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# What do Long Data Tell Us About the Inflation Hike Post COVID-19 Pandemic?

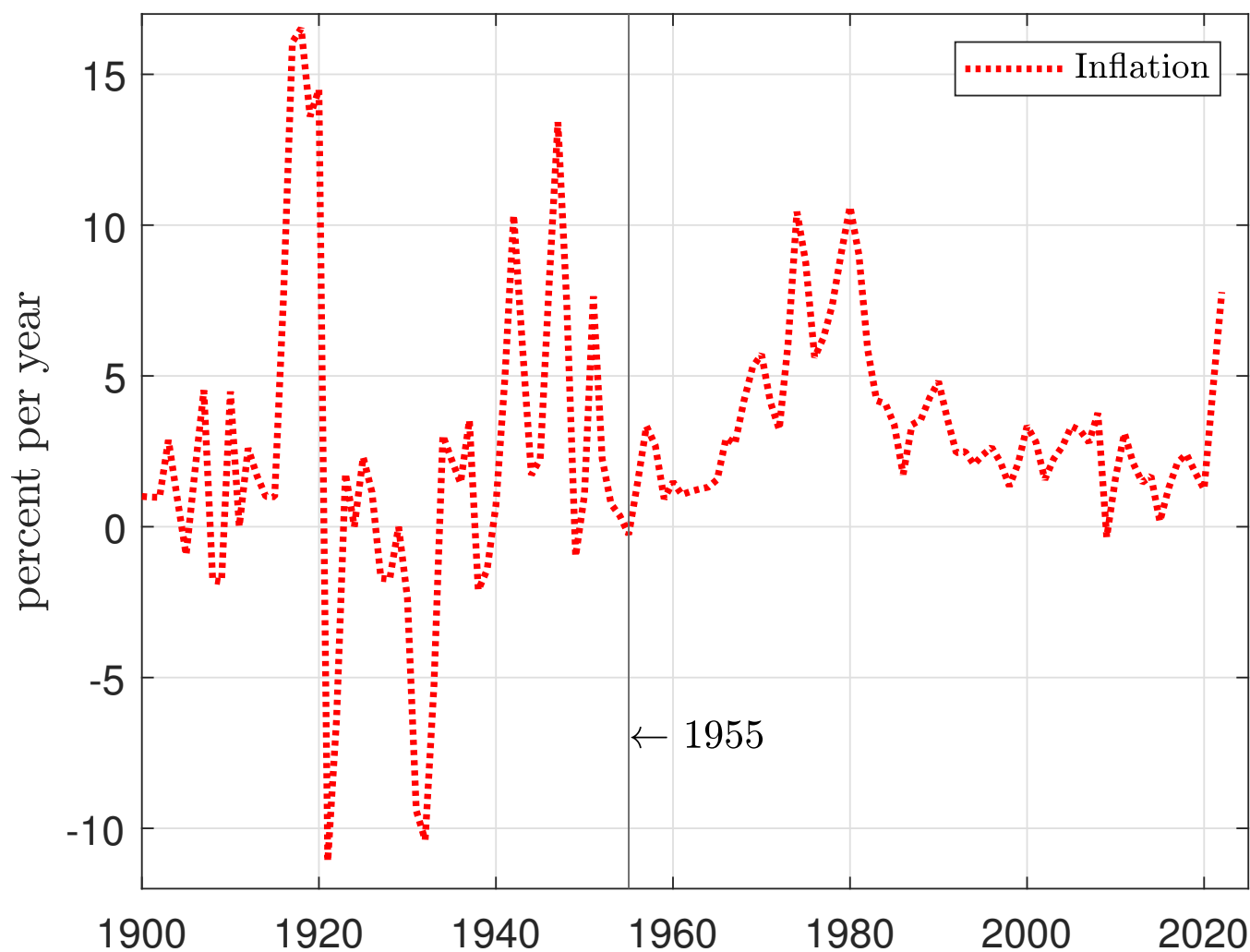
Stephanie Schmitt-Grohé

Martín Uribe

Columbia University

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## CPI Inflation, United States, 1900–2022



## The Empirical Model\*

$\pi_t$  = inflation rate

$i_t$  = nominal interest rate

$y_t$  = log of real output per capita

$X_t^m$  = permanent monetary shock

$X_t^r$  = permanent natural rate shock

$X_t$  = permanent productivity shock

Cyclical components of  $\pi_t$ ,  $i_t$ , and  $y_t$

$$\hat{\pi}_t \equiv \pi_t - X_t^m$$

$$\hat{i}_t \equiv i_t - X_t^m - X_t^r$$

$$\hat{y}_t \equiv y_t - X_t - \delta X_t^r$$

The focus of the present paper is the behavior of the **latent variable**  $X_t^m$  representing the permanent component of inflation.

\*The model is that of Schmitt-Grohé and Uribe (2022, 'The Macroeconomic Consequences of Natural Rate Shocks: An Empirical Investigation'), which in turn builds on Uribe (2022).

- The law of motion of the stationary endogenous variables

$$\begin{bmatrix} \hat{y}_t \\ \hat{\pi}_t \\ \hat{i}_t \end{bmatrix} = B \begin{bmatrix} \hat{y}_{t-1} \\ \hat{\pi}_{t-1} \\ \hat{i}_{t-1} \end{bmatrix} + C \begin{bmatrix} \Delta X_t^m \\ z_t^m \\ \Delta X_t \\ z_t \\ \Delta X_t^r \end{bmatrix},$$

where  $z_t^m$  = a stationary monetary shock and  $z_t$  = a stationary real shock

- The exogenous shocks follow univariate AR(1) processes,

$$\begin{bmatrix} \Delta X_{t+1}^m \\ z_{t+1}^m \\ \Delta X_{t+1} \\ z_{t+1} \\ \Delta X_{t+1}^r \end{bmatrix} = \rho \begin{bmatrix} \Delta X_t^m \\ z_t^m \\ \Delta X_t \\ z_t \\ \Delta X_t^r \end{bmatrix} + \Psi \begin{bmatrix} \epsilon_{t+1}^{X^m} \\ \epsilon_{t+1}^{z^m} \\ \epsilon_{t+1}^X \\ \epsilon_{t+1}^z \\ \epsilon_{t+1}^{X^r} \end{bmatrix},$$

with  $\rho$  and  $\Psi$  diagonal and  $\epsilon_t^s$ , for  $s = X^m, z^m, X, z, X^r$ , i.i.d.  $N(0, 1)$ .

## Observation equations

Observables:

$\Delta y_t$  = output growth

$\Delta \pi_t$  = change in consumer price inflation

$\Delta i_t$  = change in the short-term nominal interest rate

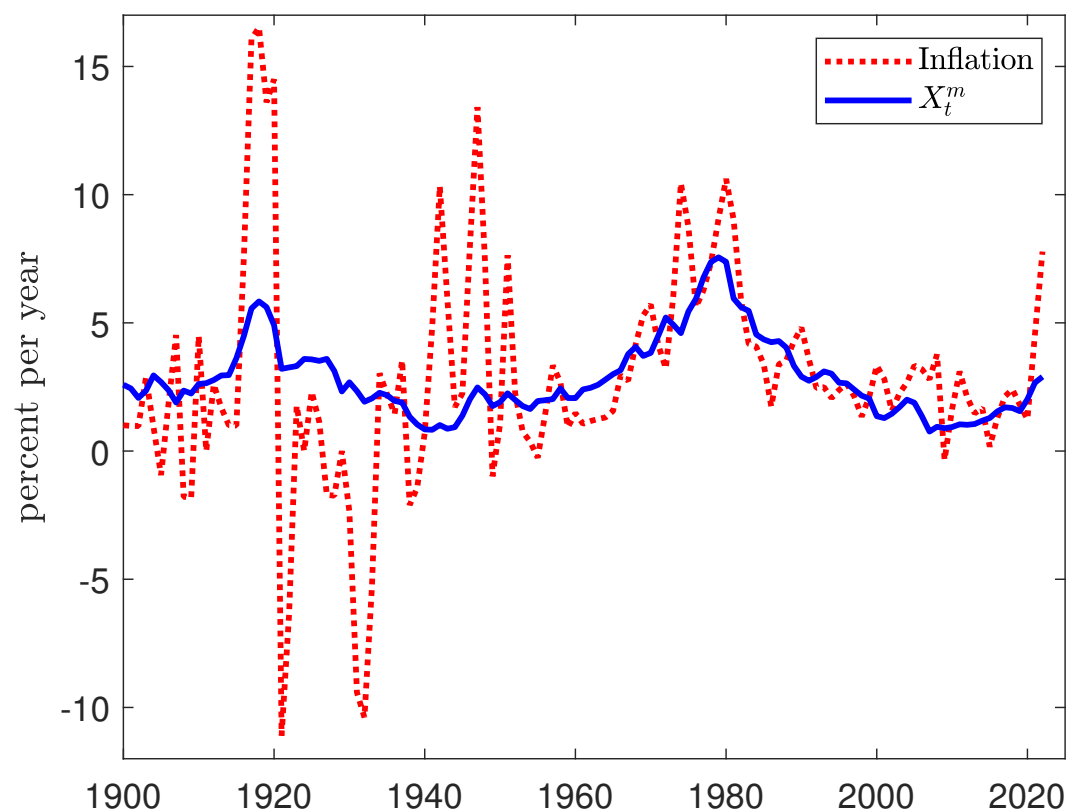
$$\Delta y_t = \hat{y}_t - \hat{y}_{t-1} + \Delta X_t + \delta \Delta X_t^r + \mu_t^y,$$

$$\Delta \pi_t = \hat{\pi}_t - \hat{\pi}_{t-1} + \Delta X_t^m + \mu_t^\pi,$$

$$\Delta i_t = \hat{i}_t - \hat{i}_{t-1} + \Delta X_t^m + \Delta X_t^r + \mu_t^i,$$

where  $\mu_t^s$ , for  $s = y, \pi, i$ , are normally distributed mean-zero i.i.d. measurement errors

## Inflation and Its Permanent Component: 1900 to 2022 Sample



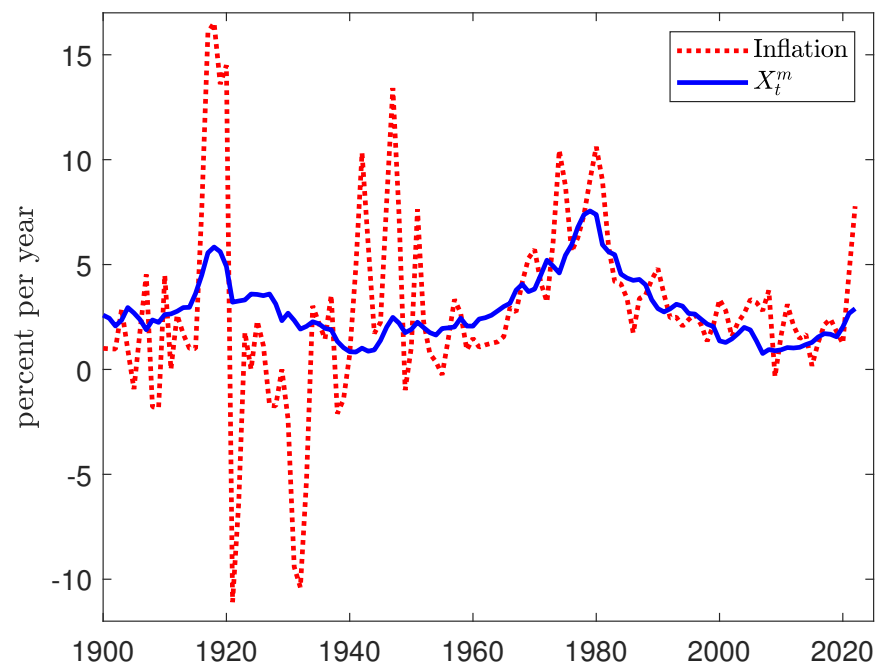
Notes.  $X_t^m$  is computed by two-sided smoothing using the Kalman filter at the posterior mean of the vector of estimated parameters and is normalized by adding a constant to match the sample mean of inflation.

$$\pi_{2022} - \pi_{2019} = 6.0\%;$$

$$X_{2022}^m - X_{2019}^m = 1.3\%$$

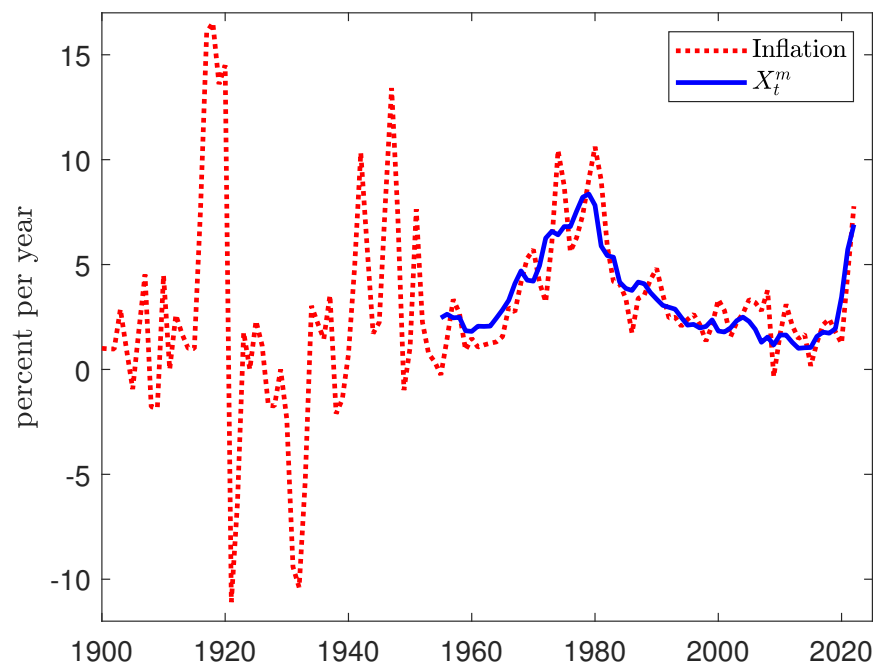
# Inflation and Its Permanent Component: 1900–2022 vs 1955–2022

Sample: 1900 to 2022



$$X_{2022}^m - X_{2019}^m = 1.3\%$$

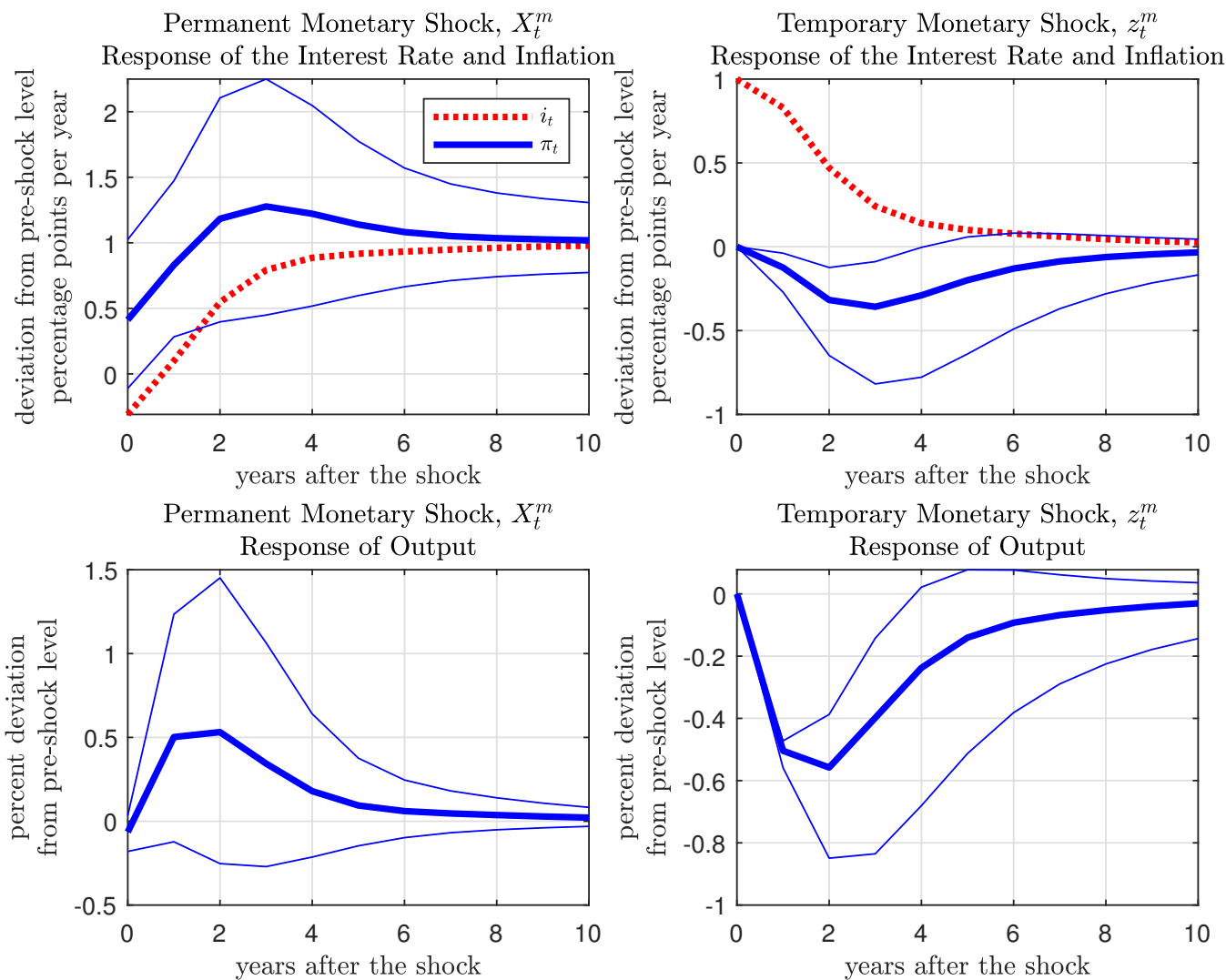
Sample: 1955 to 2022



$$X_{2022}^m - X_{2019}^m = 5.0\%$$

- Between 2019 and 2022 the permanent component of inflation experienced an increase of **1.3%** when model is estimated on 1900–2022 data but of **5.0%** when model is estimated on 1955–2022 data.

# Impulse Response to Monetary Shocks: 1900 to 2022 Sample

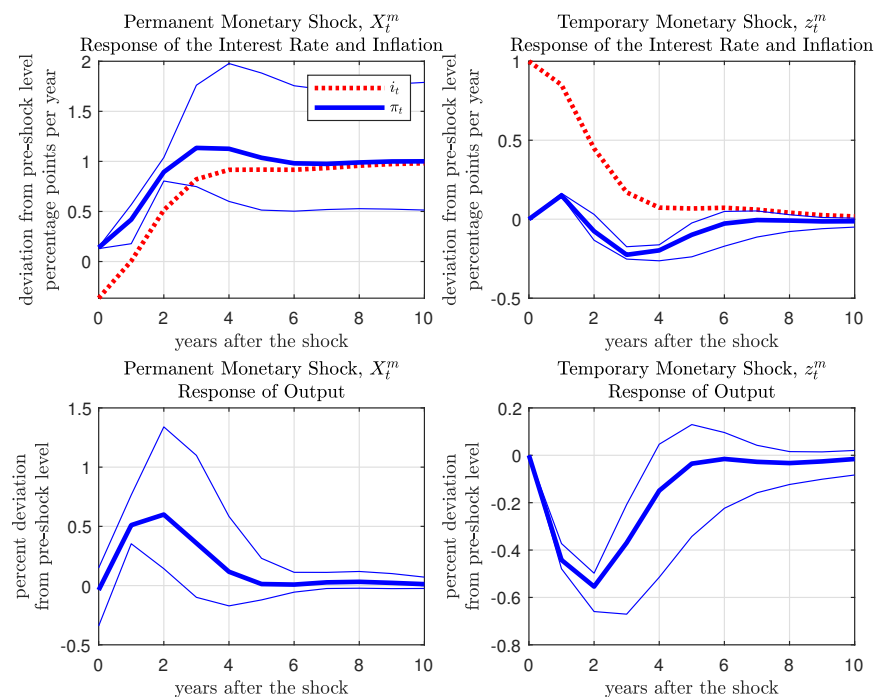
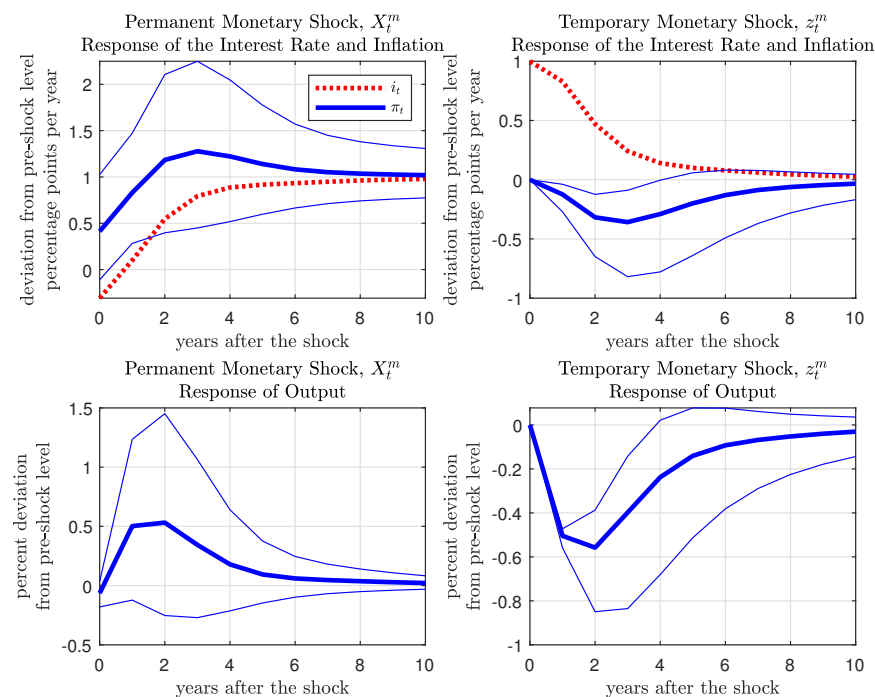


Notes. Posterior mean of impulse responses with 95-percent asymmetric Sims-Zha error bands.

# Impulse Response to Monetary Shocks

Sample: 1900 to 2022

Sample: 1955 to 2022



- Impulse responses to monetary shocks (transitory or permanent) are little affected by sample.

## Conclusion

- Seen from the perspective of a model estimated on postwar data the post-COVID-19 inflation spur is interpreted to be associated with a large increase in the permanent component of inflation.
- For the sample that includes the sudden, large, and short-lived swings in inflation observed in the first half of the 20th century, the same model attributes only a minor fraction of the post-COVID-19 inflation to an increase in its permanent component.
- The monetary transmission mechanism is estimated to be stable across the two sample periods.