Transitory and Permanent Import Tariff Shocks in the United States: An Empirical Investigation

by

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Motivation

• Theory suggests that the effects of import tariff shocks depend on their persistence:
– transitory tariff increases reduce current demand and improve the external accounts.
– permanent tariff increases have less of an effect on the external accounts.

• Motivated by this observation, we estimate the impact of tariffs using an empirical model that explicitly distinguishes between transitory and permanent tariff shocks.

• Aim to address questions such as:
– Are tariff increases inflationary?
– Are they contractionary?
– Are they effective in improving the external accounts?
– How has the Fed dealt with them in the past?

Main findings

• transitory tariff increases are neither inflationary nor contractionary and are not associated with monetary tightening.

• permanent tariff increases trigger a temporary rise in inflation (a one-off increase in the price level) and a brief tightening of monetary policy, leaving output largely unchanged.

• consistent with the intertemporal approach to the balance of payments, transitory tariff increases reduce imports and improve the trade balance, whereas permanent increases leave the trade balance largely unchanged.

• overall, tariff shocks are estimated to be a minor driver of U.S. business cycle fluctuations on average and even during episodes of substantial tariff hikes, such as Nixon 1971, Ford 1975, and Trump 2018.

Related Literature

• Surprisingly, empirical literature on macroeconomic consequences of tariff shocks is relatively thin: Boer and Rieth (2024), Barattieri, Cacciatore, and Ghironi (2021).

• Empirical literature using microdata: Amiti et al. (2019); Fajgelbaum et al. (2020); Flaaen et al. (2020); Cavallo et al. (2021). Findings: import tariff increases have a near one-to-one pass-through to import prices and negative effects on income, albeit small. Amiti et al. (2024) expected inflation falls. Static models, cannot speak to difference between transitory and permanent tariff shocks.

• Theory: early contributions, Razin and Svensson (1983) and Calvo (1987). More recent: Barattieri, Cacciatore, and Ghironi (2021), Auray, Devereux, and Eyquem (2022, 2024), Erceg, Prestipino, and Raffo (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), and Costinot and Werning (2025). Stronger emphasis on quantitative and normative implications.

• Econometric methodology follows Uribe (2022).

U.S. Import Tariff Rates

How to measure the import tariff rate, τ_t

3 approaches

1. trade-weighted import tariff rate, average ratio of import duties to imports of goods, (aggregate data, 1959:Q1–2024:Q4)

$$\tau_t = \frac{d_t}{m_t} = \sum_i \left(\frac{m_{it}}{\sum_i m_{it}} \right) \tau_{it}$$

where $d_t = \sum_i \tau_{it} m_{it}$ = import duties in t; $m_t = \sum_i m_{it}$ = value of goods imports in t.

pros: easy to compute; quarterly data since 1959:Q1 from NIPA.
cons: composition bias, no control for substitution effects

2. fixed-weight average ratio of import duties to imports, τ_t^F (based on 4,025 HTS 6-digit level import goods, since 1990:Q1, authors' calculations)

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

$\tau_{it} \equiv d_{it}/m_{it}$ = measured import tariff rate on good i in t; s_i = import share of import good i in 2006.

pros: fixed-weight index controls for composition bias.
cons: quarterly USITC microdata on imports and duties starts only in 1990:Q1. no control for substitution effects.

Examples of imported goods at the HTS 6-digit level

HS 1988/1992 (H0)

Code	Description
080450	Fruit, edible; guavas, mangoes and mangosteens, fresh or dried
090411	Spices; pepper (of the genus piper), neither crushed nor ground
151530	Vegetable oils; castor oil and its fractions, whether or not refined, but not chemically modified
160412	Fish preparations; herrings, prepared or preserved, whole or in pieces (but not minced)
180610	Cocoa; powder, containing added sugar or other sweetening matter
220710	Undenatured ethyl alcohol; of an alcoholic strength by volume of 80% vol. or higher
240120	Tobacco; partly or wholly stemmed or stripped
650200	Hat-shapes; plaited or made by assembling strips of any material, neither blocked to shape, nor with made brims, nor lined, nor trimmed
691390	Ceramic statuettes and other ornamental ceramic articles; other than of porcelain or china
820340	Tools, hand; pipe-cutters, bolt croppers, perforating punches and similar tools
830250	Hat-racks, hat-pegs, brackets and similar fixtures, of base metal
841990	Machinery, plant and laboratory equipment; parts of equipment for treating materials by a process involving a change of temperature
844712	Knitting machines; circular, with cylinder diameter exceeding 165mm
845129	Drying machines; of a dry linen capacity exceeding 10kg

3. trade restrictiveness index (TRI), tri_t (based on 2,761 HTS 6-digit level import goods, since 1990:Q1; authors' calculations)

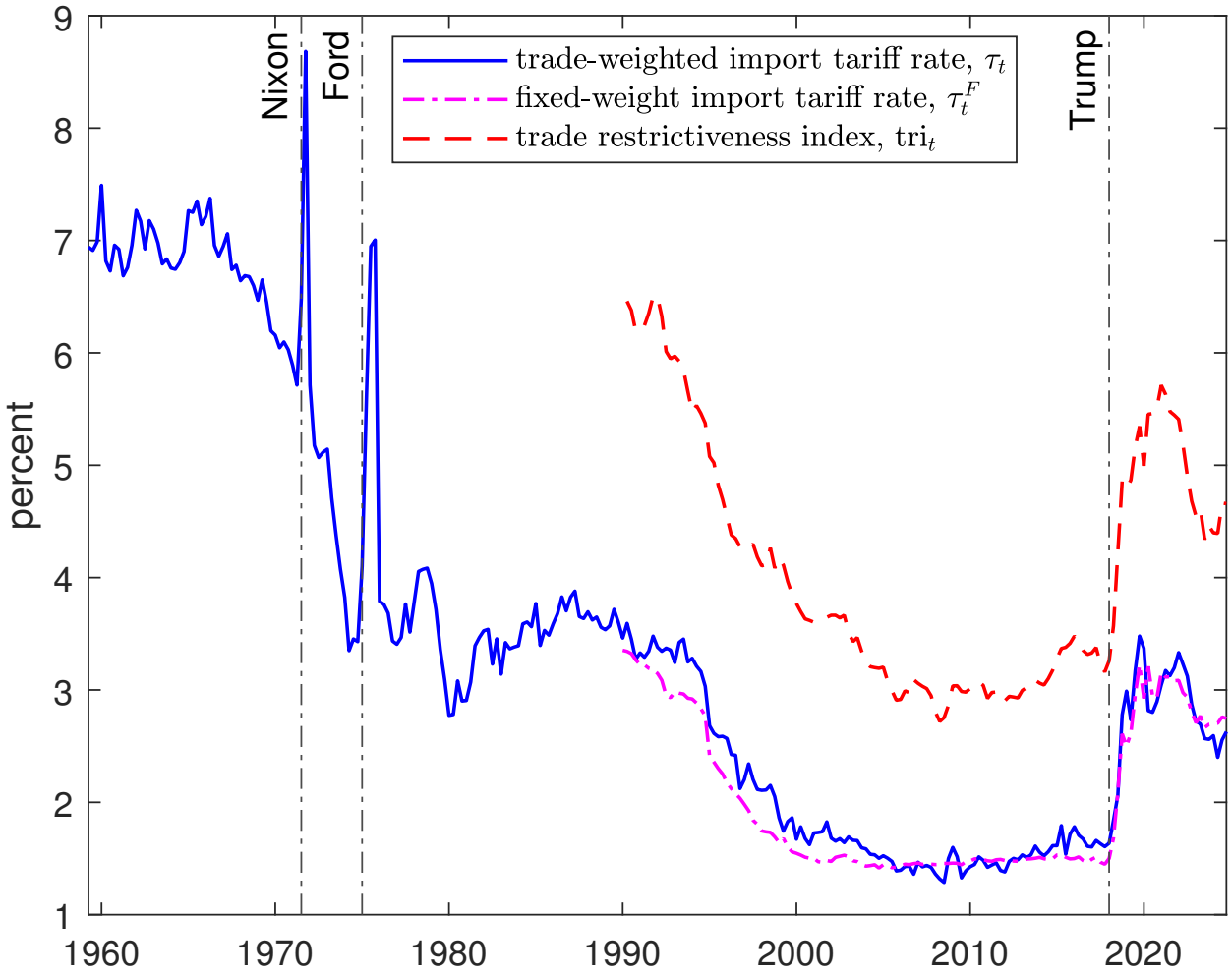
Feenstra's (1995) simplified version of Anderson and Neary's (1994) trade restrictiveness index (TRI). Defined as the uniform tariff in a given period that delivers the same level of welfare as the actual tariff schedule.

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

$\tau_{it} \equiv d_{it}/m_{it}$ = import tariff rate on good i in t, $s_{it} \equiv m_{it}/m_t$ = share of imports of good i in total imports in t, ϵ_i = price elasticity of import demand of good i (from Kee, Nicita, Olarreaga, 2008).

pros: based on welfare theoretic arguments
cons: requires estimates of import demand elasticities and quarterly micro time series data on imports and duties collected,— which starts only in 1990:Q1. Data source for the latter is United States International Trade Commission (USITC).

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



Source: Authors' calculations.

Econometric Model

– state-space model based on Uribe (2022)
– 6 observables: $\Delta\tau_t$, Δy_t, Δtby_t, Δi_t, $i_t - \pi_t$, Δmoy_t
– 6 endogenous (unobserved) stationary variables: $\widehat{\tau}_t$, $\widehat{y}_t$, $\widehat{i}_t$, $\widehat{\pi}_t$, $\widehat{tby}_t$, $\widehat{moy}_t$
– 6 transitory shocks (including the transitory tariff shock, z_t^τ)
– 4 permanent shocks (including the permanent tariff shock, X_t^τ)

$\Rightarrow$ tariff shocks, z_t^τ and X_t^τ, are made to compete with 8 other sources of aggregate fluctuations to explain the data

The 6 endogenous (unobserved) stationary variables

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

evolve over time as:*

$$\begin{bmatrix} \widehat{\tau}_t \\ \widehat{y}_t \\ \widehat{tby}_t \\ \widehat{i}_t \\ \widehat{\pi}_t \\ \widehat{moy}_t \end{bmatrix} = \sum_{i=1}^{L} B_i \begin{bmatrix} \widehat{\tau}_{t-i} \\ \widehat{y}_{t-i} \\ \widehat{tby}_{t-i} \\ \widehat{i}_{t-i} \\ \widehat{\pi}_{t-i} \\ \widehat{moy}_{t-i} \end{bmatrix} + Cu_t, \tag{2}$$

with $u_t \equiv [\ z_t^\tau \quad z_t^y \quad z_t^{tby} \quad z_t^i \quad z_t^\pi \quad z_t^{moy} \quad \Delta X_t^\tau \quad \Delta X_t^y \quad \Delta X_t^m \quad \Delta X_t^x\ ]'$. Here z_t^j, for $j = \tau, y, tby, i, \pi, moy$, are stationary shocks. The vector u_t is unobservable and follows an AR(1) process

$$u_t = \rho u_{t-1} + \psi \nu_t. \tag{3}$$

*For notational convenience, the presentation of the model omits intercepts.

- **Restrictions on B, C, ρ and ψ**

2 cases:

– (Exogenous tariffs) All elements of the first row of B_i for $i = 1, \ldots, L$ are zero.

or

– (Endogenous tariffs) First row of B_i not restricted and in fact estimated.

– C matrix

$$Cu_t = \begin{bmatrix} 1 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 & 0 \\ c_{2,1} & 1 & 0 & 0 & 0 & 0 & c_{27} & c_{2,8} & c_{2,9} & c_{2,10} \\ c_{3,1} & c_{3,2} & 1 & 0 & 0 & 0 & c_{3,7} & c_{3,8} & c_{3,9} & c_{3,10} \\ c_{4,1} & c_{4,2} & c_{4,3} & 1 & 0 & 0 & c_{4,7} & c_{4,8} & c_{4,9} & c_{4,10} \\ c_{5,1} & c_{5,2} & c_{5,3} & c_{5,4} & 1 & 0 & c_{5,7} & c_{5,8} & c_{5,9} & c_{5,10} \\ c_{6,1} & c_{6,2} & c_{6,3} & c_{6,4} & c_{6,5} & 1 & c_{6,7} & c_{6,8} & c_{6,9} & c_{6,10} \end{bmatrix} \begin{bmatrix} z_t^{\tau} \\ z_t^{y} \\ z_t^{tby} \\ z_t^{i} \\ z_t^{\pi} \\ z_t^{mtoy} \\ \Delta X_t^{\tau} \\ \Delta X_t^{y} \\ \Delta X_t^{m} \\ \Delta X_t^{x} \end{bmatrix}$$

– ρ and ψ are diagonal matrices.

We wish to estimate the elements of the matrices B_i, for $i = 1, \ldots, L$, C, ρ, and ψ. However, equations (2) and (3) cannot be directly taken to the data because the state vector is not observable.

Observation equations

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

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

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

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

$$r_t = \widehat{i}_t - \widehat{\pi}_t,$$

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

- model is estimated using the Kalman Filter and Bayesian methods.
- **Prior Distributions**

Parameter	Distribution	Mean	Std. Dev.
Estimated diagonal elements of B_1	Normal	0.95	0.5
Other estimated elements of B_i, $i = 1, \ldots, L$	Normal	0	0.25
Estimated elements of C	Normal	0	0.5
Diagonal elements of ψ	Gamma	1	1
Diagonal elements of ρ (stationary shocks)	Beta	0.7	0.2
Diagonal elements of ρ (permanent shocks)	Beta	0.3	0.2
Estimated element of H (parameter α)	Normal	0	0.25
Diagonal elements of R	Uniform	$\frac{\text{var}(o_t)}{10\times 2}$	$\frac{\text{var}(o_t)}{10\times\sqrt{12}}$

Results

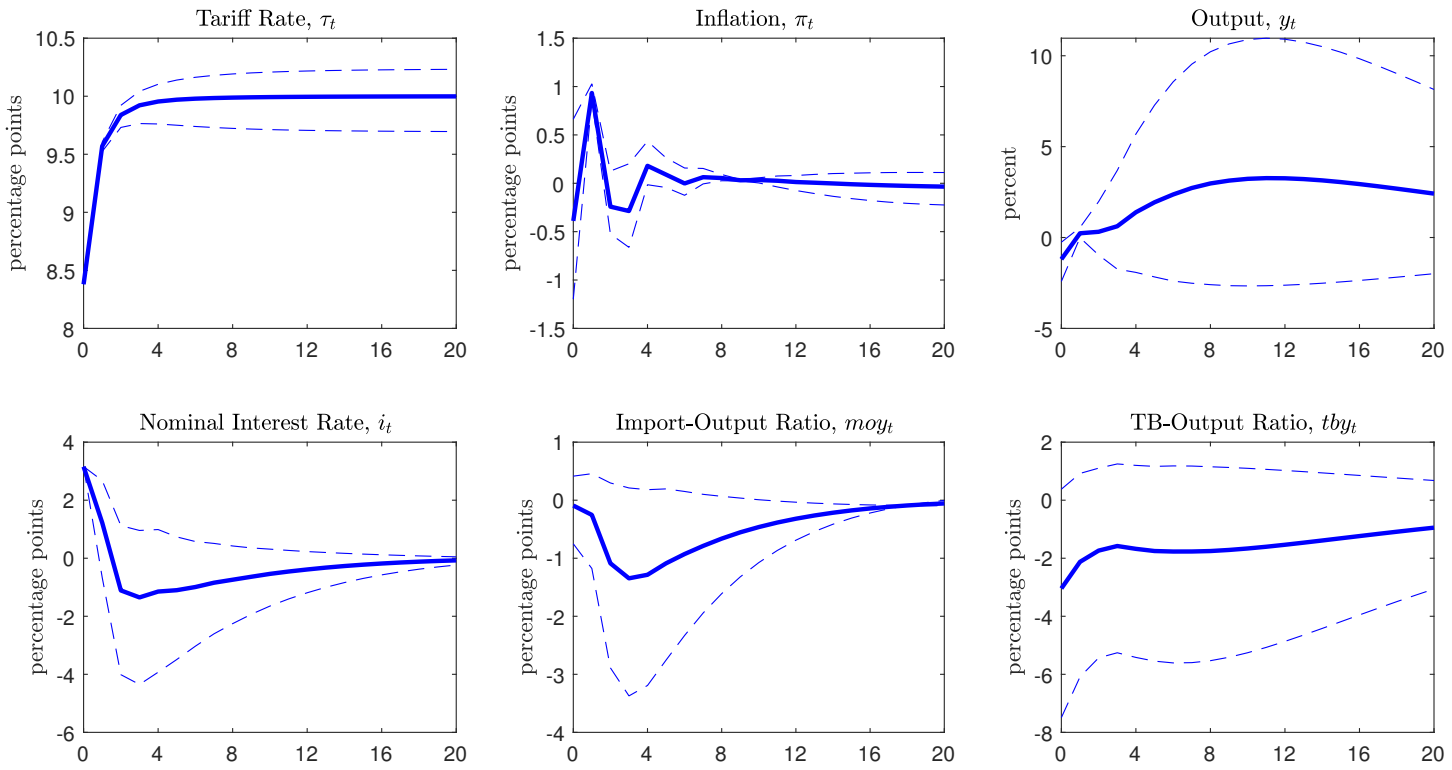
Variance Decomposition

	$\Delta\tau_t$	$\Delta\pi_t$	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 U.S. business cycle fluctuations on average.

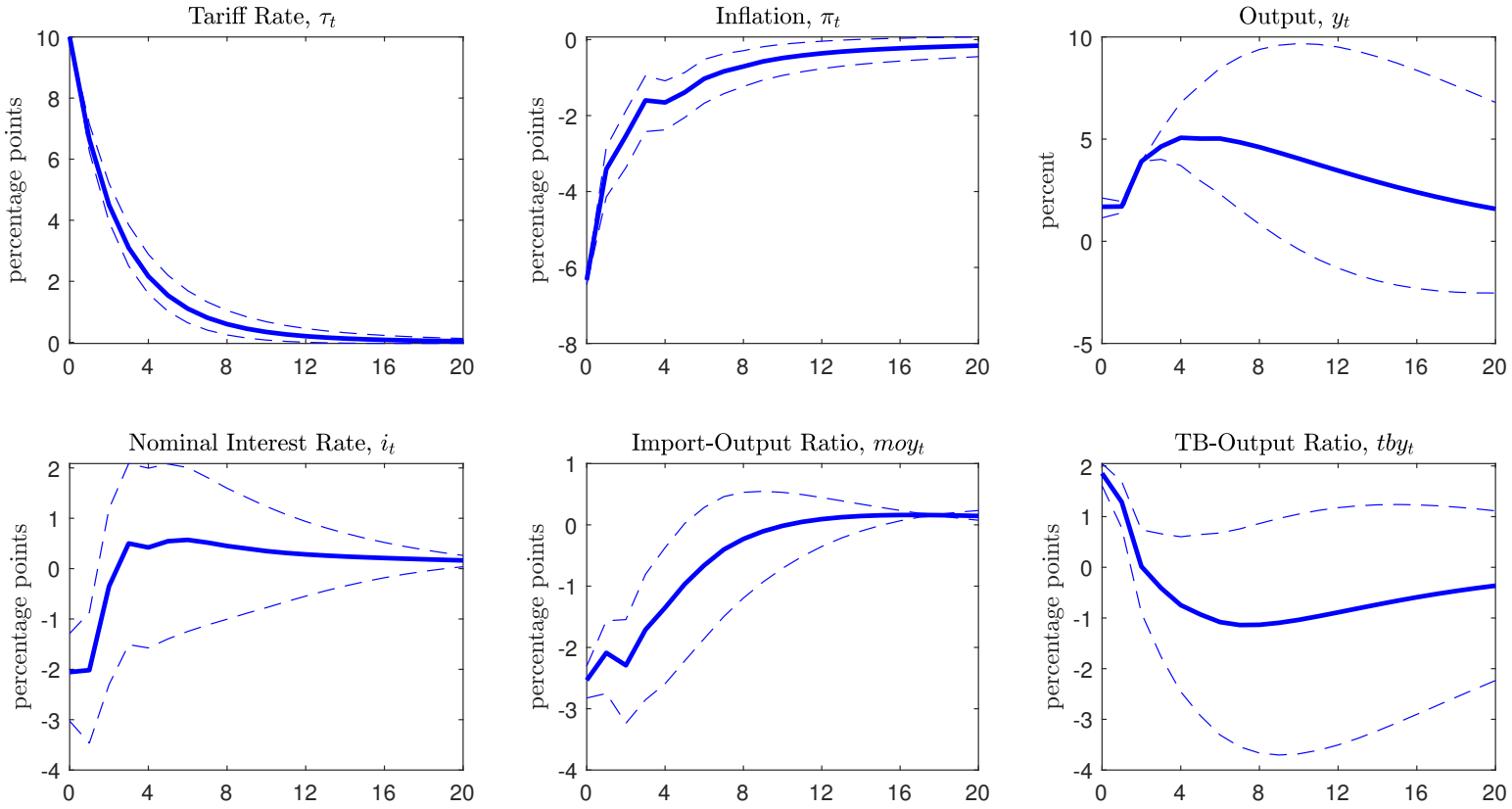
Impulse Responses to an Increase in the Permanent Import Tariff Shock, X_t^τ



Note. Solid lines are posterior means and dashed lines are 90-percent confidence bands computed using the Sims-Zha (1999) method.

Takeaway: Permanent tariff increases are estimated to generate short-lived increases in interest rates and inflation and an insignificant decline in output.

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

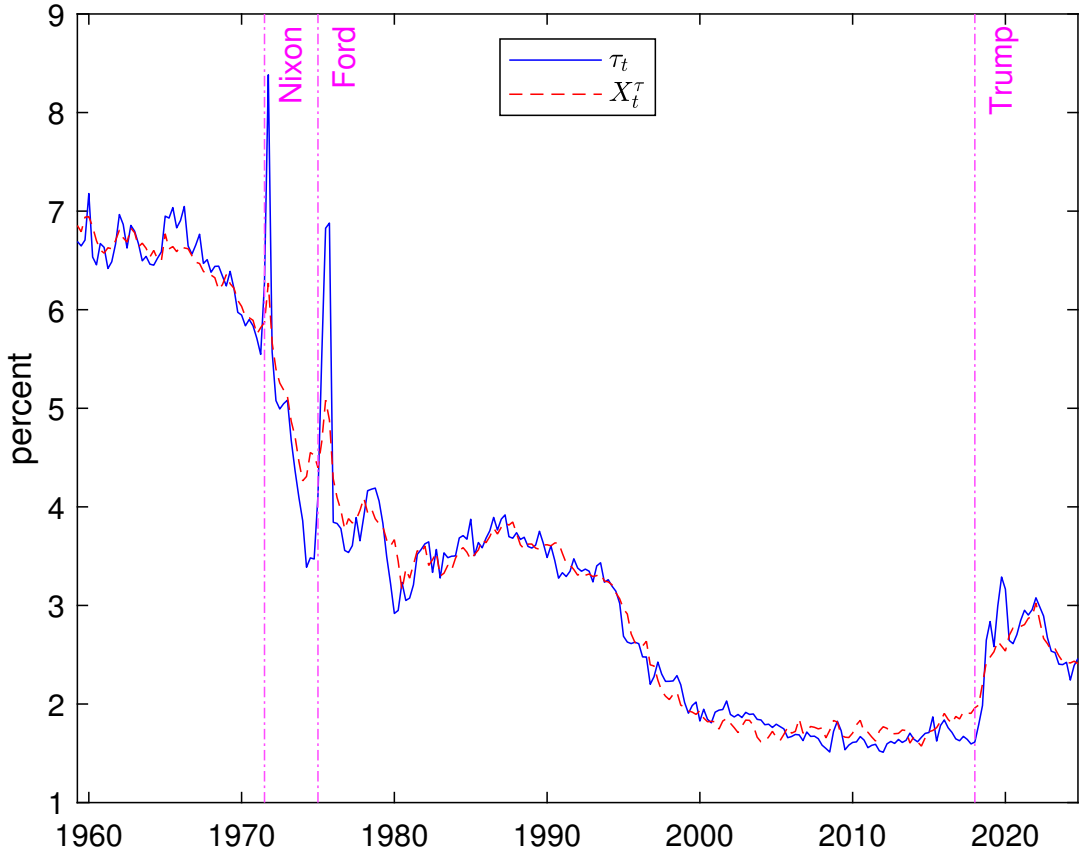


Note. Solid lines are posterior means and dashed lines are 90-percent confidence bands computed using the Sims-Zha (1999) method.

Takeaway: Transitory tariff increases are estimated to be neither inflationary nor contractionary.

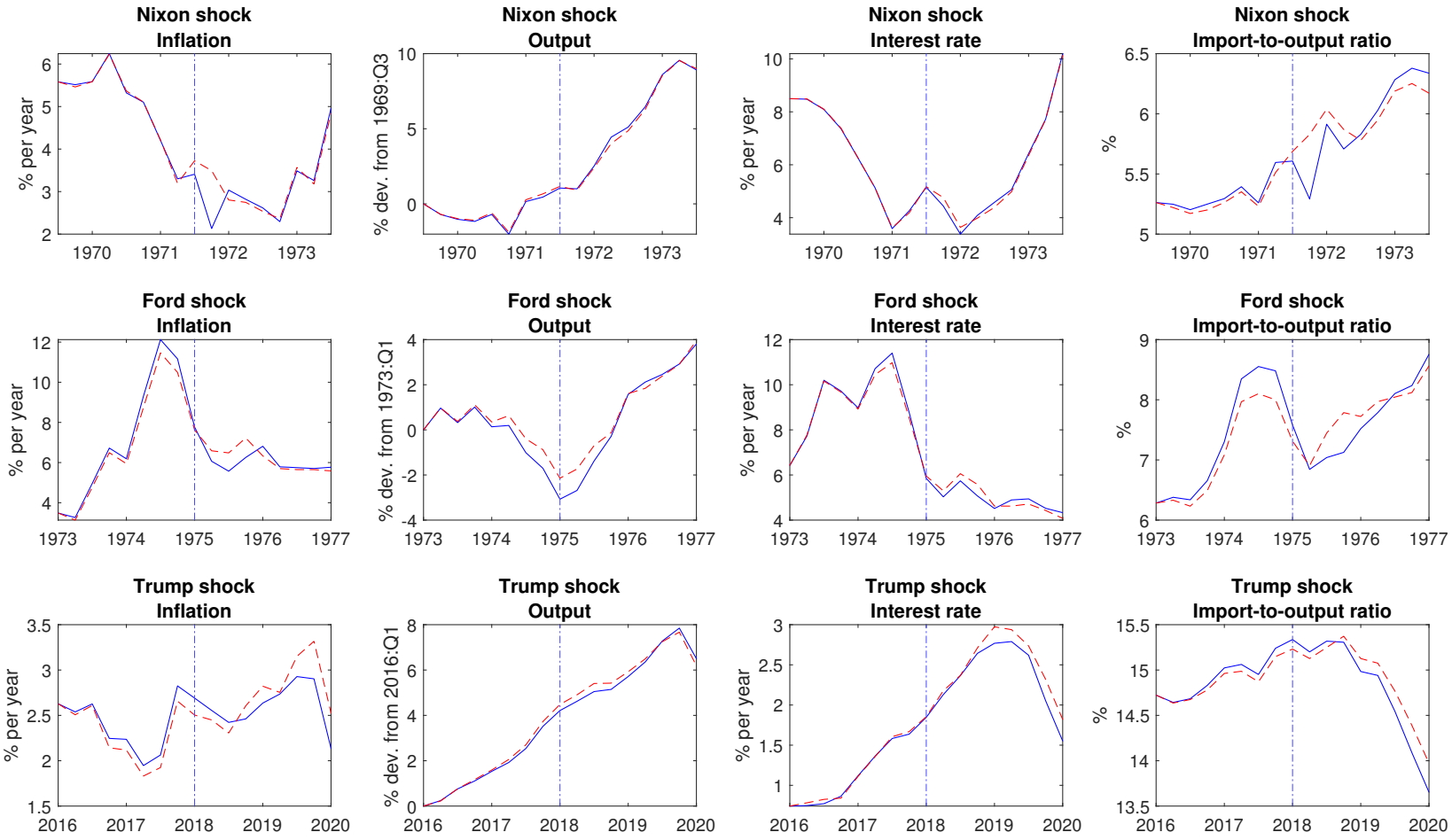
Large Tariff Surges: Nixon, Ford, and Trump

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, respectively) as mostly transitory, and the Trump tariff shock (2018:Q1) as more permanent.

Predicted and Counterfactual Paths of Macroeconomic Indicators



The model interprets the Nixon, Ford, and Trump shocks as having modest effects on macroeconomic variables.

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

Findings are robust to:

- endogenous import tariffs
- treating inflation during the Nixon price controls as missing observations
- including Laspeyres tariff index as additional observable
- including trade restrictiveness index (TRI) as additional observable

Conclusions

• The use of tariffs in the United States has a long history. Surprisingly, there are few empirical studies devoted to uncovering their macroeconomic consequences.

• The innovation of this paper is modeling tariffs as having a permanent and a transitory component and not assuming as part of the identification scheme that tariff increases have to be inflationary.

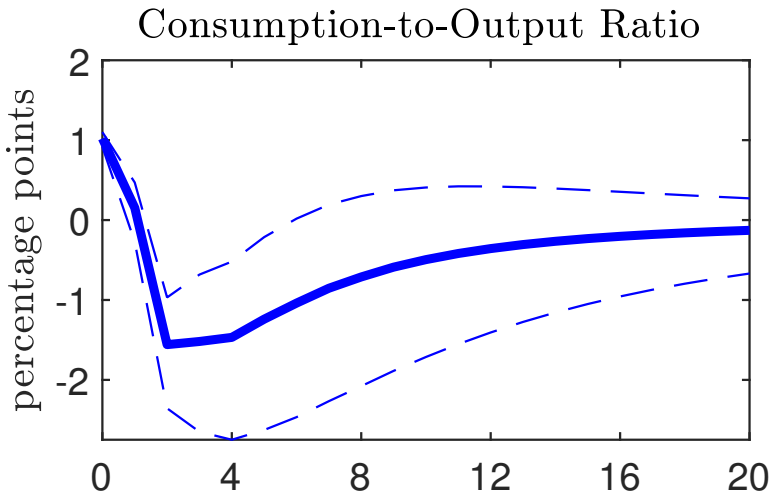
• Both modeling innovations deliver important results. Transitory tariff increases are estimated to be neither inflationary nor contractionary, while permanent tariff increases are estimated to generate a short-lived increase in inflation and an insignificant decline in output.

• In line with the intertemporal approach to the balance of payments, temporary increases in tariffs tend to reduce imports and improve net exports, whereas permanent changes have insignificant effects on net exports.

• Tariff shocks do not represent a quantitatively important source of U.S. business-cycle fluctuations within our sample period (1959:Q2–2024:Q4).

Extras

Impulse Response of the Consumption-to-Output Ratio 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 confidence bands computed using the Sims-Zha (1999) method.

Excluding the Nixon Price Controls

Variance Decomposition

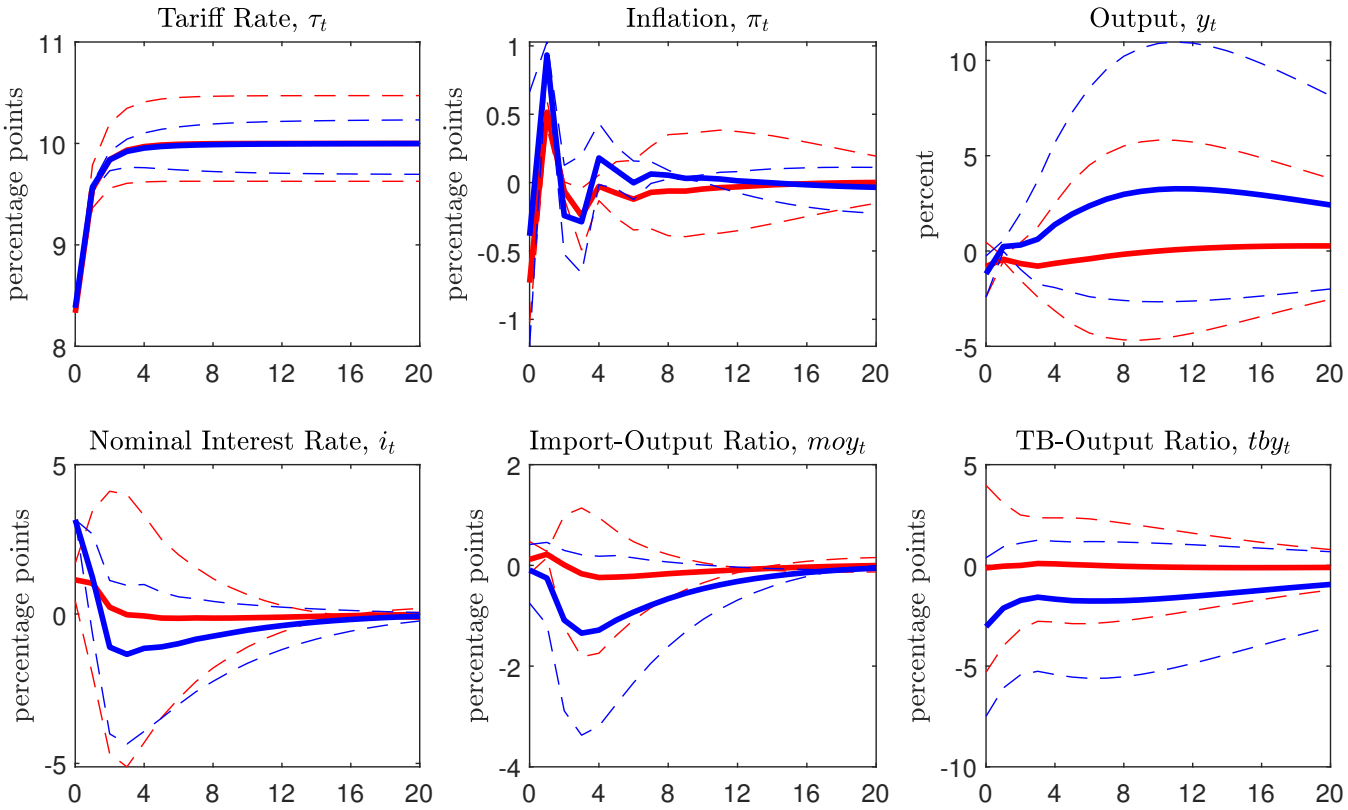
Share of Variance explained by z_t^τ and ΔX_t^τ

	$\Delta\tau_t$	$\Delta\pi_t$	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.

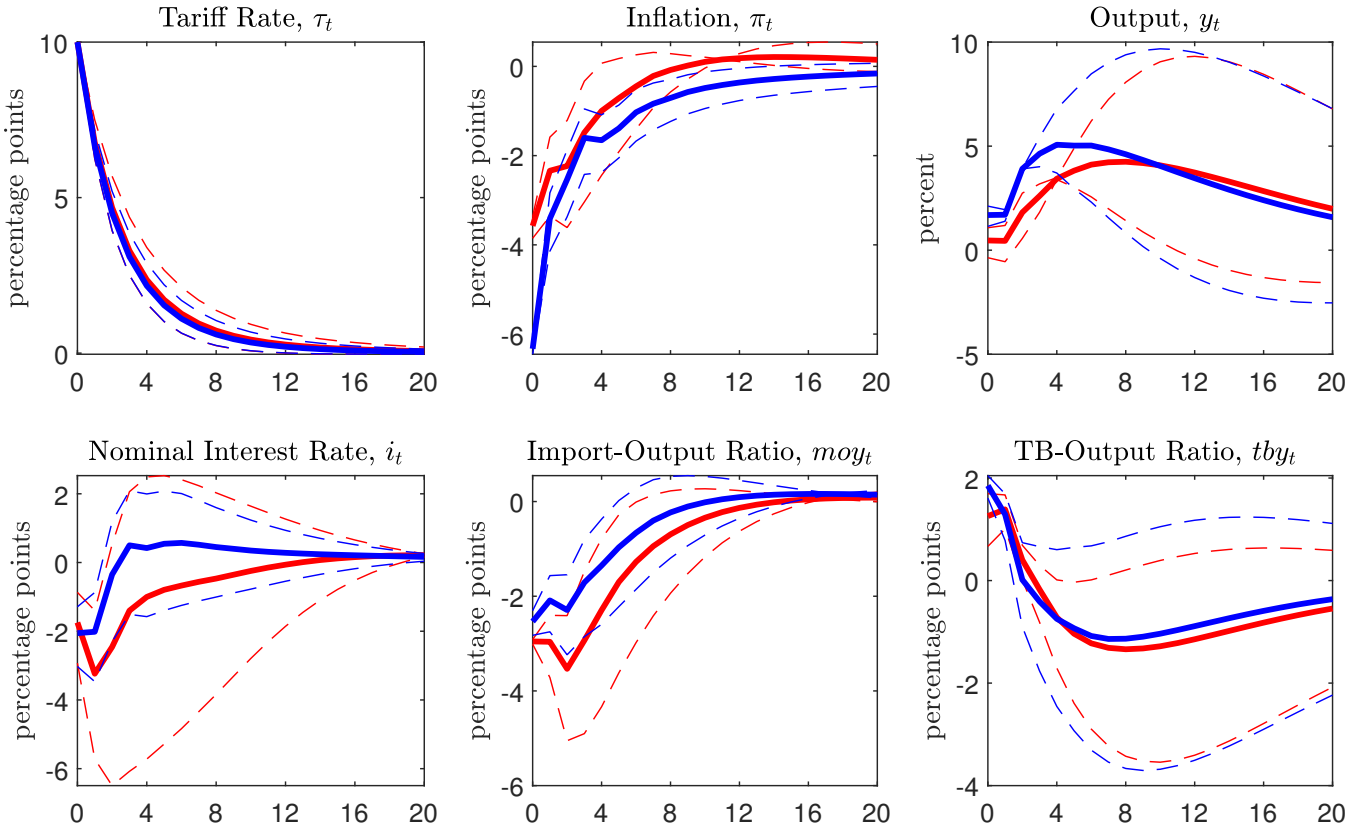
Impulse Responses to an Increase in the Permanent Import Tariff Shock, X_t^τ: Excluding Nixon Price Controls



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.

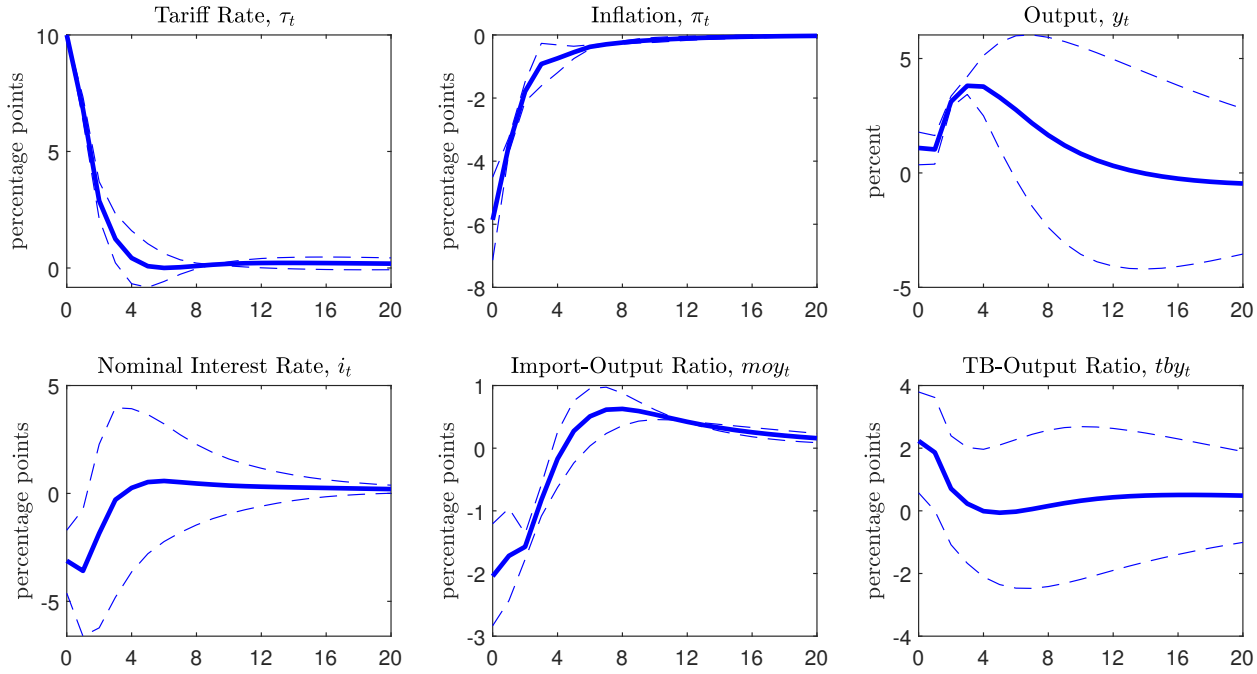
Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ: Excluding Nixon's Price Controls



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.

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