Import Tariffs and the Systematic Response of Monetary Policy*

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Abstract

We estimate the macroeconomic effects of U.S. import tariff shocks using vector autoregressions and short-run restrictions. Tariff shocks reduce output but increase consumer prices. Monetary policy partially accommodates these shocks with a policy easing. To quantify the dependence on systematic monetary policy, we use empirically identified monetary policy shocks to construct counterfactuals that are robust against model misspecification and the Lucas critique. When monetary policy strictly stabilizes inflation, the output contraction at the trough is 36% larger than in the baseline. In contrast, strict output stabilization implies a peak inflation effect that roughly doubles, compared to the baseline.

Keywords: tariffs, trade, imports, monetary policy, counterfactuals
JEL Codes: C32, E31, E32, E52, F14

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1 Introduction

What are the macroeconomic effects of tariff shocks? How are these effects shaped by the systematic response of central banks? Partly motivated by the 2025 rise in tariffs, a myriad of papers has emerged to answer these questions, primarily using structural models. These papers study tariffs focusing on business cycle effects (e.g., Antonova, Huxel, Matvieiev, and Müller, 2025; Auclert, Rognlie, and Straub, 2025; Kalemli-Özcan, Soylu, and Yildirim, 2025; Costinot and Werning, 2025), tariff design (Becko, Grossman, and Helpman, 2025; Dávila, Rodríguez-Clare, Schaab, and Tan, 2025; Itskhoki and Mukhin, 2025; Kocherlakota, 2025), and the optimal monetary policy response (e.g., Bergin and Corsetti, 2023, 2025; Bianchi and Coulibaly, 2025; Monacelli, 2025; Werning, Lorenzoni, and Guerrieri, 2025).[1] While the above papers focus on theoretical analyses, there is little empirical evidence on the business cycle effects of tariffs, and no evidence on how the effects of tariffs are shaped by systematic monetary policy. We fill this gap.

In the first part of our analysis, we estimate the effects of import tariff shocks using a vector autoregression (VAR) and quarterly U.S. data from 1990 to 2024. Import tariffs are measured as the trade-weighted average tariff rate. The responses are identified via the timing restriction that import tariff shocks affect macroeconomic outcomes with a one-period lag, except for the federal funds rate.[2] We impose this assumption to allow other macroeconomic shocks to affect our import tariff measures through compositional changes, e.g., in import prices, imported products, and trading partners.[3]

Following this approach, we present robust evidence that persistent tariff shocks are contractionary and inflationary. This implies that tariffs act as supply shocks that pose a meaningful monetary policy tradeoff. Quantitatively, a tariff shock that increases the trade-weighted U.S. import tariff rate by 1 percentage point on impact leads to a significantly elevated

[1] Alessandria, Ding, Khan, and Mix (2025) focus on tariff revenues.

[2] We provide a comprehensive assessment of the robustness of these results in Section 5.

[3] For example, since the U.S. tariff code is regressive (Acosta and Cox, 2019), changes in income inequality and associated changes in import composition may affect trade-weighted tariff rates.

tariff rate for about 3 years. It raises CPI inflation with a peak effect of 0.78 percentage points after 11 quarters. The trough in real GDP is -1.23% and is reached after 6 quarters. This confirms the theoretical predictions that U.S. import tariffs are contractionary (Auclert et al., 2025) and act as supply shocks (Werning et al., 2025). Furthermore, we estimate an increase in macroeconomic uncertainty and a decrease in real investment, imports, and exports. The terms of trade improve, albeit with a delay.

Monetary policy partially accommodates the tariff shock with lower interest rates, potentially contributing to inflationary pressure while cushioning the decline in output. Interestingly, such partial accommodation can be the optimal response to import tariff shocks (e.g., Bergin and Corsetti, 2025; Bianchi and Coulibaly, 2025; Monacelli, 2025; Werning et al., 2025). The finding of partial accommodation raises several questions. How much of the inflation is genuinely caused by the tariff hike, and how much is due to the monetary easing? Similarly, how much output must be sacrificed to fully stabilize prices? And, conversely, how much inflation must be tolerated if the central bank fully stabilizes real activity?

To study these questions, we follow McKay and Wolf (2023) and use identified monetary policy shocks to construct policy counterfactuals. These counterfactuals are based on the monetary policy shock of Miranda-Agrippino and Ricco (2021) and the Taylor rule residual of Romer and Romer (2004).

First, we consider a counterfactual in which the federal funds rate is unresponsive to the tariff shock. This scenario is useful for comparison with the findings from Auclert et al. (2025), who also consider such a case. It also resembles the commonly expressed idea of "looking through" supply shocks. Interest rates are higher than in the baseline, leading to moderately lower real GDP and CPI inflation. Hence, we confirm that the inflationary impact of tariffs is partly driven by the monetary easing.

The above counterfactual keeps monetary policy neutral in terms of the nominal rate. But how potent is monetary policy in fighting the inflationary pressure from the tariff shock? To answer this question, we consider a counterfactual in which monetary policy aims to

perfectly stabilize prices. Instead of an initial easing, monetary policy sharply increases interest rates by 0.83 percentage points in the short run. Thus, the tariff shock does not lead to meaningful inflation, with a peak impact of only 0.22 percentage points.[4] The baseline inflation response in the same quarter is almost four times larger. However, this sacrifices a considerable amount of real GDP, which is 36% (0.44 percentage points) lower at the trough, when compared with the baseline.

Finally, we consider a counterfactual in which monetary policy aims to strictly stabilize output. In this case, monetary policy cuts the federal funds rate more aggressively and more swiftly than in the baseline. The trough interest rate response is -2.0 percentage points. This policy reduces the adverse output effects but does not achieve full output stabilization. Yet, the easing generates a pronounced amplification of inflation, with the peak effect being roughly twice as large as in the baseline.

Lastly, we provide several additional exercises. First, we discuss how key differences in the literature can partly be explained by the sample period under investigation. Second, we provide further results, including estimates of the fiscal footprint of tariffs. Finally, we present a comprehensive sensitivity analysis, including alternative identification and tariff measurement approaches, that confirms that our main results are remarkably robust.

Related literature. Beyond the theoretical papers mentioned above, our work is connected to three strands of literature. First, we relate to the surprisingly scant literature that identifies the macroeconomic effects of tariffs from aggregate data. Schmitt-Grohé and Uribe (2025) and den Besten, Barnichon, Känzig, and Singh (2026) find tariffs to be deflationary, which is partly driven by the sample period under consideration, as we discuss in Section 5.1. Different from the aforementioned papers, several earlier contributions find effects consistent with tariffs being supply shocks using sign restrictions with quarterly U.S. data (Boer and Rieth, 2024) and zero restrictions with annual cross-country data (e.g., Barattieri, Caccia-

[4]The counterfactual achieves inflation stabilization only approximately, since an exact counterfactual would require infinitely many distinct monetary policy (news) shocks.

tore, and Ghironi, 2021).[5] Relative to these papers, we contribute robust evidence from a more recent sample that better captures how tariff shocks propagate given the current economic structure. Moreover, we provide novel policy counterfactuals that allow us to better understand the monetary policy tradeoff posed by tariff shocks.

Second, a recent literature studies the tariff announcements by the Trump Administration on the so-called Liberation Day using structural models (e.g., Ignatenko, Lashkaripour, Macedoni, and Simonovska, 2025; Rodríguez-Clare, Ulate, and Vasquez, 2025) or high-frequency data (e.g., Acharya and Laarits, 2025; Jiang, Krishnamurthy, Lustig, Richmond, and Xu, 2025; Pinter, Uslu, and Smets, 2025; Yan and Morck, 2025). Such event studies provide complementary insights into the economic consequences of the trade war launched by the Trump Administration in 2025. Further related are Coibion, Gorodnichenko, and Weber (2025), who surveyed U.S. households about the potential Trump tariffs before the 2025 inauguration, and Cavallo, Llamas, and Vazquez (2025), who track the price impact of tariffs in real time.

Third, we relate to a literature on systematic policy changes. Using policy shocks, Barnichon and Mesters (2023) focus on the optimality of policy, whereas McKay and Wolf (2023) and Caravello, McKay, and Wolf (2024) concentrate on the construction of policy counterfactuals. In practice, such methods are applied to construct counterfactuals for monetary policy (Wolf, 2023; Franconi, 2024) and fiscal policy (Bouscasse and Hong, 2023; Breitenlechner, Geiger, and Klein, 2024). Different from these approaches, Hack, Istrefi, and Meier (2023) leverage the exogenous rotation of voting rights among policymakers.

[5]Further related work studies the financial market response to tariffs (Ostry, Lloyd, and Corsetti, 2025), trade policy uncertainty (e.g., Caldara, Iacoviello, Molligo, Prestipino, and Raffo, 2020; Poilly and Tripier, 2025), policy uncertainty (e.g., Baker, Bloom, and Davis, 2016), and geopolitical risk (e.g., Caldara and Iacoviello, 2022).

2 Data

This section introduces the data used in the baseline analysis and the additional data used for extensions and to investigate the sensitivity of the results. More details on the data are provided in Online Appendix A.

2.1 Main data for the baseline analysis

Average tariff rate. Our baseline tariff measure is the trade-weighted average U.S. import tariff rate, given by customs duties divided by dutiable imports.[6] The baseline sample period spans 1990Q1–2024Q4.[7] In Figure 1, we present the time series of this tariff rate as a solid line, along with the standardized tariff shock indicated by the bars, which we identify using the methodology explained in Section 3.

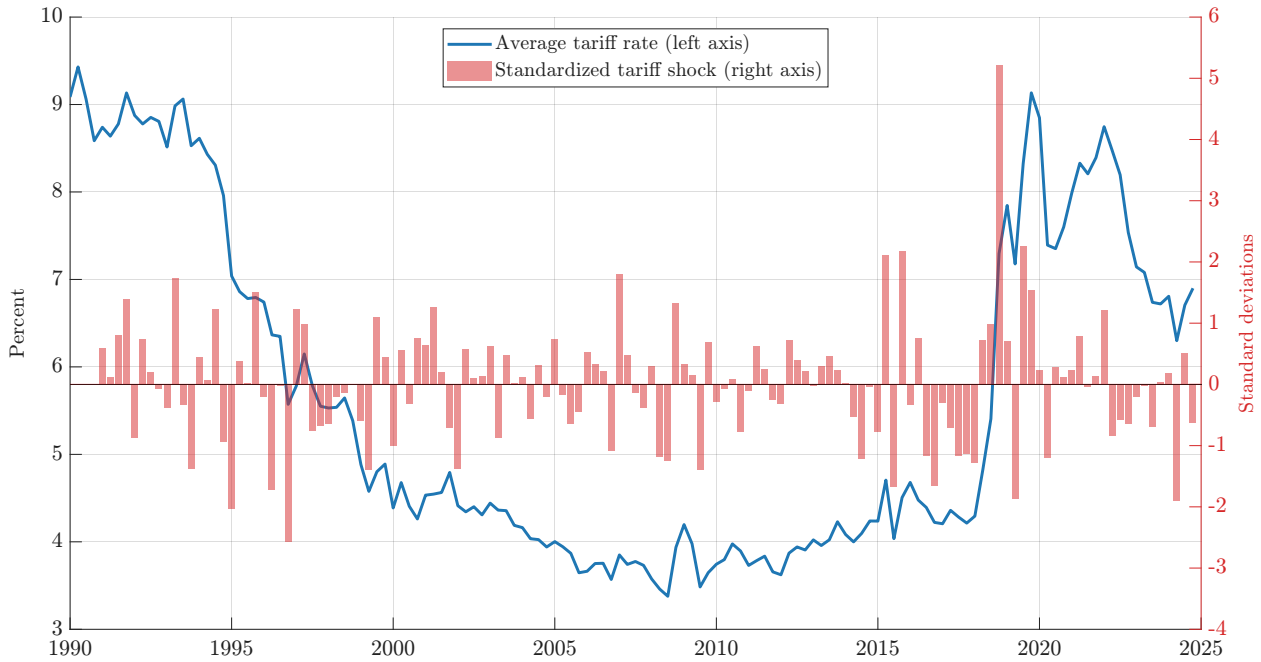
The average tariff rate fell during the 1990s and early 2000s, reflecting a general trend away from protectionism that also led to the NAFTA agreement in 1994 and the establishment of the WTO in 1995. This trend was sharply reversed with tariff increases due to the US–China trade war in 2018. These patterns suggest that there is meaningful variation in U.S. import tariffs in our sample. Our identified tariff shock picks up these important episodes: For example, we observe a large negative shock in 1995Q1 corresponding to the establishment of the WTO (the GATT Uruguay Round), and several positive tariff shocks during the 2018 trade war.[8] More generally, our identifying variation is well-distributed across the sample with sizable tariff reductions and increases.

[6] We use customs duties (FRED *B235RC1Q027SBEA*) divided by dutiable imports, given by all goods imports (FRED *A255RC1Q027SBEA*) multiplied by the average share of dutiable goods over all imported goods, computed using the DataWeb of the United States International Trade Commission (USITC).

[7] In Section 5, we discuss the role of the estimation sample in comparison to the related literature.

[8] Estimated responses to our tariff shock may also capture retaliation by third-party countries such as Chinese tariffs in direct response to U.S. tariffs.

Figure 1: Average tariff rate and the identified tariff shock



Notes: This figure shows the time series of the trade-weighted average U.S. import tariff rate as a solid blue line (left axis), and the standardized tariff shocks as red bars (right axis), which we identify based on the methodology explained in Section 3. The shock computed from the baseline Bayesian VAR by taking the mean of the reduced-form parameters.

Macroeconomic data. In addition to the tariff rate, our baseline analysis uses eight quarterly series: real GDP, year-over-year CPI inflation, and the federal funds rate (FFR) as measures of real activity, prices, and monetary policy, respectively. Beyond these core variables, we use real imports, real exports, and a terms-of-trade index to capture international trade dynamics. Lastly, we use real investment and macroeconomic uncertainty from Jurado, Ludvigson, and Ng (2015) to understand the effects of tariffs on the domestic industrial base.[9]

Monetary policy shocks. To analyze how monetary policy shapes the consequences of tariff shocks, we require multiple identified policy shocks. For our baseline analysis, we use the high-frequency-identified monetary policy shock from Miranda-Agrippino and Ricco (2021), which explicitly account for the possibility of Fed information effects, and the Taylor rule-type residuals from Romer and Romer (2004), extended by Wieland and Yang (2020).

2.2 Additional data for further results and sensitivity

Tariff measures. We consider three additional tariff series. First, we construct an unweighted average import tariff rate from disaggregated USITC data.[10] Second, we use the trade restrictiveness index of Feenstra (1995), computed at a quarterly frequency by Schmitt-Grohé and Uribe (2025). Third, we compile a series of 14 narratively identified tariff policy events. This series takes the value of the changes in the trade-weighted tariff rate for quarters with identified tariff events, and is zero otherwise.[11]

Macroeconomic data. To better understand the transmission of tariff shocks, we study real consumption, real imports of consumption goods, and the trade balance. To evaluate

[9] For data at higher frequencies, we take the arithmetic average within each quarter.

[10] First, we compute all disaggregated trade-weighted tariff rates at the four-digit HTS-by-origin-country level. Then, we compute the (unweighted) arithmetic average across these disaggregated tariff rates. To limit the influence of small trading partners, we drop all countries with average dutiable import values below the median.

[11] These events cover, e.g., the 2018 trade war and the establishment of the WTO. The full list of events and further details are in Online Appendix D.

the fiscal implications, we use customs duties, government spending, government receipts, and federal debt, all in real terms. We also use several alternative measures for the core variables. Instead of real GDP, we consider the unemployment rate, the CBO output gap, and industrial production. Instead of the CPI, we use the core CPI, the PPI, and one-year inflation expectations from the Michigan survey. As an alternative interest rate, we analyze the shadow FFR (Wu and Xia, 2016) as well as the one-year Treasury yield. Lastly, we use policy uncertainty indices (Baker et al., 2016), geopolitical risk (Caldara and Iacoviello, 2022), and trade policy uncertainty (Caldara et al., 2020), as well as the FRED-QD dataset (McCracken and Ng, 2021) and net-export SPF forecasts for diagnostic tests.

Monetary policy shocks. Finally, we use the heteroskedasticity-based shock from Jarociński (2024) and the refined Romer and Romer (2004) shock from Hack, Istrefi, and Meier (2024) to assess the sensitivity of our counterfactuals to the choice of monetary policy shocks.

3 Methodology

This section lays out the VAR model along with the identification of the tariff shock and the construction of monetary policy counterfactuals following McKay and Wolf (2023), MW henceforth.

3.1 Econometric methodology

VAR model. Our analysis is based on a covariance-stationary VAR model of the form

$$y_t = A(t) + B_1 y_{t-1} + \cdots + B_p y_{t-p} + u_t, \tag{1}$$

where $y_t \in \mathbb{R}^{n\times 1}$ is a vector of endogenous variables, $A(t) \in \mathbb{R}^{n\times 1}$ is a vector of deterministic components that may only depend on calendar time t, and $u_t \in \mathbb{R}^{n\times 1}$ is a vector of reduced-form innovations with zero mean and covariance matrix Σ, and $B_1, \ldots, B_p$ are coefficient

matrices with conforming dimensions. We estimate the VAR using conventional Bayesian techniques with inverse-Wishart priors on the reduced-form parameters.[12]

Causal effects. The reduced-form innovations are related to structural shocks $\varepsilon_t \sim (0, \mathbb{I})$ through $u_t = S\varepsilon_t$, where $S \in \mathbb{R}^{n\times n}$ is the impact matrix and the covariance matrix $\mathbb{I} \in \mathbb{R}^{n\times n}$ is the identity matrix, which is a standard normalization (e.g., Kilian and Lütkepohl, 2017). We assume the VAR to be invertible so that it admits a structural vector moving average representation

$$y_t = \sum_{h=0}^{\infty} \Theta^h \varepsilon_{t-h}, \tag{2}$$

with coefficient matrices $\Theta^h = (\theta_1^h, \dots, \theta_n^h)$ and $\theta_j^h \in \mathbb{R}^{n\times 1}$ denoting the causal effect of ε_t^j on y_{t+h}. We denote by $\theta_{i,j} = (\theta_{i,j}^0, \theta_{i,j}^1, \dots)$ the full response path of variable i to shock ε_t^j.

3.2 Counterfactual methodology

Target counterfactual. The causal effects of macroeconomic shocks, including tariff shocks, are generally a function of (unobserved) parameters $\mathcal{P} \in \mathbb{R}^{k\times 1}$ that describe the conduct of monetary policy, i.e., $\theta_{i,j} \equiv \theta_{i,j}(\mathcal{P})$. These parameters can encode a policy reaction function, but also a targeting rule that the monetary authority optimally follows. We are interested in the causal effects of tariff shocks under counterfactual conduct of monetary policy, denoted by $\widehat{\mathcal{P}} \neq \mathcal{P}$ and the corresponding causal effect $\widehat{\theta}_{i,j} \equiv \theta_{i,j}(\widehat{\mathcal{P}})$.

Counterfactual method. The key insight of MW is that we can obtain the target counterfactual exclusively from causal effects of monetary policy shocks under the baseline policy $\mathcal{P}$ with only two main assumptions.[13] The two assumptions are (i) the data-generating process is linear and that (ii) the behavior of private agents depends only on monetary policy via

[12] All results use 20,000 posterior draws.

[13] To ease the exposition, we explain the methodology in the context of our application to monetary policy counterfactuals.

the policy interest rate. Intuitively, the latter condition requires that private agents care only about the policy choices and not the specific rule through which these choices arise.[14] Importantly, a broad class of linear DSGE models satisfy these assumptions (e.g., Smets and Wouters, 2007).

The key identification result of MW states that Lucas-critique robust counterfactuals can be constructed as a linear combination of causal effects under the baseline monetary policy rule

$$\widehat{\theta}_{i,j} = \theta_{i,j} + \sum_{k=0}^{\infty} \omega_k \theta^{\mathcal{P}}_{i,k}, \tag{3}$$

where $\{\theta^{\mathcal{P}}_{i,k}\}_{k=0}^{\infty}$ denotes an infinite set of distinct (linearly independent) causal effects of monetary policy shocks, and $\{\omega_k\}_{k=0}^{\infty}$ denotes a corresponding set of scalar weights.

The weights can be chosen by the researcher in order to implement the counterfactual of interest. In our application, we seek to choose weights so that our target variable of interest becomes fully unresponsive to the tariff shock, i.e.,

$$\{\omega_k\}_{k=0}^{\infty} = \text{argmin}_{\{\omega_k\}_{k=0}^{\infty}} \left\| \theta_{z,j} + \sum_{k=0}^{\infty} \omega_k \theta^{\mathcal{P}}_{z,k} \right\|, \tag{4}$$

where index z denotes the target variable (e.g., inflation) and $\|\cdot\|$ denotes some norm (e.g., the Euclidean norm).[15] Given these weights, we can compute the counterfactual response of any variable i directly from (3).

This method is powerful because it allows estimating how tariff shocks propagate under counterfactual monetary policy, while remaining agnostic about many features of the data-generating process. If we were to follow a structural approach instead, we would need to impose many assumptions regarding, e.g., preferences and technologies. The key limitation

[14] This assumption is consistent with high attention to Fed communication to the extent that market participants monitor the Fed exclusively to better forecast future policy rates.

[15] The weights can also be chosen in order to implement a specific policy reaction function (Taylor rule), which constitutes a cross-equation restriction across macroeconomic variables. Thus, a researcher can also set the weights such that a counterfactual policy reaction function holds at any response horizon to obtain the counterfactual under that rule.

of the MW approach is of a practical nature. The exact counterfactual requires an infinite set of distinct monetary policy shock series and associated causal effects, whereas there is only a relatively small set of credibly identified shocks available. Therefore, in practice, we can only compute approximate counterfactuals, as we explain below.

3.3 Implementation

To obtain the effects of tariff shocks and monetary policy counterfactuals, we estimate a tariff VAR and a separate monetary policy VAR. The latter delivers the causal effects of monetary policy shocks used to construct counterfactuals.

Tariff VAR. Based on (1), we estimate a quarterly tariff VAR including nine variables: the trade-weighted average tariff rate, real GDP, CPI inflation, the FFR, real imports, real exports, the terms-of-trade index, real investment, and macroeconomic uncertainty. Except for the inflation, tariff and federal funds rates, all variables are expressed in natural logarithms. The deterministic component includes a constant and a linear time trend, and the lag order is $p = 4$. The estimation sample spans 1990Q1–2024Q4.

The tariff shock is identified based on two assumptions. First, we impose the timing restriction that a tariff shock affects all macroeconomic variables only with a one-period lag, except for the FFR and the tariff rate.[16] In turn, we allow other macroeconomic shocks to affect the tariff rate contemporaneously. This is important because variation in the (trade-weighted) average tariff rate can result from tariff shocks, but may also arise from changes in import composition or differential changes in import prices. By allowing other macroeconomic shocks to impact the tariff rate contemporaneously, we may control for these channels.[17] Importantly, we allow the FFR to respond to tariff shocks contemporaneously, remaining

[16] Formally, let ε_t^j denote the tariff shock and S_j the impact effect, and assume the tariff rate and the FFR are ordered last in y_t. Then, we impose $S_j = (0, \ldots, 0, *, *)'$, where $*$ indicates that we remain agnostic on the respective coefficients.

[17] We emphasize that our VAR is partially identified and we only impose restrictions on the tariff shock but not on other macroeconomic shocks that affect, e.g., supply and demand.

agnostic about the monetary policy response to tariffs, which we eventually perturb in the counterfactuals. Second, we assume partial invertibility of the VAR so that we can recover the tariff shock (Forni, Gambetti, and Sala, 2019). In Section 5.3, we present formal statistical tests and sensitivity exercises that support this assumption.

Monetary policy VAR. We follow MW and estimate a separate VAR model, as introduced in (1), to obtain the causal effects of monetary policy shocks. Although many distinct monetary policy shocks and associated causal effects are desirable to implement the counterfactuals, we use two identified monetary policy shock series, as in MW: the high-frequency-identified shock from Miranda-Agrippino and Ricco (2021, MAR) and the Taylor-rule residuals from Romer and Romer (2004, RR). For maximal consistency, we use the same VAR variables, lag specification, and estimation method as we do for the tariff VAR.

To identify the causal effects of both monetary policy shocks, we follow the internal instruments approach of MW, including both shocks in the VAR vector. The MAR shock is ordered first, and the RR shock is ordered before the FFR, but after all other variables. Identification is achieved via a lower-triangular Cholesky decomposition.[18] The estimation sample is 1969Q1–2014Q4 and is determined by the availability of the monetary policy shocks, which we take directly from MW.[19]

Monetary policy counterfactuals. To construct counterfactuals, we follow the steps explained in Section 3.2, with the following modifications. First, we use our finite set of shocks. Second, we use a weighted Euclidean norm with weights decaying at a quadratic rate when solving the minimization problem in (4). This reflects our preferences as researchers to obtain a counterfactual that is more accurate in the short run.[20] The target variable z is

[18] Ordering the RR shock second-to-last is also done in MW and is often used as "exogeneity insurance" to address residual identification concerns (see, e.g., Ramey, 2016).

[19] We set missing values within the estimation sample to zero. The MAR and RR shocks are available 1980Q1–2014Q4 and 1969Q1–2007Q4, respectively. In Section 5.3, we provide additional results by changing the sample period and using alternative shocks.

[20] Effectively, one can solve the minimization problem by weighted least squares in impulse response space. The baseline sequence of weights is proportional to $(H+1)^2, (H)^2, (H-1)^2, \ldots, (1)^2$, where H is the

either CPI inflation or real GDP. In the context of optimal policy, these counterfactuals map into a loss function that puts a zero weight on output or price stabilization, respectively. As a result, these are hypothetical scenarios that correspond to an extreme policy configuration to illustrate the full range of possible outcomes. Additionally, we consider an intermediate case where the target variable is the FFR, keeping monetary policy unresponsive to the shock.

To implement these counterfactuals, we pick both monetary shocks (the weights) so that the target variable is as unresponsive as possible. This minimization procedure provides us with the weights to compute the counterfactual responses using (3). Finally, for inference, we follow MW and take the baseline response to the tariff shock as given and account for the joint estimation uncertainty of both monetary shocks by solving the minimization in (4) for each posterior draw.

4 Results

This section presents our baseline responses of macroeconomic variables to the identified tariff shock and the corresponding monetary policy counterfactuals.

4.1 The macroeconomic effects of tariff shocks

In Figure 2, we present the baseline responses to a shock that raises the import tariff rate by 1 percentage point on impact. The medians of the posterior distribution are reported as solid blue lines, and the shaded areas indicate 68% and 90% credible sets. As shown in Panel (a), the effects on the tariff rate slowly dissipate over the five-year response horizon.

Core outcomes. Panels (b)–(d) show the responses of CPI inflation, real GDP, and the FFR. Inflation starts increasing with a delay and peaks at 0.78 percentage points after 11 quarters. This inflation effect is somewhat persistent, and the 68% credible set includes zero

maximum response horizon that we report. Using weights with a linear decay yields very similar results.

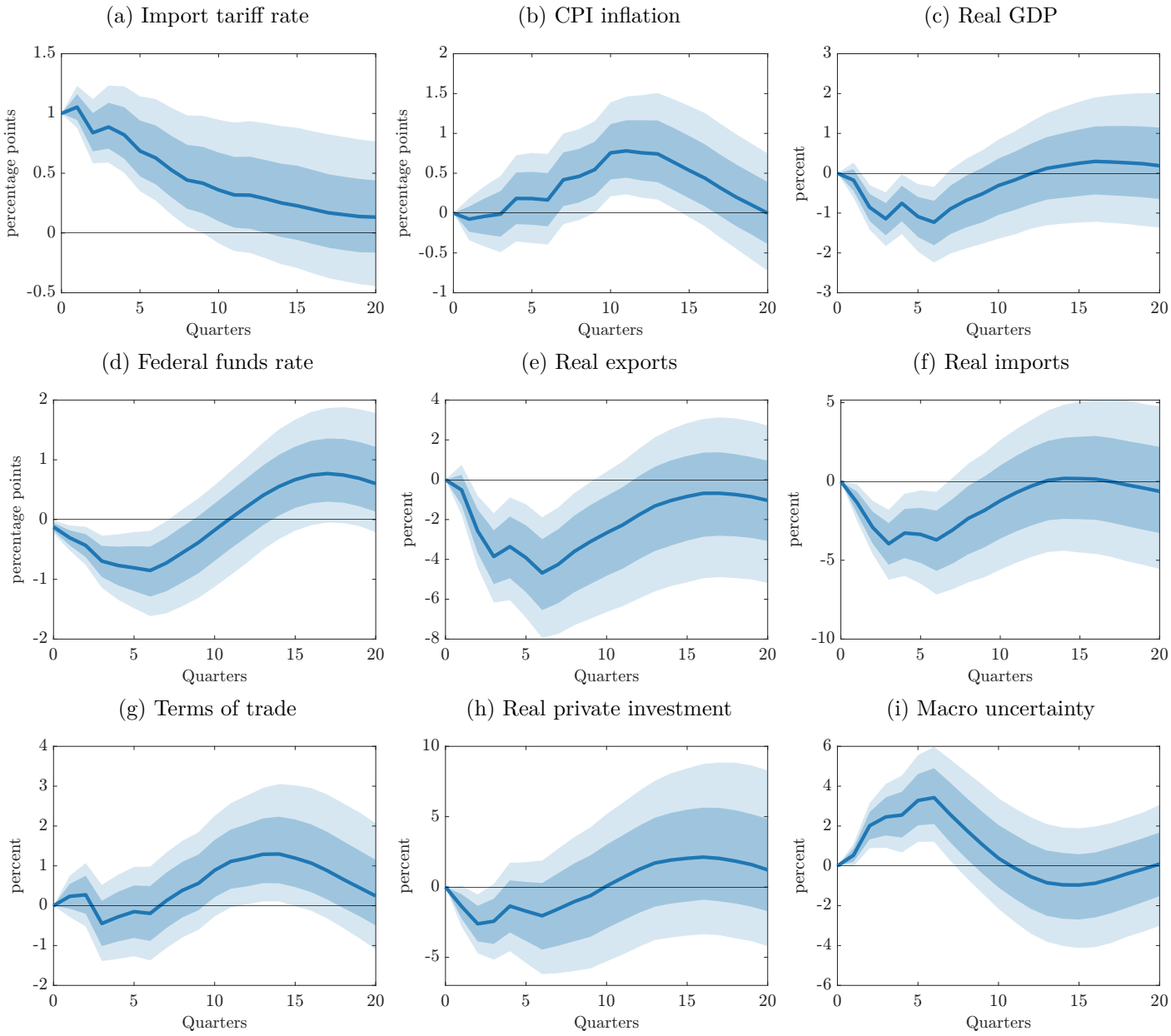
only after 17 quarters. In contrast, real GDP declines more quickly. The trough is reached 6 quarters after the shock, at which output is 1.23% lower. This decline is more transitory and vanishes after the second year, when even the 68% credible set contains zero. Lastly, we find partial monetary accommodation of the tariff shock. The FFR falls for two years. Quantitatively, at the trough, the FFR is 0.85 percentage points lower after 6 quarters and starts to revert thereafter.

Additional outcomes. The responses of the remaining VAR variables are shown in Panels (e)–(i) of Figure 2, providing insight into the broader transmission of tariff shocks. Focusing on trade, we document declining real exports and imports and a more delayed increase in the terms of trade. Macroeconomic uncertainty increases and real investment temporarily declines, consistent with real-option theory.

Discussion. The responses align well with the theoretical literature. First, we confirm that tariff shocks are contractionary, in line with Auclert et al. (2025).[21] Second, tariffs are inflationary and thus act as supply shocks, consistent with Werning et al. (2025). Third, monetary policy partially accommodates contractionary tariff shocks, which cushions the effects on real activity, albeit at the expense of higher prices. Interestingly, such partial accommodation can be the optimal response to a tariff shock (e.g., Bergin and Corsetti, 2025; Bianchi and Coulibaly, 2025; Monacelli, 2025; Werning et al., 2025).

[21] The theory in Antonova et al. (2025) suggests that our tariff shocks mostly capture tariffs imposed on upstream sectors, since they find only upstream sector tariffs to be clearly recessionary.

Figure 2: Responses of macroeconomic variables to an import tariff shock



Notes: This figure shows impulse responses estimated based on a Bayesian VAR, as specified in Section 3. The solid blue line represents the posterior median, and the shaded areas are 68% and 90% credible sets. The responses are identified by imposing the identifying restriction that the shock affects only the import tariff rate and the federal funds rate contemporaneously.

4.2 The monetary policy response to tariff shocks

The result of partial accommodation of tariff shocks by monetary policy raises the question of how these shocks propagate under alternative monetary policy responses. Thus, we present counterfactuals studying scenarios featuring (i) no interest rate response, (ii) full inflation stabilization, and (iii) full output stabilization. We focus our discussion on the counterfactual responses of the core variables, which we present as solid red lines in Figure 3. For comparison, we also show the baseline responses as gray dashed lines.

No interest rate response. A natural benchmark is a scenario where nominal interest rates do not respond, as considered by Auclert et al. (2025). Therefore, we construct a corresponding counterfactual in which the FFR responds as little as possible to the tariff shock. This scenario is shown in the first row of Figure 3. By construction, the FFR is less responsive than in the baseline. Real GDP is broadly unaffected by this alternative monetary response for around 4 quarters. However, the adverse GDP effects are stronger at the trough and more persistent, absent the monetary easing from the baseline. In turn, this results in a peak inflation effect that is 14% (0.11 percentage points) lower, as well as a less persistent inflation response. Thus, we confirm that the inflationary impact of tariffs is partly driven by monetary easing.

Strict inflation stabilization. Since inflation is less persistent absent partial monetary accommodation, we explore how potent monetary policy is in stabilizing prices and what output costs it implies. Thus, we consider a counterfactual in which CPI inflation responds as little as possible and show the results in the second row of Figure 3.[22] This policy requires a short-lived interest rate hike that peaks at 0.83 percentage points only 1 quarter after the shock. Then, the policy rate falls rapidly. Such a sharp and short-lived rate hike is

[22]This counterfactual does not imply zero inflation unconditionally. Instead, it implies that inflation evolves unconditionally as before, except that tariff shocks do not affect inflation. In the hypothetical scenario where no non-tariff shocks affect inflation (or no non-tariff shocks hit the economy), this would imply that inflation is at its long-run value despite tariff shocks hitting the economy.

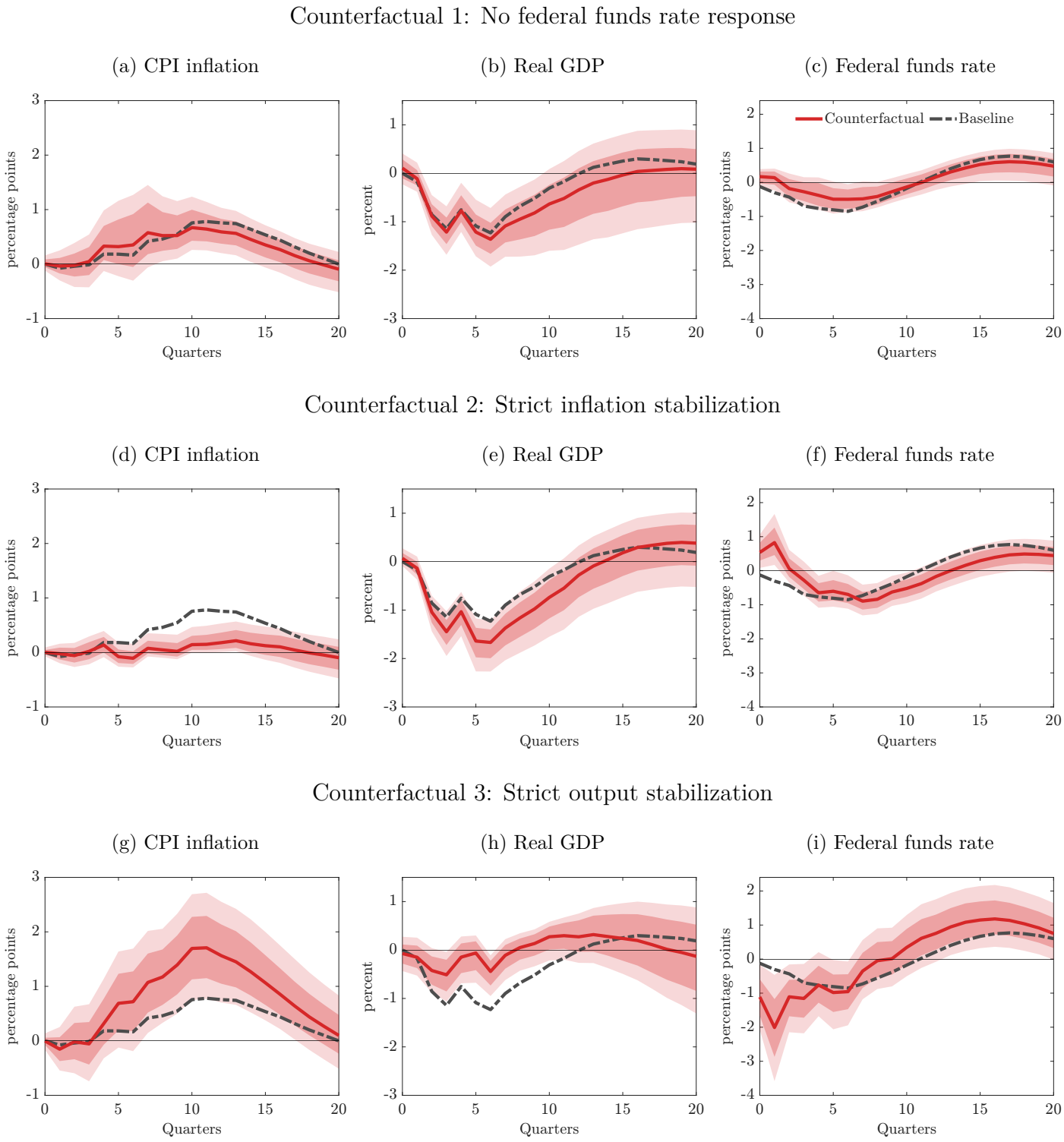
sufficient to tame inflation, with peak inflation reduced from 0.78 to only 0.22 percentage points. However, this policy amplifies the recessionary impact of the shock considerably. The counterfactual GDP trough is 0.44 percentage points lower than the baseline. This represents a 36% increase in the adverse output effects between the baseline and counterfactual troughs. Moreover, it takes 16 quarters for the counterfactual response to catch up with the baseline, suggesting persistent adverse effects.

Strict output stabilization. Lastly, we estimate a counterfactual in which monetary policy aims to fully stabilize real activity. This scenario is displayed in the third row of Figure 3. It is implemented with a peak interest rate cut of about 2 percentage points reached only 1 quarter after the tariff shock. As expected, inflation increases considerably in this counterfactual scenario: the peak inflation effect roughly doubles compared with the baseline (an increase of 0.93 percentage points). This suggests a sizable sacrifice of price stability to minimize the adverse GDP impact.

Additional counterfactual outcomes. We present counterfactual responses of the additional outcome variables in Figure 4. Real investment is an important channel through which interest rates are transmitted. In contrast, macroeconomic uncertainty is less affected, especially in the short run. We also combine the responses of real imports and exports to obtain the effect on the trade balance.[23] Output stabilization reverses the effects on the trade balance, whereas inflation stabilization amplifies the modest trade balance improvement in the baseline. This pattern is consistent with the dominant currency paradigm (Gopinath, Boz, Casas, Díez, Gourinchas, and Plagborg-Møller, 2020), in which muted expenditure-switching effects imply that monetary policy primarily influences the trade balance through domestic demand. Finally, there are no meaningful differences in the terms of trade.

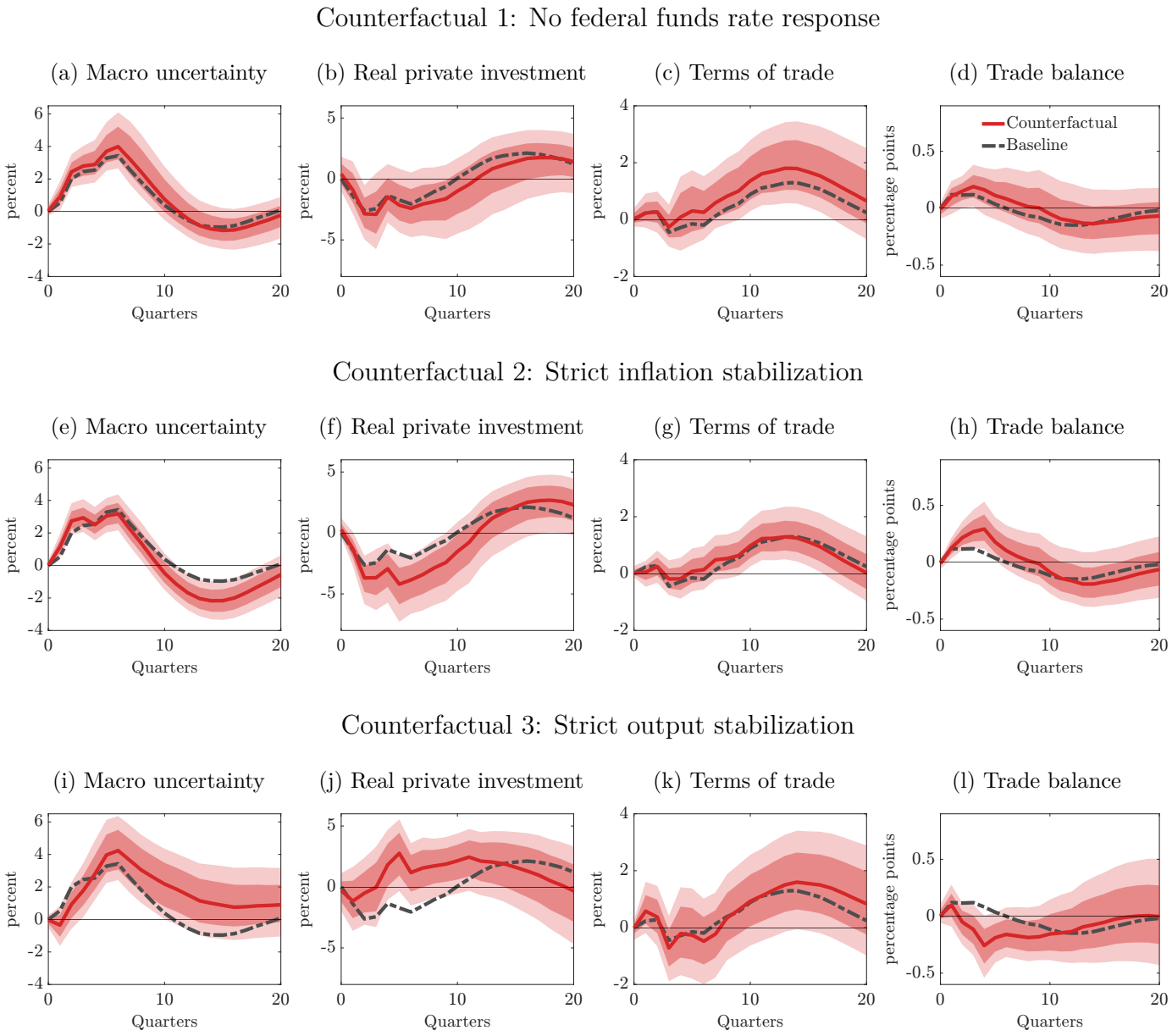
[23] We compute the trade balance response based on our estimated semi-elasticities of real exports and real imports, which we convert into level effects by multiplying by average real exports and average real imports, respectively. We then use the implied level effects to compute real exports minus real imports and divide by average real GDP.

Figure 3: Responses of core variables to tariffs under counterfactual monetary policy



Notes: This figure shows counterfactual impulse responses estimated based on a Bayesian VAR, as specified in Section 3. The counterfactuals are computed using monetary policy shocks following McKay and Wolf (2023). The solid red line represents the posterior median of the counterfactual, and the shaded areas are 68% and 90% credible sets. The dashed gray line corresponds to the baseline median response to a tariff shock, as displayed in Figure 2. For comparison, we keep the vertical axis for each variable across counterfactuals fixed.

Figure 4: Responses of additional variables to tariffs under counterfactual monetary policy



Notes: This figure shows counterfactual impulse responses estimated based on a Bayesian VAR, as specified in Section 3. The counterfactuals are computed using monetary policy shocks following McKay and Wolf (2023). The solid red line represents the posterior median of the counterfactual, and the shaded areas are 68% and 90% credible sets. The dashed gray line corresponds to the baseline median response to a tariff shock, as displayed in Figure 2. For comparison, we keep the vertical axis for each variable across counterfactuals fixed.

5 Additional results and sensitivity analysis

5.1 The role of the sample period

Differences from the related literature. Two closely related papers are Schmitt-Grohé and Uribe (2025, henceforth SGU), who study permanent and transitory tariff shocks, and den Besten et al. (2026, henceforth dBBKS), who present a long-run narrative analysis. Their results agree that non-permanent tariff increases are deflationary post-World War II, but only dBBKS find tariffs to be contractionary. Although our paper and the two aforementioned works differ in a range of aspects, including modeling choices and identification approaches, we find that the sample period plays an important role in explaining the differences from our work.

SGU use quarterly data covering 1959Q2–2024Q4, whereas dBBKS use annual data covering 1946–2024 for their post-World War II analysis. In contrast, we use a 1990Q1–2024Q4 sample, which we view as desirable because it is more representative of the current economic environment and less susceptible to structural breaks. For example, increasing supply chain complexity and the growing importance of intermediate inputs may alter the effects of tariffs on domestic prices (Bergin and Corsetti, 2023; Moro and Landi, 2026).

Reconciliation with the related literature. In Online Appendix B, we present results using longer samples. Tariffs remain contractionary and inflationary if we expand the sample to start in 1980. When extending the sample back to 1967, the earliest year permitted by data availability, tariffs instead appear deflationary and not contractionary. These deflationary effects seem relatively robust in longer samples, consistent with SGU and dBBKS, and with intermediate inputs being less important in the first half of this extended sample (Bergin and Corsetti, 2023). However, the absence of an output contraction in the extended sample is exclusively driven by two extraordinary tariff spikes during the Nixon and Ford Administrations, both of which are classified as endogenous events in the narrative account

of dBBKS. Thus, one cannot use these events to identify the causal effects of tariffs. If we exclude these events, we recover a significant real GDP contraction.

5.2 Additional outcome variables

In Online Appendix C, we present the responses of several additional variables.

Alternative core variables. We consider a range of alternative measures for real activity (unemployment rate, output gap, and industrial production), prices (PPI inflation, core CPI inflation, and one-year inflation expectations), and interest rates (one-year Treasury yield and the shadow FFR). Across all specifications, we find that tariffs are contractionary, inflationary, and accompanied by lower nominal rates.

Fiscal implications. We find that tariff shocks generate customs revenue and induce a corresponding transitory increase in government spending, consistent with the narratives of tariff proponents. However, total government receipts tend to decline due to the contractionary impact. Ultimately, we find that tariffs have a negative effect on the government budget, and federal debt increases.

Trade balance. Tariffs are often justified with protectionist arguments, claiming that they shield domestic producers from foreign competition and thereby improve the trade balance. If anything, we find that the trade balance improves only transitorily, indicating little evidence for the protectionist view.

Consumption. We also study the effects of tariffs on private consumption. Private consumption declines strongly and broadly mirrors the response of real GDP, whereas consumer goods imports experience a more temporary decline.

5.3 Sensitivity analysis

In Online Appendix D, we investigate the sensitivity of our results to various modeling choices, finding that our key insights are remarkably robust.

Anticipation of tariff changes. Tariffs may be announced ahead of implementation. Such tariff news shocks could lead to a failure of invertibility, a key identifying assumption. If this were a substantial concern, we should expect that lagged financial market data and professional forecasts would predict our shock. However, neither net-export forecasts from the SPF nor principal components from a large macro-financial dataset have significant predictive power for the tariff shock.[24] The latter exercise is precisely the procedure from Forni and Gambetti (2014) to formally test for invertibility failures. Lastly, our results are also robust to including several of the principal components, which comprehensively controls for anticipation effects.

Relaxing identifying assumptions. We evaluate the baseline zero restrictions by considering three alternatives. First, we employ a block-recursive identification similar to Christiano, Eichenbaum, and Evans (2005): we relax the zero restrictions on all "fast-moving" variables, namely the terms of trade, macroeconomic uncertainty, and inflation. Second, we relax all zero restrictions using the penalty function approach of Uhlig (2005): we identify the tariff shock as the one that increases the tariff rate the most over the first four response horizons. Third, we include a series of narratively identified tariff events as an exogenous variable in the VAR. Regardless of which approach we take, we obtain estimates similar to the baseline.

Alternative tariff measures. Our baseline tariff measure is trade-weighted, which is desirable because goods-level tariffs are weighted by aggregate importance. However, trade

[24] Net-export forecasts are an indirect proxy for tariff expectations, which we use because we do not observe the latter.

weights can respond to non-tariff shocks, creating additional identification concerns. When using the unweighted tariff rate, we obtain broadly similar but less significant results. This reduction in significance is expected because tariffs are not weighted by their aggregate importance. Finally, we use the trade restrictiveness index from Schmitt-Grohé and Uribe (2025), which yields larger magnitudes, possibly because it also captures distortions due to cross-sectional tariff variation. In both cases, we still find that tariffs raise prices but depress output.

Modeling choices. We focus on a range of additional modeling aspects. First, we relax VAR assumptions by adjusting the lag order or estimating local projections, as recommended by Montiel Olea, Plagborg-Møller, Qian, and Wolf (2025). Second, we account for the Covid-19 pandemic by dummying out the pandemic period (Lenza and Primiceri, 2022). Third, we add higher-order deterministic time trends to account for slow-moving trends in international trade. Fourth, we include a wide range of policy uncertainty measures in the VAR. None of these extensions change our conclusions.

The role of monetary policy shocks. The counterfactuals hinge on the monetary policy shocks used. Thus, we first study their raw impulse responses. Both shocks yield responses that align well with theoretical predictions. Second, to understand the gains from including two shocks, we re-estimate all counterfactuals using only a single shock. Although the results are qualitatively similar, we find that the precision with which we can implement the counterfactuals is considerably higher with two shocks. Third, we vary the sample period and use alternative shocks identified using a heteroskedasticity-based approach (Jarociński, 2024) and an augmented Romer and Romer (2004) regression that accounts for time variation in systematic monetary policy (Hack et al., 2024). Throughout, we obtain results that are similar to the baseline.

6 Conclusion

This paper provides two main empirical insights. First, tariffs act as supply shocks, which monetary policy partially accommodates by lowering interest rates. Second, the macroeconomic effects of tariffs are strongly shaped by systematic monetary policy.

Finally, we note that the effects of tariffs may depend on many aspects, including the degree of persistence, the credibility of tariff announcements, and the composition of tariffed goods. These aspects possibly set tariffs in our sample apart from tariffs imposed by the Trump Administration in 2025. Thus, we caution against applying our results directly to calculate the impact of 2025 tariffs. Instead, future research may combine our estimates with a structural model to account for the above-mentioned aspects of tariffs, e.g., using a multi-sector model. Going beyond positive analysis, such a model could also be used to assess the optimal monetary policy response to tariffs. Beyond monetary policy, future work may also consider fiscal policy counterfactuals that vary how tariff revenues are used, which may complement existing theoretical analysis (Alessandria et al., 2025).

References

Acharya, V. V. and T. Laarits (2025): "Tariff War Shock and the Convenience Yield of US Treasuries-A Hedging Perspective," Working Paper 5229097, Available at SSRN.

Acosta, M. and L. Cox (2019): "The Regressive Nature of the US Tariff Code: Origins and Implications," Working paper, Columbia University.

Alessandria, G. A., J. Ding, S. Y. Khan, and C. B. Mix (2025): "The Tariff Tax Cut: Tariffs as Revenue," Working Paper 33784, NBER.

Alessi, L., M. Barigozzi, and M. Capasso (2010): "Improved Penalization for Determining the Number of Factors in Approximate Factor Models," *Statistics & Probability Letters*, 80, 1806–1813.

Antonova, A., L. Huxel, M. Matvieiev, and G. J. Müller (2025): "The Propagation of Tariff Shocks via Production Networks," CEPR Discussion Paper 20305.

Auclert, A., M. Rognlie, and L. Straub (2025): "The Macroeconomics of Tariff Shocks," Working Paper 33726, NBER.

Baker, S. R., N. Bloom, and S. J. Davis (2016): "Measuring Economic Policy Uncertainty," *Quarterly Journal of Economics*, 131, 1593–1636.

Barattieri, A., M. Cacciatore, and F. Ghironi (2021): "Protectionism and the Business Cycle," *Journal of International Economics*, 129, 103417.

Barnichon, R. and G. Mesters (2023): "A Sufficient Statistics Approach for Macro Policy," *American Economic Review*, 113, 2809–2845.

Becko, J. S., G. M. Grossman, and E. Helpman (2025): "Optimal Tariffs with Geopolitical Alignment," Working Paper 34108, NBER.

Bergin, P. and G. Corsetti (2025): "Monetary Stabilization of Sectoral Tariffs," Working Paper 33845, NBER.

Bergin, P. R. and G. Corsetti (2023): "The Macroeconomic Stabilization of Tariff Shocks: What is the Optimal Monetary Response?" *Journal of International Economics*, 143, 103758.

Bianchi, J. and L. Coulibaly (2025): "The Optimal Monetary Policy Response to Tariffs," Working Paper 33560, NBER.

Boer, L. and M. Rieth (2024): "The Macroeconomic Consequences of Import Tariffs and Trade Policy Uncertainty," Working Paper 2024/013, IMF.

Bouscasse, P. and S. Hong (2023): "Monetary-Fiscal Interactions in the United States," *Mimeo*.

Breitenlechner, M., M. Geiger, and M. Klein (2024): "The Fiscal Channel of Monetary Policy," Tech. rep., Working Papers in Economics and Statistics.

Caldara, D. and M. Iacoviello (2022): "Measuring Geopolitical Risk," *American Economic Review*, 112, 1194–1225.

Caldara, D., M. Iacoviello, P. Molligo, A. Prestipino, and A. Raffo (2020): "The Economic Effects of Trade Policy Uncertainty," *Journal of Monetary Economics*, 109, 38–59.

Caravello, T. E., A. McKay, and C. K. Wolf (2024): "Evaluating Monetary Policy Counterfactuals: (When) Do We Need Structural Models?" Working Paper 32988, NBER.

Cavallo, A., P. Llamas, and F. M. Vazquez (2025): "Tracking the Short-Run Price Impact of U.S. Tariffs," Working Paper 34496, NBER.

Christiano, L. J., M. Eichenbaum, and C. L. Evans (2005): "Nominal Rigidities and the Dynamic Effects of a Shock to Monetary Policy," *Journal of Political Economy*, 113, 1–45.

Coibion, O., Y. Gorodnichenko, and M. Weber (2025): "The Upcoming Trump Tariffs: What Americans Expect and How They Are Responding," *Mimeo*.

Costinot, A. and I. Werning (2025): "How Tariffs Affect Trade Deficits," Working Paper 33709, NBER.

den Besten, T., R. Barnichon, D. R. Känzig, and A. Singh (2026): "The Macroeconomic Effects of Tariffs: Insights from 180 Years of U.S. Trade Policy," Working Paper 35102, NBER.

Dávila, E., A. Rodríguez-Clare, A. Schaab, and S. Tan (2025): "A Dynamic Theory of Optimal Tariffs," Working Paper 33898, NBER.

Feenstra, R. C. (1995): "Estimating the Effects of Trade Policy," in *Handbook of International Economics*, vol. 3, 1553–1595.

Forni, M. and L. Gambetti (2014): "Sufficient Information in Structural VARs," *Journal of Monetary Economics*, 66, 124–136.

Forni, M., L. Gambetti, and L. Sala (2019): "Structural VARs and Noninvertible Macroeconomic Models," *Journal of Applied Econometrics*, 34, 221–246.

Franconi, A. (2024): "Central Banking in Times of High Geopolitical Risk," Working Paper 4728914, Available at SSRN.

Gopinath, G., E. Boz, C. Casas, F. J. Díez, P.-O. Gourinchas, and M. Plagborg-Møller (2020): "Dominant currency paradigm," *American Economic Review*, 110, 677–719.

Hack, L., K. Istrefi, and M. Meier (2023): "Identification of Systematic Monetary Policy," CEPR Discussion Paper 17999.

——— (2024): "The Systematic Origins of Monetary Policy Shocks," CEPR Discussion Paper 19063.

Ignatenko, A., A. Lashkaripour, L. Macedoni, and I. Simonovska (2025): "Making America great again? The economic impacts of Liberation Day tariffs," *Journal of International Economics*, 157, 104138.

Itskhoki, O. and D. Mukhin (2025): "The Optimal Macro Tariff," Working Paper 33839, NBER.

Jarociński, M. (2024): "Estimating the Fed's Unconventional Policy Shocks," *Journal of Monetary Economics*, 144, 103548.

Jiang, Z., A. Krishnamurthy, H. N. Lustig, R. Richmond, and C. Xu (2025): "Dollar Upheaval: This Time is Different," Working Paper 5220444, Available at SSRN.

Jurado, K., S. C. Ludvigson, and S. Ng (2015): "Measuring Uncertainty," *American Economic Review*, 105, 1177–1216.

Kalemli-Özcan, S., C. Soylu, and M. A. Yildirim (2025): "Global Networks, Monetary Policy and Trade," Working Paper 33686, NBER.

Kilian, L. and H. Lütkepohl (2017): *Structural Vector Autoregressive Analysis*, Cambridge University Press.

Kocherlakota, N. R. (2025): "Optimal Tariffs When Labor Income Taxes Are Distortionary," Working Paper 33759, NBER.

Lenza, M. and G. E. Primiceri (2022): "How to Estimate a Vector Autoregression after March 2020," *Journal of Applied Econometrics*, 37, 688–699.

McCracken, M. W. and S. Ng (2021): "FRED-QD: A Quarterly Database for Macroeconomic Research." *Review (00149187)*, 103.

McKay, A. and C. K. Wolf (2023): "What Can Time-Series Regressions Tell Us About Policy Counterfactuals?" *Econometrica*, 91, 1695–1725.

Miranda-Agrippino, S. and G. Ricco (2021): "The Transmission of Monetary Policy Shocks," *American Economic Journal: Macroeconomics*, 13, 74–107.

Monacelli, T. (2025): "Tariffs and Monetary Policy," CEPR Discussion Paper 20142.

Montiel Olea, J. L., M. Plagborg-Møller, E. Qian, and C. K. Wolf (2025): "Local Projections or VARs? A Primer for Macroeconomists," Working Paper 33871, NBER.

Moro, A. and V. N. Landi (2026): "FraNK: fragmentation in the NK model," *Journal of Monetary Economics*, 103933.

Ostry, D., S. Lloyd, and G. Corsetti (2025): "Trading Blows: The Exchange-Rate Response to Tariffs and Retaliations," RSC Working Paper 2025/25.

Pinter, G., S. Uslu, and F. Smets (2025): "Market Whiplash After the 2025 Tariff Shock: An Event-Targeted VAR Approach," Working Paper 5303690, Available at SSRN.

Poilly, C. and F. Tripier (2025): "Regional Trade Policy Uncertainty," *Journal of*

International Economics, 155, 104078.

Ramey, V. (2016): "Macroeconomic Shocks and Their Propagation," in *Handbook of Macroeconomics*, vol. 2, 71 – 162.

Rodríguez-Clare, A., M. Ulate, and J. P. Vasquez (2025): "The 2025 Trade War: Dynamic Impacts Across U.S. States and the Global Economy," Working Paper 33792, NBER.

Romer, C. D. and D. H. Romer (2004): "A New Measure of Monetary Shocks: Derivation and Implications," *American Economic Review*, 94, 1055–1084.

Schmitt-Grohé, S. and M. Uribe (2025): "Transitory and Permanent Import Tariff Shocks in the United States: An Empirical Investigation," Working Paper 33997, NBER.

Smets, F. and R. Wouters (2007): "Shocks and Frictions in US Business Cycles: A Bayesian DSGE Approach," *American Economic Review*, 97, 586–606.

Uhlig, H. (2005): "What Are the Effects of Monetary Policy on Output? Results from an Agnostic Identification Procedure," *Journal of Monetary Economics*, 52, 381–419.

Werning, I., G. Lorenzoni, and V. Guerrieri (2025): "Tariffs as Cost-Push Shocks: Implications for Optimal Monetary Policy," Working Paper 33772, NBER.

Wieland, J. F. and M.-J. Yang (2020): "Financial Dampening," *Journal of Money, Credit and Banking*, 52, 79–113.

Wolf, C. K. (2023): "Fiscal Stimulus and the Systematic Response of Monetary Policy," *AEA Papers and Proceedings*, 113, 388–393.

Wu, J. C. and F. D. Xia (2016): "Measuring the Macroeconomic Impact of Monetary Policy at the Zero Lower Bound," *Journal of Money, Credit and Banking*, 48, 253–291.

Yan, H. and R. Morck (2025): "Who's Afraid of Tariffs? The Geographic Distribution of Fear and Loss," Working Paper 34299, NBER.

Online Appendix

Import Tariffs and the Systematic Response of Monetary Policy

October 14, 2026

Alessandro Franconi and Lukas Hack

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A Data sources

All data sources are described below. We use the arithmetic average across observations to aggregate to a quarterly frequency for all monthly data except the monetary shocks. In addition to the VAR data stated in the tables below, we use the FRED-QD data set (McCracken and Ng, 2021) and net-export consensus forecasts from the U.S. Survey of Professional Forecasters (SPF) to investigate invertibility concerns in Online Appendix D.1.

Table A.1: Import tariff measures

Variable	Data identifier and details
Trade-weighted average tariff rate	Computed as customs duties (*B235RC1Q027SBEA*) divided by dutiable imports. Dutiable imports are given by all goods imports (*A255RC1Q027SBEA*) multiplied by the average share of dutiable goods over all imported goods taken from the DataWeb of the United States International Trade Commission.
Unweighted average tariff rate	We use an approximate unweighted average tariff rate computed as follows. First, we compute all disaggregated trade-weighted tariff rates at the four-digit HTS-by-origin-country level. Then, we compute the (unweighted) arithmetic average across these disaggregated tariff rates. To limit the influence of small trading partners, we drop all countries with average import values below the median, where average import values are computed over the full sample. The data is retrieved from the DataWeb of the United States International Trade Commission.
Trade restrictiveness index	The index is provided by Schmitt-Grohé and Uribe (2025) and can be downloaded from the authors websites, e.g., here.

Notes: Data identifiers are in italic letters if taken from FRED, provided by the FRB of St. Louis.

Table A.2: Macroeconomic data

Variable	Data identifier and details
CPI inflation	*CPIAUCSL* and implied year-over-year inflation.
Core CPI inflation	*CPILFESL* and implied year-over-year inflation.
Inflation expectations	*MICH* (One-year horizon).
PPI inflation	*PPIACO* and implied year-over-year inflation.
Real GDP	*GDPC1.*
Real investment	*GPDIC1.*
Real consumption	*PCECC96.*

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Table A.2 (continued)

Variable	Data identifier and details
Imported consumption goods	Computed as nominal imported consumption goods (excluding automotive and food) (*A652RC1Q027SBEA*) divided by the GDP deflator (*GDPDEF*).
Real government spending	*GCEC1*.
Real exports	*EXPGSC1*.
Real imports	*IMPGSC1*.
Unemployment rate	*UNRATE*.
Industrial production	*INDPRO*.
Output gap	Computed as real GDP (*GDPC1*) divided by potential output (*GDPPOT*).
Terms of trade (non-petroleum goods)	*W371RG3Q020SBEA*.
Federal funds rate	*DFF*.
One-year Treasury yield	*GS1*.
Real federal debt	Computed as nominal federal debt (*FGSDODNS*) divided by the GDP deflator (*GDPDEF*).
Real government receipts	Computed as nominal federal receipts (*FGRECPT*) divided by the GDP deflator (*GDPDEF*) minus real customs duties (*B235RC1Q027SBEA*).
Macroeconomic uncertainty	We use the 12-month index, which can be downloaded here.
Shadow federal funds rate	We use the shadow federal funds rate from Wu and Xia (2016), which can be downloaded here. The series ends in 2023Q2 and we replace missing values by the effective federal funds rate.
Trade policy uncertainty	We use the quarterly index of Caldara et al. (2020), which can be downloaded here.
Geopolitical risk	We use the monthly index of Caldara and Iacoviello (2022), which can be downloaded here.

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Table A.2 (continued)

Variable	Data identifier and details
Policy uncertainty	We use the 12 monthly categorical indices of Baker et al. (2016) (overall economic policy uncertainty, monetary policy, fiscal policy, taxes, government spending, health care, national security, entitlement programs, regulation, financial regulation, trade policy, and sovereign debt and currency crises), which can be downloaded here. There is a single observation in which an aggregated index is zero (1991Q1 for sovereign debt and currency crises), which we replaced by the average of the two adjacent quarters before taking logarithms.
Romer and Romer (2004) shock	We use the extended shock that ends in 2007Q4, taken from McKay and Wolf (2023).
Miranda-Agrippino and Ricco (2021) shock	We use the shock that ends in 2014Q4, taken from McKay and Wolf (2023). They take the shock corresponding to the posterior mode of the reduced-form parameters of the original paper.
Jarociński (2024) shock	We use the conventional monetary shock (*u1*), which can be downloaded here. The series end in 2024Q3 and we set 2024Q4 to zero.
Hack et al. (2024)	We use the refined Romer and Romer (2004) shock taken from here.

Notes: The displayed variables are from FRED, provided by the FRB of St. Louis. Data identifiers are in italic letters. All remaining variables are provided by the mentioned scholars as indicated in the second column.

B Comparison with Schmitt-Grohé and Uribe (2025) and den Besten et al. (2026)

Schmitt-Grohé and Uribe (2025) estimate transitory and permanent U.S. import tariff shocks. Different from our results, they find that transitory import tariff shocks are deflationary and expansionary. Their permanent shocks yield a highly transitory inflation response and a mostly insignificant expansion of output. den Besten et al. (2026) estimate an annual VAR over 180 years and also find that tariffs are deflationary in the post-World War II subsample. However, in contrast to Schmitt-Grohé and Uribe (2025), they document contractionary effects of tariffs, robust across various subsamples. Below, we investigate why these results differ from our findings.

The core methodological differences between Schmitt-Grohé and Uribe (2025) and our approach are that they use a state-space model, impose that the trade-weighted average tariff rate is exogenous to the economy

(in their baseline), consider a different set of macroeconomic variables, and study a sample that starts earlier (1959Q2–2024Q4). In comparison with den Besten et al. (2026), there are similar differences in the macroeconomic variables included in the analysis, and their annual post-World War II subsample covers 1946–2024. In contrast to Schmitt-Grohé and Uribe (2025), they rely on more conventional time series techniques and a narratively identified external instrument. The latter is based on 10 events that are classified as exogenous in the aforementioned sample.

To compare with their results, we use our baseline identification approach and focus on the sample period. First, we re-estimate our VAR but let our sample start in 1980Q1 to ensure that our findings are not unduly sensitive to 1990Q1 as sample start. The results are shown as solid blue lines in Figure B.1. In this sample, our main findings remain unchanged. In particular, we still find that tariff shocks are inflationary and contractionary.

Next, we go further and start the sample in 1967Q1, which is the earliest feasible sample start due to data availability.[1] The results are shown as gray dashed-dotted lines. Indeed, in this extended sample, we find that the shock is deflationary and not contractionary anymore, broadly consistent with Schmitt-Grohé and Uribe (2025).

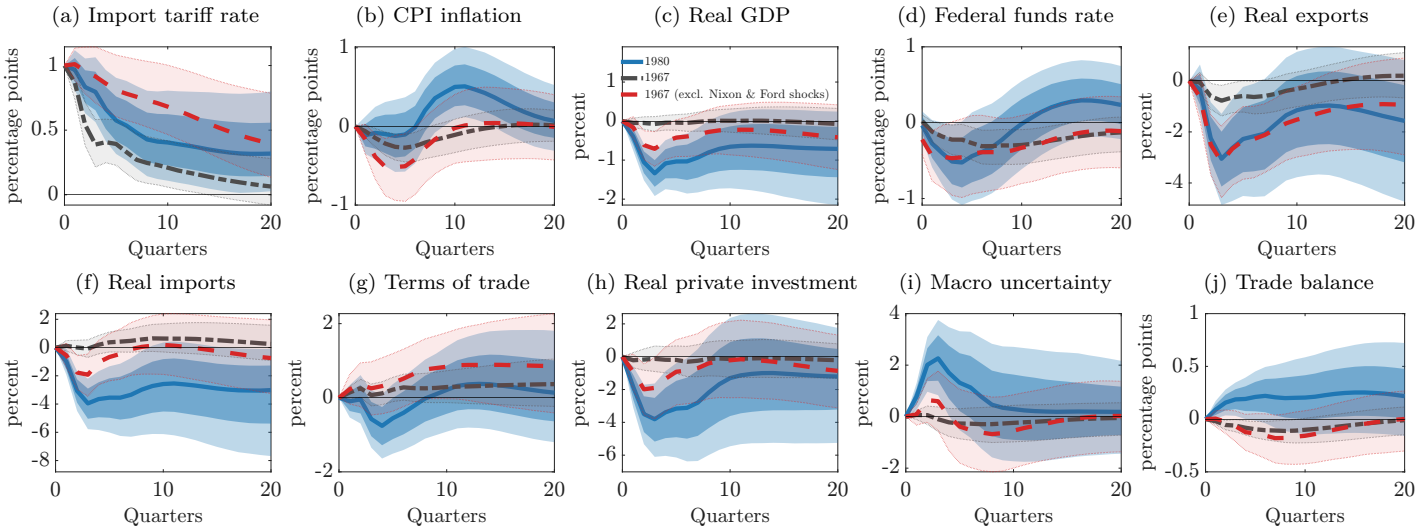
However, the extended sample includes two large tariff spikes, the well-known Nixon and Ford tariff events, which are also discussed in Schmitt-Grohé and Uribe (2025); see their Figure 4. The Nixon tariffs partly capture the endogenous response of the US government to the turmoil associated with the end of the Bretton Woods system. The Ford tariffs were levied on oil imports, partly in response to high oil prices. Thus, both of these events are classified as endogenous in the narrative account of den Besten et al. (2026).

Thus, we investigate how the results change if we remove these two tariff spikes from the raw series. Specifically, we smooth out these events from the average tariff rate time series in the following way: We replace the values during these episodes with the average import tariff across the pre- and post-event tariff rate.[2] The responses using the smoothed import tariff series are shown as dashed red lines in Figure B.1. It turns out that we recover a significant output contraction, which is also visible in other components of aggregate demand, e.g., in real private investment. Therefore, we conclude that there is robust evidence for tariffs being contractionary, consistent with den Besten et al. (2026), while the effects on inflation are more sample dependent. A potential reason for this sample dependence is that supply chain length and complexity have increased substantially, so that more products are affected by tariff changes in recent decades. In a similar vein, Bergin and Corsetti (2023) and Moro and Landi (2026) show that a sufficiently low share of imported intermediate inputs in marginal cost may predict tariff hikes to be deflationary. Investigating such dependencies in greater detail is left for future research.

[1] An earlier sample start is infeasible since the terms of trade index is only available starting in 1967.

[2] The Nixon tariff event took place in the third and fourth quarters of 1971. The Ford tariff event took place during all quarters of 1975.

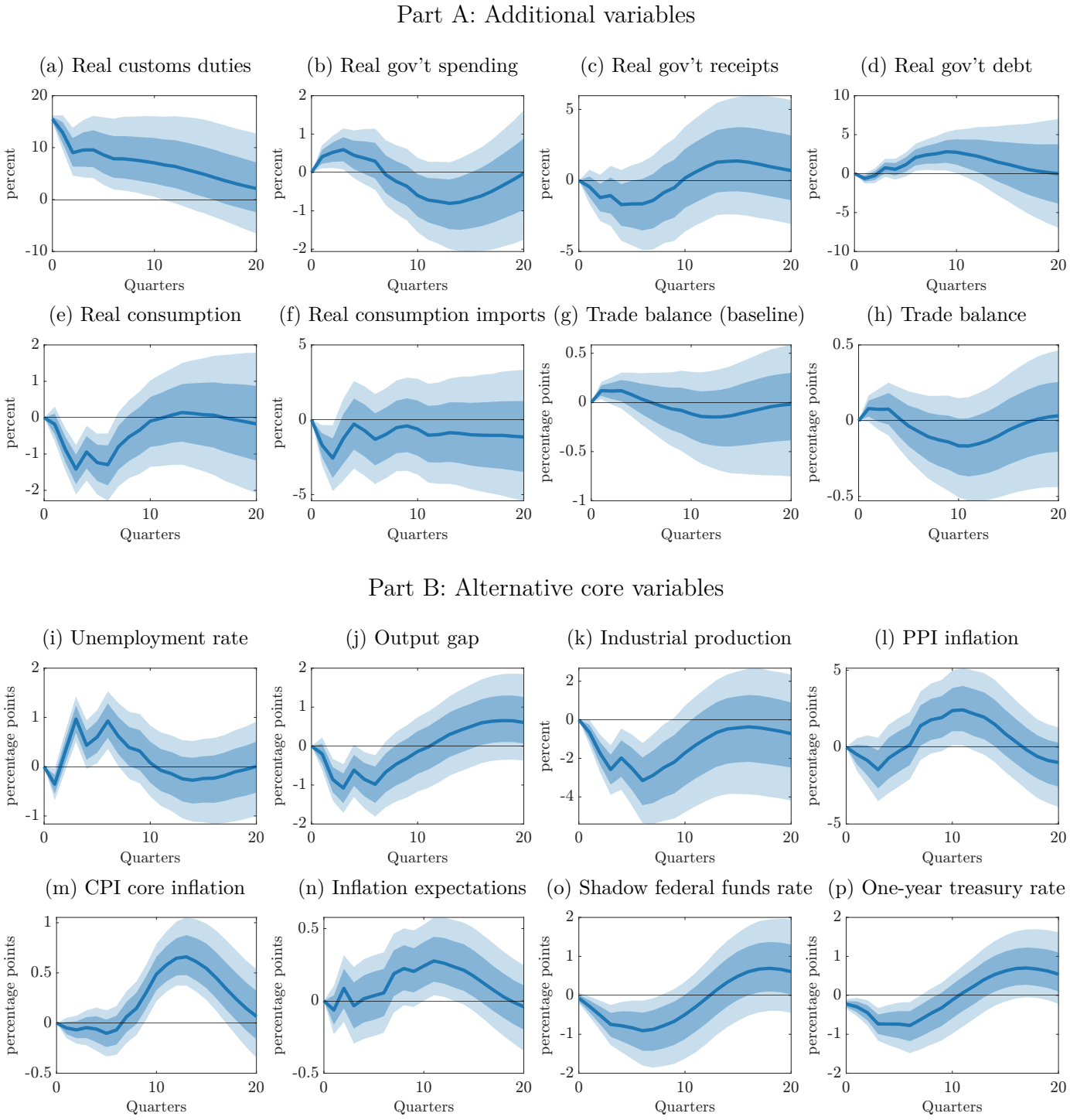
Figure B.1: Varying sample starts



Notes: The solid blue, dashed-dotted gray, and dashed red lines represent posterior medians. The blue shaded areas are 68% and 90% credible sets, and the thin-dotted lines indicate 90% credible sets. The legend indicates the sample start of the respective specification; see text for details.

C Responses of additional outcome variables

Figure C.1: Responses of further macroeconomic variables to the import tariff shock



Notes: This figure shows impulse responses estimated based on a Bayesian VAR. The solid blue line represents the posterior median, and the shaded areas are 68% and 90% credible sets. In Part A, Panels (a)-(f), we augment the baseline VAR by each variable individually and re-estimate the model. We impose a zero impact effect on all additional variables, except for customs duties. In Panel (g), we use our baseline VAR and compute the implied trade balance response, see Footnote 23 in the main text for details. In Panel (h), we include the trade balance relative to GDP instead of real imports and exports in the VAR. In Part B, we replace individual variables from the baseline VAR by alternative measures. We replace real GDP by alternative measures of real activity in Panel (i) to (k). We replace CPI inflation by other price measures in Panel (l) to (n). We replace the federal funds rate by alternative interest rates in Panel (o) to (p).

D Sensitivity analysis

D.1 Testing partial invertibility

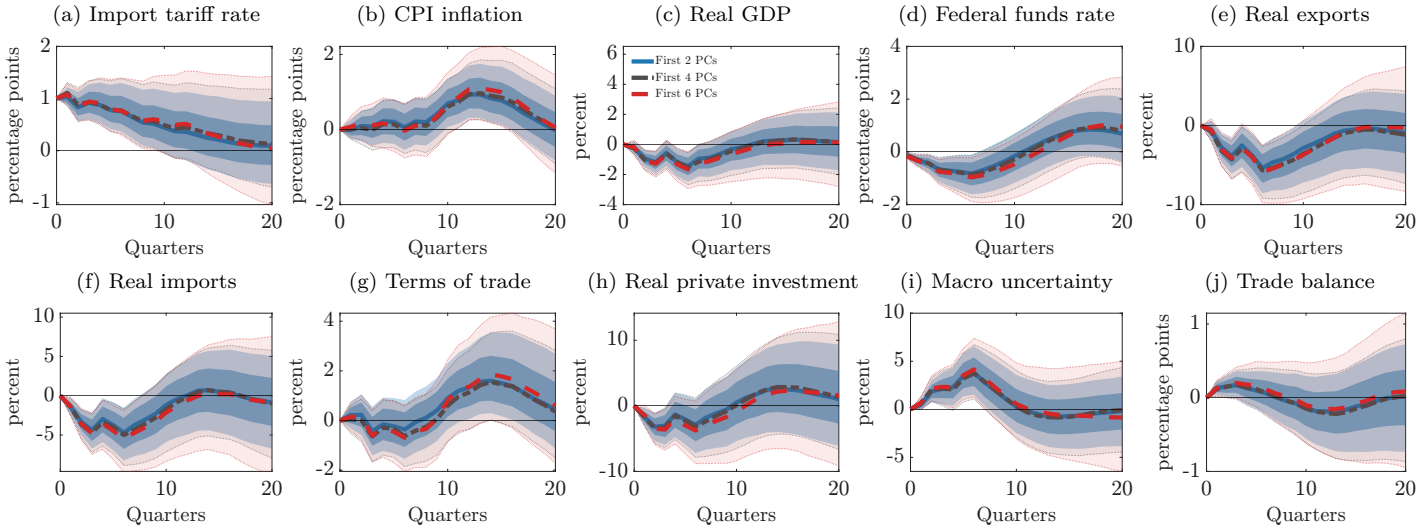
To ensure that our baseline VAR contains sufficient information to identify the tariff shock, we perform the orthogonality test proposed by Forni and Gambetti (2014). First, we estimate the principal components using a large quarterly dataset of macroeconomic and financial variables for the U.S. economy, taken from McCracken and Ng (2021). Then, we test for orthogonality with respect to the lags of these principal components. To select the optimal number of principal components to be included in the test, we rely on the criteria proposed by Alessi, Barigozzi, and Capasso (2010), which suggests the first four or first six principal components. The results of the orthogonality test are reported in Table D.1. In all cases, we cannot reject the null hypothesis of orthogonality, indicating a lack of shock predictability by the information set spanned by the principal components. As an additional test, we include the first two, four, and six principal components in the VAR and order them after the federal funds rate. The results in Figure D.1 are similar to the baseline. This indicates that our results are not driven by the omission of important macroeconomic and financial variables from our VAR. Overall, both exercises indicate that our baseline VAR is informationally sufficient to identify the tariff shock.

Table D.1: Testing partial invertibility based on Forni and Gambetti (2014)

	First 4 PCs, k lags				First 6 PCs, k lags			
	$k=1$	$k=2$	$k=3$	$k=4$	$k=1$	$k=2$	$k=3$	$k=4$
F-stat	0.187	0.392	0.412	0.438	0.241	0.466	0.526	0.479
p-value	0.945	0.923	0.957	0.969	0.962	0.931	0.941	0.980

Notes: The table shows the results of the "Structuralness" test proposed in Forni and Gambetti (2014). Specifically, we report the F-statistics and the p-values for regressions of the tariff shock on up to k lags of the first four and six principal components. The shock is based on the posterior mean of the Tariff VAR, taken over the reduced-form parameters.

Figure D.1: Include principal components in VAR vector



Notes: The solid blue, dashed-dotted gray, and dashed red lines represent posterior medians. The blue shaded areas are 68% and 90% credible sets, and the thin-dotted lines indicate 90% credible sets. We include principal components in the VAR and allow the tariff shock to impact these principal components in the quarter of the shock; see text for details.

A possible caveat of the above approach is that the McCracken and Ng (2021) data is not specific to tariffs, and its variation could be dominated by non-tariff shocks. Thus, we present another predictability test using forecasts of future trade flows from the Survey of Professional Forecasters (SPF). The core idea is that SPF participants should incorporate the effect of a tariff shock once it is announced. If our identified tariff shock picks up these anticipated events, it follows that it should be predictable by the SPF forecasts. Therefore, we estimate

$$\varepsilon_t^\tau = \alpha + \sum_{h=0}^{3} \beta^h E_{t-1}\left[NX_{t+h} - NX_{t-1}\right] + v_t, \tag{D.1}$$

where ε_t^τ is our identified tariff shock (based on the posterior mean of the reduced-form parameters), and the regressors $E_{t-1}\left[NX_{t+h} - NX_{t-1}\right]$ denote the date $t-1$ expected change in net exports over the next $h+1$ periods, based on the consensus forecast. v_t is an error term.[3] Table D.2 shows the point estimates of β^h and associated standard errors in parentheses, which are robust to heteroskedasticity and serial correlation. The results indicate that our tariff shock is not predictable. All coefficients are statistically insignificant at conventional levels and the R^2 is fairly low. This holds regardless of whether we estimate these effects individually or jointly. Therefore, we conclude that anticipation (and subsequent invertibility failures) likely has a negligible effect on our estimated responses.

[3]We opted for this specification because we find it particularly intuitive. When using exactly the same regression specification as for the McCracken and Ng (2021) data, we obtain similar results.

Table D.2: Tariff shock and SPF net-export expectations

	(1)	(2)	(3)	(4)	(5)
$E_{t-1}[NX_t - NX_{t-1}]$	-0.0139				-0.0327
	(0.0120)				(0.0343)
$E_{t-1}[NX_{t+1} - NX_{t-1}]$		-0.0066			-0.0214
		(0.0075)			(0.0379)
$E_{t-1}[NX_{t+2} - NX_{t-1}]$			-0.0040		0.0651
			(0.0054)		(0.0481)
$E_{t-1}[NX_{t+3} - NX_{t-1}]$				-0.0034	-0.0341
				(0.0044)	(0.0270)
R^2	0.014	0.009	0.006	0.007	0.031
Observations	136	136	136	136	136

Notes: The table shows regression results based on equation (D.1). The shock is based on the posterior mean of the Tariff VAR, taken over the reduced-form parameters. Standard errors robust to heteroskedasticity and serial correlation are shown in parentheses, with corresponding asterisks for statistical significance: $^{*}p < 0.10$, $^{**}p < 0.05$, $^{***}p < 0.01$.

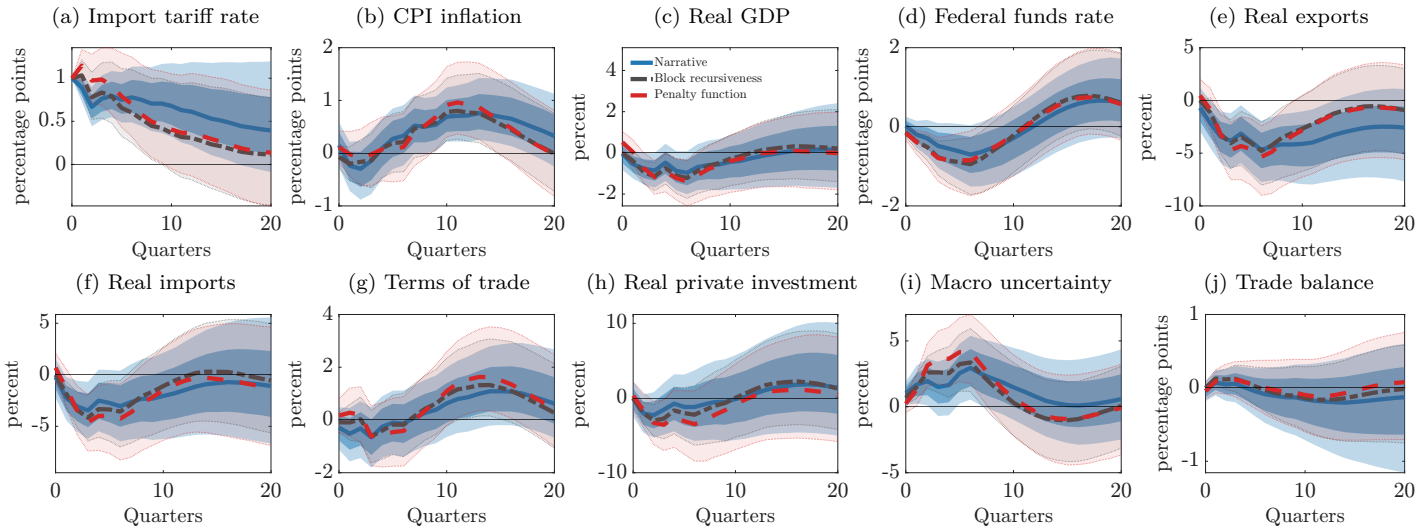
D.2 Alternative identification

Narrative identification Our baseline tariff rate measure could pick up variation unrelated to tariff policy changes. To address the concern that our estimates pick up these alternative sources of variation, we compile a series of narratively identified tariff policy changes, which are unlikely to be confounded by the above-described issues. To this end, we define an indicator, $\mathbb{I}_t\{\text{tariff policy event}\} \in \{0, 1\}$, which is only activated when we identify a tariff policy change in quarter t. Table D.3 lists all of these events. Finally, we compute our narrative tariff change time series as $\Delta\tau_t^{narr} = \mathbb{I}_t\{\text{tariff policy event}\}\Delta\tau_t$, where $\Delta\tau_t$ denotes the quarter-on-quarter change in the trade-weighted average tariff rate. We include this series as an exogenous variable in the VAR.

Table D.3: Narratively identified tariff policy changes

#	Event description	Quarterly date
(1)	NAFTA Agreement	1994Q1
(2)	WTO Establishment	1995Q1
(3)	US–Canada SLA Agreement I	1996Q2
(4)	WTO ITA I	1997Q3
(5)	Trade & Development Act (Sub-Saharan Africa)	2000Q2
(6)	Bush Steel Safeguard	2002Q1
(7)	Early Removal of Bush Steel Safeguard	2003Q4
(8)	US–Canada SLA Agreement II	2006Q4
(9)	WTO ITA II	2016Q3
(10)	US Tariffs (Solar, Washing Machines, Steel, Aluminum)	2018Q1
(11)	Section 232 Expansion (EU, Canada, Mexico)	2018Q2
(12)	Section 301 China Tariffs – List 1 & 2	2018Q3
(13)	Section 301 China Tariffs – List 3	2018Q4
(14)	Section 301 China Tariffs – List 3 Increase	2019Q1

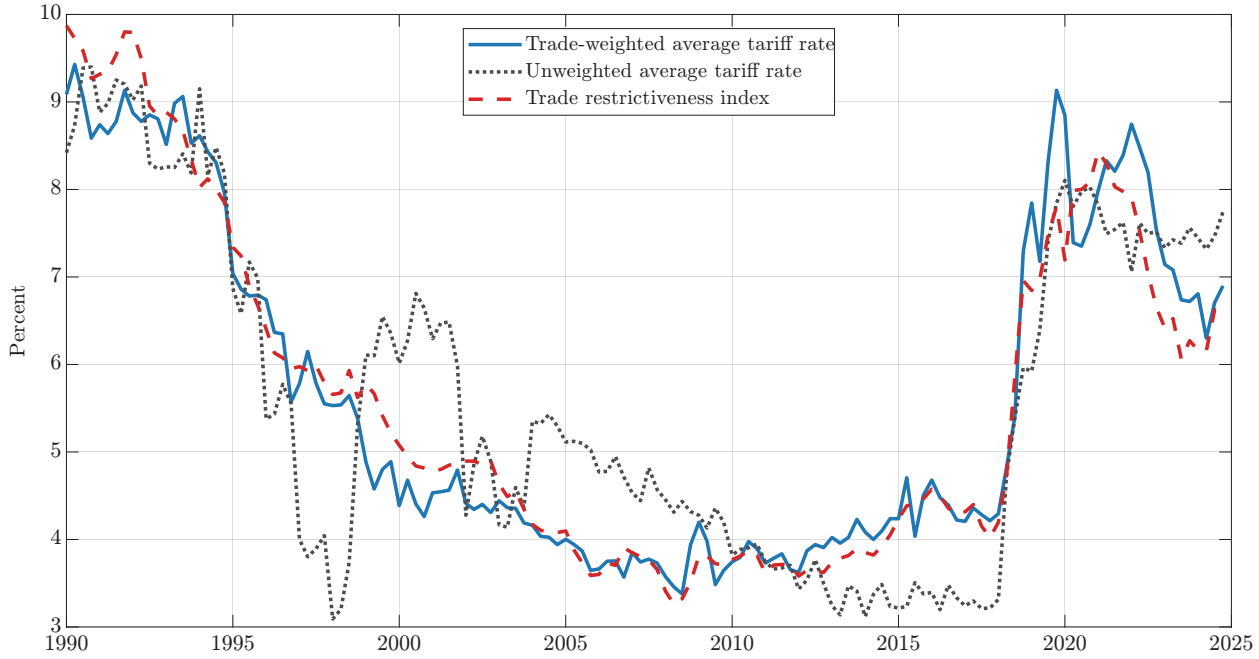
Figure D.2: Alternative identification approaches



Notes: The solid blue, dashed-dotted gray, and dashed red lines represent posterior medians. The blue shaded areas are 68% and 90% credible sets, and the thin-dotted lines indicate 90% credible sets. The legend indicates the identification approach of the respective specification; see main text for details.

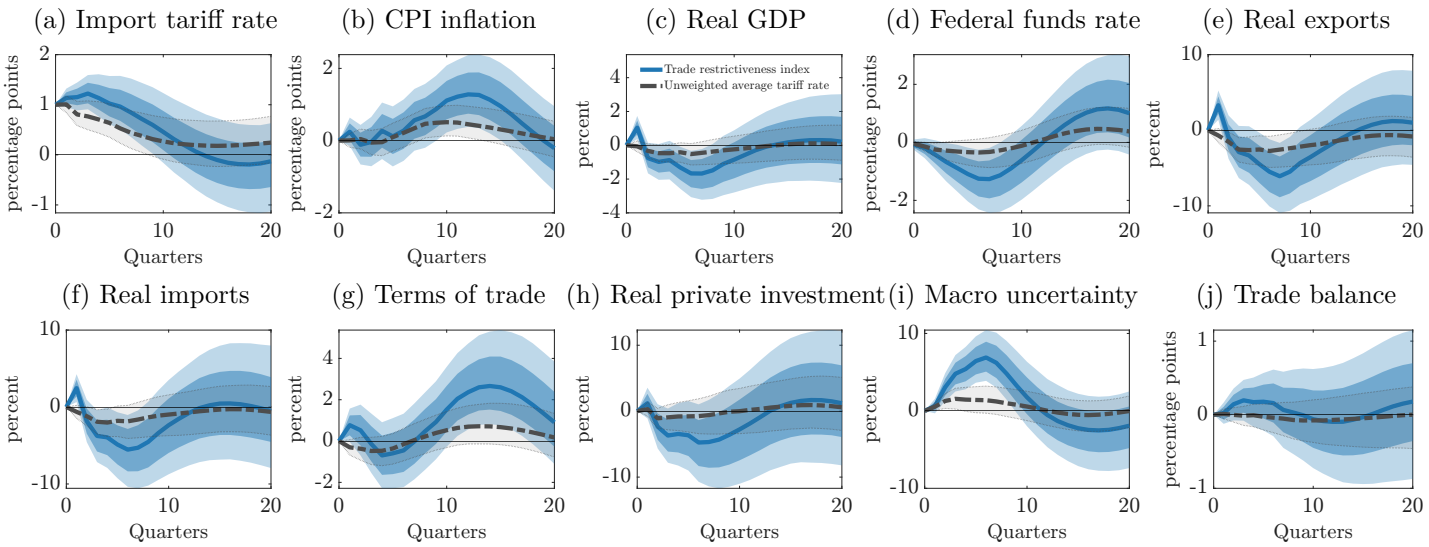
D.3 Alternative tariff measurement

Figure D.3: Comparison across tariff measures



Notes: This figure shows the time series of the (i) trade-weighted and (ii) unweighted average U.S. import tariff rates, as well as (iii) the trade restrictiveness index from Schmitt-Grohé and Uribe (2025). Series (ii) and (iii) have been standardized to match the mean and standard deviation of series (i) to ease comparison.

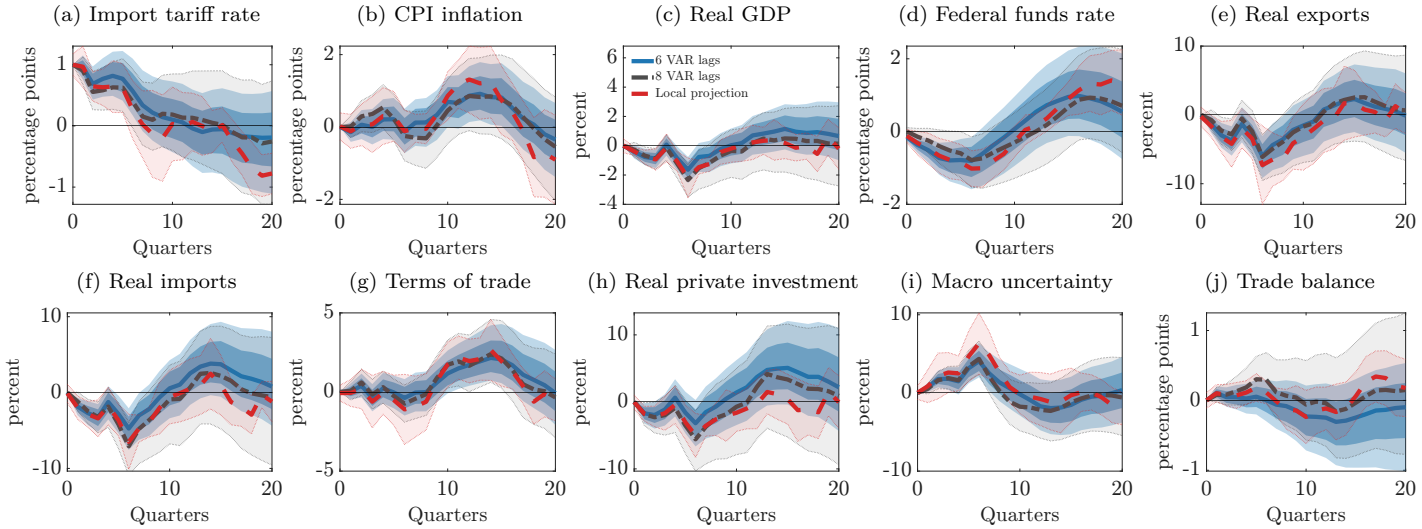
Figure D.4: Responses to the import tariff shock using alternative tariff measures



Notes: The solid blue and dashed-dotted gray lines represent posterior medians. The blue shaded areas are 68% and 90% credible sets, and the thin-dotted lines indicate 90% credible sets. The legend indicates the tariff measure used in the respective specification; see main text for details. We normalize both tariff series to have the same variance as the trade-weighted average tariff rate to make them as comparable as possible.

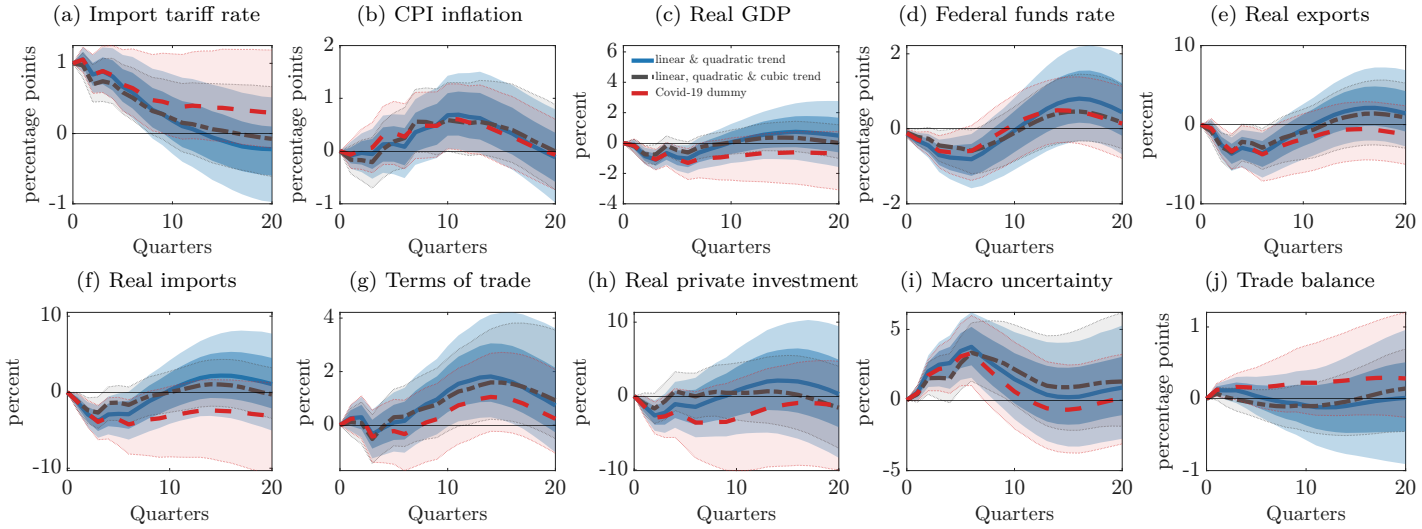
D.4 Further sensitivity analysis

Figure D.5: Relaxing VAR assumptions



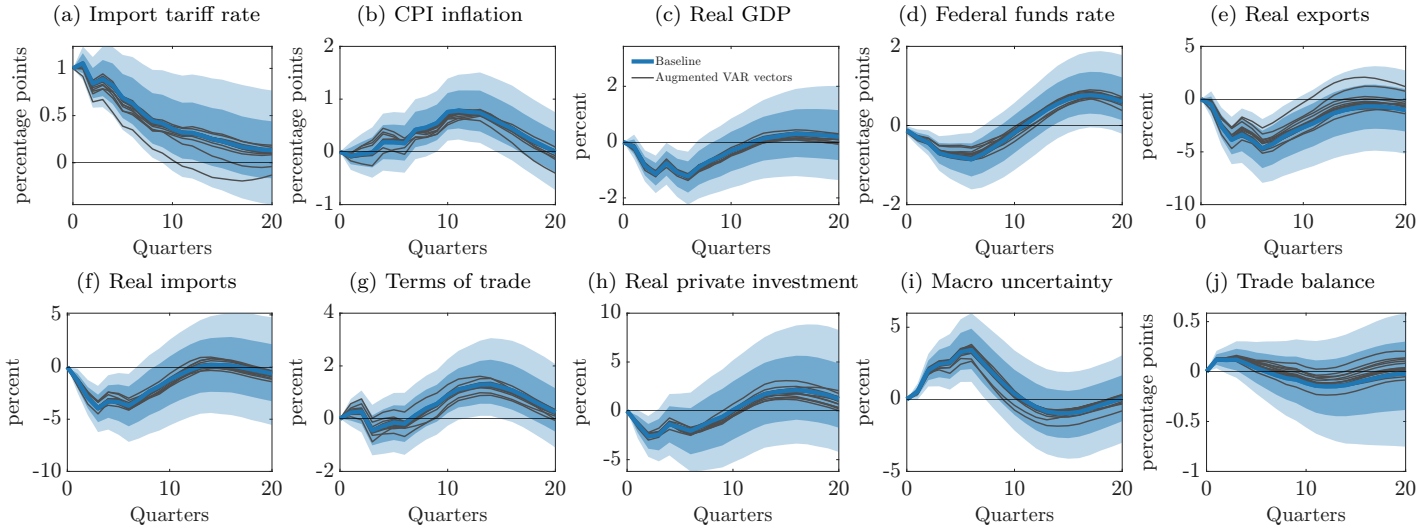
Notes: The solid blue and dashed-dotted gray lines represent posterior medians. The blue shaded areas are 68% and 90% credible sets, and the thin-dotted gray lines indicate 90% credible sets. The dashed red line corresponds to a local projection point estimate, and the thin-dotted red lines indicate 90% confidence bands based on standard errors robust to heteroskedasticity and serial correlation. The local projection includes four lags of the shock and the outcome variable as control variables, and a linear time trend. The shock is based on the posterior mean of the baseline tariff VAR, taken over the reduced-form parameters.

Figure D.6: Additional deterministic variables



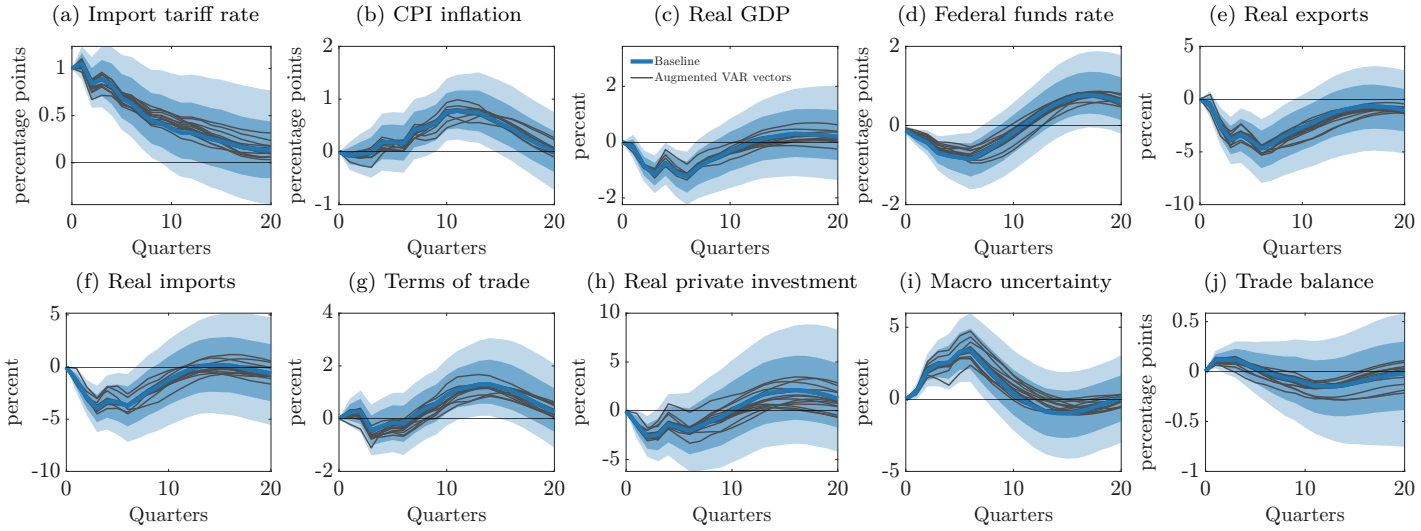
Notes: The solid blue, dashed-dotted gray, and dashed red lines represent posterior medians. The blue shaded areas are 68% and 90% credible sets, and the thin-dotted lines indicate 90% credible sets. The legend indicates the included deterministic variables of the respective specification.

Figure D.7: Controlling for additional measures of uncertainty



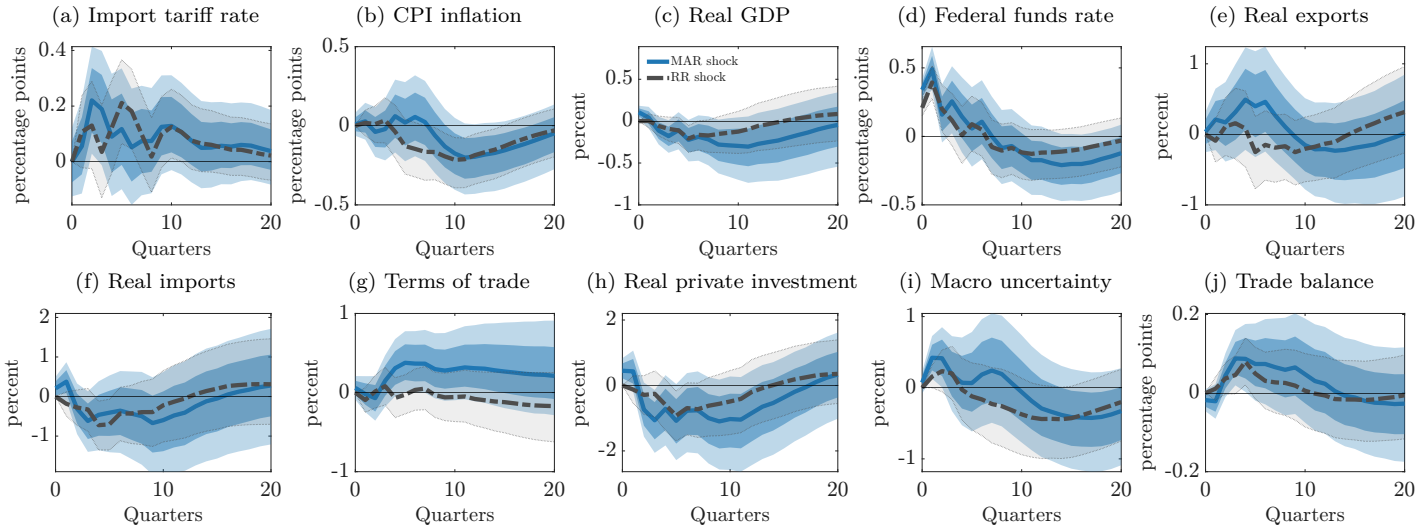
Notes: The solid blue lines represent the posterior median of the baseline tariff VAR, and the blue shaded areas are 68% and 90% credible sets. Each thin gray line corresponds to the posterior median of an augmented VAR, where we include an additional measure of uncertainty and allow the tariff shock to impact this variable in the quarter of the shock. We consider the 12 categorical economic policy uncertainty indices from Baker et al. (2016), the geopolitical risk measure from Caldara and Iacoviello (2022), and the trade policy uncertainty index from Caldara et al. (2020). All indices are available via the website https://www.policyuncertainty.com.

Figure D.8: Controlling for additional variables from Figure C.1



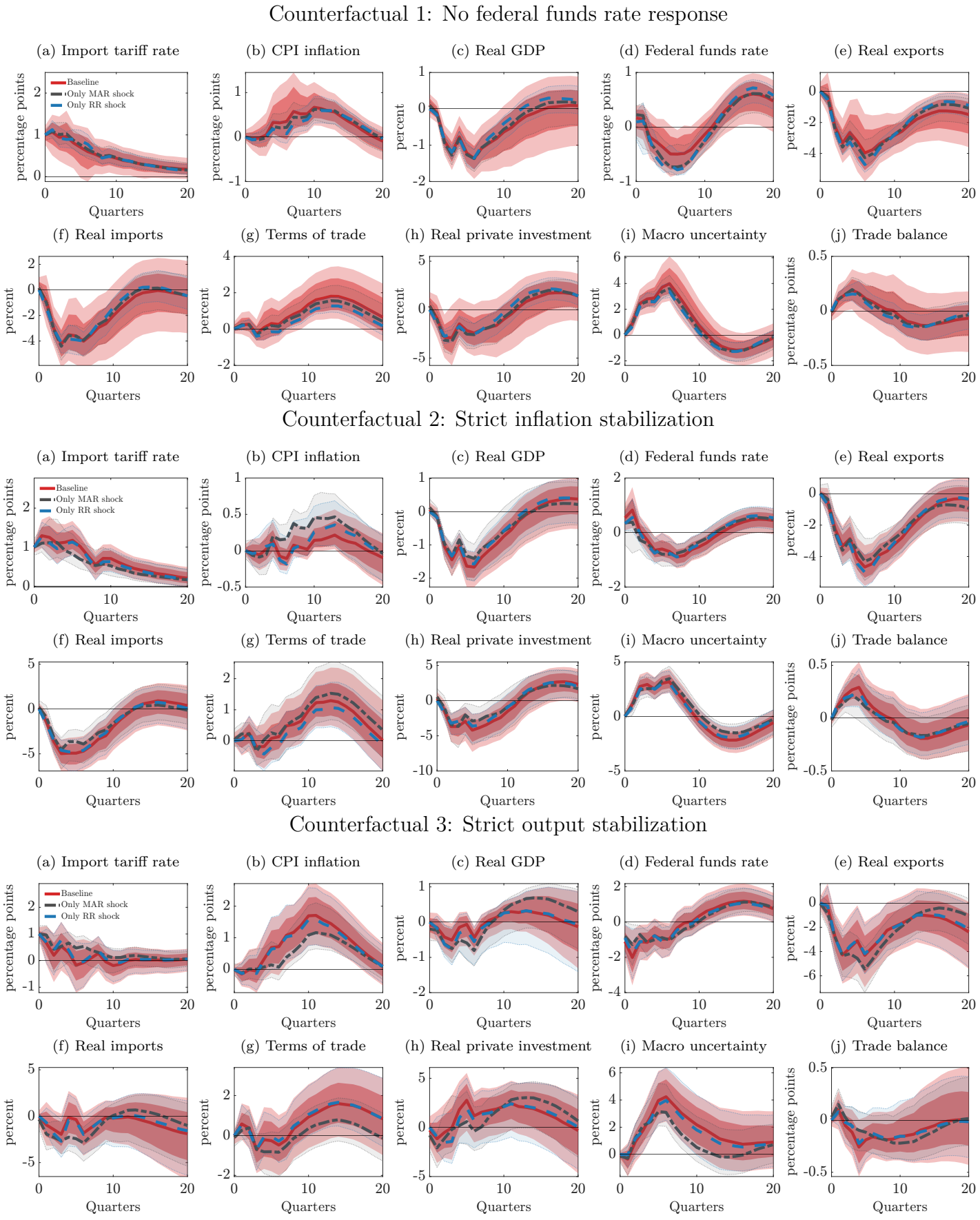
Notes: The solid blue lines represent the posterior median of the baseline tariff VAR, and the blue shaded areas are 68% and 90% credible sets. Each thin gray line corresponds to the posterior median of an augmented VAR, where we include an additional variable to the VAR or replace a baseline measure by a different variable. The displayed specifications correspond to all VAR results shown in Figure C.1.

Figure D.9: Baseline responses to monetary policy shocks



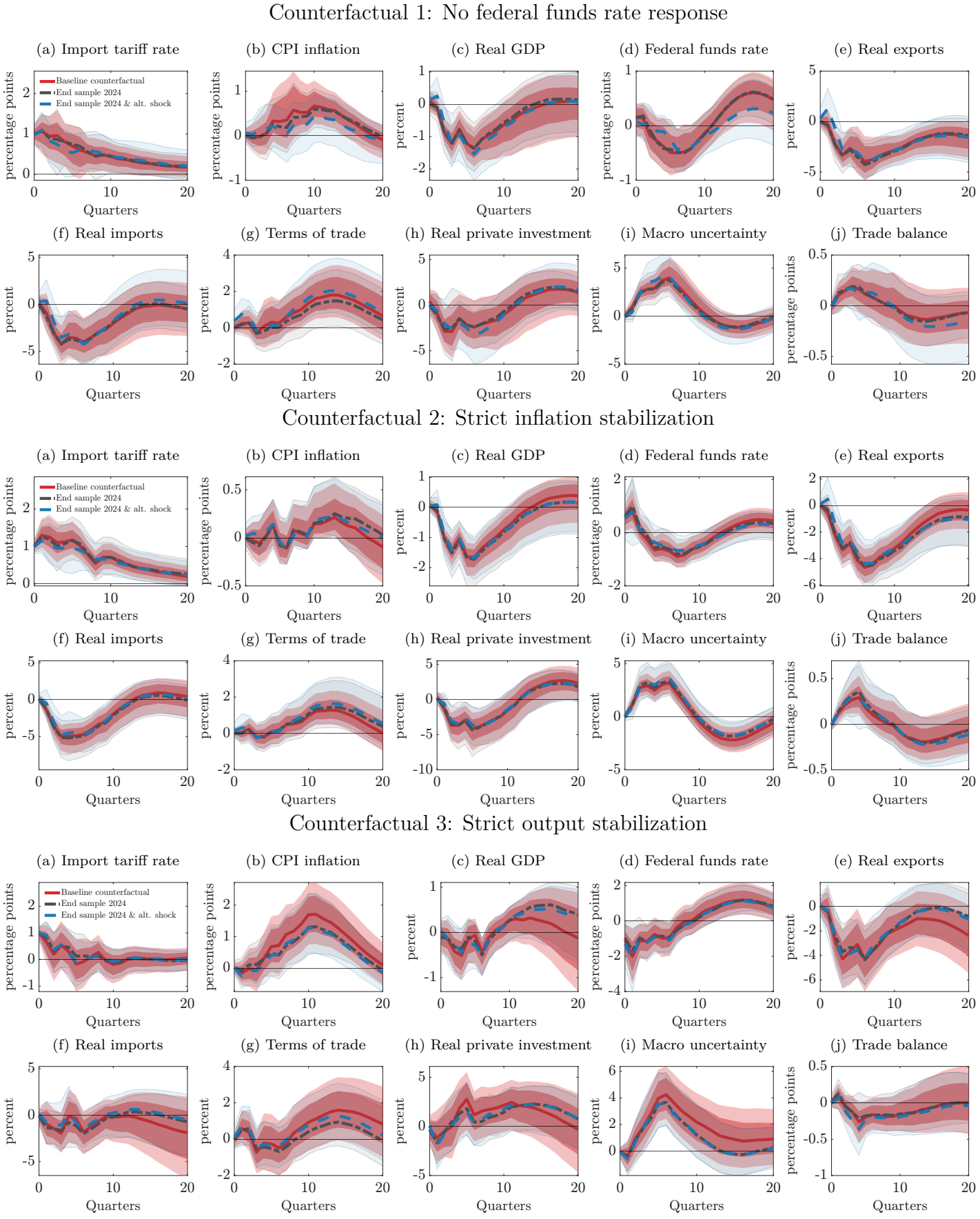
Notes: The solid blue and dashed-dotted gray lines represent posterior medians. The blue shaded areas are 68% and 90% credible sets, and the thin-dotted gray lines indicate 90% credible sets. The results are from the baseline monetary policy VAR.

Figure D.10: Counterfactuals using only a single monetary policy shock



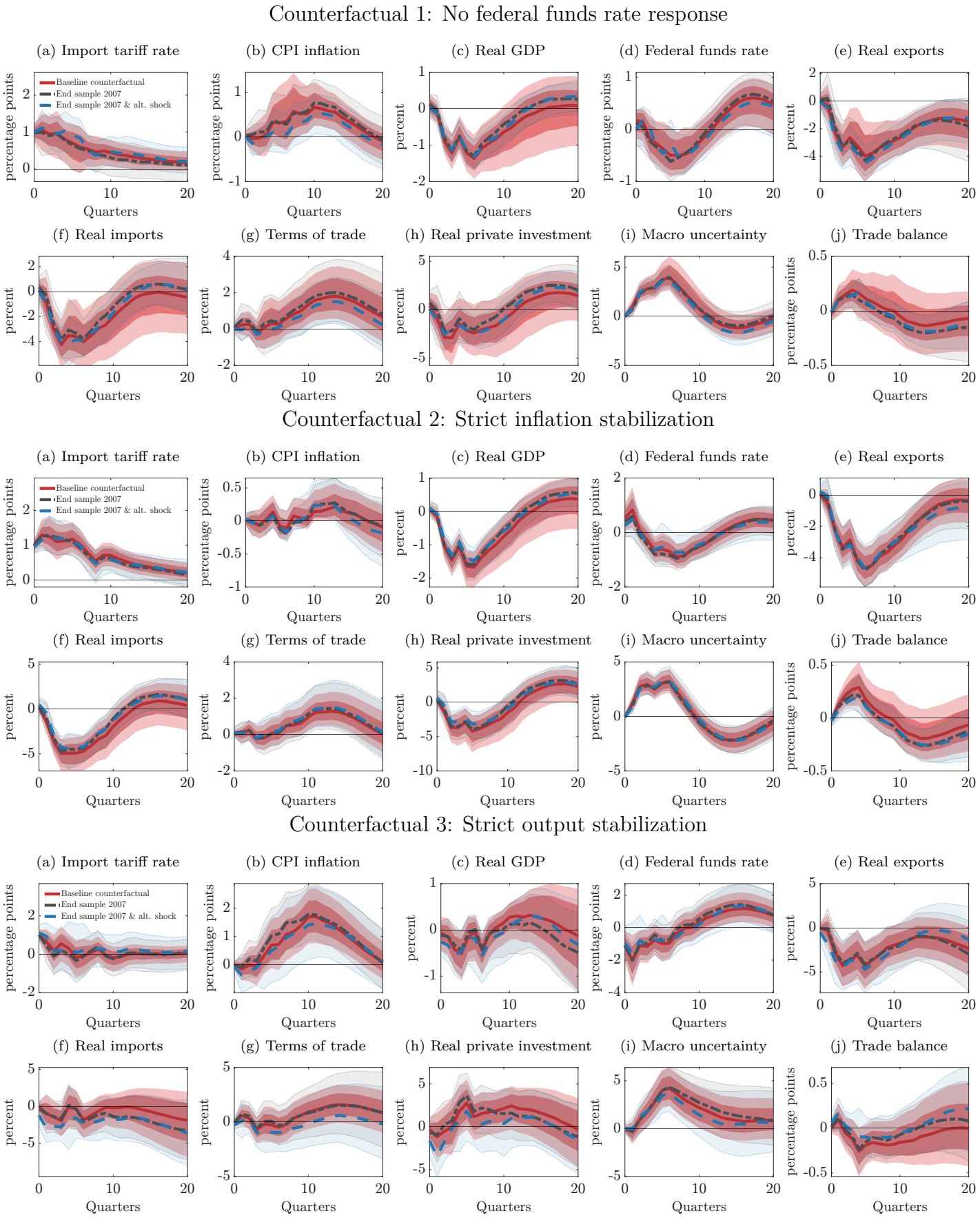
Notes: Alternative monetary policy counterfactuals in comparison to the baseline counterfactual.

Figure D.11: Counterfactuals using an extended sample and the Jarociński (2024) shock



Notes: Alternative monetary policy counterfactuals in comparison to the baseline counterfactual. Extended sample end to 2024 and Jarociński (2024) *u1* shock instead of MAR.

Figure D.12: Counterfactuals using an shorter sample and the Hack et al. (2024) shock



Notes: Alternative monetary policy counterfactuals in comparison to the baseline counterfactual. Using a shorter sample and Hack et al. (2024) shock instead of RR.