

# **Inflation Inattention on the Production Network: Firm-Level Evidence and Macro Implications**

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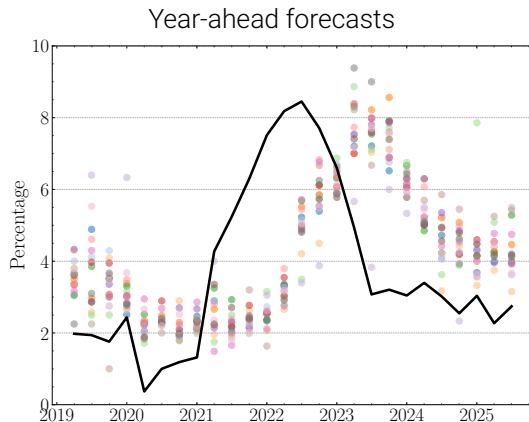
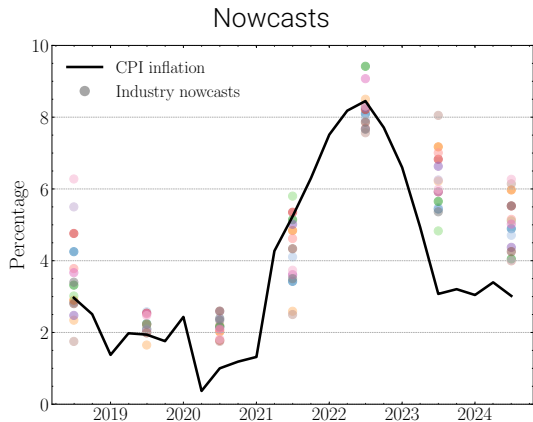
# Motivation

- ▶ Firms' inflation expectations are **dispersed and inaccurate**  
(Coibion, Gorodnichenko, & Kumar, 2018; Candia, Coibion, & Gorodnichenko, 2024)
- ▶ Beliefs differ systematically **across industries**  
(Coibion, Gorodnichenko, & Kumar, 2018; Afrouzi, 2024, Fang et al. 2025)

**This paper:** causes and macro consequences of heterogeneous inflation expectations across industries

# Firms' inflation forecasts vary across industries

Cleveland Fed's Survey of Firms' Inflation Expectations



# This Paper

**Empirics:** link firms' inflation expectations to industry characteristics

- ▶ High-Domar-weight and flexible-price industries forecast inflation more accurately
- ▶ Firms' inflation expectations are positively associated with industry marginal costs

# This Paper

**Empirics:** industry characteristics shape forecast accuracy and expectations

**Theory:** GE price-setting model with a production network under rational inattention

- ▶ Forecast accuracy rises with
  - \* attention to industry marginal costs (price flexibility)
  - \* comovement between marginal costs and the CPI (Domar weight)
- ▶ IO links alter the Phillips curve slope through a new **endogenous attention** channel

# This Paper

**Empirics:** industry characteristics shape forecast accuracy and expectations

**Theory:** attention responds to the network and moves the Phillips curve slope

**Quantification:** dynamic model calibrated to US input-output and SoFIE data

- ▶ Matches the cross-industry patterns in forecast accuracy
- ▶ Stronger I-O linkages  $\Rightarrow$  lower attention  $\Rightarrow \approx 30\%$  of the muted inflation response to a monetary shock

Related literature

# Evidence

# Firms in large, flexible-price industries forecast inflation better

$$|\pi_{t+h} - \mathbb{E}_{fit}[\pi_{t+h}]| = \psi_t + \beta \times \text{Industry Characteristics}_i + \phi \times \text{Firm Size}_{f(i)} + \varepsilon_{fit}$$

|                        | Nowcast error<br>$ \pi_t - \mathbb{E}_{fit}[\pi_t] $ | Forecast error<br>$ \pi_{t+4} - \mathbb{E}_{fit}[\pi_{t+4}] $ |
|------------------------|------------------------------------------------------|---------------------------------------------------------------|
| Domar weight           | -0.831***<br>(0.234)                                 | -0.218*<br>(0.119)                                            |
| Price flexibility      | -3.635***<br>(0.961)                                 | -1.002**<br>(0.475)                                           |
| Upstreamness           | 0.025<br>(0.040)                                     | -0.009<br>(0.019)                                             |
| TFP volatility         | 0.003<br>(0.031)                                     | -0.008<br>(0.018)                                             |
| Time FE, size controls | ✓                                                    | ✓                                                             |
| Observations           | 2,178                                                | 7,884                                                         |

Robustness

Data

# Firms' expectations rise with their own industry's costs

$$\mathbb{E}_{fit}[\pi_{t+h}] = \chi_i + \chi_t + \beta \times \Delta mc_{it} + \varepsilon_{fit}$$

- $\Delta mc_{it}$ : year-over-year growth in industry marginal cost

|                  | 1-year ahead forecast $\mathbb{E}_{fit}[\pi_{t+4}]$ |                      |                      |
|------------------|-----------------------------------------------------|----------------------|----------------------|
|                  | (1)                                                 | (2)                  | (3)                  |
| $\Delta mc_{it}$ | 0.107***<br>(0.0340)                                | 0.012***<br>(0.0040) | 0.013***<br>(0.0034) |
| Time FE          |                                                     | ✓                    | ✓                    |
| Industry FE      |                                                     |                      | ✓                    |
| Observations     | 7,532                                               | 7,532                | 7,532                |

**Model**

# Setup

GE model of price-setting firms with two main features:

- ▶ **Rational inattention**: information is costly, firms choose what to pay attention to  
(Sims, 2003; Maćkowiak & Wiederholt, 2009; Afrouzi, 2024)
- ▶ **Production networks**: heterogeneous industries buy from and sell to each other  
(Rubbo, 2023; La'O & Tahbaz-Salehi, 2022)

# Setup

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In equilibrium:

- ▶ Firms choose to observe a **noisy signal of their own marginal cost** and form beliefs about aggregates based on it
- ▶ Inattention upstream reduces marginal cost uncertainty downstream

Analytical results next: myopic firms ( $\beta = 0$ ),  $m_t \equiv \log M_t \sim \mathcal{N}(0, \sigma_m^2)$ . Quantification later

Households

Production

Information

Policy

Equilibrium

# Prices and attention

Equilibrium prices:

Details

$$p_{fit} = \underbrace{\mu_i \left( \alpha_i w_t + \sum_k a_{ik} p_{kt} - z_{it} \right)}_{=mc_{it}} + \underbrace{v_{fit}}_{\substack{\text{iid} \\ \text{mean 0}}}$$

Optimal attention:

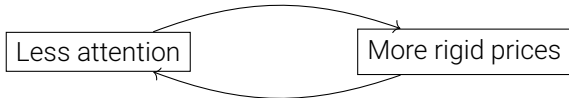
$$\mu_i = \max \left\{ 0, 1 - \frac{\omega}{\theta_i \lambda_i \text{Var}(mc_{it})} \right\}$$

$\omega$ : information cost

$\theta_i$ : elasticity of substitution

$\lambda_i$ : Domar weight

►  $\text{Var}(mc_{it})$  depends on upstream attention levels



# Forecast accuracy and industry characteristics

Firms forecast inflation by projecting the CPI onto their noisy signal of own marginal cost

- Industry-level average forecast accuracy:

$$\mathbb{E}_i[FE_{fit}^2[\pi_t]] = (1 - \mu_i R_i^2) \mathbb{E}[\pi_t^2]$$

\*  $R_i^2$ : R-squared of a regression of CPI inflation  $\pi_t$  on sectoral  $\pi_{it}$  or  $\Delta mc_{it}$

- Smaller forecast mistakes in industries with:
  1. higher attention  $\mu_i$  (**more flexible prices**), or
  2. higher  $R_i^2$  (**Domar weights**)

Details

# Phillips curve slope

Stronger I-O linkages affect the Phillips curve slope through two channels:

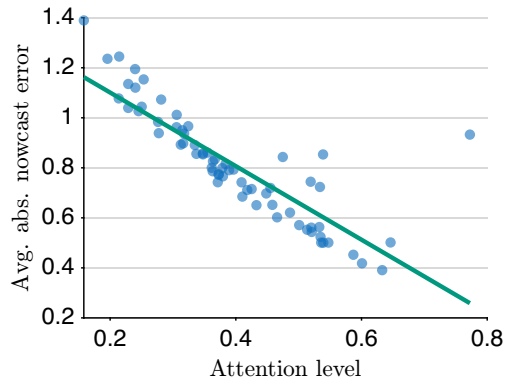
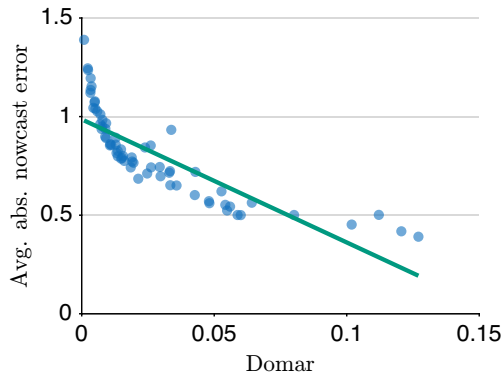
- ▶ **Nominal rigidities (attention) fixed:** networks compound them ⇒ **flatter**  
(Basu 1995, Rubbo 2023)
- ▶ **Nominal rigidities (attention) endogenous:** linkages change marginal cost volatility, and attention responds
  - monetary shocks dominate: low vol. suppliers ⇒ costs less volatile ⇒ **flatter**
  - TFP shocks dominate: volatile suppliers ⇒ costs more volatile ⇒ **steeper**

Phillips curve

# **Quantitative Exercise**

# Model reproduces cross-industry patterns

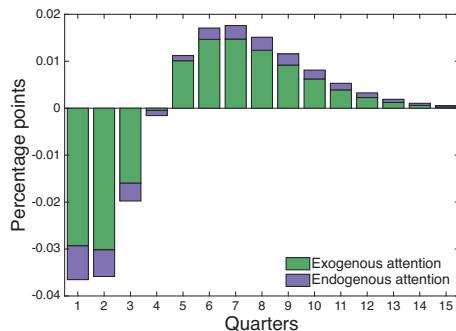
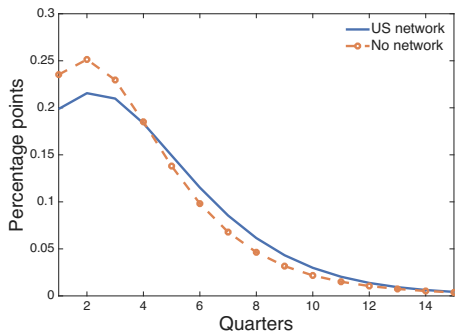
66 industries, US input-output structure



Calibration

SoFIE industries

# Inflation response to a monetary shock: US network vs. no network



- ▶  $\approx 30\%$  of the dampening comes from firms **reducing attention** Output response
- ▶ Intuition from the simple model:
  - \* real rigidities flatten the PC
  - \* adjustment of attention flattens it since monetary shocks are important in the data

# Concluding Remarks

- ▶ Industry conditions shape firms' inflation expectations
  - Domar weights
  - frequency of price adjustment
  - marginal costs
- ▶ Rational inattention on the production network explains the patterns
- ▶ Attention readjustment deepens Phillips curve flattening due to stronger IO linkages

## Related Literature

- ▶ **Inattention & inflation:** Sims (2003), Maćkowiak & Wiederholt (2009, 2011), Afrouzi & Yang (2021), Pfäuti (2025), Weber et al. (2025)...
- ▶ **Incomplete information in networks:** Afrouzi (2024), Nikolakoudis (2025), Fang et al. (2025), Hajdini et al. (2025), Afrouzi, Flynn, and Yang (2026)...
- ▶ **Networks & inflation:** Pastén, Schoenle & Weber (2020, 2024), La'O & Tahbaz-Salehi (2022), Rubbo (2023), Afrouzi & Bhattarai (2024)
- ▶ **Evidence on firms' inflation expectations:** Coibion, Gorodnichenko & Kumar (2020), Andrade et al. (2022), Candia, Coibion & Gorodnichenko (2024), ...

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# Firms' CPI Inflation Nowcasts

## Proposition

Firm-level CPI nowcasts are given by

$$\mathbb{E}_{fit}[\pi_t] = \underbrace{\frac{\text{Cov}(mc_{it}, p_t^{CPI})}{\text{Var}(mc_{it})}}_{\delta_i \equiv \text{comovement between } mc \text{ and CPI}} \underbrace{\mu_i}_{\text{attention to own } mc} \underbrace{\Delta mc_{it}}_{\text{realized } \Delta mc} + \underbrace{u_{fit}}_{\text{noise}}, \quad u_{fit} \perp \Delta mc_{it}.$$

- ▶ Slope of expectations on  $\Delta mc_{it}$  is  $\delta_i \mu_i \Rightarrow$  Fact 2
- ▶ Forecast error  $\propto 1 - \mu_i R_i^2$ : falls with attention and comovement  $\Rightarrow$  Fact 1

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# Appendix

# Households

- Representative household with **complete information** maximizes

$$\max \mathbb{E}_0 \left[ \sum_{t=0}^{\infty} \beta^t (\ln C_t - L_t) \right]$$

subject to

$$P_t^{CPI} C_t + B_t \leq W_t L_t + (1 + i_{t-1}) B_{t-1} + \Pi_t + T_t$$

- Cobb-Douglas consumption aggregator over  $n$  industries:

$$C_t = \prod_{i=1}^n C_{it}^{\gamma_i} \quad \text{and} \quad P_t^{CPI} = \prod_{i=1}^n P_{it}^{\gamma_i}, \quad \sum_{i \in I} \gamma_i = 1$$

## Firms: Production

- ▶ Unit mass of monopolistically competitive firms  $f$  within each industry  $i$
- ▶ Industry-specific CRS Cobb-Douglas technology:

$$Y_{fit} = \zeta_i Z_{it} L_{fit}^{\alpha_i} \prod_{k=1}^n x_{fit,k}^{a_{ik}}$$

- ▶  $A \equiv [a_{ik}]$ : input-output matrix,  $\alpha \equiv (\alpha_i)_{i \in I}$ : sectoral labor shares
- ▶ Industry-level TFP:

$$\log \mathbf{Z}_t \sim iid \mathcal{N}(0, \Sigma)$$

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- ▶ Industry output aggregated according to CES:  $Y_{it} = \left( \int_0^1 Y_{fit}^{(\theta_i-1)/\theta_i} df \right)^{\theta_i/(\theta_i-1)}$
- ▶ Wage stickiness as in Blanchard & Gali (2007):  $W_t = (W_t^*)^{\delta_w} (W_{t-1})^{1-\delta_w}$

# Firms: Information Acquisition and Timing

- ▶ Firms set prices under imperfect information about  $\mathbf{Z}_t$  and aggregate demand  $M_t$
- ▶ Choose **attention capacity**  $\kappa_{fit} \geq 0$  subject to linear cost  $\omega \kappa_{fit}$
- ▶ Given  $\kappa_{fit}$ , choose **signals**  $S_{fit}$  from rich set of signals  $\mathbb{S}$
- ▶ Info acquisition constraint:  $\mathcal{I}(S_{fit}; M_t, \mathbf{Z}_t) \leq \kappa_{fit}$   
→  $\mathcal{I}(\cdot)$  is Shannon's mutual information function: info  $S_{fit}$  contains about  $(M_t, \mathbf{Z}_t)$   
(Sims 2003)

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→  $\mathcal{I}(\cdot)$  is Shannon's mutual information function: info  $S_{fit}$  contains about  $(M_t, \mathbf{Z}_t)$   
(Sims 2003)
- ▶ **Timing:** prices set given  $S_{fit}$ ; inputs chosen *after* shocks realization

Prices

Inputs

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# Monetary Policy and Fiscal Government

- Monetary policy controls nominal demand  $M_t \equiv P_t C_t$  according to:  
(Woodford 2003, Golosov & Lucas 2007, Nakamura & Steinsson 2010)

$$\Delta \log M_t = \rho_m \Delta \log M_{t-1} + \varepsilon_{m,t}, \quad \varepsilon_{m,t} \sim \mathcal{N}(0, \sigma_m^2)$$

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- ▶ Industry-specific taxes  $\tau_i$  offset monopolistic inefficiencies
- ▶ Balanced government budget

Equilibrium definition

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# Equilibrium Characterization

## Proposition

Sectoral prices and attention levels are determined by:

$$\mathbf{p}_t = \mathcal{M}(I - A\mathcal{M})^{-1}(\boldsymbol{\alpha}\delta_w m_t - \mathbf{z}_t)$$

$$\mathcal{M} = I - \omega \text{diag}(\boldsymbol{\theta}\boldsymbol{\lambda}')^{-1} \left( \text{Var}(\mathcal{M}^{-1}\mathbf{p}_t) \odot I \right)^{-1},$$

where  $\mathcal{M} \equiv \text{diag}(\boldsymbol{\mu})$ .

$A$ : IO matrix

$\boldsymbol{\alpha}$ : labor shares

$\boldsymbol{\theta}$ : CES

$\boldsymbol{\lambda}$ : Domar weights

$\omega$ : info. cost

$\delta_w$ : wage flexibility

► Fixed point between the responsiveness of prices and attention:



# Phillips Curve

- ▶ Persistent monetary shocks ( $\rho_m > 0$ ), keep  $\beta = 0$
- ▶ CPI Phillips curve:

$$\pi_t = \boldsymbol{\gamma}' \mathcal{B} y_t + \boldsymbol{\gamma}' (I - \mathcal{V}) \bar{\mathbb{E}}_{t-1}[\Delta \mathbf{mc}_t] - \boldsymbol{\gamma}' \mathcal{V} \mathbf{x}_t$$

- \*  $\boldsymbol{\gamma}$ : consumption shares
  - \*  $y_t = m_t - \boldsymbol{\gamma}' \mathbf{p}_t - \boldsymbol{\lambda}' \mathbf{z}_t$ : output gap
  - \*  $\mathbf{x}_t \equiv \mathbf{p}_{t-1} + (I - A)^{-1} \mathbf{z}_t$ : wedge between efficient and lagged prices
- ▶ Slope of the sectoral Phillips curves:

$$\mathcal{B} \equiv \frac{\mathcal{M}(I - A\mathcal{M})^{-1} \boldsymbol{\alpha}}{1 - \boldsymbol{\gamma}' \mathcal{M}(I - A\mathcal{M})^{-1} \boldsymbol{\alpha}}, \quad \mathcal{M} \equiv \text{diag}(\boldsymbol{\mu})$$

- ▶ Inflation depends on **expectations about sectoral mcs**, not aggregate inflation

# Calibration

- ▶ 66 US industries, quarterly frequency
- ▶ Numerical solution using DRIP (Afrouzi and Yang, 2021; Afrouzi 2024)

[Details on the method](#)

| Parameter  | Description                 | Value        | Source                                                                        |
|------------|-----------------------------|--------------|-------------------------------------------------------------------------------|
| $\alpha$   | Labor shares                |              | 2022 BEA IO table                                                             |
| $A$        | Input expenditure shares    |              | 2022 BEA IO table                                                             |
| $\gamma$   | Consumption shares          |              | 2022 BEA IO table                                                             |
| $\omega$   | Information cost            | 0.030        | Anchoring to prior <a href="#">details</a><br>(Wiederholt 2015, Afrouzi 2024) |
| $\beta$    | Discount factor             | $0.96^{1/4}$ | Annual real rate = 4%<br>(Afrouzi 2024)                                       |
| $\rho_m$   | Persistence of NGDP growth  | 0.265        | US NGDP                                                                       |
| $\sigma_m$ | Std of NGDP growth          | 0.011        | US NGDP                                                                       |
| $\delta_w$ | Wage flexibility            | 0.30         | $Cov(\Delta m, \Delta w)$<br>(Beraja et al. 2019)                             |
| $\Sigma$   | Cov. matrix of sectoral TFP |              | ILPA/KLEMS                                                                    |
| $\theta$   | Industry CES                | 6            | 20% markup<br>(McKay et al. 2016)                                             |

## Robustness: cost-based Domar weight

|                     | $ FE_{fit}[\pi_t] $ |                      |                      | $ FE_{fit}[\pi_{t+4}] $ |                      |                      |
|---------------------|---------------------|----------------------|----------------------|-------------------------|----------------------|----------------------|
|                     | (1)                 | (2)                  | (3)                  | (4)                     | (5)                  | (6)                  |
| Domar weight (cost) | -0.338<br>(0.235)   | -0.634***<br>(0.222) | -0.582***<br>(0.221) | 0.228*<br>(0.128)       | -0.036<br>(0.108)    | 0.004<br>(0.109)     |
| Upstreamness        | -0.056<br>(0.035)   | -0.013<br>(0.033)    | -0.017<br>(0.033)    | -0.075***<br>(0.020)    | -0.050***<br>(0.017) | -0.054***<br>(0.017) |
| TFP volatility      | 0.024<br>(0.040)    | 0.014<br>(0.038)     | 0.010<br>(0.038)     | -0.002<br>(0.022)       | -0.004<br>(0.019)    | -0.006<br>(0.019)    |
| Price flexibility   | -2.008*<br>(1.031)  | -2.987***<br>(0.963) | -2.758***<br>(0.965) | 0.405<br>(0.561)        | -0.425<br>(0.459)    | -0.189<br>(0.463)    |
| Observations        | 2,178               | 2,178                | 2,178                | 8,581                   | 8,581                | 8,581                |
| $R^2$               | 0.022               | 0.136                | 0.139                | 0.004                   | 0.296                | 0.300                |
| Time FE             | No                  | Yes                  | Yes                  | No                      | Yes                  | Yes                  |
| Size controls       | Yes                 | No                   | Yes                  | Yes                     | No                   | Yes                  |

HC3 robust standard errors. Sales- and cost-based Domar weights correlate 0.96.

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## 1. US Survey of Firms' Inflation Expectations (SoFIE) [Questions](#)

- \* Nationally representative, quarterly survey of CEOs/top executives, since 2018:Q2
- \* Manufacturing and service industries (2-digit NAICS) [Industries](#)
- \* Firms' CPI inflation **nowcasts and year-ahead forecasts**

## 2. Industry-level information

- \* BEA I–O tables, labor and consumption shares (La'O & Tahbaz-Salehi 2022)
- \* ILPA sectoral TFP shock variances
- \* Sectoral price flexibilities (Pastén, Schoenle & Weber 2024) [Details](#)

# Industry-Level Data Sources

Table: Data Sources and Variable Definitions

| Variable          | Definition                              | Source                             | Period    |
|-------------------|-----------------------------------------|------------------------------------|-----------|
| Domar weight      | Industry sales as fraction of GDP       | BEA I-O Tables                     | 2022      |
| Upstreamness      | Column sum of Leontief inverse          | BEA I-O Tables                     | 2022      |
| Price flexibility | Probability of price readjustment       | Pastén, Schoenle, and Weber (2024) | 1998–2014 |
| TFP volatility    | Std. dev. of linearly detrended log-TFP | BEA/BLS ILPA                       | 1987–2021 |

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# Industries in SoFIE

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## Manufacturing

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Food and drink

Timber and paper

Textiles and clothing

Basic metals

Electrical

Mechanical engineering

Chemicals and plastics

Other manufacturing

Transport

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## Services

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Hotels and restaurants

Financial intermediation

Transport and storage

Renting and business activities

Post and telecommunication

Other services

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# Questions in SoFIE

- ▶ **(Year-ahead inflation):** “What do you think will be the inflation rate (for the Consumer Price Index) over the next 12 months? Please provide an answer in an annual percentage rate.”
- ▶ **(Current inflation):** “What do you think has been the annual inflation rate (for the Consumer Price Index) over the last twelve months? Please provide an answer in annual percentage rate.”

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# Calibration of $\omega$

- ▶ Calibrate info cost  $\omega$  based on weight of inflation expectations on priors:  
(Wiederholt 2015, Afrouzi 2024)

$$\mathbb{E}_{fit}[\pi_t] = \chi_t + \psi \mathbb{E}_{fit-4}[\pi_t] + \text{error}_{fit}$$

- ▶ **Intuition:** higher  $\omega \Rightarrow$  higher weight on prior ( $\psi$ )
- ▶  $\hat{\psi} = 0.242 \Rightarrow \omega = 0.030$  to match the moment

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# Solution Method

- Solution takes the form:

$$\mathbf{p}_t = \Phi_m(L)\boldsymbol{\varepsilon}_{m,t} + \Phi_z(L)\boldsymbol{\varepsilon}_{z,t}$$

- Truncate to lag  $L(=40)$  and take into account the unit root in  $\mathbf{m}_t$ :

$$\mathbf{p}_t \approx \Psi \mathbf{x}_t, \quad \Psi \text{ is } n \times (n+1)L$$

$$\mathbf{x}_t \equiv \left( \tilde{\varepsilon}_{mt}, \tilde{\varepsilon}_{m,t-1}, \dots, \tilde{\varepsilon}_{m,t-L+1}, z_{1,t}, \dots, z_{1,t-L+1}, \dots, z_{n,t}, \dots, z_{n,t-L+1} \right)'$$

$$\tilde{\varepsilon}_{mt} = \sum_{s=0}^{\infty} \boldsymbol{\varepsilon}_{m,t-s}$$

## Algorithm:

1. Start with a guess for  $\Psi$
2. Solve the DRIP for every sector  $i \in I$
3. Update guess  $\Psi$
4. Iterate until convergence

# Solution Method: State Space Representation

- Given guess  $\psi^{(n)}$ , state space representation for firm's problem is:

$$x_t = Bx_{t-1} + Q \underbrace{\begin{bmatrix} \varepsilon_{m,t} & \varepsilon_{z_1,t} & \vdots & \varepsilon_{z_n,t} \end{bmatrix}'}_{u_t \in \mathbb{R}^{n+1}},$$

$$mc_t = \alpha \psi_m x_t + A \psi^{(n)} x_t - \psi_z x_t \equiv H^{(n)} x_t,$$

$$mc_{it} = H_{i\cdot}^{(n)} x_t$$

# Solution Method: DRIP

## ► General representation:

$$\min_{\{a_{it}\}_{t \geq 0}} \mathbb{E} \left[ \sum_{t=0}^{\infty} \beta^t (a_{it} - H_{i \cdot}^{(n)} x_t)' (a_{it} - H_{i \cdot}^{(n)} x_t) + \omega \mathcal{I}(a_{it}; x_t \mid a_{it-1}) \mid a_{i-1} \right]$$

$$\text{s.t. } x_t = Bx_{t-1} + Qu_t, \quad u_t \sim N(0, I_{(n+1) \times (n+1)})$$

$a_{-1}$  given.

## ► Optimal signal: $S_{fit} = Y_i' x_t + e_{fit}$

## ► Output:

→  $K_i$ : Kalman-gain vector

→  $Y_i$ : loading of optimal signals on the state  $x_t$

→  $\sigma_{i,e}^2$ : variance of  $e_{fit}$

## ► Next step: update rule for $\psi^{(n)}$

# Updating $\Psi$

- ▶ With the solution to DRIP, we can construct IRFs of  $p_{it}$ :

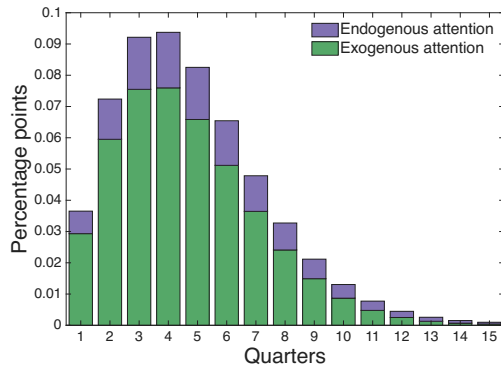
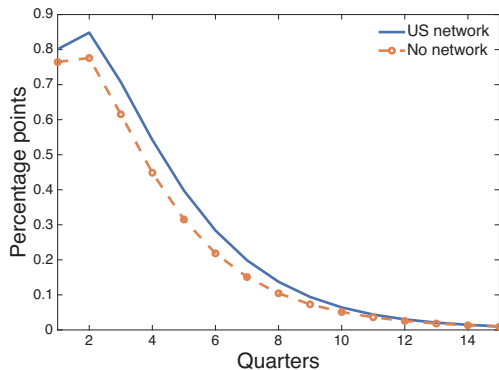
$$p_{it} = \sum_{\tau=0}^{\infty} w_{i,m,\tau} \epsilon_{m,t-\tau} + \sum_{\tau=0}^{\infty} w'_{i,z,\tau} \epsilon_{z,t-\tau}$$

- ▶ Update guess for  $\Psi$  as follows:

$$\psi_{i,m,\tau} = w_{i,m,\tau}$$

$$\psi_{i,z,\tau} = w'_{i,z,\tau}$$

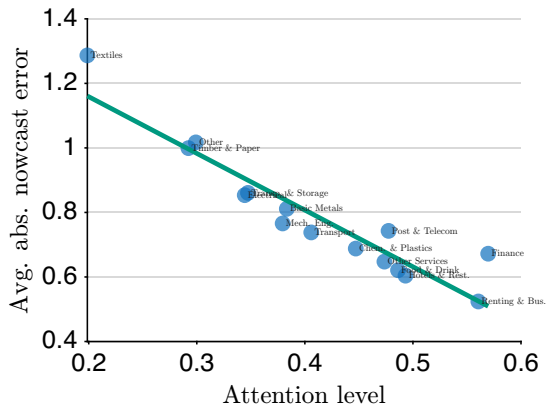
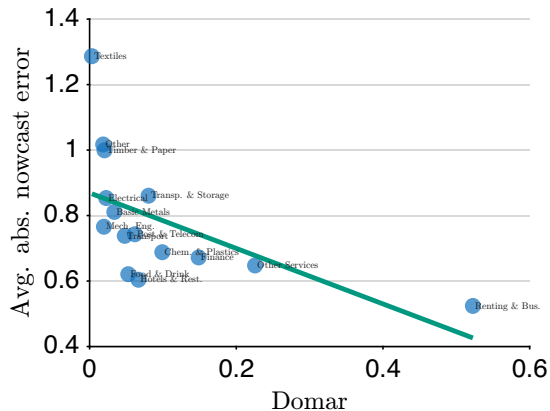
# Output Response to an Expansionary Monetary Shock



►  $\approx 20\%$  of the network amplification of output comes from endogenous attention

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# Model Fits Empirical Patterns for the SoFIE Industries



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# Firms Maximizing Problem

$$\max_{\{S_{fit}, P_{fit}, K_{fit}\}_{t=0}^{\infty}} \mathbb{E}_0 \left[ \sum_{t=0}^{\infty} \beta^t M_t^{-1} \left( (1 - \tau_i) P_{fit} Y_{fit}^d - W_t L_{fit} - \sum_{k=1}^n P_{kt} X_{fit,k} - \omega K_{fit} \right) \middle| S_{fit}^{-1} \right]$$

s.t.

$$Y_{fit}^d = \left( \frac{P_{fit}}{P_{it}} \right)^{-\theta_i} Y_{it} \quad (\text{demand schedule})$$

$$\mathcal{I}(S_{fit}; (M_t, (P_{kt})_{k \in I}, \mathbf{Z}_t)) \leq K_{fit} \quad (\text{information processing constraint})$$

# Firms' Optimal Input Choices

$$\min W_t L_{fit} + \sum_k P_{kt} X_{fit,k} \quad s.t. : \quad F_i(L_{fit}, X_{fit,k}) = Y_{fit}^d$$

► Input choices:

$$L_{fit} = Z_{it}^{-1} \alpha_i \left( \prod_{j=1}^n P_{jt}^{a_{ij}} \right) W_t^{\alpha_i - 1} Y_{fit}^d$$
$$X_{fit,k} = Z_{it}^{-1} a_{ik} \left( \prod_{j=1}^n P_{jt}^{a_{ij}} \right) \frac{W_t^{\alpha_i}}{P_{kt}} Y_{fit}^d.$$

# Equilibrium Definition

An equilibrium for the economy is:

- ▶ an allocation for the household,  $\Omega_H \equiv \{(C_{fit})_{i \in I, f \in [0,1]}, L_t, B_t : t = 0, 1, \dots\}$ ,
- ▶ a strategy profile for firms

$$\Omega_F \equiv \{(\kappa_{fit}, S_{fit} \subseteq \mathbb{S}, P_{fit}, L_{fit}, (X_{fit,k})_{k \in I}, Y_{fit})_{i \in I, f \in [0,1]} : t = 0, 1, \dots\}$$

- ▶ and a set of prices  $\{(P_{fit})_{i \in I, f \in [0,1]}, W_t, i_t : t = 0, 1, \dots\}$

such that:

1. given prices and  $\Omega_F$ ,  $\Omega_H$  solves the household's problem;
2. given prices and  $\Omega_H$ , no firm has an incentive to deviate from  $\Omega_F$ ;
3. the government budget constraint is satisfied;
4. labor, goods and bond markets clear.

# Firms' Problem

- Second-order approximation of firms' problem around non-stochastic equilibrium:
  - Usual approach to ensure that signals and best responses are jointly normal (Máckowiak et al., 2018; Afrouzi & Yang, 2021)

$$\begin{aligned} \min_{\kappa_{fit}, S_{fit}, p(S_{fit})} & \frac{1}{2} \theta_i \lambda_i \mathbb{E} \left[ (p_{if}(S_{fit}) - mc_{it})^2 \middle| S_{fit} \right] + \omega \kappa_{fit} \\ \text{s.t. : } & mc_{it} = \alpha_i w_t + \sum_{k=1}^n a_{ik} p_{kt} - z_{it} \\ & \mathcal{I}(S_{fit}; m_t, \mathbf{z}_t) \leq \kappa_{fit} \end{aligned}$$

- $\theta_i$ : CES
- $\lambda_i$ : Domar weight