The Effects of Transitory, Permanent, and Anticipated U.S. Import Tariff Shocks*

by

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Motivation

• Theory suggests that the macroeconomic effects of import tariff shocks depend on their persistence and anticipation:

– transitory tariff increases reduce current demand and improve the external accounts.

– permanent tariff increases have less of an effect on demand and the external accounts.

– anticipated tariff increases stimulate current demand and worsen the external accounts.

• Accordingly, we estimate the impact of tariffs on the macroeconomy using an empirical model that explicitly distinguishes between transitory, permanent, and anticipated tariff shocks.

Takeaway

Estimating the macroeconomic effects of import tariff shocks without distinguishing among transitory, permanent, and anticipated shocks can lead to misleading conclusions.

Related Literature

• Empirical literature on macro effects of tariff shocks is surprisingly thin: Boer and Rieth (2024), Barattieri, Cacciatore, and Ghironi (2021), Den Besten et al. (2026). Does not distinguish transitory, permanent, anticipated tariff shocks; some impose that tariff increases are inflationary.

• Empirical literature using microdata: Amiti et al. (2019); Fajgelbaum et al. (2020); Flaaen et al. (2020); Cavallo et al. (2021); Amiti et al. (2024). Static models, cannot speak to difference between transitory, permanent, or anticipated tariff shocks.

• Theory: early contributions, Razin and Svensson (1983) and Calvo (1987). More recent contributions stronger emphasis on quantitative and normative implications, Barattieri, Cacciatore, and Ghironi (2021), Auray, Devereux, and Eyquem (2022, 2024), Erceg, Prestipino, and Raffo (2023), Bergin and Corsetti (2023), Boer and Rieth (2024), Jeanne and Son (2024), Monacelli (2025), Bianchi and Coulibaly (2025), Cuba-Borda et al. (2025), Auclert, Rognlie, and Straub (2025), Kalemli-Özcan, Soylu, and Yıldırım (2025), Itskhoki and Mukhin (2025), Costinot and Werning (2025), and Werning, Lorenzoni, and Guerrieri (2025).

U.S. Import Tariff Rates

How to measure the import tariff rate, τ_t: 3 approaches

1. **Trade-weighted import tariff rate**, ratio of import duties, d_t, to imports of goods, m_t:

$$\tau_t = \frac{d_t}{m_t},$$

2. **Fixed-Weight Measure**
Fixed-weight average ratio of import duties to imports,

$$\tau_t^F = \sum_i s_i \tau_{it},$$

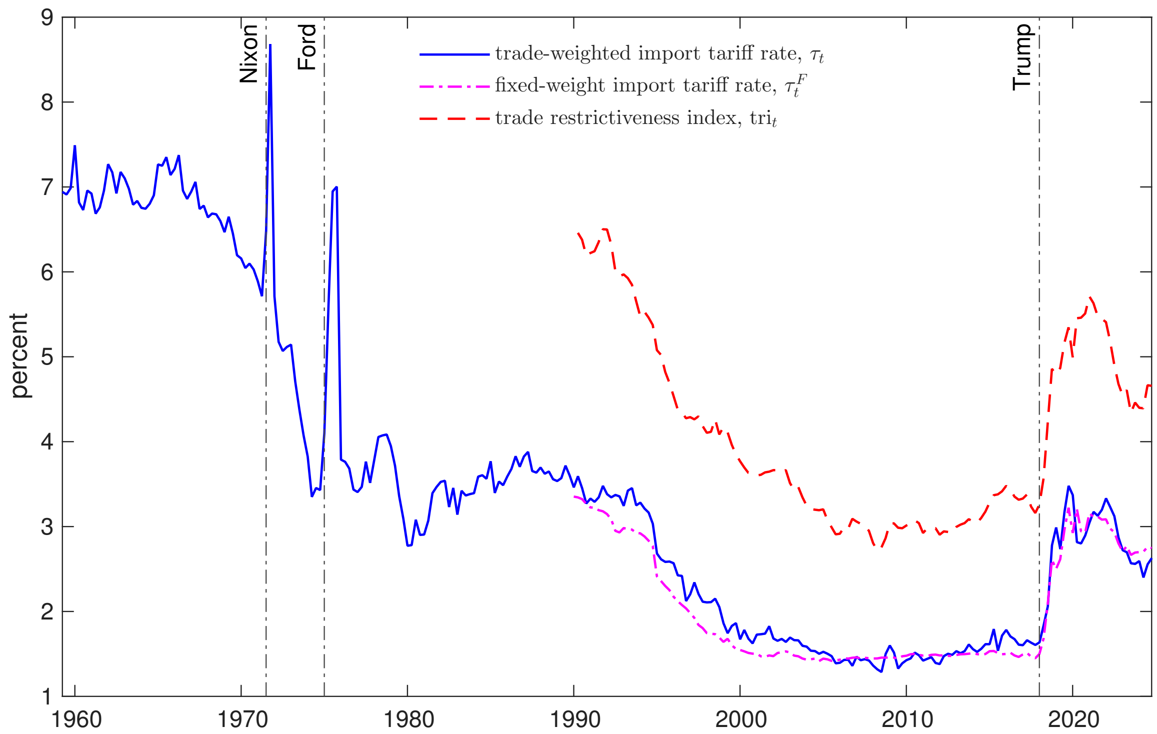
where s_i = import share of import good i in a given year (2006); $\tau_{it} \equiv d_{it}/m_{it}$ and $s_i = m_i/m$.

3. **Trade Restrictiveness Index (TRI)**

$$\text{tri}_t = \left(\frac{\sum_i s_{it} \epsilon_i \tau_{it}^2}{\sum_i s_{it} \epsilon_i} \right)^{\frac{1}{2}}, \qquad (1)$$

where ϵ_i = price elasticity of import demand of good i (from Kee, Nicita, Olarreaga, 2008).

U.S. Trade-Weighted Import Tariff Rate, Fixed-Weight Import Tariff Rate, and Trade Restrictiveness Index, 1959:Q2–2024:Q4



Takeaway: The three import tariff measures track one another closely over time and display a synchronized increase around the Trump 2018 episode. (Source: authors' calculations.)

Econometric Model

Key Features

– state-space model

– 6 observables:
$\Delta\tau_t$ = change in import tariff rate
Δy_t = output growth
Δmoy_t = import-to-output ratio
Δtby_t = change in trade-balance-to-output ratio
Δi_t = change in the nominal interest rate
$i_t - \pi_t$ = interest-rate-inflation differential

– 10 shocks compete to explain the 6 observables:
6 transitory shocks, including a transitory tariff shock, z_t^τ
4 permanent shocks, including a permanent tariff shock, X_t^τ

The 6 (unobserved) cyclical components

$\widehat{\tau}_t \equiv \tau_t - X_t^{\tau}$; $\widehat{y}_t \equiv y_t - X_t^{y}$; $\widehat{moy}_t \equiv moy_t - X_t^{x}$; $\widehat{tby}_t \equiv tby_t - \alpha X_t^{x}$; $\widehat{i}_t \equiv i_t - X_t^{m}$; $\widehat{\pi}_t \equiv \pi_t - X_t^{m}$

evolve over time as:

$$\begin{bmatrix} \widehat{\tau}_t \\ \widehat{y}_t \\ \widehat{moy}_t \\ \widehat{tby}_t \\ \widehat{i}_t \\ \widehat{\pi}_t \end{bmatrix} = \sum_{i=1}^{L} B_i \begin{bmatrix} \widehat{\tau}_{t-i} \\ \widehat{y}_{t-i} \\ \widehat{moy}_{t-i} \\ \widehat{tby}_{t-i} \\ \widehat{i}_{t-i} \\ \widehat{\pi}_{t-i} \end{bmatrix} + \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ c_{2,1} & 1 & 0 & 0 & 0 & 0 & c_{27} & c_{2,8} & c_{2,9} & c_{2,10} \\ c_{3,1} & c_{3,2} & 1 & 0 & 0 & 0 & c_{3,7} & c_{3,8} & c_{3,9} & c_{3,10} \\ c_{4,1} & c_{4,2} & c_{4,3} & 1 & 0 & 0 & c_{4,7} & c_{4,8} & c_{4,9} & c_{4,10} \\ c_{5,1} & c_{5,2} & c_{5,3} & c_{5,4} & 1 & 0 & c_{5,7} & c_{5,8} & c_{5,9} & c_{5,10} \\ c_{6,1} & c_{6,2} & c_{6,3} & c_{6,4} & c_{6,5} & 1 & c_{6,7} & c_{6,8} & c_{6,9} & c_{6,10} \end{bmatrix} \begin{bmatrix} z_t^{\tau} \\ z_t^{y} \\ z_t^{moy} \\ z_t^{tby} \\ z_t^{i} \\ z_t^{\pi} \\ \Delta X_t^{\tau} \\ \Delta X_t^{y} \\ \Delta X_t^{x} \\ \Delta X_t^{m} \end{bmatrix}$$

The z's are stationary and the X's are nonstationary. They are unobservable and follow the $AR(1)$ process

$$\begin{bmatrix} z_t^{\tau} \\ z_t^{y} \\ z_t^{moy} \\ z_t^{tby} \\ z_t^{i} \\ z_t^{\pi} \\ \Delta X_t^{\tau} \\ \Delta X_t^{y} \\ \Delta X_t^{x} \\ \Delta X_t^{m} \end{bmatrix} = \rho \begin{bmatrix} z_{t-1}^{\tau} \\ z_{t-1}^{y} \\ z_{t-1}^{moy} \\ z_{t-1}^{tby} \\ z_{t-1}^{i} \\ z_{t-1}^{\pi} \\ \Delta X_{t-1}^{\tau} \\ \Delta X_{t-1}^{y} \\ \Delta X_{t-1}^{x} \\ \Delta X_{t-1}^{m} \end{bmatrix} + \psi \begin{bmatrix} \epsilon_t^{1} \\ \epsilon_t^{2} \\ \epsilon_t^{3} \\ \epsilon_t^{4} \\ \epsilon_t^{5} \\ \epsilon_t^{6} \\ \epsilon_t^{7} \\ \epsilon_t^{8} \\ \epsilon_t^{9} \\ \epsilon_t^{10} \end{bmatrix}$$

with $\epsilon_t^i \sim \mathcal{N}(0,1)$ i.i.d. The matrices ρ and ψ are diagonal.

Observation equations

$$\Delta \tau_t = \widehat{\tau}_t - \widehat{\tau}_{t-1} + \Delta X_t^{\tau},$$

$$\Delta y_t = \widehat{y}_t - \widehat{y}_{t-1} + \Delta X_t^{y},$$

$$\Delta moy_t = \widehat{moy}_t - \widehat{moy}_{t-1} + \Delta X_t^{x},$$

$$\Delta tby_t = \widehat{tby}_t - \widehat{tby}_{t-1} + \alpha \Delta X_t^{x},$$

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

$$i_t - \pi_t = \widehat{i}_t - \widehat{\pi}_t.$$

- model is estimated using Bayesian methods.

Results

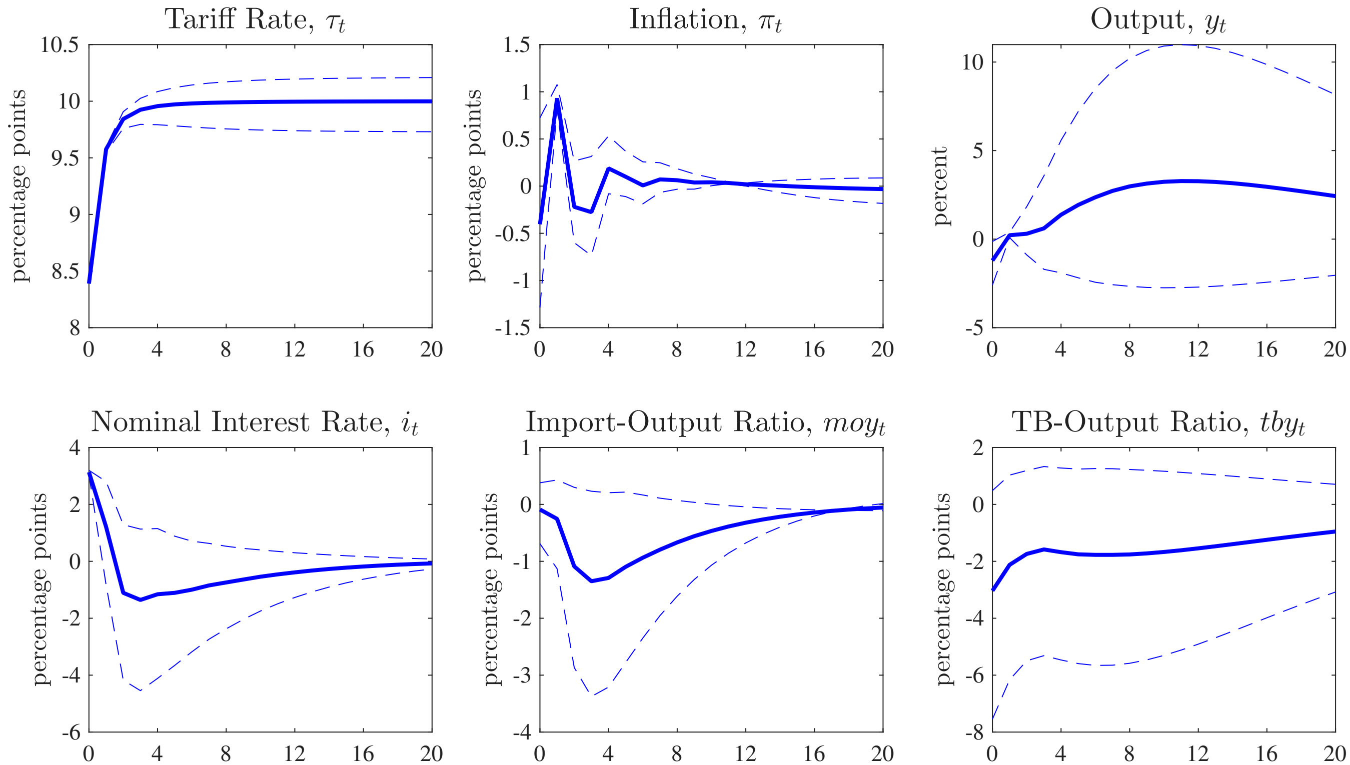
Variance Decomposition

	$\Delta\tau_t$	$\Delta\pi_t$	Δy_t	Δi_t	Δmoy_t	Δtby_t
$z_t^\tau + \Delta X_t^\tau$	100	6	3	5	9	19

Notes. Variance shares are expressed in percent and are posterior means computed from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws.

Takeaway: Tariff shocks are a minor driver of the domestic dimension of the U.S. business cycle (output, inflation, and interest rates), but a relevant one for its external dimension (imports and the trade balance).

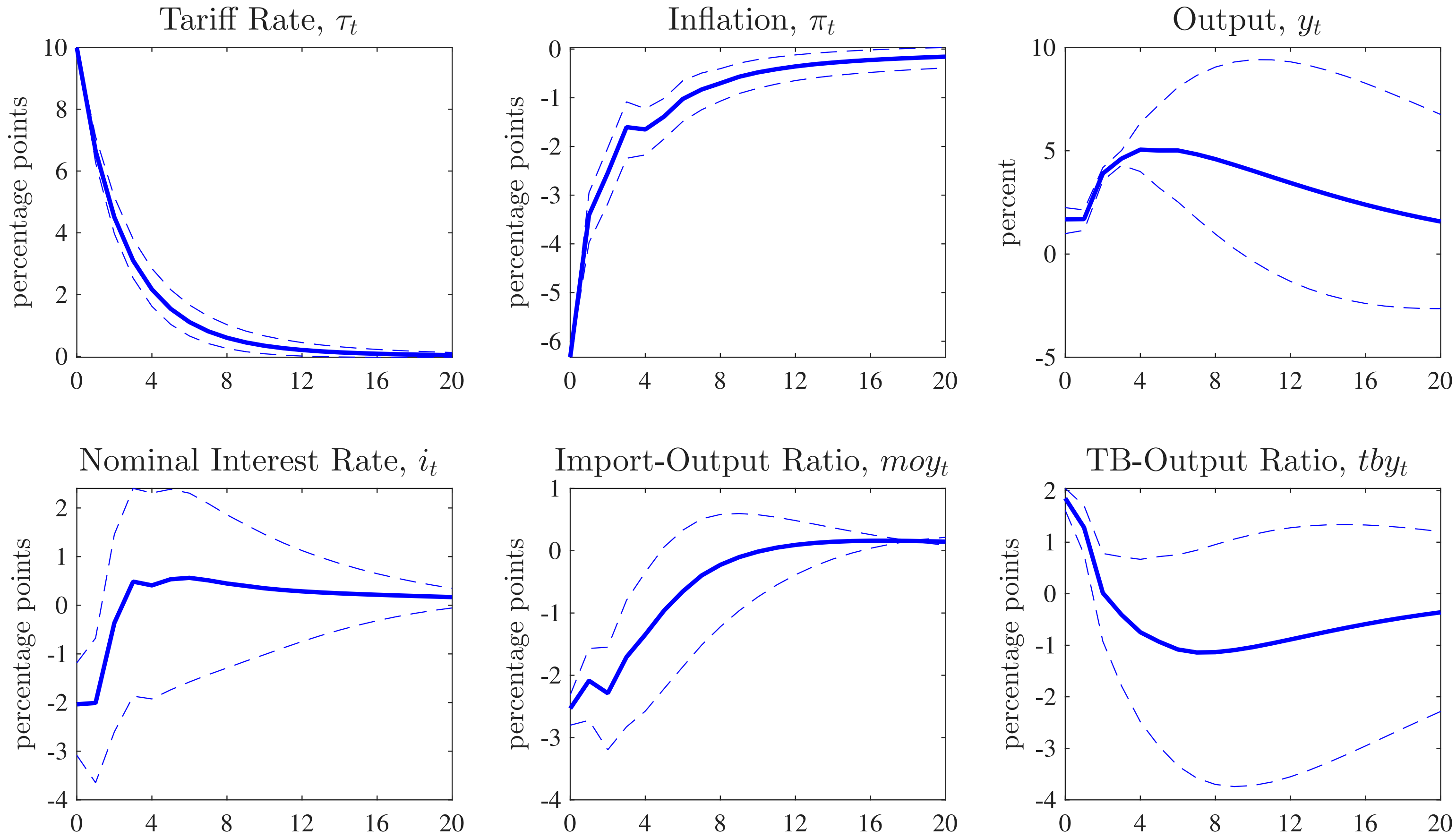
Impulse Responses to an Increase in the Permanent Import Tariff Shock, X_t^τ



Note. Solid lines are posterior means and dashed lines are 90-percent credible bands.

Takeaway: Permanent tariff increases are estimated to generate a short-lived increase in inflation (a one-off price increase) and interest rates, and an insignificant response of output. Consistent with the intertemporal approach to the balance of payments, they do not cause a significant increase in the trade balance.

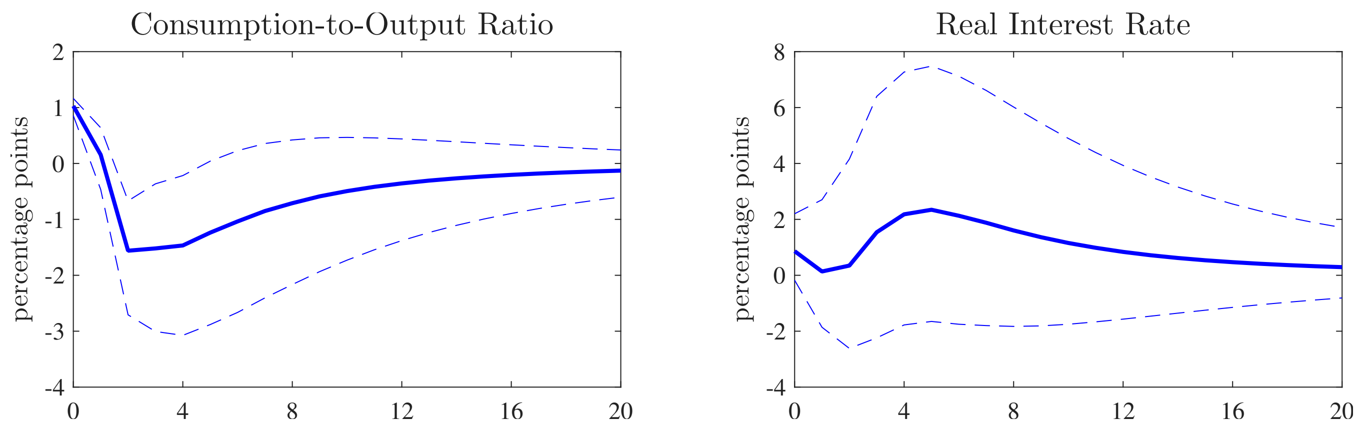
Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ



Note. Solid lines are posterior means and dashed lines are 90-percent credible bands.

Takeaway: Transitory tariff increases are estimated to be neither inflationary nor contractionary. Consistent with the intertemporal approach to the balance of payments, they cause an increase in the trade balance.

IRF of the Consumption-to-Output Ratio and the Real Interest Rate to a 10% Transitory Import Tariff Increase, z_t^{τ}



Note. Solid lines are posterior means and dashed lines are 90-percent credible bands.

Takeaway: Consumption-to-output ratio falls and the real interest rate rises, suggesting that transitory tariff increases depress inflation through a demand channel to which the Fed responds by easing.

Anticipated Tariff Shocks

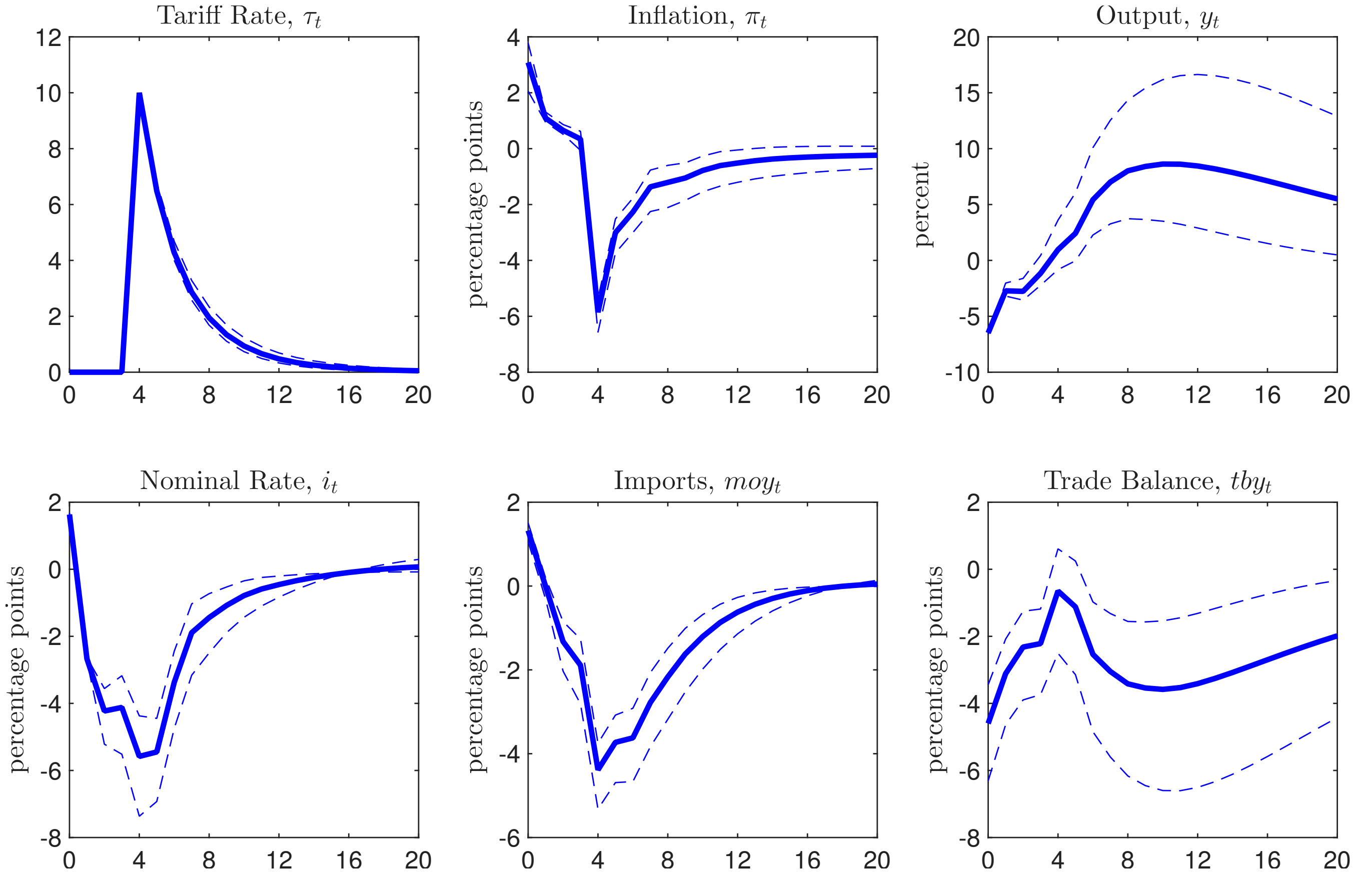
Identification of Anticipated Shocks

The proposed empirical model allows for the identificaiton of anticipated shocks.

Example: Let ϵ_t^4 be a transitory tariff shock anticipated 4 quarters in advance.

Identification restriction: ϵ_t^4 is the only shock that can affect all variables other than the tariff today, but affects the transitory component of the tariff only 4 quarters from now.

Impulse Responses to a 4-Quarter Anticipated Ten-Percentage-Point Increase in the Transitory Import Tariff Shock



Note. Solid lines are posterior means and dashed lines are 90-percent credible bands.

Takeaway: In the short run, anticipated tariff increases are inflationary and contractionary, boost imports, and worsen the external accounts.

Theory

Calvo (1987) SOE + Import-Competing Sector

Households

$$\max \quad \sum_{t=0}^{\infty} \beta^t [u(c_t) - v(h_t)]$$

$$(1+\tau_t)c_t + b_t^* = x + w_t h_t + (1+r^*)b_{t-1}^*$$

FOCs

$$u'(c_t) = (1+\tau_t)\lambda_t$$

$$\frac{v'(h_t)}{u'(c_t)} = \frac{w_t}{1+\tau_t}$$

$$\lambda_t = \beta(1+r^*)\lambda_{t+1}$$

Assume $\beta(1+r^*) = 1 \Rightarrow$

$$\lambda_t = \lambda$$

Notation
c_t = importable good; h_t = hours worked; b_t^* = foreign bond; r^* = foreign interest rate; w_t = real wage in terms of export goods; x = endowment of export goods.

Import-competing firm

$$\max \quad (1+\tau_t)F(h_t) - w_t h_t$$

$$F'(h_t) = \frac{w_t}{1+\tau_t}$$

Equilibrium

$$u'(c_t) = (1 + \tau_t)\lambda$$

$$\frac{v'(h_t)}{u'(c_t)} = F'(h_t)$$

$$y_t = F(h_t) + x$$

$$m_t = c_t - F(h_t)$$

$$tb_t = x - m_t$$

$$(1 + r^*)b^*_{-1} = -\sum_{t=0}^{\infty} \frac{tb_t}{(1 + r^*)^t}$$

Conclusion

The estimated empirical model and the theoretial model both predict that:

	Tariff Increase		
	Transitory	Permanent	Anticipated
imports	< 0	0	> 0
trade balance	> 0	0	< 0
consumption	< 0	0	> 0
output	> 0	0	< 0

Takeaway: Estimating the macroeconomic effects of import tariff shocks without distinguishing among transitory, permanent, and anticipated shocks can lead to misleading conclusions.

Extras

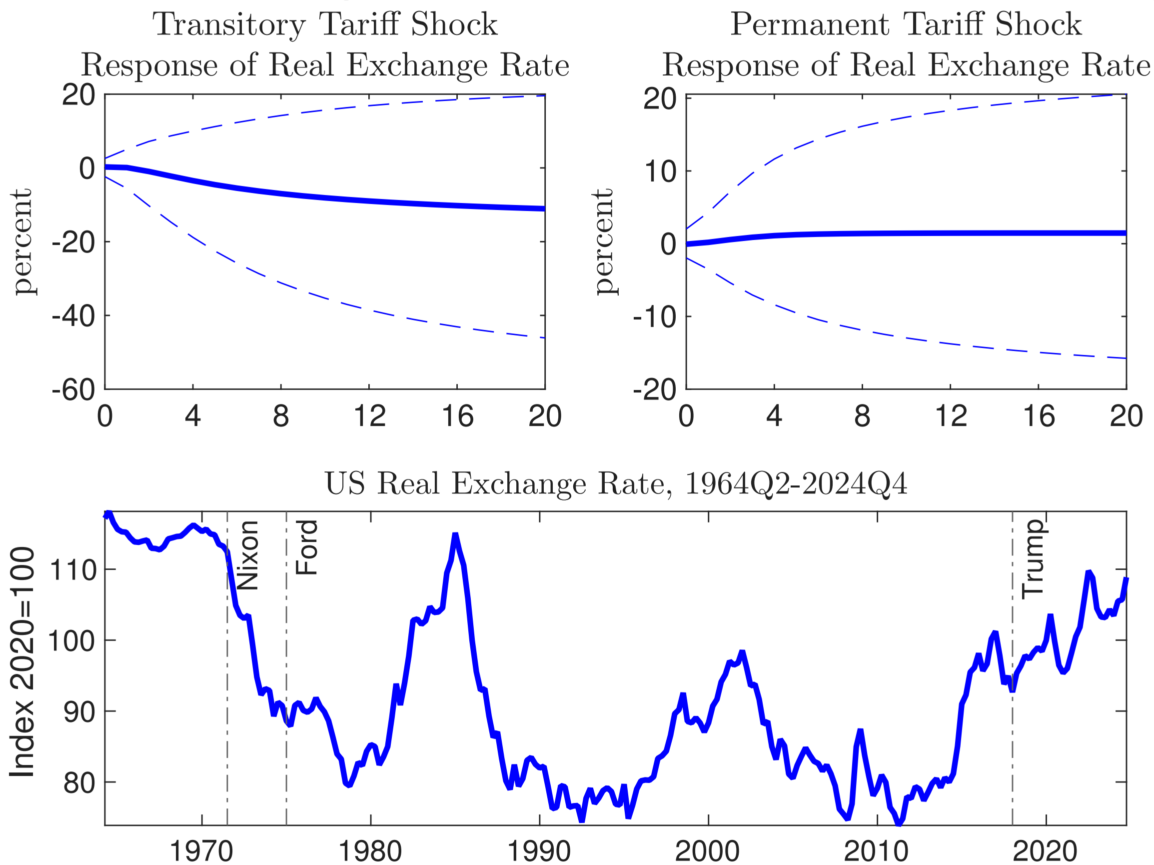
What about inflation and the nominal interest rate?

The response of these variables depends on the stance of **monetary policy**.

We show that if monetary policy behaves as in the empirical estimates, that is, if the central bank tightens in response to permanent and anticipated tariff increases but not in response to transitory ones, then the model predicts that

- permanent and anticipated tariff shocks are inflationary, whereas
- transitory tariff shocks are not.

Do increases in U.S. import tariffs affect U.S. competitiveness?

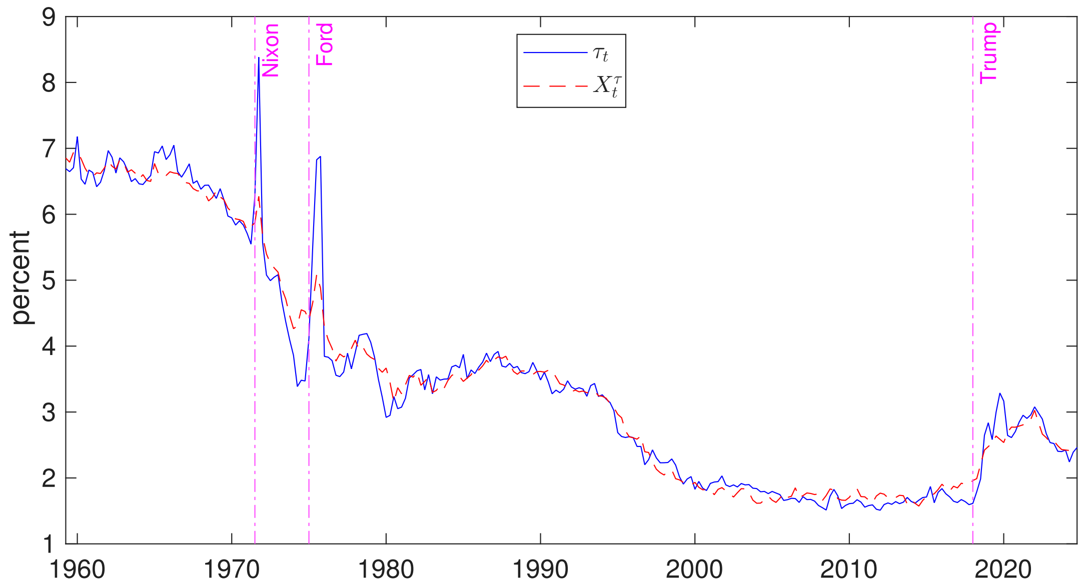


Notes. Top panel, impulse responses to a 10% point increase in tariff. An increase in the real exchange rate indicates a real appreciation of the U.S. dollar.

Takeaway: Import tariff shocks have no significant effect on U.S. competitiveness. In particular, tariff increases don't depreciate the real exchange rate.

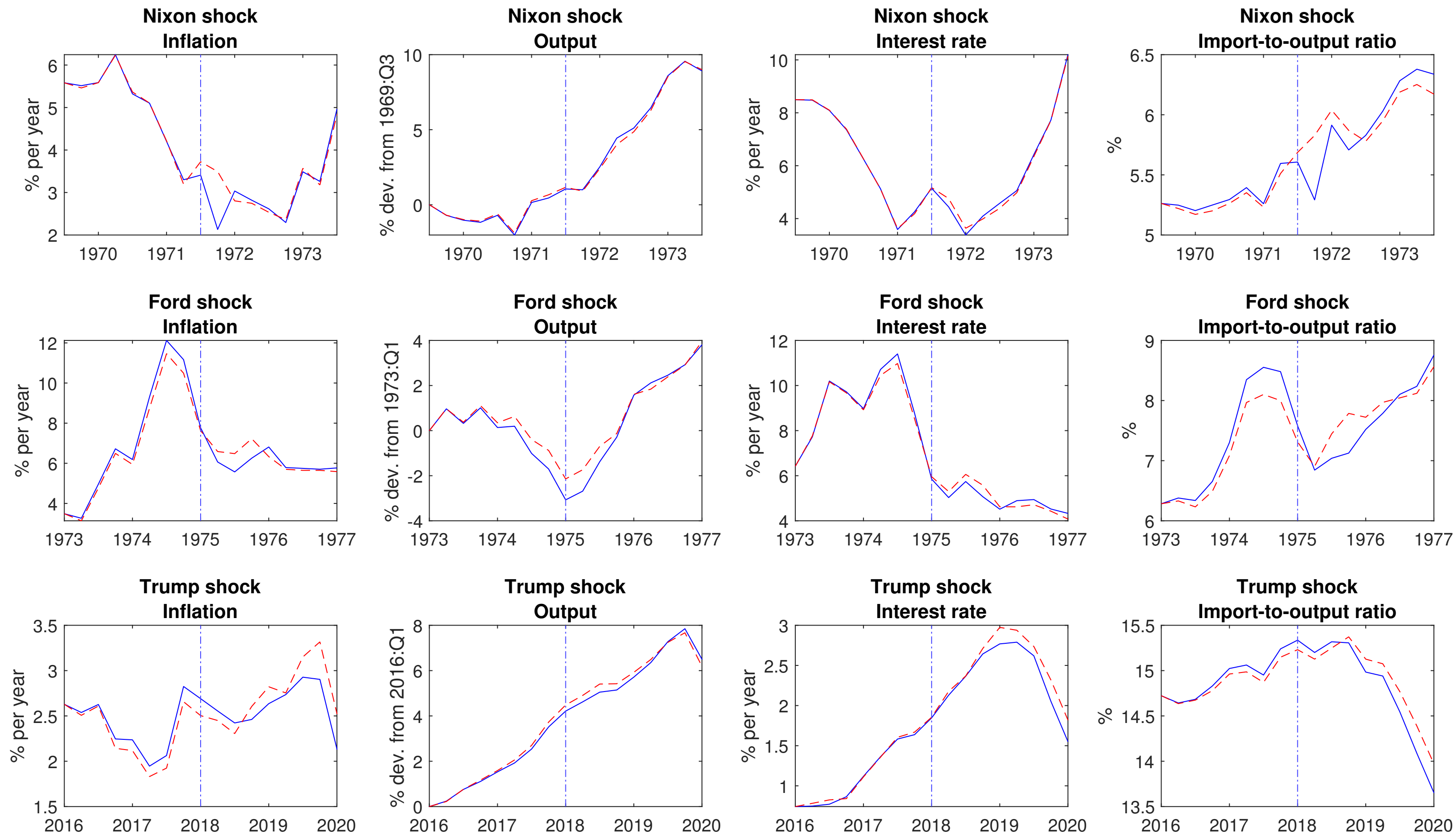
Large Tariff Surges: Nixon, Ford, and Trump

Predicted Time Path of the Import Tariff and Its Permanent Component



Takeaway: The model interprets the Nixon and Ford tariff shocks (1971:Q3 and 1975:Q1) as mostly transitory, and the Trump tariff shock (2018:Q1) as more permanent.

Predicted and Counterfactual Paths Around 3 Large Tariff Shocks



Note. Solid lines: all shocks active. Dashed lines: tariff shocks shut down.

Takeaway. Even large tariff shocks generate relatively small movements in real and nominal macroeconomic aggregates.

Excluding the Nixon Price Controls

Variance Decomposition

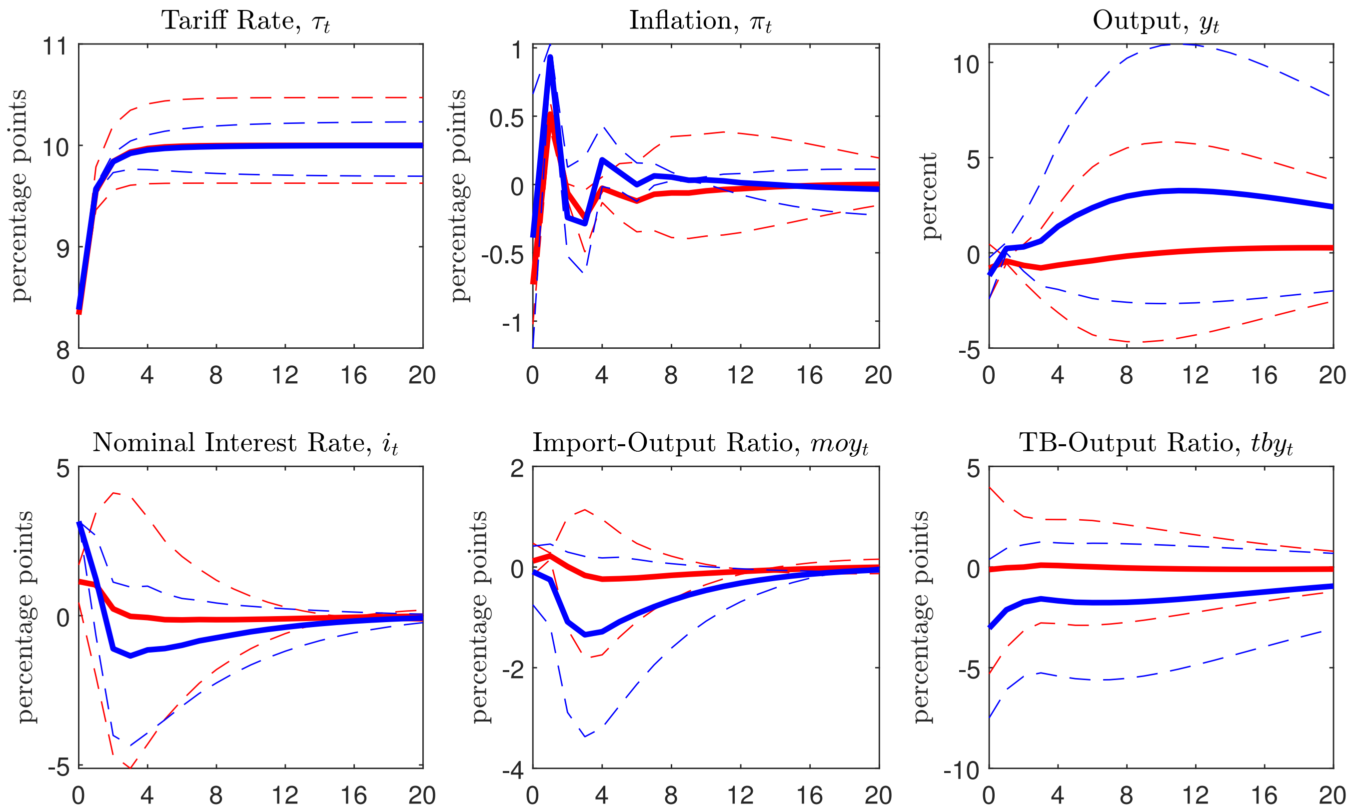
Share of Variance explained by z_t^τ and ΔX_t^τ

	$\Delta\tau_t$	$\Delta\pi_t$	Δy_t	Δi_t	Δmoy_t	Δtby_t
Baseline	100	6	3	5	9	19
Excluding Nixon price controls	100	5	3	5	10	15

Notes. Variance shares are expressed in percent and are posterior means computed from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws.

Takeaway: The finding that tariff shocks are a minor driver of U.S. business cycle fluctuations is robust to excluding π_t observations during Nixon price controls, 1971:Q3–1974:Q3.

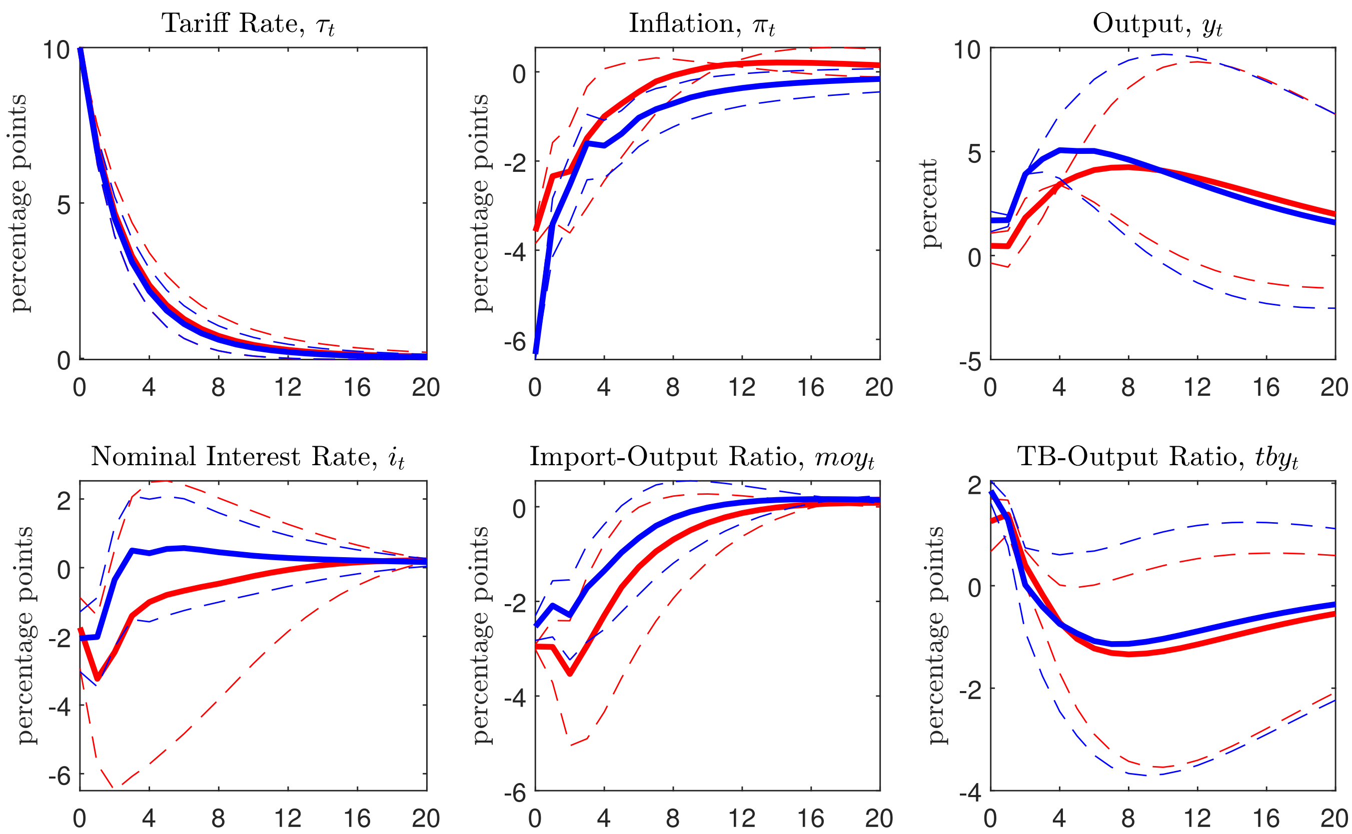
Impulse Responses to an Increase in the Permanent Import Tariff Shock, X_t^{τ}: Excluding Nixon Price Controls



blue = baseline; red = excluding π_t during, 1971:Q3–1974:Q3.

Takeaway: Prediction that permanent tariff increases generate a one-time increase in the price level is robust to excluding π_t observations during the Nixon price controls.

Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ: Excluding Nixon's Price Controls

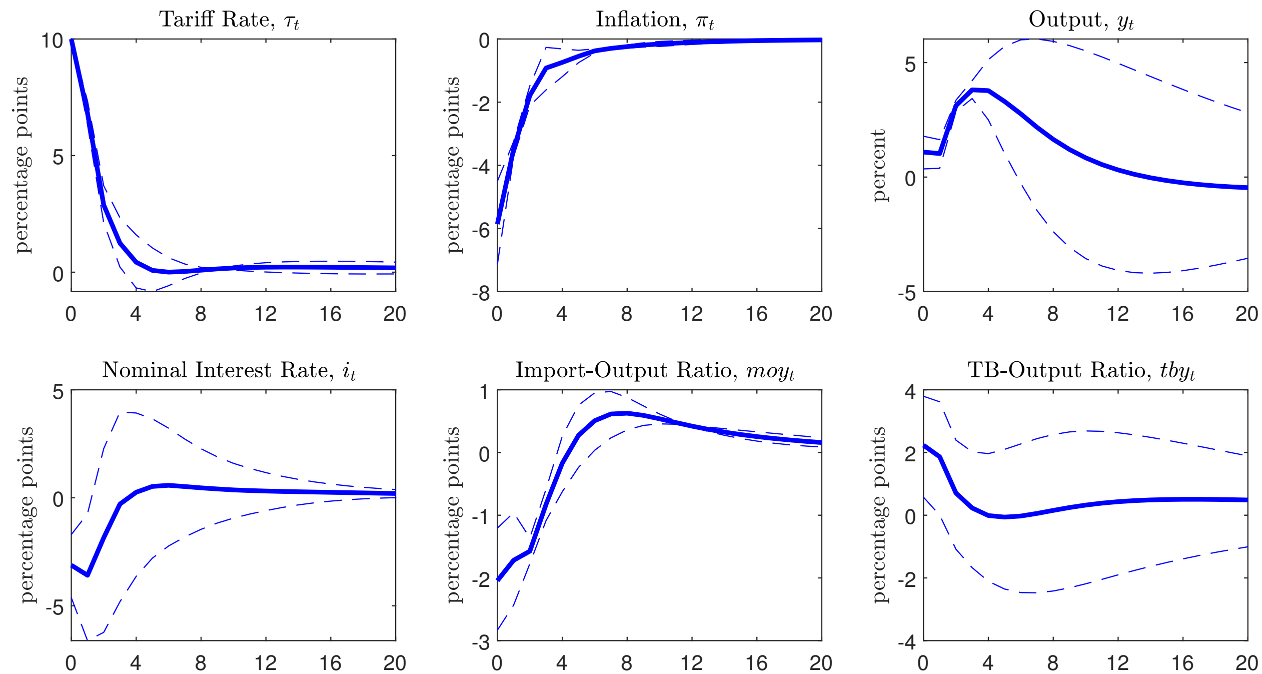


blue = baseline; red = excluding π_t during 1971:Q3–1974:Q3.

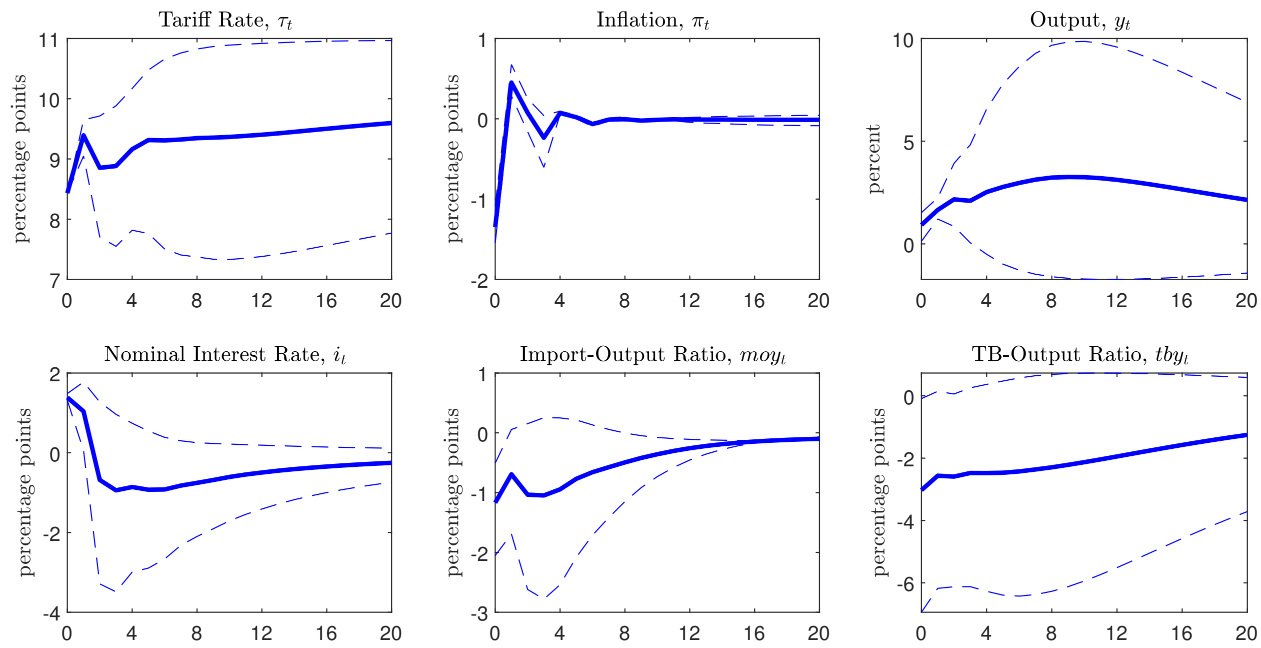
Takeaway: Prediction that transitory tariff increases do not raise inflation is robust to excluding observations on π_t during the Nixon price controls.

Endogenous Import Tariffs

Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ, in a Model with Endogenous Import Tariffs

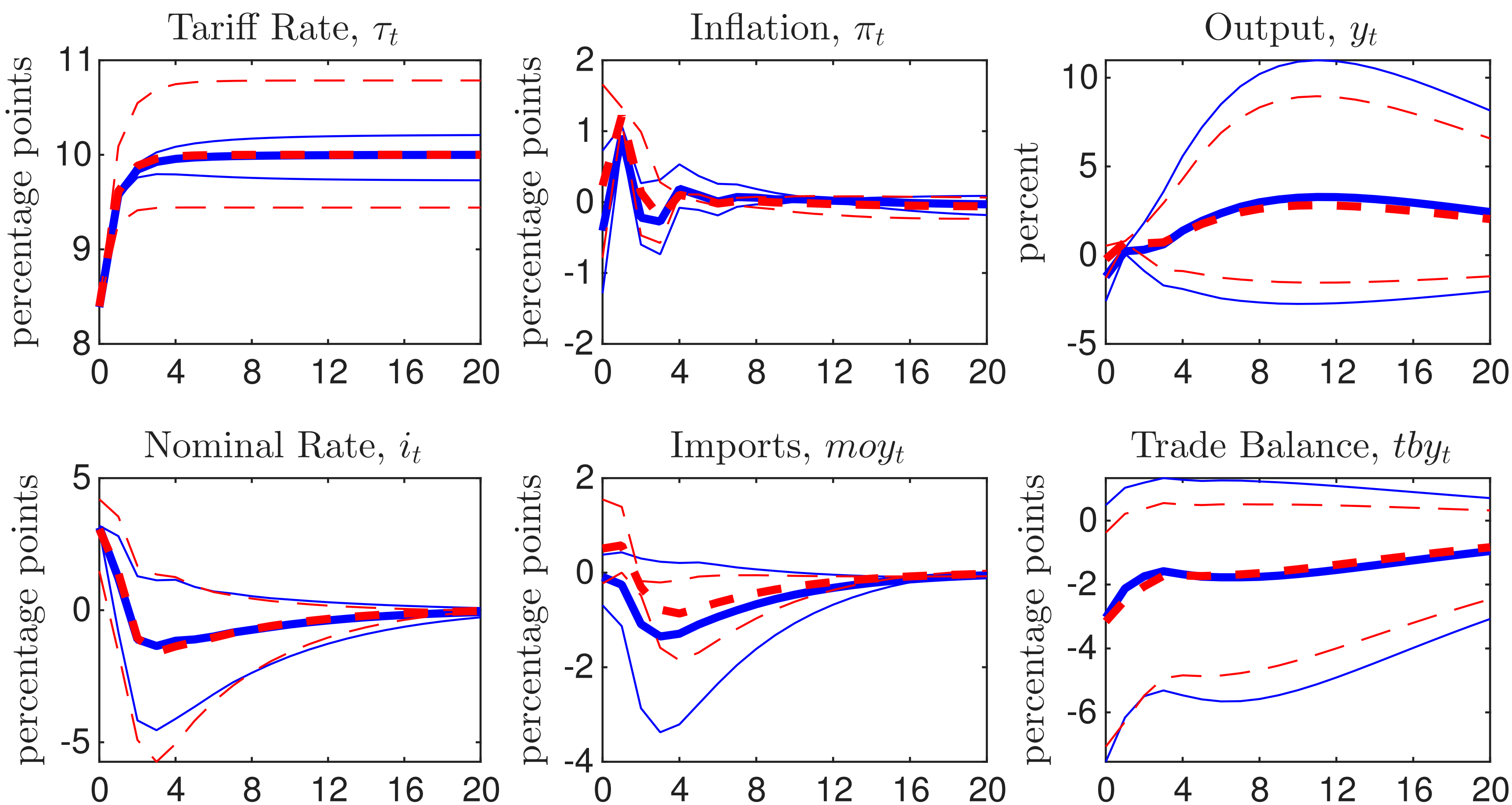


Impulse Responses to a Ten-Percentage-Point Increase in the Permanent Import Tariff Shock, X_t^{τ}, in a Model with Endogenous Import Tariffs



Robustness of Results to Allowing for Anticipation

Impulse Responses to an Unanticipated Ten-Percentage-Point Increase in the Permanent Import Tariff Shock



Note. Solid lines baseline model. Dashed lines model that allows for anticipated shocks as well.

Takeaway: Allowing for anticipation does not change the estimated effects of the unanticipated permanent tariff shock.

Introduce auxiliary state vectors ϵ_t^j

$$\begin{aligned}
\epsilon_t^1 &= \epsilon_{t-1}^2 + \sigma_1 \nu_t^1 \\
\epsilon_t^2 &= \epsilon_{t-1}^3 + \sigma_2 \nu_t^2 \\
&\vdots \\
\epsilon_t^{J-1} &= \epsilon_{t-1}^J + \sigma_{J-1} \nu_t^{J-1} \\
\epsilon_t^J &= \sigma_J \nu_t^J
\end{aligned}$$

Structure of model with 4-quarters (J=4) of anticipated shocks:

$$\begin{bmatrix} \widehat{\tau}_t \\ \widehat{y}_t \\ \widehat{moy}_t \\ \widehat{tby}_t \\ \widehat{i}_t \\ \widehat{\pi}_t \end{bmatrix} = \sum_{i=1}^{L} B_i \begin{bmatrix} \widehat{\tau}_{t-i} \\ \widehat{y}_{t-i} \\ \widehat{moy}_{t-i} \\ \widehat{tby}_{t-i} \\ \widehat{i}_{t-i} \\ \widehat{\pi}_{t-i} \end{bmatrix} + [C_0 \quad C_1 \quad C_2 \quad C_3 \quad C_4] \begin{bmatrix} u_t \\ \epsilon_t^1 \\ \epsilon_t^2 \\ \epsilon_t^3 \\ \epsilon_t^4 \end{bmatrix}$$

$$C_i = \begin{bmatrix} 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ c_{2,1}^i & 0 & 0 & 0 & 0 & 0 & c_{2,7}^i & 0 & 0 & 0 \\ c_{3,1}^i & 0 & 0 & 0 & 0 & 0 & c_{3,7}^i & 0 & 0 & 0 \\ c_{4,1}^i & 0 & 0 & 0 & 0 & 0 & c_{4,7}^i & 0 & 0 & 0 \\ c_{5,1}^i & 0 & 0 & 0 & 0 & 0 & c_{5,7}^i & 0 & 0 & 0 \\ c_{6,1}^i & 0 & 0 & 0 & 0 & 0 & c_{6,7}^i & 0 & 0 & 0 \end{bmatrix} \qquad \text{for } i = 1, 2, 3, 4.$$

$$\begin{bmatrix} u_{t+1} \\ \epsilon_{t+1}^1 \\ \epsilon_{t+1}^2 \\ \epsilon_{t+1}^3 \\ \epsilon_{t+1}^4 \end{bmatrix} = \begin{bmatrix} \rho & I & \emptyset & \emptyset & \emptyset \\ \emptyset & \emptyset & I & \emptyset & \emptyset \\ \emptyset & \emptyset & \emptyset & I & \emptyset \\ \emptyset & \emptyset & \emptyset & \emptyset & I \\ \emptyset & \emptyset & \emptyset & \emptyset & \emptyset \end{bmatrix} \begin{bmatrix} u_t \\ \epsilon_t^1 \\ \epsilon_t^2 \\ \epsilon_t^3 \\ \epsilon_t^4 \end{bmatrix} + \begin{bmatrix} \sigma_0 & \emptyset & \emptyset & \emptyset & \emptyset \\ \emptyset & \sigma_1 & \emptyset & \emptyset & \emptyset \\ \emptyset & \emptyset & \sigma_2 & \emptyset & \emptyset \\ \emptyset & \emptyset & \emptyset & \sigma_3 & \emptyset \\ \emptyset & \emptyset & \emptyset & \emptyset & \sigma_4 \end{bmatrix} \begin{bmatrix} \nu_{t+1}^0 \\ \nu_{t+1}^1 \\ \nu_{t+1}^2 \\ \nu_{t+1}^3 \\ \nu_{t+1}^4 \end{bmatrix}, \tag{2}$$

with $\nu_t^i \sim \mathcal{N}(0, I)$ i.i.d. The matrices ρ and σ_i, for $i = 0, 1, 2, 3, 4$, are diagonal.