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ABSTRACT

We estimate transitory and permanent import tariff shocks in the United States over the postwar period. We find that transitory tariff increases are neither inflationary nor contractionary, and are not associated with monetary tightening. In contrast, permanent tariff increases trigger a temporary rise in inflation (a one-off increase in the price level) and a brief tightening of monetary policy. Consistent with the intertemporal approach to the balance of payments, transitory tariff increases reduce imports and improve the trade balance, whereas permanent increases leave both largely unchanged. Transitory shocks account for approximately 80 percent of tariff movements. 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.

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1 Introduction

This paper empirically investigates the macroeconomic effects of import tariff shocks. It addresses a number of questions that have been in the minds of observers both in academic and policy circles for a long time and have resurfaced with vigor since the Trump administration's imposition of a broad array of import tariffs: Are tariff increases inflationary? Are they contractionary or expansionary? Are they effective in improving the external accounts? How has the Fed dealt with them?

We begin with the observation that, in dynamic optimizing macroeconomic models, the effects of import tariff shocks depend on their persistence. For example, in a framework where tariffs affect the intertemporal relative price of consumption, transitory tariff increases reduce current demand and improve the external accounts. In contrast, permanent tariff increases, because they do not alter the relative price of consumption across periods, have no effect on the external accounts.[1] Motivated by this observation, we estimate the impact of tariffs using an empirical model that explicitly distinguishes between transitory and permanent tariff shocks.

The model aims to explain the behavior of import tariffs, inflation, output, the nominal interest rate, imports, and the trade balance. It is driven by a number of transitory and permanent shocks, including temporary and permanent tariff shocks. We estimate the model using U.S. quarterly data from 1959:Q1 to 2024:Q4. We proxy the import tariff rate using two alternative measures, the trade-weighted import tariff rate and the trade restrictiveness index (TRI). The former is computed as the ratio of U.S. import customs duties to the value of imports of goods. Its advantages are that it is straightforward to compute at the quarterly frequency and is available since 1959:Q1. The TRI is based on Feenstra (1995) and represents an approximation of the uniform tariff such that the level of welfare under the uniform tariff is the same as under the actual tariff schedule. Its advantages are that it better captures distortions created by cross-sectional variation in individual import tariff rates and substitutability across goods. The TRI is not available at a quarterly frequency. An empirical contribution of this paper is to fill this gap. Construction of the TRI requires knowledge of good-specific import tariff rates, import shares, and import demand elasticities. Using a balanced panel dataset of 2,761 imported products at the 6-digit harmonized tariff schedule (HTS) level, we produce a time series of the TRI in the United States covering the period 1990:Q1 to 2024:Q4.

We estimate the model using Bayesian techniques. The focus of our analysis is on the

[1] Tariff persistence can also matter in different ways. For example, if tariffs affect the cost of intermediate materials of production, permanent changes in tariffs can have larger effects on economy activity than temporary ones, to the extent that firms face adjustment costs in the acquisition of inputs of production.

macroeconomic effects of identified transitory and permanent movements in import tariffs. We find that movements in tariffs have been driven primarily by transitory tariff shocks. Specifically, this type of disturbance explains about 80 percent of the observed variance of quarterly changes in tariffs.

We estimate that transitory increases in import tariffs are not inflationary. This result goes against the conventional view according to which an increase in import tariffs is passed on to prices and therefore generates inflation. However, an increase in tariffs represents a change in relative prices whereas inflation is a generalized increase in nominal prices. How such a change in relative prices ends up affecting inflation depends on a multitude of factors including the persistence of the shock, the behavior of markups and aggregate demand, and the stance of monetary policy. For example, if the temporary increase in tariffs depresses domestic consumption, for which we find some evidence, it could in principle cause a fall in inflation, unless the Fed is sufficiently accommodative. In fact, a fall in inflation could take place even if the Fed responds by easing, as long as the easing is not sufficient to fend off the fall in aggregate demand. We also find that transitory increases in tariffs do not cause a contraction in output or a tightening of monetary policy.

Permanent tariff shocks conform more closely to the conventional view. They are estimated to cause a one-time, permanent increase in the price level (effectively a brief rise in inflation), while leaving output largely unaffected. In response, the Federal Reserve tightens policy on impact, but quickly reverts to a neutral stance.

The responses of the external accounts to tariff shocks are consistent with the predictions of the intertemporal approach to the current account: we find that in response to a transitory increase in tariffs imports fall and the trade balance improves while in response to a permanent increase in tariffs both variables are little changed. Beyond its theoretical interest, this result is of policy relevance, as the question of whether tariffs are an effective tool for reducing trade imbalances is almost always at the center of discussions around episodes of tariff hikes.

We also assess the role of import tariff shocks as drivers of U.S. business cycles. We find that they do not play an important role. Variance decomposition analysis indicates that, taken together, transitory and permanent movements in import tariffs account for only about 5 percent of the variation in inflation, output, and the interest rate. This limited influence holds not only on average, but also during prominent episodes of tariff increases, such as those implemented by Presidents Nixon in 1971, Ford in 1975, and Trump in 2018, regardless of whether these episodes are estimated to have been transitory or permanent in nature. Specifically, we estimate that the Nixon and Ford tariff increases were primarily transitory, while the Trump tariffs had a more permanent component, yet we find that in all cases their macroeconomic effects were modest.

Related Literature. This paper is related to a literature on the effects of import tariffs that has grown significantly over the past years. One branch of the literature, including the present paper, aims to estimate the macroeconomic effects of tariff shocks. Boer and Rieth (2024), using U.S. quarterly data, follow an SVAR approach to estimate the macroeconomic effects of tariff shocks using sign and narrative identification restrictions. To our knowledge, these authors are the first to empirically estimate the macroeconomic effects of U.S. tariffs using a dynamic approach. The main departure of the present paper from their work is twofold: first, their work assumes, as a way to identify tariff shocks, that they must cause an increase in the price level, ruling out by assumption the possibility that tariff increases may fail to be inflationary, which is one of the main results of our investigation. Second, their framework does not distinguish between transitory and permanent movements in tariffs, which is at the core of our analysis, and a key vehicle to discriminate across different theories of the aggregate effects of tariff shocks. Barattieri, Cacciatore, and Ghironi (2021) examine the dynamic macroeconomic effects of temporary trade barriers using Canadian data, specifically, the initiation of anti-dumping investigations, and find that these measures are inflationary, contractionary, and marginally improve the trade balance. While informative, this measure captures anticipated retaliatory tariff increases and is not directly comparable to the types of trade barriers analyzed in the present study. Their paper also examines temporary trade barriers using import-weighted averages of applied tariff rates, which are more directly comparable to one of the tariff measures used here. While their approach differs from ours in several respects, one notable difference is that it models the permanent component of tariffs as a deterministic linear time trend. In contrast, we model tariffs as having stochastic transitory and permanent components, a distinction that turns out to be important, as we find that transitory and permanent tariff shocks have meaningfully different effects on macroeconomic indicators.

There is a literature devoted to measuring the economic effects of tariffs using microeconomic data. See, for example, Amiti, Redding, and Weinstein (2019), Fajgelbaum et al. (2020), Flaaen, Hortacsu, and Tintelnot (2020), and Cavallo et al. (2021), and the literature review by Fajgelbaum and Khandelwal (2022). This body of work has provided valuable insights on the price and welfare effects of tariff changes using granular information. A central result that emerges from this micro approach is that import tariff increases have a near one-to-one pass-through to import prices, and that their effect on income is negative albeit small. A methodological difference between this literature and the present study is that the former is static. This distinction is important because an intertemporal approach allows one to separate transitory and permanent changes in tariff, which, as empirically documented here, can give rise to different effects on inflation, output, and the external accounts.

The theoretical contributions closest to our empirical framework are Razin and Svensson (1983) and Calvo (1987), which study the effects of tariffs in an optimizing model that distinguishes between permanent and transitory tariff shocks. They show that transitory (or noncredible) changes in tariffs cause a fall in aggregate demand and an improvement in the trade balance, while permanent (or credible) changes can leave both variables unchanged. These results are broadly consistent with our empirical findings. More recently, each of the two Trump tariff shocks has triggered a wave of theoretical work analyzing the macroeconomic effects of tariffs, including contributions by 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), and Costinot and Werning (2025). A characteristic of this recent literature, which distinguishes it from earlier contributions, is a stronger emphasis on quantitative and normative implications.

Finally, the econometric approach follows Uribe (2022).

The remainder of the paper is organized as follows. Section 2 develops the model and describes the identification strategy, the data, and the estimation procedure. Section 3 presents the estimated effects of transitory and permanent tariff shocks and shows that tariff shocks play a modest role as drivers of the business cycle on average and during major tariff shock episodes. Section 4 performs a robustness analysis. Section 5 offers concluding remarks.

2 Model, Identification, and Estimation

This section presents a model with transitory and permanent import tariff shocks, discusses the identification of these shocks, and describes the data and the estimation procedure.

2.1 The Model

The model is cast in state-space form along the lines of Uribe (2022). It shares 2 properties with optimizing dynamic models: one is that the number of shocks can be larger than the number of observable variables; and the other is that the identified shocks can have an autoregressive representation. It shares with SVAR models their flexibility in terms of cross-equation parameter restrictions. The baseline model features six unobservable endogenous variables, six transitory shocks, including a transitory import tariff shock, four permanent shocks, including a permanent import tariff shock, and six observables. The advantage of having a rich set of shocks is to ensure that tariff shocks, which are the focus of the present investigation, are forced to compete with other sources of aggregate fluctuations to explain the data, just as is done in estimated DSGE models.

Let τ_t, y_t, tby_t, i_t, π_t, and moy_t denote, respectively, the import tariff rate, the natural logarithm of real output per capita, the trade-balance-to-output ratio, the nominal interest rate, inflation, and the import-to-output ratio in period t. We assume that these variables can have stochastic trends. Let X_t^τ and X_t^y be the stochastic trends of the tariff rate and of output, respectively, X_t^m be the common stochastic trend of i_t and π_t, and X_t^x be the common stochastic trend of moy_t and tby_t. We interpret X_t^τ to be a permanent tariff shock, X_t^y to be a permanent productivity shock, X_t^m to be a permanent monetary shock, and X_t^x to be a permanent external shock. Let $\hat{\tau}_t \equiv \tau_t - X_t^\tau$, $\hat{y}_t \equiv y_t - X_t^y$, $\hat{tby}_t \equiv tby_t - \alpha X_t^x$, $\hat{i}_t \equiv i_t - X_t^m$, $\hat{\pi}_t \equiv \pi_t - X_t^m$, and $\hat{moy}_t \equiv moy_t - X_t^x$ denote the cyclical components of the variables of the model, where α is a parameter to be estimated. If α is equal to 0, then the trade-balance-to-output ratio is stationary (i.e., X_t^x is the common permanent component of the import- and export-to-output ratios), and if α is equal to -1, then the export-to-output ratio is stationary. In general, the cyclical components are unobservable, since we don't observe their respective trends.

Let the vector $\hat{Y}_t \equiv [\begin{array}{cccccc} \hat{\tau}_t & \hat{y}_t & \hat{tby}_t & \hat{i}_t & \hat{\pi}_t & \hat{moy}_t \end{array}]'$. We assume that $\hat{Y}_t$ evolves over time according to

$$\hat{Y}_t = \sum_{i=1}^{L} B_i \hat{Y}_{t-i} + C u_t, \tag{1}$$

where L is the number of lags in the autoregressive component of $\hat{Y}_t$ and u_t is a vector of exogenous shocks. For notational convenience, the presentation of the model omits intercepts. The vector u_t is assumed to be given by

$$u_t \equiv [\begin{array}{cccccccccc} z_t^\tau & z_t^y & z_t^{tby} & z_t^i & z_t^\pi & z_t^{moy} & \Delta X_t^\tau & \Delta X_t^y & \Delta X_t^m & \Delta X_t^x \end{array}]'.$$

Here z_t^j, for $j = \tau, y, tby, i, \pi, moy$, are stationary shocks. The vector u_t is unobservable and is assumed to follow an AR(1) process of the form

$$u_t = \rho u_{t-1} + \psi \nu_t, \tag{2}$$

where ρ and ψ are diagonal matrices and ν_t is a vector of i.i.d. innovations normally distributed with mean 0 and variance equal to 1.

Letting $\xi_t \equiv [\begin{array}{ccccc} \hat{Y}_t' & \hat{Y}_{t-1}' & \dots & \hat{Y}_{t-L+1}' & u_t' \end{array}]'$ be the unobserved state of the system, equations (1) and (2) can be written in companion form as

$$\xi_{t+1} = F\xi_t + \Psi\nu_{t+1}, \tag{3}$$

where the matrix F is a function of B_i, for $i = 1, \ldots, L$, C, and ρ, and the matrix Ψ is a function of C and ψ.

We wish to estimate the elements of the matrices B_i, for $i = 1, \ldots, L$, C, ρ, and ψ. However, equation (3) cannot be directly taken to the data because the state vector ξ_t is not observable. To address this problem, we introduce observable variables for which the model has precise predictions. Specifically, the model predicts that the change in the import tariff rate, $\Delta\tau_t$, the growth rate of real output per capita, Δy_t, the change in the trade-balance-to-output ratio, Δtby_t, the change in the nominal interest rate, Δi_t, the interest-rate-inflation differential, $r_t \equiv i_t - \pi_t$, and the change in the import-to-output ratio, Δmoy_t are linked to the unobservable states of the model by the equations

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

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

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

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

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

and

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

These equations can be written compactly as

$$\begin{bmatrix} \Delta\tau_t \\ \Delta y_t \\ \Delta tby_t \\ \Delta i_t \\ r_t \\ \Delta moy_t \end{bmatrix} = H'\xi_t,$$

where H is a matrix containing zeroes, ones, and the parameter α. We assume that the left-hand side of this equation can be observed up to measurement error. Letting the vector $o_t \equiv [\ \Delta\tau_t^o \quad \Delta y_t^o \quad \Delta tby_t^o \quad \Delta i_t^o \quad r_t^o \quad \Delta moy_t^o\ ]'$ collect the observed realizations of the corresponding variables without the superscript o, we can write

$$o_t = H'\xi_t + \mu_t, \tag{4}$$

where μ_t is a vector of measurement errors. We assume that μ_t is i.i.d., normally distributed with mean zero and a diagonal variance-covariance matrix R, and uncorrelated with ν_t. Equation (4) represents the observation equation of the model.

2.2 Identification

The 6 stationary shocks, z_t^{τ}, z_t^{y}, z_t^{tby}, z_t^{i}, z_t^{π}, and z_t^{moy} are identified by assuming that the submatrix of C consisting of its first 6 columns is lower triangular with diagonal elements equal to 1. Through this restriction, the stationary shock z_t^{τ} is identified as a stationary tariff shock because it is the only stationary shock that affects the import tariff rate contemporaneously. This is guaranteed by the facts that $\hat{\tau}_t$ is the first element of $\hat{Y}_t$ and z_t^{τ} is the first element of u_t. Since our focus is on the effects of tariff shocks, we need not assign an economic interpretation to the remaining stationary shocks.

A relevant identification issue is whether the import tariff rate, τ_t, is exogenous or responds to the state of the business cycle. A central theme in international trade is that politics, rather than macroeconomic conditions, is the primary driver of trade policy. See Grossman and Helpman (1994) for a theoretical framework, and Goldberg and Maggi (1999) and Gawande and Bandyopadhyay (2000) for econometric support for that theory. The view that tariff changes are not systematically linked to the business cycle is also consistent with historical evidence. For example, Irwin (2020) finds that governments have traditionally used tariffs for three main objectives: to raise revenue for the government, to restrict imports and protect domestic producers from foreign competition, and to reach reciprocity agreements that reduce trade barriers.

Accordingly, our baseline specification assumes that the import tariff rate, τ_t, is exogenous and driven solely by the transitory and the permanent tariff shocks, z_t^{τ} and X_t^{τ}. (In section 4.1, we show that the main results of the paper are robust to allowing the import tariff rate to feed back from past values of the endogenous variables.) Thus, under the baseline specification, we have that

$$\tau_t = z_t^{\tau} + X_t^{\tau}. \tag{5}$$

The baseline specification given in equation (5) imposes the following restrictions on the matrices B_i, for $i = 1, \ldots, L$, and C: All elements of the first row of B_i, for $i = 1, \ldots, L$, are zero. And all elements of the first row of C are zero, except for C_{11}, which is equal to 1.

The nonstationary tariff shock X_t^τ is identified because it is the only shock that affects the import tariff in the long run. Notice that the fact that the coefficient on ΔX_t^τ in the first row of C is restricted to be 0 does not mean that X_t^τ does not affect τ_t on impact. In fact, because $\hat{\tau}_t = \tau_t - X_t^\tau$, a change in X_t^τ affects the tariff one-for-one contemporaneously.

2.3 Data and Estimation

The system defined by equations (3) and (4) is linear and features Gaussian innovations, implying that the likelihood function of the observed data, o_t, has a known form. This allows for the econometric estimation of the model's parameters.

Our baseline specification employs a lag length of two, $L = 2$, which fits the data better than longer lag specifications. For example, it substantially dominates in fit a specification with four lags, which is often used in empirical business-cycle studies based on SVAR models with quarterly data. Specifically, the model with two lags yields a log marginal data density approximately 40 log points higher than a specification with four lags (see Table B1 in Appendix B).[2] Nevertheless, as we show in section 4.2, the key results are robust to using four lags.

We estimate the model using Bayesian techniques on quarterly U.S. data from 1959:Q2 to 2024:Q4. The starting date is dictated by the availability of import duty data at a quarterly frequency.

Following Irwin (2003), we proxy τ_t by the ratio of U.S. import customs duties to the value of goods imports. Specifically, letting d_t denote import duties in period t and m_t the value of goods imports in period t, we have that $\tau_t = d_t/m_t$. This proxy represents an import-weighted measure of tariff rates. To see this, let d_{it} denote import duties on good i, m_{it} the value of imports of good i, $\tau_{it} \equiv d_{it}/m_{it}$ the tariff rate on imports of good i, and $s_{it} \equiv m_{it}/m_t$ the import share of good i, we can write

$$\tau_t = \sum_i s_{it}\tau_{it}. \tag{6}$$

An alternative measure of the aggregate import tariff rate used in trade studies is the trade restrictiveness index (TRI) of Anderson and Neary (1994), later simplified by Feenstra

[2]One reason why, in the present setup, a specification with two lags is preferred to one with four lags could be that the model explicitly allows the underlying shocks, u_t, to follow an autoregressive process, as in optimizing dynamic models (see equation (2)). This feature introduces an additional layer of persistence and dynamic responses to shocks, enabling the model to capture serial correlation in the innovations directly and reducing the need for a longer lag structure in the autoregressive representation of the endogenous variables. By contrast, SVAR formulations typically assume that structural innovations are serially uncorrelated, which means that any persistence in the shocks must be absorbed by including additional lags in the autoregressive dynamics.

(1995), which accounts for the deadweight loss of trade barriers and incorporates non-tariff restrictions. The advantages of the import-weighted tariff measure relative to the TRI are that it is available at quarterly frequency for a relatively long sample period and is straightforward to compute. To the best of our knowledge, a quarterly measure of the TRI for the the United States is not available. In section 4.3, we construct a quarterly series of this index from 1990:Q1 to 2024:Q4 using data at the harmonized-tariff-schedule (HTS) 6-digit product level. We regard the construction of this index as a contribution of the paper by itself. We then add the quarterly TRI as an observable in estimation. We find that the results of the model are robust to this modification.

We proxy y_t by the log of U.S. real GDP per capita, tby_t by the ratio of net exports of goods and services to GDP, i_t by the federal funds rate, π_t by core CPI inflation, and moy_t by the ratio of imports of goods and services to GDP. Appendix A provides detailed data sources.

We impose normal prior distributions for the estimated parameters of the matrices B_i, for $i = 1, \ldots, L$. In the spirit of the Minnesota prior, for the diagonal elements of B_1, we impose a relatively high prior mean and standard deviation, 0.95 and 0.5, respectively. For the remaining estimated elements of B_i, we impose a prior mean of 0 and a standard deviation of 0.25. We impose normal prior distributions with mean 0 and standard deviation 0.5 for the estimated elements of C. We assume Gamma distributions with unit mean and standard deviation for the diagonal elements of the matrix ψ. For the diagonal elements of ρ defining the serial correlations of stationary shocks, we impose beta prior distributions with a relatively high mean of 0.7 and standard deviation 0.2. For the elements of ρ defining the serial correlations of the changes in the permanent shocks, we impose beta prior distributions with relatively low means of 0.3 and standard deviations of 0.2. For the parameter α defining the cointegration vector between the import-to-output ratio and the trade-balance-to-output ratio we assume a normal prior distribution with mean zero and standard deviation 0.25. This assumption implies that under the prior mean the trade-balance-to-output ratio is stationary. Finally, for the variances of the measurement errors, the diagonal elements of R, we assume uniform prior distributions with lower bound equal to 0 and upper bound equal to 10 percent of the variance of the corresponding observable variable. Table 1 summarizes the prior distributions.

3 Results

We now present the main results of the paper. We begin by examining the effects of transitory and permanent import tariff shocks on inflation, output, the interest rate, and the external

Table 1: Prior Distributions

Parameter	Distribution	Mean	Std. Dev.
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	$\frac{\text{var}(o_t)}{10\times 2}$	$\frac{\text{var}(o_t)}{10\times\sqrt{12}}$

accounts. Next, we quantify the contribution of import tariff shocks to regular business cycle fluctuations and during prominent episodes of large tariff increases.

3.1 Estimated Effects of Transitory and Permanent Tariff Shocks

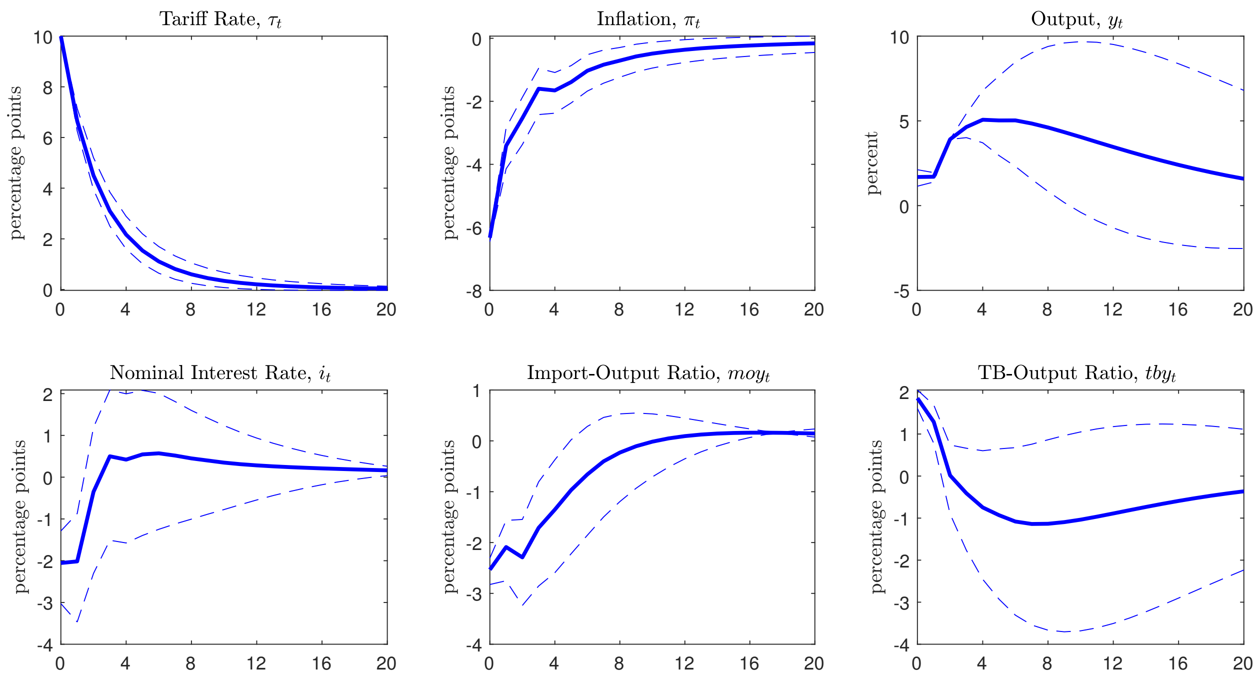
Figure 1 displays posterior mean impulse responses to a ten-percentage-point increase in the transitory import tariff shock, z_t^τ, along with 90-percent posterior confidence bands computed using the Sims-Zha (1999) method (principal component) from a random subsample of 100,000 draws from an MCMC chain of 1,000,000 draws. The tariff shock is estimated to be short-lived, with a half life of about 2 quarters.

The key result that emerges from Figure 1 is that a temporary increase in the import tariff is neither inflationary nor contractionary. In fact, core inflation falls significantly by 6 annual percentage points on impact and converges gradually from below to its trend level. Output increases by 2 percent on impact, peaks at 5 percent above trend one year after the shock, and remains significantly above trend for about two years. The estimated response of inflation goes against the conventional wisdom according to which tariff increases are inflationary. The Fed response is accommodative but short-lived. The federal funds rate falls significantly on impact and one quarter after the shock by about 2 annual percentage points and reaches its trend level in less than a year.

The tariff hike succeeds in curbing imports. The import-to-output ratio falls significantly by 2.5 percentage points on impact and converges gradually from below to its trend level after about a year. The trade balance experiences a brief improvement of about 2 percentage points on impact and is insignificantly different from its trend level afterwards.

To gauge the effect of the transitory tariff shock on domestic demand conditions, Figure 2 displays the response of the consumption-to-output ratio to a 10-percentage-point increase in z_t^τ. To estimate this effect without altering the dimension of the model, we replaced

Figure 1: Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ

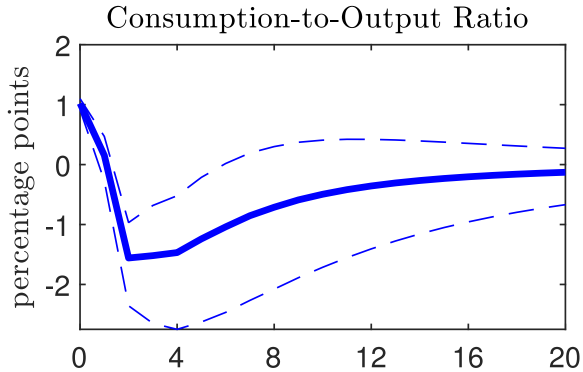


Notes. Horizontal axes measure quarters after the shock. Solid lines are posterior means and dashed lines are 90-percent confidence bands computed using the Sims-Zha (1999) method (principal component) from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws. Inflation and the nominal interest rate are in percent per year.

the trade-balance-to-output ratio with the consumption-to-output ratio and reestimated the model. The transitory tariff shock reduces the share of consumption in GDP with some delay. It follows that the estimated expansion in aggregate activity triggered by the temporary tariff hike is not led by an expansion in private consumption. Together with the estimated fall in inflation, this result sheds additional light on possible reasons why the Fed chooses not to tighten in response to transitory tariff shocks.

Consider now permanent import tariff shocks. Figure 3 displays impulse responses to a change in X_t^τ that increases the import tariff by 10 percentage points on average in the long run. Following the X_t^τ shock, the import tariff, τ_t, reaches its new long-run level relatively quickly, in less than half a year. The effects of a permanent change in the import tariff rate on inflation and the nominal interest rate are more in line with conventional wisdom. The 10-percentage-point permanent increase in the import tariff causes a one time inflation spike of about 1 annual percentage point—i.e., a permanent increase in the price level of 0.25 percent. In response to the permanent tariff increase the Fed tightens for one quarter but

Figure 2: Impulse Response of the Consumption-to-Output Ratio to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ



Notes. The horizontal axis measures quarters after the shock. The solid line is the posterior mean impulse response and the two dashed lines are a 90-percent confidence band computed using the Sims-Zha (1999) method (principal component) from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws. The figure is based on a reestimation of the model after replacing the trade-balance-to-output ratio with the consumption-to-output ratio.

reverts its action immediately thereafter. The responses of output, imports, and the trade balance are not significantly different from zero. The mute response of the trade balance to a permanent increase in tariffs and its positive response to a transitory increase in tariffs is consistent with the predictions of the intertemporal approach to the current account.

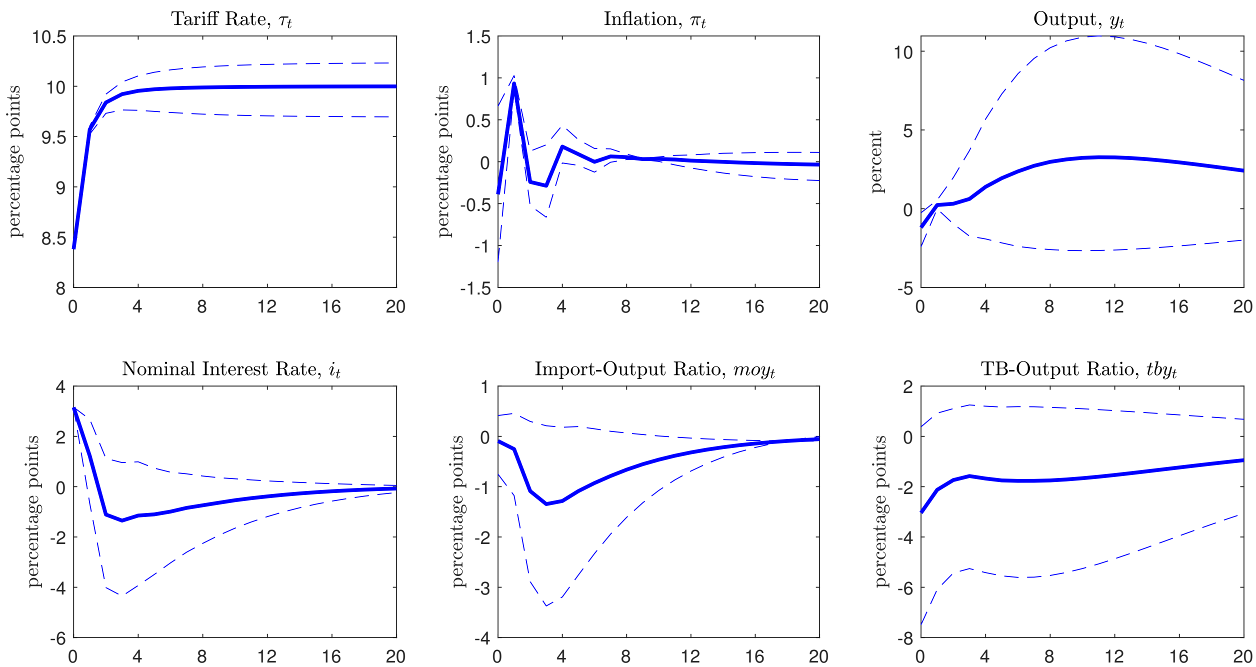
Taken together, Figures 1 and 3 convey a relevant economic message, namely, that transitory and permanent tariff shocks give rise to different dynamics for inflation, output, interest rates and external variables.

This is important for the analysis of episodes of large tariff hikes, because not all come in the same flavor. For example, in section 3.3 we will show that of the main large tariff increases observed between 1959 and 2024 two were mostly transitory (Nixon 1971 and Ford 1975) and one was of a more permanent nature (Trump 2018).

3.2 Are Tariff Shocks Important Drivers of the Regular Business Cycle?

The short answer is no. Table 2 displays the unconditional variance decomposition of the endogenous variables of the model. Three relevant results emerge from this decomposition. First, the transitory tariff shock, z_t^τ, explains the vast majority of changes in tariffs, about 80 percent, leaving only about 20 percent for changes in its trend component, ΔX_t^τ. This finding implies that the impulse responses to transitory tariff shocks, shown in Figure 1, constitute

Figure 3: Impulse Responses to a Increase in the Permanent Import Tariff Shock, X_t^τ



Notes. The permanent tariff shock increases the import tariff rate by 10 percentage points on average in the long run. Horizontal axes measure quarters after the shock. Solid lines are posterior means and dashed lines are 90-percent confidence bands computed using the Sims-Zha (1999) method (principal component) from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws. Inflation and the nominal interest rate are in percent per year.

the empirically more relevant characterization of the macroeconomic effects of tariff shocks. Those results indicate that typical tariff shocks are not inflationary or contractionary and do not elicit a tightening of money market conditions.

Second, jointly, transitory and permanent movements in tariffs (z_t^τ and ΔX_t^τ) explain a small fraction of the variation in output growth (about 3 percent) and changes in inflation (about 6 percent). Thus, import tariffs are not significant drivers of the regular business cycle. And third, import tariff shocks are more significant drivers of external variables, explaining about 20 percent of changes in the trade-balance-to-output ratio and about 10 percent of changes in the import-to-output ratio.

3.3 Large Tariff Surges: Nixon, Ford, and Trump

We have established that typical import tariff shocks account for only a small share of movements in output and inflation. In this section, we show that even large tariff shocks generate relatively modest movements in real and nominal macroeconomic aggregates.

Table 2: Variance Decomposition

	$\Delta\tau_t$	Δy_t	Δtby_t	Δi_t	Δmoy_t	$\Delta\pi_t$
z_t^τ	78	2	9	2	6	5
ΔX_t^τ	22	1	10	3	3	1
$z_t^\tau + \Delta X_t^\tau$	100	3	19	5	9	6

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.

To this end, we examine three prominent episodes of sizable import tariff increases included in our sample: (1) The Nixon shock of 1971:Q3, when President Nixon imposed a 10 percent surcharge on all imported goods; (2) The Ford shock of 1975:Q1, when President Ford introduced a \$2-per-barrel tax on oil imports, at a time when the market price of oil was approximately \$11 per barrel; and (3) The Trump shock of 2018:Q1, when President Trump levied tariffs on approximately 15 percent of imported goods, primarily from China.

Figure 4 displays, with a solid line, the predicted path of the import tariff when all structural shocks in the model are active. This path closely tracks the actual tariff data, differing only by measurement errors, which we filter out and which are small by construction. The overall trend in import tariffs over the past six decades has been downward: between 1959 and 2000, average tariffs fell from about 7 percent to around 2 percent.

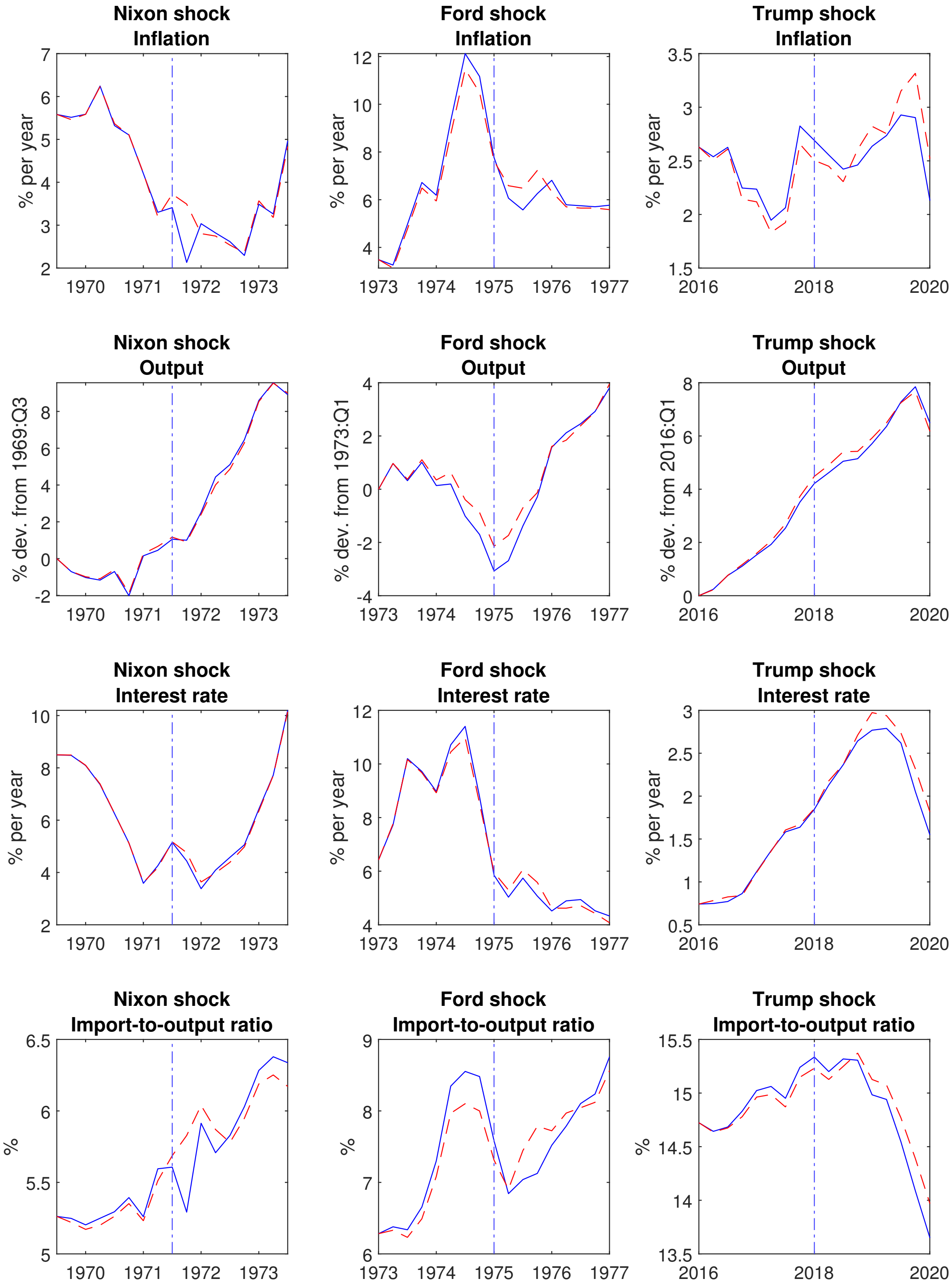
The three major tariff hikes just mentioned are clearly visible in the figure. Our model allows us to decompose the tariff into its permanent and transitory components. The figure shows the permanent component, X_t^τ, with a dashed line. Thus, the difference between the solid and the broken line is the transitory tariff shock, z_t^τ. The model interprets the Nixon and Ford shocks as predominantly transitory and the Trump shock as largely permanent. This classification is consistent with the historical record. President Nixon rescinded the import surcharge in December 1971, only four months after its implementation. Similarly, the Ford administration revoked the \$2 oil import fee in December 1975, less than a year after it was introduced. By contrast, the Trump tariffs initiated in 2018 proved more persistent. Owing largely to continued geopolitical tensions with China, President Biden chose to maintain most of the tariffs enacted by President Trump.

How much did these three large tariff hikes affect the macroeconomy? To address this question, Figure 5 depicts the predicted paths of inflation, output, the policy rate, and the import-to-output ratio during these episodes under two assumptions. Solid lines display the dynamics of these variables when all shock realizations take their estimated values. Up to measurement error these paths are identical to the actually observed ones. Dashed lines

Figure 4: Predicted Time Path of the Import Tariff and Its Permanent Component

Notes. The variable τ_t denotes the import tariff rate. The variable X_t^τ denotes the permanent component of the import tariff, that is, the import tariff when the transitory import tariff shock, z_t^τ, is turned off. Both paths are computed at the posterior mean of the estimated parameter vector and are net of measurement error. 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.

Figure 5: Predicted Paths of Macroeconomic Indicators Around Three Large Tariff Shocks



Notes. Solid lines show paths with all shocks active, and dashed lines show paths with the transitory and permanent tariff shocks (z_t^τ and X_t^τ) shut down. Vertical dash-dotted lines mark the starting dates of the large shocks. Time paths are computed at the posterior mean of the estimated parameter vector and are net of measurement error. The model interprets the Nixon, Ford, and Trump shocks as having modest effects on macroeconomic variables.

display dynamics when both the transitory and the permanent tariff shocks (z_t^τ and X_t^τ) are turned off over a four-year window centered around the onset of the tariff hike. The main result that emerges from the figure is that the predicted paths with and without tariff shocks are fairly similar, suggesting that tariff shocks are not a significant driver of aggregate variables even during episodes of large tariff increases.

Having said that, it is worth noting that in all three large tariff hike episodes the behavior of inflation is consistent with our findings that transitory tariff shocks tend to reduce inflation and permanent ones tend to raise it. Specifically, for the two large transitory tariff shocks (Nixon 1971 and Ford 1975), the tariff hike lowered inflation. This can be seen by the fact that in the top left and middle panels of Figure 5, displaying the behavior of inflation during these 2 episodes, the broken line is above the solid line during the tariff increase, indicating that the inflation rate is higher when one turns off the tariff shock. By contrast, during the Trump 2018 shock, which, as argued before, was of a more permanent nature, the broken line is below the solid line for several quarters after the shock (top right panel) implying that inflation is lower than the actual one when the tariff shocks are turned off.

4 Robustness Analysis

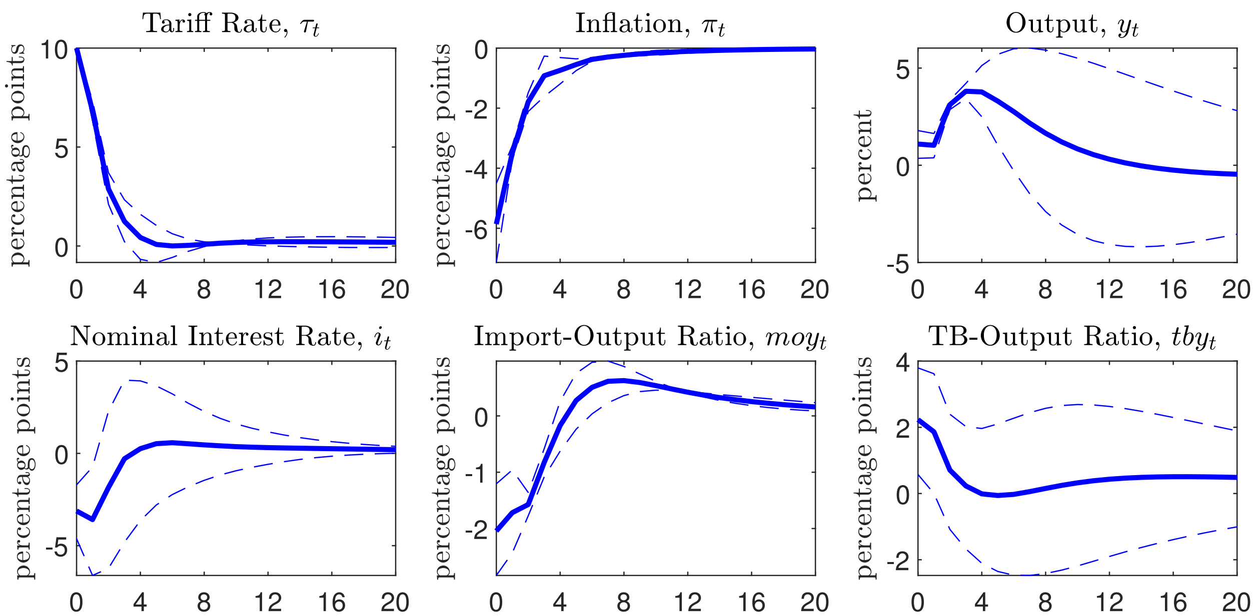
In this section, we perform a number of sensitivity checks aimed at establishing the robustness of the results derived from the baseline specification. The first check relaxes the assumption that import tariff rates are exogenous and assumes instead that they can respond to macroeconomic conditions. The second check extends the lag length of the autoregressive component of the model from two to four. And a third check adds as an observable the trade restrictiveness index, which is an alternative way of measuring the import tariff rate.

Because transitory tariff shocks are estimated to explain a large fraction of movements in tariff rates, for brevity, the sensitivity analysis focuses on this type of tariff disturbance. We find that the main results of the paper, namely, that transitory increases in tariffs cause neither inflation nor a contraction, and that they are not associated with tightening of money market conditions, are robust to these changes.

4.1 Endogenous Import Tariff

The baseline specification assumes that import tariffs follow an exogenous process with transitory and permanent shocks, z_t^τ and X_t^τ, as shown in equation (5). As discussed in section 2.2, this assumption is motivated by an important line of research in international trade suggesting that the key reasons for import tariff changes are not linked to the state of

Figure 6: Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ, in a Model with Endogenous Import Tariffs



Notes. Horizontal axes measure quarters after the shock. Solid lines are posterior means and dashed lines are 90-percent confidence bands computed using the Sims-Zha (1999) method (principal component) from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws. Inflation and the nominal interest rate are in percent per year.

the business cycle.

To assess whether this exogeneity assumption is restrictive, in this section, we entertain the possibility that tariffs respond to endogenous variables. Specifically, we now allow $\hat{\tau}_t$ to feed back from lagged values of all of the variables of the model, namely, output, the trade balance, the interest rate, inflation, and imports. Accordingly, we estimate the first-row elements of B_i for $i = 1, 2$, which were set to zero in the baseline estimation. Priors follow the same structure as in the baseline estimation: element $(1, 1)$ of B_1 has a normal prior with mean 0.95 and standard deviation 0.5, while all other first-row elements of B_1 and B_2 have normal priors with mean 0 and standard deviation 0.25.

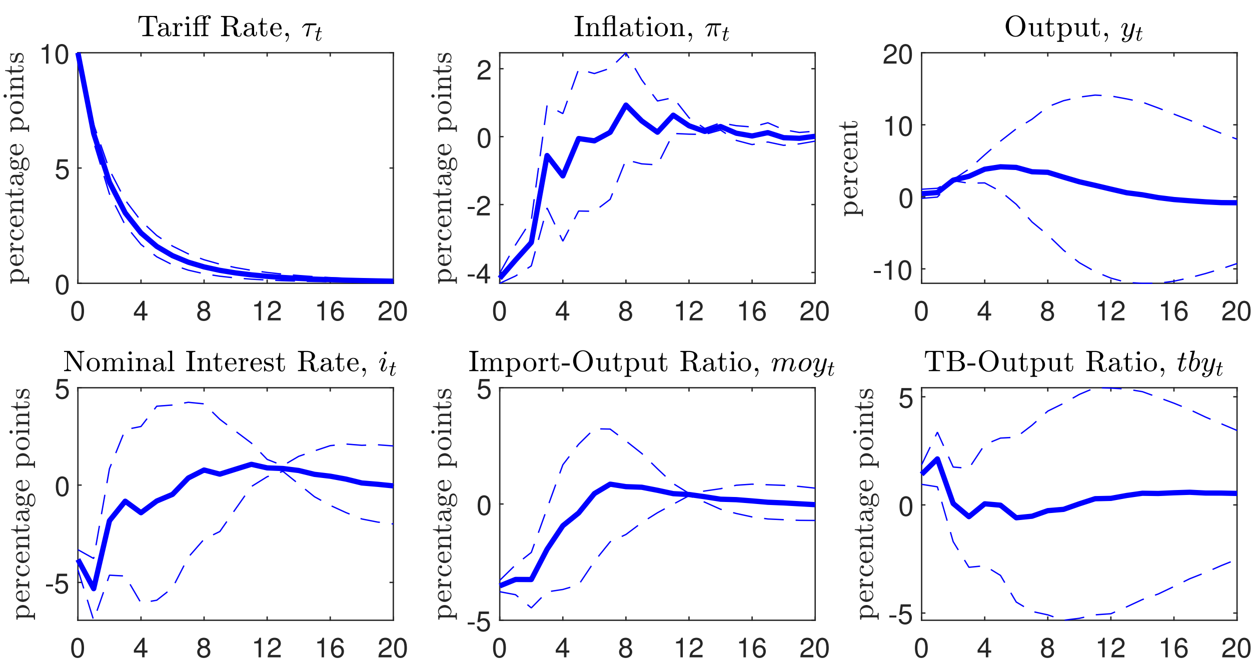
Reestimating the model we find that jointly the tariff shocks z_t^τ and X_t^τ explain 84 percent of changes in tariffs, supporting the baseline assumption that these two shocks are the main drivers of τ_t. Also in line with the baseline specification, we find that the stationary tariff shock, z_t^τ is the main source of tariff fluctuations, accounting for 75 percent of the changes in τ_t explained by tariff shocks.

Figure 6 displays the impulse responses to a 10-percentage point increase in the transitory tariff shock z_t^τ in the model with endogenous tariffs. The results are quite robust to this modification, in the sense that the increase in tariffs continues to be noninflationary and noncontractionary. Further, as in the baseline specification with exogenous tariffs, the transitory tariff hike depresses imports and briefly improves the trade balance and induces the Fed to ease.

4.2 Four Lags

Figure 7 displays impulse responses to a 10-percentage point increase in the transitory tariff shock, z_t^τ, in an extension of the baseline model that includes 4 time lags instead of 2. As mentioned in section 3.1, this specification is substantially dominated by the 2-lag one in terms of its marginal data density (see Table B1 in Appendix B). It is apparent from the figure that the error bands are wider under this specification, which could be a reflection of the fact that adding lags does not significantly improve model fit. Nonetheless, the figure shows that the key results of the paper are robust to expanding the model to four lags. In particular, the increase in the import tariff is neither inflationary nor contractionary, the monetary authority responds by briefly easing, the import-to-output ratio falls, and the net-export-to-output ratio increases temporarily.

Figure 7: Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^τ, in a Model with Four Time Lags



Notes. Horizontal axes measure quarters after the shock. Solid lines are posterior means and dashed lines are 90-percent confidence bands computed using the Sims-Zha (1999) method (principal component) from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws. Inflation and the nominal interest rate are in percent per year.

4.3 Trade Restrictiveness Index

Thus far, we have proxied the U.S. import tariff rate, τ_t, by a trade-weighted import tariff measure, as defined in equation (6). The trade literature has developed alternative measures of a uniform tariff in a given period to better capture the distortions created by cross-sectional variation in individual tariff rates and substitutability across goods. Anderson and Neary (1994) developed the trade restrictiveness index (TRI), which is the uniform tariff in a given period that delivers the same level of welfare as the actual tariff schedule. This measure, however, is model specific and difficult to compute. Feenstra (1995) developed a simplified version of the TRI, which can be computed with model-free information. Specifically, the simplified TRI requires knowledge of good-specific import tariff rates, import shares, and import demand elasticities. Formally, the simplified TRI in period t, denoted tri_t, is given by

$$\text{tri}_t = \left(\frac{\sum_i s_{it} \epsilon_i \tau_{it}^2}{\sum_i s_{it} \epsilon_i} \right)^{\frac{1}{2}}, \tag{7}$$

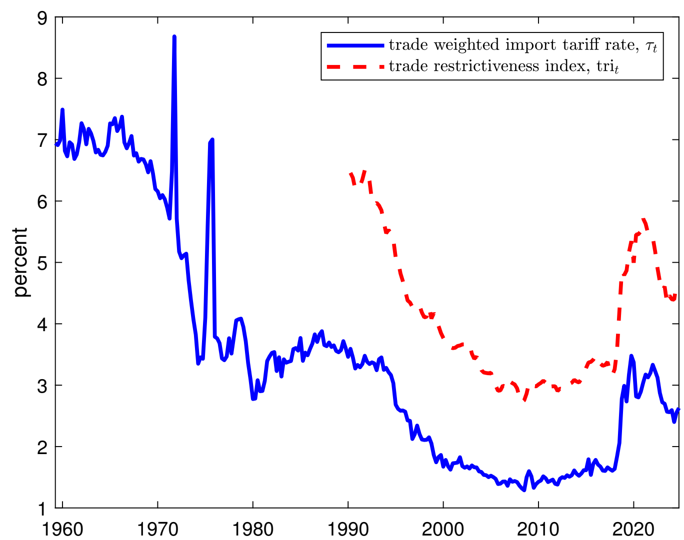
where $\tau_{it} \equiv d_{it}/m_{it}$ denotes the import tariff rate on good i in period t, $s_{it} \equiv m_{it}/m_t$ denotes the share of imports of good i in total imports in period t, and ϵ_i denotes the price elasticity of import demand of good i. The variables d_{it}, m_{it}, and $m_t \equiv \sum_i m_{it}$ denote import duties on good i in period t, the value of imports of good i in period t, and the value of imports in period t, respectively, as in section 2.3.

There is no available data for the simplified trade restrictiveness index for the United States at the quarterly frequency. Kee, Nicita, and Olarreaga (2008) construct the TRI for 88 countries using granular data (HTS 6-digit level), but without a time dimension. Irwin (2010) constructs an annual time series of the TRI for the United States using a relatively coarse disaggregation (17 product categories) for the period 1867 to 1961.

We therefore construct the TRI for the period 1990:Q1 to 2024:Q4 using quarterly U.S. data on imports, import duties, and import demand elasticities at the HTS 6-digit product level. The starting date is dictated by data availability. Data on imports and import duties come from the United States International Trade Commission (2025) and import demand elasticities were taken from Kee, Nicita, and Olarreaga (2008). Product code concordance across time and availability of import elasticity measures at the product level restrict the cross-sectional dimension of the sample to 2,761 imported products for which data is available throughout the sample, ensuring a balanced panel.

Figure 8 displays our estimate of the trade restrictiveness index, tri_t, along with the trade-weighted import tariff rate, τ_t, used in the baseline estimation. The trade restrictiveness index is consistently higher than the trade-weighted import tariff rate. The average gap is nearly 2 percentage points. However, what matters for our analysis is that the two series

Figure 8: U.S. Trade-Weighted Import Tariff Rate and Trade Restrictiveness Index



Notes. The variable τ_t is the trade-weighted U.S. import tariff rate used in the baseline estimation and defined in equation (6). The variable tri_t is the U.S. trade restrictiveness index defined in equation (7) and calculated using quarterly data on imports, import duties, and import demand elasticities at the HTS 6-digit product level. Both time series are seasonally adjusted.

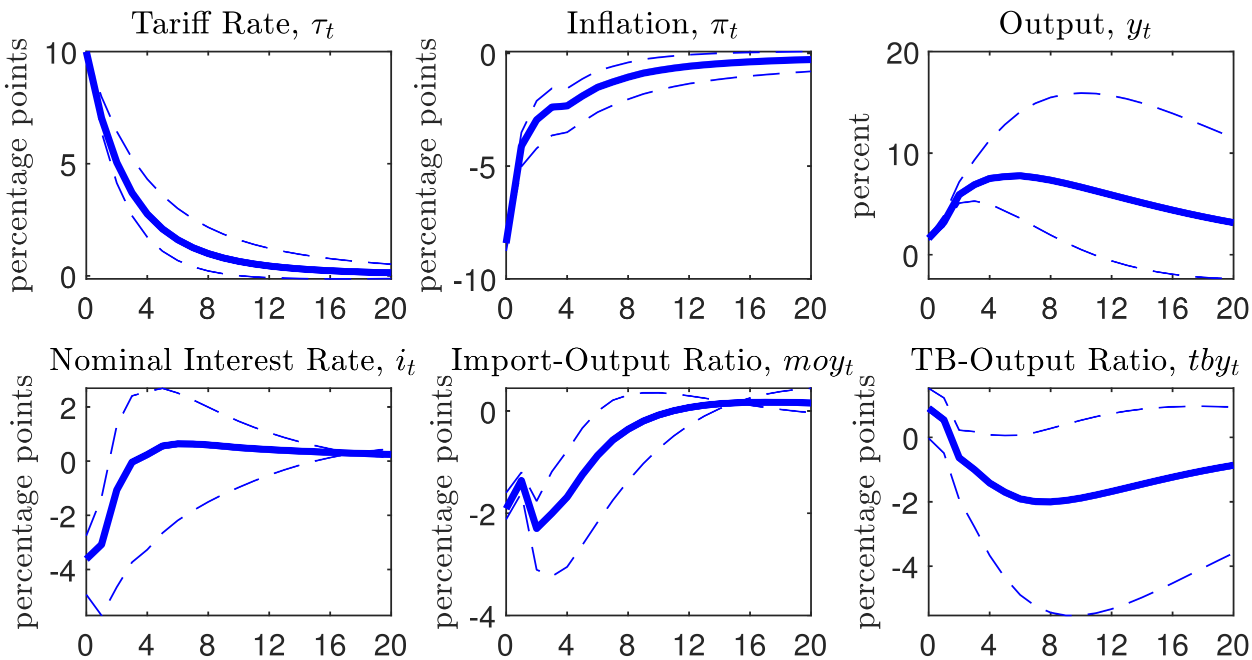
move in tandem over time, with a correlation of 0.97. The finding that the TRI is similar to the trade-weighted tariff rate, apart from a level difference, confirms similar results reported in the cross-country study by Kee, Nicita, and Olarreaga (2008) and the historical U.S. annual study by Irwin (2010).

Next, we add the TRI as an observable and reestimate the model. To this end, we assume that changes in τ_t and tri_t are linked by the relation

$$\Delta \text{tri}_t^o = \Delta \tau_t + \mu_t^{tri},$$

where μ_t^{tri} is assumed to be an exogenous i.i.d. normally distributed random variable, capturing mean-invariant cross-sectional movements in tariffs, sectoral shocks, and possibly measurement error. The rest of the model is as described in section 2.1. This formulation maintains that $\Delta \tau_t^o$ and Δtri_t^o are two alternative noisy measures of the unobserved change in the import tariff rate, $\Delta \tau_t$. We impose a gamma prior distribution for the variance of μ_t^{tri} with mean equal to 25 percent of the sample variance of Δtri_t and standard deviaiton equal to 15 percent percent of the observed variance of Δtri_t. The time series of tri_t starts in 1990:Q1, whereas the other observable time series included in the model start in 1959:Q1. Accordingly, we treat realizations of tri_t prior to 1990:Q1 as missing observations (Harvey,

Figure 9: Impulse Responses to a Ten-Percentage-Point Increase in the Transitory Import Tariff Shock, z_t^{τ}, with the TRI as Observable



Notes. Horizontal axes measure quarters after the shock. Solid lines are posterior means and dashed lines are 90-percent confidence bands computed using the Sims-Zha (1999) method (principal component) from a random subsample of 100,000 posterior draws from an MCMC chain of 1,000,000 draws. Inflation and the nominal interest rate are in percent per year.

1989).

Figure 9 displays impulse responses to a 10-percentage-point transitory increase in the import tariff rate. The dynamic response of the model is qualitatively similar to that of the model estimate without using information on the TRI. In particular, the transitory increase in tariffs is neither inflationary nor contractionary. Also, the transitory tariff increase induces a fall in the policy rate and the import-output ratio, and an improvement in the trade balance. A variance decomposition shows that under this specification the transitory component of the import tariff continues to explain the majority of movements in tariffs, with a share of 65 percent.

5 Conclusion

The use of tariffs in the United States has a long history. Surprisingly, there are few empirical studies devoted to uncovering their macroeconomic consequences. This paper contributes to this relatively thin literature. The innovation of our approach 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 either variable.

We estimate that transitory tariff shocks explain the vast majority of movements in tariffs. It follows that the empirically relevant way of understanding the macroeconomic effects of tariff changes is through the lens of this type of disturbance.

Another key finding that emerges from the present analysis is that tariff shocks do not represent a quantitatively important source of business-cycle fluctuations. This result holds unconditionally, that is, over regular tariff movements, and also conditionally on episodes of large tariff shocks. However, this result should not be interpreted to mean that tariff shocks are macroeconomically costless. While their short-run aggregate effects are limited, they may still have meaningful consequences for long-run growth, income distribution, or the allocation of resources across sectors.

In recent years, there has been significant progress in understanding the positive and normative effects of import tariff shocks and their implications for monetary policy. However, in light of the empirical results presented here, there remains scope for further research into why and how transitory and permanent tariff shocks generate different effects on inflation, output, and interest rates, and why their role in driving business cycles remains limited even during episodes of substantial tariff increases.

Appendix

A Data Sources

This appendix documents the sources and construction of the time series used in estimation.

All data are quarterly, spanning the period 1959:Q2 to 2024:Q4, except those used to construct the TRI, which span the period 1990:Q1 to 2024:Q4.

1. **Import Tariff Rate (τ_t):** Computed as the ratio of U.S. federal customs duties to U.S. imports of goods (excluding duties), following Irwin (2003). Specifically:

   (a) *Numerator:* U.S. federal import customs duties, from BEA NIPA Table 3.5U, line 15.

   (b) *Denominator:* Imports of goods, from BEA NIPA Table 1.1.5, line 20.

   The import tariff rate is calculated as:

   $$\tau_t = 100 \times \frac{\text{Customs Duties}}{\text{Imports of Goods}}$$

2. **Real GDP per Capita (y_t):** Logarithm of U.S. real GDP per capita. Real GDP is sourced from BEA NIPA Table 1.1.6, line 1. Population is from BEA NIPA Table 2.1, line 40.

3. **Trade Balance to Output Ratio (tby_t) and the Import to Output Ratio (moy_t):** Ratio of net exports of goods and services to GDP and Ratio of imports of goods and services to GDP. Exports and imports are sourced from BEA NIPA Table 1.1.5:

   (a) Exports of Goods and Services: line 16.

   (b) Imports of Goods and Services: line 19.

   (c) Nominal GDP: line 1.

   The trade balance to output ratio is computed as exports minus imports of goods and services divided by nominal GDP and multiplied by 100. The import to output ratio is computed as imports of goods and services divided by nominal GDP and multiplied by 100.

4. **Federal Funds Rate (i_t):** Quarterly average of the effective federal funds rate. Source: Board of Governors of the Federal Reserve System, H.15 release, via FRED

series `FEDFUNDS`. Monthly data were converted to quarterly averages and expressed in percent per year.

5. **Core CPI Inflation (π_t):** percent change in the Consumer Price Index (CPI) less food and energy. Source: U.S. Bureau of Labor Statistics, via FRED series `CPILFESL`. Monthly data were converted to quarterly geometric averages, from which quarter-over-quarter growth rates were computed and expressed in percent per year.

6. **Trade restrictiveness index $\mathbf{tri}_t$:**

   (a) Product-level imports, m_{it}, and import duties, d_{it}: United States International Trade Commission (2025).

   (b) Product-level import demand elasticities, ϵ_i: Kee, Nicita, and Olarreaga (2008), downloaded from World Bank Group (2025).

   (c) Product code concordances: United Nations (2025).

B Marginal Data Densities

Table B1 reports log marginal data densities (MDDs) for models with two and four lags ($L = 2$ and $L = 4$), computed using the modified harmonic mean estimator with a truncated chi-squared auxiliary density. It shows that the estimated MDDs are robust across a wide range of truncation parameters $p \in [0.1, 0.9]$, indicating numerical stability of the estimator. In all cases, the $L = 2$ model yields higher log MDDs than the $L = 4$ specification, suggesting that the data favor the more parsimonious model.

Table B1: Log Marginal Data Densities for the Baseline Model with Two and Four Lags

p	$L = 2$	$L = 4$
0.10	-1303.26	-1348.85
0.20	-1302.75	-1348.71
0.30	-1302.51	-1348.43
0.40	-1302.28	-1348.19
0.50	-1302.08	-1348.26
0.60	-1302.02	-1348.32
0.70	-1302.04	-1348.19
0.80	-1301.92	-1348.18
0.90	-1301.83	-1348.10

Notes. The variable p denotes the truncation parameter of the chi-squared auxiliary density, and L denotes the number of lags. The model specification is the one discussed in section 2.1.

References

Amiti, Mary, Stephen J. Redding, and David E. Weinstein, "The Impact of the 2018 Tariffs on Prices and Welfare," *Journal of Economic Perspectives 33,* Fall 2019, 187–210.

Anderson, James E., Peter Neary, "Measuring the restrictiveness of trade policy," *The World Bank Economic Review 8,* 1994, 151-169.

Auclert, Adrien, Matthew Rognlie, and Ludwig Straub, "The Macroeconomics of Tariff Shocks," NBER Working Paper 33726, April 2025.

Auray, Stéphane, Michael B. Devereux, and Aurélien Eyquem, "Self-Enforcing Trade Policy and Exchange Rate Adjustment," *Journal of International Economics 134,* January 2022, 103552.

Auray, Stéphane, Michael B. Devereux, and Aurélien Eyquem, "Trade Wars, Nominal Rigidities, and Monetary Policy," *Review of Economic Studies,* 2024, `https://doi.org/10.1093/restud/rdae075`.

Barattieri, Alessandro, Matteo Cacciatore, and Fabio Ghironi, "Protectionism and the Business Cycle," *Journal of International Economics 129,* 2021, 103417.

Bianchi, Javier, and Louphou Coulibaly, "The Optimal Monetary Policy Response to Tariffs," NBER Working Paper 33560, April 2025.

Boer, Lukas, and Malte Rieth, "The Macroeconomic Consequences of Import Tariffs and Trade Policy Uncertainty," IMF working paper 24-13, January 2024.

Calvo, Guillermo A., "On the Costs of Temporary Policy," *Journal of Development Economics 27,* 1987, 245-261.

Cavallo, Alberto, Gita Gopinath, Brent Neiman, and Jenny Tang, "Tariff Pass-Through at the Border and at the Store: Evidence from US Trade Policy," *American Economic Review: Insights 3,* March 2021, 19-34.

Costinot, Arnaud, and Iván Werning, "How Tariffs Affect Trade Deficits," NBER Working Paper 33709, June 2025.

Cuba-Borda, Pablo, Albert Queralto, Ricardo Reyes-Heroles, and Mikaël Scaramucci, "Trade Costs and Inflation Dynamics," manuscript, Federal Reserve Board, February 2025.

Erceg, Christopher, Andrea Prestipino, and Andrea Raffo, "Trade Policies and Fiscal Devaluations," *American Economic Journal: Macroeconomics 15,* 2023, 104–140.

Fajgelbaum, Pablo D., Pinelopi Goldberg, Patrick Kennedy, and Amit Khandelwal, "The Return to Protectionism," *Quarterly Journal of Economics 135,* February 2020, 1–55.

Fajgelbaum, Pablo D., and Amit Khandelwal, "The Economic Impacts of the US-China Trade War," *Annual Review of Economics 14,* 2022, 205–228.

Federal Reserve Bank of St. Louis, FRED, data retrieved from `https://fred.stlouisfed.org`, (accessed, May 29, 2025).

Feenstra, Robert C., "Estimating the Effects of Trade Policy," in Gene M. Grossman and Kenneth Rogoff, *Handbook of International Economics,* Volume 3, 1995, Amsterdam: Elsevier, 1553–95.

Flaaen, Aaron, Ali Hortacsu, and Felix Tintelnot, "The Production Relocation and Price Effects of U.S. Trade Policy: The Case of Washing Machines," *American Economic Review 110,* July 2020, 2103–2127.

Goldberg, Pinelopi, and Giovanni Maggi, "Protection for Sale: An Empirical Investigation," *American Economic Review 89,* December 1999, 1135–1155.

Grossman, Gene M., and Elhanan Helpman, "Protection For Sale," *American Economic Review 84,* September 1994, 833–850.

Gawande, Kishore, and Usree Bandyopadhyay, "Is Protection for Sale? Evidence on the Grossman-Helpman Theory of Endogenous Protection," *Review of Economics and Statistics 82,* February 2000, 139–152.

Harvey, Andrew C., *Forecasting, Structural Time Series Models, and the Kalman Filter,* Cambridge, UK: Cambridge University Press, 1989.

Irwin, Douglas A., "New Estimates of the Average Tariff of the United States, 1790-1820," NBER Working Paper 9616, April 2003.

Irwin, Douglas A., "Trade Restrictiveness and Deadweight Losses from US Tariffs," *American Economic Journal: Economic Policy 2,* August 2010, 111–133.

Irwin, Douglas A., "Trade Policy in American Economic History," *Annual Review of Economics 12,* August 2020, 23–44.

Jeanne, Olivier, and Jeongwon Son, "To What Extent Are Tariffs Offset by Exchange

Rates?," *Journal of International Money and Finance 142,* 2024, 103015.

Kee, Hiau Looi, Alessandro Nicita, and Marcelo Olarreaga, "Import Demand Elasticities and Trade Distortions," *Review of Economics and Statistics 90,* 2008, 666–82.

Monacelli, Tommaso, "Tariffs and Monetary Policy," mimeo, Bocconi University, April 29, 2025.

Razin, Assaf, and Lars E. O. Svensson, "Trade Taxes and the Current Account," *Economics Letters 13,* 1983, 55-57.

Sims, Christopher, and Tao Zha, "Error Bands for Impulse Responses," *Econometrica 67,* September 1999, 1113–1155.

United Nations, Statistics Division, Classifications on economic statistics, `https://unstats.un.org/unsd/classifications/Econ`, (accessed on July 15, 2025).

United States International Trade Commission, DataWeb, `https://dataweb.usitc.gov`, (accessed on July 15, 2025).

Uribe, Martín, "The Neo-Fisher Effect: Econometric Evidence from Empirical and Optimizing Models," *American Economic Journal: Macroeconomics 14,* July 2022, 133–62.

U.S. Bureau of Economic Analysis, Interactive Data Tables, data retrieved from `https://www.bea.gov`, (accessed May 9, 2025).

World Bank Group, Data Catalog, overall trade restrictiveness indices and import demand elasticities, data retrieved from `https://datacatalog.worldbank.org/search/dataset/0039585/Overall-Trade-Restrictiveness-Indices-and-Import-Demand-Elasticities`, (accessed on July 7, 2025).