colon \geq 5t \text{ where } \frac{\Delta x_t + \Delta x_{t-1} + \Delta x_{t-2}}{3} > 20\%,\ x \in \{\text{sales, employment, TFAS}\} \right\}$

[6] Jordà (2005) Estimation and inference of impulse responses by local projections. The American Economic Review 95 (1), 161–182.
[7] Driscoll & Kraay (1998) Consistent covariance matrix estimation with spatially dependent panel data. REStat 80(4) 549–560.

## Investment response weakens with age & size, while high-growth firms are not responsive for any age or size group

**Average response**

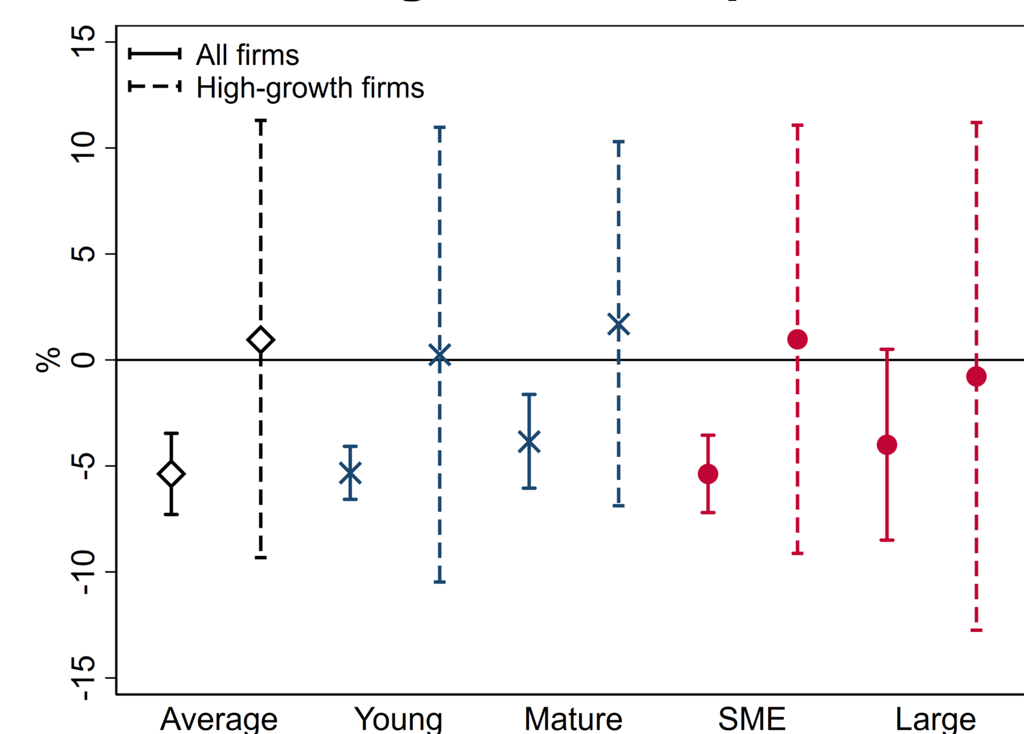



**Note:** The figure shows the IRF to a 25 bps MP tightening shock. The dashed line is the 90% confidence band using Driscoll-Kraay [7] standard errors.

➡ Investment of average firm falls in response to MP tightening

- Magnitudes within range of other empirical estimates (Cloyne et al., forthcoming [8]; Crouzet, 2021 [9])

**Heterogeneous response**




**Note:** The figure shows the IRF to a 25 bps MP tightening shock at the projection horizon *h* = 3. The error bands are the 90% confidence interval using Driscoll-Kraay [7] standard errors.

➡ Younger and smaller firms respond more strongly
➡ Investment of high-growth firms not affected by monetary policy

Finding for high-growth firms **contrasts with literature and theory**

- More likely to be financially constrained (Davis & Haltiwanger, 2019) [10]
- Real frictions make adjusting firms more sensitive

**Robustness** w.r.t. *(i)* sub-samples and *(ii)* alternative MP indicators and shocks (including shadow rate and principal component of shocks)

[8] Cloyne et al. (forthcoming) Monetary policy, corporate finance and investment. Journal of the European Economic Association.
[9] Crouzet (2021) Credit disintermediation and monetary policy. IMF Economic Review 69 (1), 1–67.
[10] Davis & Haltiwanger (2019) Dynamism diminished: the role of housing markets and credit conditions. NBER WP No. 25466.

## Potential mechanisms & policy implications

I. Cleansing effect of MP: reallocation to high-growth firms
II. Higher investment returns of high-growth firms
III. Alternative constraints (e.g. earnings-based borrowing)

**Policy implications**
- $\Delta i$ does not have an effect on the investments of high-growth firms (either good or bad)
- Other tools from policymakers required to stimulate these firms (e.g. sound financial sector, tax incentives)