Policy-Induced Inflation Dynamics in the US: A Bayesian DSGE Model with Prospective Policy Shocks

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1 Motivation and Policy Relevance

The inflation dynamics observed since the COVID-19 pandemic have fundamentally altered the context in which macroeconomic policy is designed and implemented. While supply chains and production systems have recovered significantly, the rapid reopening of the economy exposed persistent imbalances in the monetary and real sectors. These imbalances were gradually mitigated, and by May 2025, headline inflation had fallen to 2.4%, largely due to a coordinated monetary tightening cycle and supportive fiscal measures. However, underlying inflationary pressures remain elevated: core inflation continues to exceed the Fed's 2% target, reflecting rigidities that monetary policy alone has not fully addressed.

In addition to structural price stickiness, recent policy developments, including increased tariffs, restrictions on immigration, and shifts in government spending and taxation, pose further challenges to inflation convergence. These policies not only influence aggregate demand but also distort price-setting behavior, labor market dynamics, and external competitiveness. In this context, it becomes imperative to assess the macroeconomic consequences of such interventions within a rigorous and tractable framework.

To this end, we propose a New Keynesian open economy DSGE model, grounded in the fiscal structure developed by Eric Sims and Adrian et al. (2022). The model incorporates nominal rigidities in both prices and wages, features Ricardian households, and embeds a trade sector with tariffs. By having this we can get responses for all the prospective policies: if tariffs increased or labor supply diminishes or tax rates reduce or government spending goes up. These extensions are essential to reflect the complex interactions between fiscal behavior, labor market frictions, and external shocks that shape the U.S. inflation outlook.

The model is estimated using Bayesian methods, with the Metropolis-Hastings algorithm employed to calibrate the proposal distribution and recover the posterior distribution of key structural parameters. Steady-state and dynamic analyses will be performed to evaluate how inflation responds to various prospective policies under uncertainty. In particular, *Impulse Response Functions* (IRFs) will be used to study the transition dynamics following prospective policies shocks, both individually and jointly through a stochastic policy trigger ϵ_t^{ψ}. The model will also employ *forecast error variance decomposition* (FEVD) to quantify the contribution of each structural shock to inflation variability, and perfect foresight simulations to trace inflation trajectories under different policy scenarios.

In general, this modeling strategy provides a comprehensive framework for analyzing the persistence of inflation, quantifying policy trade-offs, and designing optimal monetary responses. By aligning theoretical structure with empirical relevance, the model

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contributes to academic research and practical policy formulation in an era marked by uncertainty, geopolitical fragmentation, and evolving macroeconomic regimes.

2 Related Literature

As outlined in our research focus, we aim to analyze how tariff shocks, expansionary fiscal policy, and adverse labor supply shocks affect inflation dynamics. In this context, we present a brief review of recent literature that explores these mechanisms.

Tariff shocks have been shown to exert persistent inflationary pressures. Fajgelbaum et al. (2020) document full pass-through of U.S. import tariffs in 2018 to final goods prices, resulting in a real income loss of 0.27% of GDP. Furceri et al. (2022) corroborate this globally, finding statistically significant and lasting inflationary effects of tariff hikes using panel local projections. Within DSGE frameworks, Erceg et al. (2018) use a New Keynesian open economy model to show that tariffs, combined with export subsidies, temporarily raise inflation by stimulating external demand. Barattieri et al. (2021), using both VAR and DSGE models, find that import tariffs operate as negative supply shocks—reducing output and raising inflation. Auray et al. (2025) estimate that tariffs during the U.S.–China trade war added roughly 0.3 percentage points to U.S. CPI inflation. Similarly, Alvarez and Yilmazkuday (2025) find a tariff pass-through to inflation of 9% under unilateral imposition and 10% with retaliation in a two-country DSGE setting.

Fiscal policy shocks also play a key role. Cevik and Miryugin (2024), using local projections for 140 countries, find that expansionary fiscal shocks increase headline inflation by 0.73 percentage points in the short run, with more pronounced effects in developing economies and constrained fiscal settings. DSGE studies further illuminate these channels: Mayer et al. (2013) show that high debt levels amplify the inflationary response to fiscal expansions; Drautzburg (2020), through a DSGE-SVAR approach, finds that government spending increases inflation, especially when monetary policy is unresponsive. Bianchi et al. (2023) integrate the fiscal theory of the price level into a DSGE framework, highlighting that unfunded fiscal shocks significantly explain post-pandemic inflation dynamics.

Adverse labor supply shocks have gained renewed attention for their inflationary effects. Kurozumi and Zandweghe (2022), in a New Keynesian model with endogenous labor force participation, show that declines in participation elevate wage growth via reduced employment, thereby raising inflation. Amiti et al. (2024) model labor supply contraction as a rise in workers' disutility of labor, finding that this shock contributed to wage and price inflation—especially when compounded by input price increases, due to limited factor substitution.

3 Methodology

The basis for the construction of the model is the Fiscal DSGE model of Sims (2024) and the medium-scale DSGE model of Adrian et al. (2022). The utility function follows a GHH form in which the wealth effect is eliminated and also incorporates a labor supply shock η_t :

$$E_0 \sum_{t=0}^{\infty} \beta^t \left\{ \frac{\left[C_t^o - C_{t-1}^o - \eta_t \frac{N_{o,t}^{1+\phi}}{1+\phi} \right]^{1-\gamma}}{1-\gamma} \right\}$$

The η_t shock follows an $AR(1)$ and is the way in which the restrictions on immigration policy dynamics will be set in the model.

$$\eta_t = \rho^{\eta} \eta_{t-1} + \epsilon_t^{\eta}$$

For the trade sector, the Trade Balance will have the following expression in which tariffs appeared in the following form, and τ_t^{trade} process will be shown in the next paragraph.

$$TB_t = P_t^X X_t + (1 - \tau_t^{trade}) P_t^M M_t$$

For the government, it chooses its spending level G_t exogenously and finances itself through taxes on labor τ_t^n, capital τ_t^k and corporate earnings τ_t^π , new debt $D_{t+1} - D_t$ and tariffs τ_t^{trade}. The government also inherits existing debt on which it must pay interest $r_{t-1}D_t$. The government's cash-flow budget constraint is therefore interpreted as follows:

$$G_t + r_{t-1}D_t \leq \tau_t^n W_t N_t + \tau_t^k R_t^k K_t + \tau_t^{trade} P_t^m M_t + \tau_t^\pi \Pi_t + D_{t+1} - D_t$$

Through it, the prospective expansionary fiscal policy is shocked thanks to distortionary taxes and the government spending dynamics in the form of:

$$\begin{aligned}
\tau_t^k =& (1-\rho_k)\left(\tau_{ss}^k \rho_{\tau^k}^D \left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_k \tau_{t-1}^k + \epsilon_t^k \\
\tau_t^n =& (1-\rho_n)\left(\tau_{ss}^n \rho_{\tau^\eta}^D \left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_n \tau_{t-1}^n + \epsilon_t^n \\
\tau_t^{trade} =& (1-\rho_n)\left(\tau_{ss}^{trade} \rho_{\tau^{trade}}^D \left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_n \tau_{t-1}^{trade} + \epsilon_t^{trade} \\
\tau_t^\pi =& (1-\rho_n)\left(\tau_{ss}^\pi + \rho_{\tau^\pi}^D \left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_n \tau_{t-1}^\pi + \epsilon_t^\pi \\
\frac{G_t}{Y_t} =& (1-\rho_g)\left(\frac{G_{ss}}{Y_{ss}} - \rho_g^D \left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_g \frac{G_{t-1}}{Y_{t-1}} + \epsilon_t^g
\end{aligned}$$

To relate more to the actual prospective policies in the fiscal case we will mainly focus on the shocks of the τ_t^π and the $\frac{G_t}{Y_t}$.

Stickiness is modeled in the output supply, the labor demand and the international trade, following the framework of Calvo (1983) Erceg et al. (2000), and Monacelli (2005), respectively. For all the setting there will be a proportion of agents $(1 - \omega^i)\ \forall\ i \in \{y, N, X, M\}$ that adjust their prices optimally as:

$$P_t^y = \left[(1-\omega^y)(\tilde{P}_t^y)^{(1-\theta^y)} + \omega^y \left(\left(\frac{P_{t-1}^y}{P_{t-2}^y}\right)^{\gamma^y} \left(\frac{\bar{P}_{t-1}^y}{\bar{P}_{t-2}^y}\right)^{(1-\gamma^y)} P_{t-1}^y\right)^{(1-\theta^y)}\right]^{\frac{1}{1-\theta^y}}$$

$$\begin{aligned}
W_t = \Bigg[&(1-\omega^N)(\tilde{W}_t)^{(1-\theta^L)} + \omega^N \Bigg(\Bigg(\left(\frac{W_{t-1}}{W_{t-2}}\right)^{1-\mu^L} \left(\frac{P_{t-1}^c A_{t-1}^T}{P_{t-2}^c A_{t-2}^T}\right)^{\mu^L}\Bigg)^{\gamma^L} \\
&\left(\left(\frac{\bar{W}_{t-1}}{\bar{W}_{t-2}}\right)^{(1-\mu^L)} \left(\frac{\bar{P}_{t-1}^c \bar{A}_{t-1}^T}{\bar{P}_{t-2}^c \bar{A}_{t-2}^T}\right)^{\mu^L}\right)^{1-\gamma^L} W_{t-1}\Bigg)^{(1-\theta^L)}\Bigg]^{\frac{1}{1-\theta^L}}
\end{aligned}$$

$$\begin{aligned}
P_t^X = \Bigg[&(1-\omega^X)(\tilde{P}_t^X)^{1-\theta^X} + \omega^X \Bigg(\Bigg(\left(\frac{P_{t-1}^X}{P_{t-2}^X}\right)^{1-\mu^X} \left(\frac{\varepsilon_t P_t^{Y,f}}{\varepsilon_{t-1} P_{t-1}^{Y,f}}\right)^{\mu^X}\Bigg)^{\gamma^X} \\
&\Bigg(\left(\frac{\bar{P}_{t-1}^X}{\bar{P}_{t-2}^X}\right)^{1-\mu^X} \left(\frac{\bar{\varepsilon}_t \bar{P}_t^{Y,f}}{\bar{\varepsilon}_{t-1} \bar{P}_{t-1}^{Y,f}}\right)^{\mu^X}\Bigg)^{1-\gamma^X} P_{t-1}^X\Bigg)^{1-\theta^X}\Bigg]^{\frac{1}{1-\theta^X}}
\end{aligned}$$

$$\begin{aligned}
P_t^M = \Bigg[&(1-\omega^M)(\tilde{P}_t^M)^{(1-\theta^M)} + \omega^M \Bigg(\Bigg(\left(\frac{P_{t-1}^M}{P_{t-2}^M}\right)^{1-\mu^M} \left(\frac{\varepsilon_t P_t^{Y,f}}{\varepsilon_{t-1} P_{t-1}^{Y,f}}\right)^{\mu^M}\Bigg)^{\gamma^M} \\
&\Bigg(\left(\frac{\bar{P}_{t-1}^M}{\bar{P}_{t-2}^M}\right)^{(1-\mu^M)} \left(\frac{\bar{\varepsilon}_t \bar{P}_t^{Y,f}}{\bar{\varepsilon}_{t-1} \bar{P}_{t-1}^{Y,f}}\right)^{\mu^M}\Bigg)^{1-\gamma^M} P_{t-1}^M\Bigg)^{(1-\theta^M)}\Bigg]^{\frac{1}{1-\theta^M}}
\end{aligned}$$

In the model there is also a proportion ξ of non-ricardian agents that do not make forward-looking decisions because of a simpler utility function subject to a budget restriction as:

$$\frac{(C_t^n)^{1-\sigma}}{1-\sigma} - \chi \frac{(N_t^n)^{1+\varphi}}{1+\varphi}$$
$$\text{s.t.} \quad C_t^n = (1-\tau_t^h) N_t^n$$

After that, C_t and N_t are aggregated as:

$$C_t = \xi C_t^o + (1-\xi) C_t^n$$
$$N_t = \xi N_t^o + (1-\xi) N_t^n$$

According to these mechanisms, the steady-state comparison will be performed by stressing the baseline scenario towards a more rigid one, characterized by a larger proportion of ω^i and ξ, due to the effective implementation of the prospective policies.

Finally, the join shock ϵ_t^ψ will enter the other shocks through its respective stochastic equation in the next form. So whenever the shock is active with a σ^ψ standard deviation, it will enable all prospective policies simultaneously.

$$\begin{aligned}
\frac{G_t}{Y_t} &= (1-\rho_g)\left(\frac{G_{ss}}{Y_{ss}} - \rho_g^D\left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_g \frac{G_{t-1}}{Y_{t-1}} + \epsilon_t^\psi \\
\tau_t^\pi &= (1-\rho_n)\left(\tau_{ss}^\pi + \rho_{\tau^\pi}^D\left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_n \tau_{t-1}^\pi + \epsilon_t^\psi \\
\tau_t^{trade} &= (1-\rho_n)\left(\tau_{ss}^{trade}\rho_{\tau^{trade}}^D\left(\frac{D_t}{Y_t} - \frac{D_{ss}}{Y_{ss}}\right)\right) + \rho_n \tau_{t-1}^{trade} + \epsilon_t^\psi \\
\eta_t &= \rho^\eta \eta_{t-1} + \epsilon_t^\psi
\end{aligned}$$

4 Data and estimation

The primary insights of the model will derive from the dynamics within the labor market, the trade sector, the financial sector, and the fiscal policy framework. Consequently, data inputs will be primarily sourced from the *U.S. Bureau of Labor Statistics* (BLS), *the Federal Reserve Bank of St. Louis* (FRED), and *Bloomberg*. More information could be seen in table 1

Prior to estimation, the data will be seasonally adjusted and first-differenced, if necessary, to ensure stationarity and avoid distortions that could compromise the model's performance. The DSGE model will be implemented using *Dynare*. Bayesian estimation will be conducted via the Metropolis-Hastings algorithm, which will be used to calibrate the scaling parameter of the proposal distribution's covariance matrix. This tuning step ensures efficient exploration of the posterior distribution by maximizing the acceptance rate and improving the convergence of the *Markov Chain Monte Carlo* (MCMC) process. The prior distributions for some of the parameters will be *Beta* with $\mu = 0.5$ and $\sigma = 1$ and the standard deviations of the shocks will be *Inverse Gamma* with $\mu = 1$ and $\sigma = 2$ as proposed in the literature. If there is some misidentification, μ and σ will differ to obtain the proper results.

5 Expected contribution

The results will present the implications of each prospective policy by evaluating a calibrated version of the model in which the mechanisms associated with these policies are already active. A comparative steady-state analysis will be conducted to assess how inflation is affected under different policy settings, using a calibration aligned with actual

macroeconomic data. This allows us to isolate and measure the long-run inflationary impact of each policy in a controlled environment.

In addition to the steady-state comparison, a more dynamic evaluation will be performed through *Impulse Response Functions* (IRFs), simulating the short- and medium-term responses of key macroeconomic variables to unexpected policy shocks. These stochastic simulations allow us to capture the transitional dynamics of the economy, emphasizing not only the inflationary consequences but also the optimal response of the Federal Reserve. Importantly, the analysis will go beyond isolated shocks by incorporating a joint policy shock, denoted by ϵ_t^{ψ}, which activates multiple policy mechanisms simultaneously, providing a more realistic representation of policy implementation under uncertainty.

To further quantify the contribution of each shock to inflation variability, a *Forecast Error Variance Decomposition* (FEVD) will be conducted. This will allow us to determine which shocks are most influential in driving inflation dynamics over time, highlighting potential sources of instability. Lastly, a perfect foresight simulation will be used to decompose inflation into its underlying structural components, offering a forward-looking perspective on how monetary policy could be best designed to mitigate the inflationary effects of these shocks.

Overall, this multilayered analysis, combining steady-state comparisons, dynamic stochastic simulations, and structural decomposition tools, provides a comprehensive evaluation of the inflationary impact of prospective U.S. policies. By integrating both short-run responses and long-run implications, the model offers valuable insights into the channels through which fiscal, trade, and wage rigidity policies affect inflation. This approach allows policymakers to identify which sources of inflationary pressure are most critical to monitor and address, ultimately contributing to the design of more robust and forward-looking policy strategies.

6 Research Agenda

First, we will start by setting up the new blocks and the prospective policy shocks and calibrate them with the actual data to perform the steady-state comparisons mentioned in the last paragraph. It is important to note that all variables will be in percentage of GDP and in real terms. Then we will run identification tests for the parameters and when everything is well set up, we will perform the Bayesian estimation for them. However, there will be a group of parameters that will be calibrated according to the literature as the ones from the Taylor rule. After that we will proceed with the analysis of the IRF's and the FEVD of inflation along with its decomposition simulated for the next horizons.

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Appendix

Table 1: Data summary

Variable / Indicator	**Role in the Model**	**Source**
Real GDP / Output	Aggregate production, output gap	FRED (BEA)
Inflation (CPI, Core CPI)	Price dynamics, Taylor rule	BLS, FRED
Fed Funds Rate / Nominal Interest Rate	Monetary policy instrument	FRED, Bloomberg
Government Spending / Revenue	Fiscal rule, tax revenues	FRED, CBO
Public Debt (gross/net)	Fiscal constraints and dynamics	FRED, U.S. Treasury
Trade-weighted Import Prices	Tariff impacts on inflation and trade	Bloomberg, USTR, FRED
Net Exports / Trade Balance	Open economy sector, foreign demand	FRED, BEA
Nominal / Real Wages	Wage stickiness and labor cost dynamics	BLS, FRED
Unemployment Rate / Labor Force Participation	Ricardian household labor behavior	BLS, FRED
Private Consumption	Intertemporal household decisions	FRED (NIPA tables)
Private / Public Investment	Capital accumulation (private/public)	FRED, Bloomberg
Exchange Rate / Real Exchange Rate	External sector pricing and competitiveness	Bloomberg, FRED
Financial Spreads / Risk Premiums	Financial frictions and transmission mechanisms	Bloomberg