Firm Financial Heterogeneity and Monetary Policy

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Firm Balance Sheet Channel & Monetary Policy

- The *empirical literature* has established that the real effects of monetary policy shocks are larger among firms that rely on **external finance** (e.g. Cloyne et al., 2019).
    - These findings emphasize the role of **financial frictions**, and consequently support the idea of a **firm balance sheet channel** (Bernanke et al., 1999).

- What is the precise mechanisms through which the firm balance sheet channel operates?
    - Ippolito et al. (2018) show that a quantitatively significant firm balance sheet channel operates through the fluctuations of **interest payments** due to the floating-rate loan arrangements.

Corporate Borrowing Constraints

- Lian and Ma (2021) show that the key constraint on US corporate debt are cash flows measured by earnings.
    - Drechsel (2022) show that earnings based constraints amplify the aggregate effects of shocks
    - Greenwald (2019) compares the importance of different type of covenants for the transmission of shocks.

Monetary Policy and Corporate Borrowing Constraints

- How different types of corporate borrowing constraints affect the interest payment channel of monetary policy?
  - Tradition *financial accelerator channel*: monetary policy affect collateral value
  - Following an interest rate increase, a fall in earnings could further accelerate the decline in capital expenditure if a significant fraction of firm debt is earnings-based

- Our goal: study how different types of corporate borrowing constraints affect the aggregate and **heterogeneous** effects of monetary policy shocks
  - NK model of firm heterogeneity: study the effects of earning-based vs asset-based collateral constraints
  - EA credit register data: evidence of effects of interest-repayment channel on investment

The Model

The Investment Block

Heterogenous Intermediate Good Producers

- Each firm j produces a quantity $y_{t,j}$ of the intermediate good using a Cobb-Douglas production function that combines **capital** k_t and **labor** l_t and features **decreasing returns to scale**:

$$y_{t,j} = z_t \varepsilon_{t,j} k_{t,j}^{\theta} n_{t,j}^{\nu} \quad \text{with} \quad \theta, \nu > 0 \quad \text{and} \quad \theta + \nu < 1 \tag{1}$$

  where z_t is the common component of total factor productivity, ε_t is the firm-specific counterpart.

- For now, we assume that $z_t = 1$ and that **idiosyncratic total factor productivity** follows an first order autoregressive process in logs:

$$\log \varepsilon_{t,j} = \rho_{\varepsilon} \log \varepsilon_{t-1,j} + \sigma_{\varepsilon} u_{t,j} \quad \text{with} \quad u_{t,j} \sim \mathcal{N}(0,1) \tag{2}$$

- Since we are interested in how financial constraints affect aggregate outcomes, we must impose **entry and exit** in the model to avoid that firms grow out of their borrowing constraints.
  - We assume that each firm faces a fixed probability, $\pi_d \in (0,1)$ that forces firms to exit following production.

Firms Financing

- Firms **cannot issue new equity**. That is, dividend payments are bounded below:

$$d_{t,j} \geq 0 \tag{3}$$

- Firms can borrow (or save) in **one-period** nominal **debt** $B_{t,j}$ with real face value $b_{t+1,j} = \frac{B_{t+1,j}}{P_t}$ where P_t is the price of the final good.

- Firms will face one of these two types of constraints:
  - **Asset-Based**:

$$b_{t+1,j} \leq \chi_k \cdot \mathbb{E}_t \left[q^k_{t+1} k_{j,t} \right] \tag{4}$$

  - **Earnings-Based**:

$$b_{t+1,j} \leq \chi_\pi \cdot \Pi_{j,t} \tag{5}$$

The Rest of the Economy

HHs, Retailers, Final & Capital Good Producers, & the CB

- There is a **representative household** that consumes, works and saves (or borrows) in one-period bonds.
- There is a fixed mass of **monopolistically competitive retailers** that transform the undifferentiated intermediate goods into goods of different varieties with a one-to-one production technology. In doing so, they face Rotemberg quadratic price adjustment costs.
- A **final good producer** aggregates up these varieties into a final good using a CES aggregator.
- There is also a representative **capital good producer** that transforms the final good into new capital and it is subject to aggregate adjustment costs.
- The **Central Bank** set the nominal interest rate according to a Taylor-type rule.