Can Supply Shocks Be Inflationary with a Flat Phillips Curve?
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The New Keynesian Phillips Curve

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$$\pi_t = \beta E_t \pi_{t+1} - \lambda\varphi\hat{u}_t - \lambda\hat{a}_t$$

▶ Inflation depends on:
  ▶ Inflation expectations $\beta E_t \pi_{t+1}$
  ▶ Unemployment deviations $\hat{u}_t$
  ▶ "Supply shocks" $\hat{a}_t$

▶ Literal interpretation of supply shocks is TFP
  ▶ With minimal extension: shocks to price of non-labor inputs (e.g. oil)

▶ λ measures nominal rigidity

▶ φ is "real rigidity" from input markets
  ▶ E.g. search, elastic labor supply, intermediate goods

Background: Supply Shocks Relatively Important for Inflation

This paper's motivation: conditional on π^e, supply shocks more important than demand shocks for inflation

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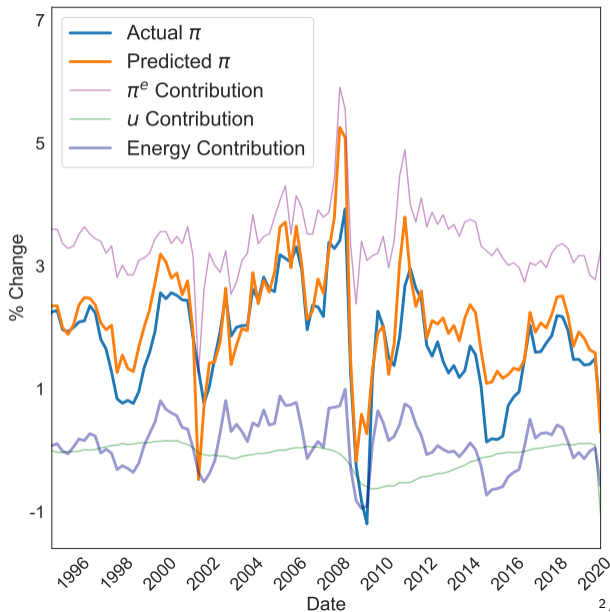
Estimate by OLS:

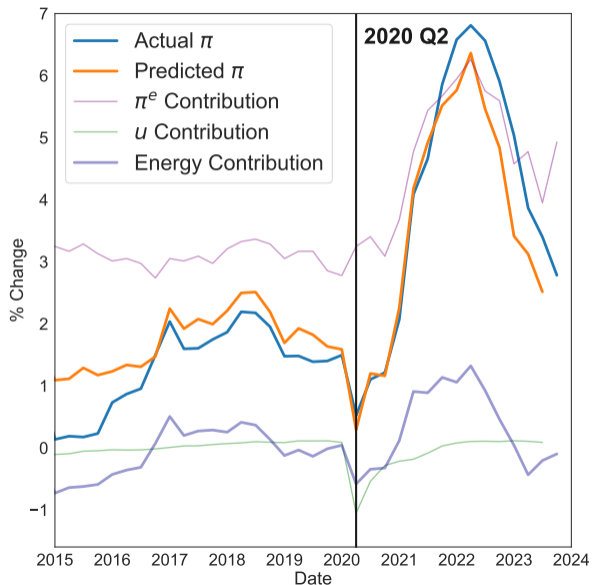$$\pi_t = \beta \pi^e_{t,t+4} - \kappa \tilde{u}_t + \gamma e_t + \varepsilon_t$$

- ▶ π_t: PCE headline inflation
- ▶ $\pi^e_{t,t+4}$: 1 year expectations (Michigan)
- ▶ $\tilde{u}_t$: Unemployment gap (CBO)
- ▶ e_t: PCE energy inflation
- ▶ Sample: 1984Q1-2020Q1

Flat Phillips Curve: u_t contribution to π_t small

- ▶ Despite big changes in u_t
- ▶ But bigger contributions from **energy**

Background: Supply Shocks Remain Important Post Pandemic

This Paper: A Shock Dependent Phillips Curve

▶ **Claim:** hard for standard New Keynesian model to explain relative importance of supply shocks

    ▶ The standard Phillips Curve is

$$\pi_t = \beta E_t \pi_{t+1} - \lambda \varphi \hat{u}_t - \lambda \hat{a}_t$$

    ▶ Existing evidence suggests $\varphi \times \lambda$ is small (the "flat" Phillips Curve)

    ▶ Arguably φ is relatively large

    ▶ Therefore λ is low

    $\rightarrow$ Meaning shocks to $\hat{a}$ have tiny effects on inflation

This Paper: A Shock Dependent Phillips Curve

▶ **Claim:** hard for standard New Keynesian model to explain relative importance of supply shocks

▶ **Model:** firms are better informed than consumers about aggregate conditions
  - ▶ Departure from standard New Keynesian model
  - ▶ Two shocks: monetary policy $+$ TFP
  - ▶ All firms and subset of consumers observe both shocks
  - ▶ Remaining consumers do not observe either shock
  - $\rightarrow$ Infer shocks via Bayesian updating
  - ▶ Otherwise static economy (dynamics are difficult!)

This Paper: A Shock Dependent Phillips Curve

▶ **Claim:** hard for standard New Keynesian model to explain relative importance of supply shocks

▶ **Model:** firms are better informed than consumers about aggregate conditions

▶ **Result:** a shock dependent New Keynesian Phillips Curve

$$\pi_t = \kappa \hat{x}_t + \hat{a}_t$$

  ▶ Differences from the New Keynesian Phillips:
    ▶ No nominal rigidity term pre-multiplying supply shock $\hat{a}_t$
    ▶ Also: static model does not have inflation expectations
  ▶ **Implication:** can explain relative importance of supply shocks for inflation
    ▶ κ can be low, demand shocks affect inflation little
    ▶ But shocks to $\hat{a}_t$ affect inflation one-for-one

Intuition for Shock Dependence

My pidgin version of the intuition:

▶ Suppose there is a negative demand shock

  ▶ If the firm were to cut prices, uninformed consumers would realize there is a recession

  ▶ They would lower their demand, meaning lower profits for the firm

  → The firm keeps the price high to "fool" uninformed consumers into keeping demand high

  ▶ Higher demand raises profits for the firm during recessions

  ▶ Sticky prices is a perfect Bayesian equilibrium with enough uninformed consumers

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- ▶ Suppose there is a supply shock
  - ▶ The firm has no incentive to fool anyone
  - ▶ With positive supply shocks the firm wants to increase output and lowers prices to raise demand
  - ▶ Just as in a frictionless model

Some Thoughts

This is a **really nice paper**

▶ Well motivated

▶ Interesting and novel mechanism

▶ Supporting empirical evidence

▶ Room for follow up work:
   ▶ Novel mechanism generating nominal rigidity
   ▶ Scope to connect to expectations + micro data

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My main comment: perhaps the standard model can fit the relative importance of supply shocks

- ▶ Even without the authors' additional (and appealing) mechanism

- ▶ Two ways to do so:
    - ▶ Strong "real rigidities"
    - ▶ More persistent supply than demand shocks

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Many models suggest strong real rigidity:

▶ Input-output networks

▶ Sticky wages in New Keynesian model

▶ Rigid wages in New Keynesian search model

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Direct evidence: Gagliardone, Gertler, Lenzu & Tielens (2024) find $\varphi = 0.25$
▶ Uses high quality Belgian microdata with measures of marginal cost
▶ Valid for a range of microfoundations for real rigidity

$\rightarrow$ High real rigidity may allow standard model to fit relative importance of supply shocks

Importance of Supply Shocks in the Standard Model

▶ Strong "real rigidities"

▶ **More persistent supply than demand shocks**

Persistent Supply Shocks

Solving forwards the New Keynesian Phillips Curve:

$$\pi_t = -\lambda\varphi E_t \sum_{j=0}^{\infty} \beta^j \hat{u}_{t+j} - \lambda E_t \sum_{j=0}^{\infty} \beta^j \hat{a}_{t+j}.$$

Imposing that $\hat{u}_t$, $\hat{a}_t$ are AR(1) processes:

$$\pi_t = -\lambda\varphi \frac{u_t}{1 - \rho_u\beta} - \lambda \frac{\hat{a}_t}{1 - \rho_a\beta}.$$

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- ▶ Extreme case: if $\beta, \rho_a \rightarrow 1$ then effect is very large

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In practice: supply shocks thought to be more persistent than demand shocks

- ► E.g. oil prices and TFP well approximated by random walks
- $\rightarrow$ May account for relative importance of supply shocks in standard model

Conclusion

Really nice and **thought provoking paper**

▶ Motivated by relative importance of supply shocks for inflation

▶ Argues that New Keynesian model cannot match the data

▶ Proposes novel and interesting theory w/ incomplete information

My comment: great to "steelman" the standard model to make sure new model is needed