Price stickiness along the income distribution and the effects of monetary policy

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Monetary shocks have distributional consequences

- Monetary policy has differential effect across agents:
  - Savers vs. borrowers (Doepke and Schneider 2006)
  - Financially constrained vs. unconstrained (Williamson, 2008)
  - Young vs. old (Wong, 2016)
- Coibion et al. 2017: Monetary shocks increase income inequality
- Mechanism: differential effects on agents income/wealth
- This paper: Alternative mechanism – differential effect on prices
  - Monetary policy differentially affects prices of different goods
  - Households with different income consume different goods

What we do

1) Document two new differences across consumption baskets:

- High income households consume goods whose prices are:

  i) More sticky

  ii) Less volatile

2) Quantify distributional consequences of monetary shock

- Factor-Augmented VAR (FAVAR) model
- Quantitative New-Keynesian DSGE model
  - Inequality affects effectiveness of monetary policy – modestly

Main result: Shock that $\uparrow \pi^{agg}$ by 1% $\rightarrow \pi^{mid} - \pi^{top} = 0.2\%$

A simple model to guide the discussion

- Two periods. State is known at $t = 1$. S possible states at $t = 2$
- H types of households, J types of goods or 'sectors'
  - CPI faced by household h: $p_t^h(s) \equiv \sum_j \omega_j^h p_{j,t}(s)$
  - Aggregate CPI: $p_t(s) \equiv \sum_h s^h p_t^h(s) = \sum_j \omega_j p_{j,t}(s)$
- Cont. monopolistically competitive firms in each j, same technology
  - $t = 1$: all firms set same price, p_1
  - $t = 2$: fraction $1 - \theta_j$ set prices before shocks, $p_2^e = p_1$
  - $t = 2$: fraction θ_j set prices after shocks, $\bar{p}_2(s)$
- Sectoral inflation:

$$\pi_j(s) = \theta_j [\bar{p}_2(s) - p_1]$$

Price rigidities and inflation differences

- Difference in inflation across households:

$$\pi^h(s) - \pi^{h'}(s) = [\bar{p}_2(s) - p_1] \sum_j \left[\omega_j^h - \omega_j^{h'}\right] \theta_j.$$

$$\frac{\pi^h(s) - \pi^{h'}(s)}{\pi(s)} = \frac{\bar{\theta}^h - \bar{\theta}^{h'}}{\bar{\theta}}$$

where $\bar{\theta}^h \equiv \sum_j \omega_j^h \theta_j$; $\bar{\theta} \equiv \sum_h s^h \bar{\theta}^h$.

- More flexible sectors are more volatile

$$\frac{\sigma_{\pi_j}}{\sigma_\pi} = \frac{\theta_j}{\bar{\theta}}$$

- More flexible baskets are more volatile

$$\frac{\sigma_{\pi^h}}{\sigma_\pi} = \frac{\bar{\theta}^h}{\bar{\theta}}$$

Data

- Household specific inflation:

$$\pi_t^h = \sum_j \omega_j^h \pi_{j,t}$$

  - ω_j^h : Consumption expenditures from the US Consumption Expenditure Survey (CES)
  - $\pi_{j,t}$: Item-level price indices from BLS (178 goods)

- Household specific average frequency of price changes:

$$\bar{\theta}^h \equiv \sum_j \omega_j^h \theta_j$$

  - θ_j: ELI-level frequencies from Nakamura and Steinsson 2008 (265 goods)
    - Fraction of prices that change in a month

Consumption Expenditure Survey

- Two modules: the Interview and the Dairy
  - Expenditure files
    - Collect expenditures on about 600 UCC categories
    - 350 UCCs in the Interview
    - 250 UCCs in the Dairy
  - Income files
  - Characteristics files
- Dairy and interview survey different households each year
- Percentile-level household expenditure share ω_j^h

Aggregating HHs into percentiles

- Sort households into percentiles in two steps:
  - Aggregate HHs in the Interview survey into percentiles
  - Use Interview income cutoffs to divide HHs from the Diary into percentiles
- Imputed income before tax
  - CES starts to include imputed income since 2004
  - Fisher, Johnson and Smeeding (2015) imputes income back to 1984

Adjusting the expenditure values

Housing

- Owner's equivalent rent of primary residence

  "If someone were to rent your home today, how much do you think it would rent for monthly, unfurnished and without utilities?"

  - Response saves in the variable *RENTEQVX* in the characteristics file
  - Construct an artificial UCC code *999999* to store the value

- Seperate consumption component from investment component

  - Adjust expenditures on homeowner insurance, maintenance, and major appliances
  - Apply a factor of 0.43

Adjusting the expenditure values

Medical care

- Redistribution factors
  - Redistribute private health insurance and Medicare premiums to medical care services
  - The BLS constructs redistribution factors from the National Health Expenditure (NHE) tables
  - Use NHE table 20 directly
- Allocate reimbursements across all HHs

Concordance

- In-scope expenditures for CPI could be divided into
  - 8 groups
  - 70 expenditure classes
  - 211 item strata (item level)
  - 303 entry level items (ELIs)
- Concordance from UCCs to item strata to ELIs
  - Following BLS document *CPI requirement for CE Appendix B*

Calculating the expenditure shares

- Distinction between the survey period and the expenditure reference period
  - HHs surveyed in Feb.2017
  - Reports expenditures for Nov. and Dec. 2016 and Jan. 2017
- Calculate the mean value of a calendar year
  - Create MO_SCOPE
  - Annualized average expenditure for each UCC category k at percentile h

$$\bar{X}_k^h = \frac{\sum_i FINLWT_i^h \cdot \sum_t C_{i,k,t}^h}{\sum_i FINLWT_i^h \cdot MO\_SCOPE_i^h} \times 12$$

- Expenditure share

$$\omega_j^h = \frac{\bar{X}_j^h}{\sum_j \bar{X}_j^h}$$

Takeaways

1. Households with different incomes consume different goods
2. Heterogeneous effects of monetary policy across goods

$\Longrightarrow$Distributional consequences of monetary policy

- Goods consumed by high-income households are:
  - more sticky
  - less volatile
- FAVAR + DSGE evidence
  - Large effects relative to impact of monetary shocks on prices
  - Inequality affects monetary policy effectiveness - modestly