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 several tariff measurement and identification approaches. Tariff shocks reduce output but increase consumer prices. Monetary policy partially accommodates these shocks with a transitory policy easing. To quantify the dependence on systematic monetary policy, we construct counterfactuals using identified monetary policy shocks. This avoids specifying a full structural model, making the results robust against model misspecification. When monetary policy strictly stabilizes inflation, the output contraction is 36% larger at the trough than in the baseline. In contrast, strict output stabilization implies a peak inflation effect being almost twice as large.

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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 by the Trump Administration, a myriad of papers has emerged to answer these questions, primarily using microfounded structural models. These papers study the business cycle effects of tariffs (e.g., Antonova, Huxel, Matvieiev, and Müller, 2025; Auclert, Rognlie, and Straub, 2025; Kalemi-Özcan, Soylu, and Yildirim, 2025; Costinot and Werning, 2025), the design of tariff policies (Becko, Grossman, and Helpman, 2025; Dávila, Rodríguez-Clare, Schaab, and Tan, 2025; Itskhoki and Mukhin, 2025; Kocherlakota, 2025), and the optimal monetary policy response to tariffs (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 analysis, there is little empirical evidence on the business cycle effects of tariffs. The few existing empirical studies offer a wide range of results, including tariffs being neither contractionary nor inflationary (Schmitt-Grohé and Uribe, 2025), contractionary but deflationary (Barnichon and Singh, 2025), and contractionary and inflationary (e.g., Boer and Rieth, 2024). Consistent with the latter, we provide new evidence that tariffs are supply shocks using several tariff measurement and identification approaches. We also discuss potential reasons for the wide range of empirical results below.

Beyond the direct effect of tariff shocks, to the best of our knowledge, there is no empirical evidence on how the effects of tariffs are shaped by systematic monetary policy. We fill this gap by estimating the macroeconomic effects of U.S. import tariff shocks and their dependence on the monetary policy response, without relying on a fully specified structural model. This approach follows McKay and Wolf (2023) and is appealing because it is robust to the Lucas critique and to model misspecification.

Our identified tariff shock reduces real activity, increases prices, and is partially accommodated by monetary policy. As alternatives to partial accommodation, we consider counter-

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

factuals featuring a central bank that aims to (i) not respond to the tariff shock, (ii) strictly stabilize prices, or (iii) strictly stabilize real activity. Relating to optimal policy, our counterfactuals map into a loss function that puts a zero weight (iii) on price stabilization, or (ii) on output stabilization, and (i) represents an intermediate case, where monetary policy "looks through" the shock, as sometimes advocated for supply shocks. As such, our results quantify the policy tradeoff and provide new moments to discipline structural models.

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 using three approaches: a trade-weighted and an unweighted average tariff rate, and the trade restrictiveness index from Schmitt-Grohé and Uribe (2025), which also captures cross-sectional tariff variation. 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. 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.[2] Furthermore, we show that our identifying restrictions are not overly restrictive by considering alternative identification approaches that relax those assumptions. The first adopts the penalty function approach of Uhlig (2005), the second imposes a block-recursiveness assumption similar to Christiano, Eichenbaum, and Evans (2005), and the third relaxes each zero restriction individually. In all three approaches, the unrestricted contemporaneous effects are close to zero, in line with our baseline approach. Lastly, we construct a time series of narratively identified tariff policy events and use only tariff changes due to those events as a source of plausibly exogenous variation. Across all four approaches, we obtain very similar dynamic effects.

We find that a shock that increases the trade-weighted U.S. import tariff rate by 1 percentage point induces considerable pressure on consumer prices. The CPI inflation rate responds with a delay of 4 quarters and, subsequently, increases continuously to its peak effect of 0.78

[2] 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.

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. We obtain similar results when considering the alternative import tariff measures discussed above.

Monetary policy partially accommodates the tariff shock with a temporary easing, 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 valid in a broad class of macroeconomic models, including conventional New Keynesian frameworks. As in McKay and Wolf (2023), we estimate a monetary VAR using the high-frequency identified monetary policy shock from Miranda-Agrippino and Ricco (2021) and the Taylor rule residual from Romer and Romer (2004), and use the resulting responses to construct three counterfactuals.[3]

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 in a New Keynesian model. It also resembles the commonly expressed idea of "looking through" supply shocks.[4] Interest rates are higher than in the

[3]We provide a sensitivity analysis using alternative monetary policy shocks.

[4]For example, U.S. Fed Chair Jerome Powell discussed this idea on November 9, 2023 (https://www.federalreserve.gov/newsevents/speech/powell20231109a.htm?).

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 policy rate. But how potent is monetary policy in fighting the inflationary pressure from the tariff shock? To answer this question, we consider a second counterfactual in which monetary policy aims to perfectly stabilize prices. Instead of an initial easing, monetary policy sharply raises interest rates by 0.82 percentage points in the short run. As a result, the tariff shock does not lead to meaningful inflation, with a peak impact of only 0.21 percentage points.[5] 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.

Finally, we consider the opposite counterfactual, in which monetary policy aims to strictly stabilize output. In this scenario, monetary policy cuts the federal funds rate more aggressively and more swiftly than in the baseline. The trough interest rate impact 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 almost twice as large than in the baseline.

Overall, our results confirm that the monetary response to tariff shocks is critical for the impact of tariffs on the U.S. economy. Pursuing extreme policies of stabilizing only output or only prices induces considerable costs in terms of the other, untargeted variable. Quantitative optimal policy analysis can be disciplined by comparing with our counterfactuals, while actual optimal policy likely constitutes an intermediate case.

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 tariff shocks from aggregate time series data. Two close

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

papers are Schmitt-Grohé and Uribe (2025), who identify permanent and transitory tariff shocks, and Barnichon and Singh (2025), who adopt a long-run perspective. Both argue that observed fluctuations in (trade-weighted) average tariffs may be treated as exogenous, whereas we are concerned about potential endogeneity due to tariff measurement. Their results agree that tariff increases are deflationary, but only Barnichon and Singh (2025) find tariffs to be contractionary. In the Supplemental Appendix, we show that differences in results are primarily driven by the sample. If we expand the sample to start in 1980, we still obtain that tariffs act as supply shocks. Instead, if we expand the sample to the earliest feasible start due to data availability in 1967, tariffs appear to be deflationary and not contractionary. The deflationary effects appear to be relatively robust in historical samples, in line with both papers from above. However, the expansionary output effects found in Schmitt-Grohé and Uribe (2025) appear to be driven by two exceptional episodes, the so-called Nixon and Ford shocks. Both events capture the endogenous response to macroeconomic developments. Indeed, in the narrative account in Barnichon and Singh (2025), these events are classified as likely endogenous to contemporaneous economic conditions. Different from the two papers discussed above, 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 (Furceri, Hannan, Ostry, and Rose, 2018; Barattieri, Cacciatore, and Ghironi, 2021).[6] Relative to these papers, we contribute robust evidence that tariffs act as supply shocks using several tariff measurement and identification approaches, while also delivering novel monetary policy counterfactuals.

Another recent strand of 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-

[6] Further related empirical work studies the financial market response to tariff changes (Ostry, Lloyd, and Corsetti, 2025), as well as the effects of trade policy uncertainty (e.g., Caldara, Iacoviello, Molligo, Prestipino, and Raffo, 2020; Poilly and Tripier, 2025) and geopolitical risk (e.g., Caldara and Iacoviello, 2022; Franconi, 2024). We instead focus on the first-order effects of import tariff shocks, but our results are robust to including trade policy uncertainty and geopolitical risk in the VAR.

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 tariff trade war launched by the Trump Administration in 2025, although Liberation Day likely conflates uncertainty and tariff news shocks. Further related are the complementary works by 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.

Finally, we relate to the literature concerned with the impact of systematic policies on the consequences of macroeconomic shocks. Using monetary policy shocks, Barnichon and Mesters (2023) focus on the optimality of policy, whereas McKay and Wolf (2023) and Caravello, McKay, and Wolf (2024) focus on the construction of counterfactuals. Such methods are used to construct counterfactual monetary responses to government spending shocks (Wolf, 2023) and counterfactual fiscal responses to monetary policy shocks (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 in conjunction with time variation in the hawkishness of the Federal Open Market Committee.

2 Data and econometric methodology

2.1 Tariff shocks

Tariff VAR model. We estimate a quarterly vector autoregression model (VAR) with a deterministic intercept and a linear time trend. The VAR includes four lags of the nine endogenous variables. Specifically, we use real GDP, CPI inflation, and the federal funds rate as measures of real activity, prices, and monetary policy, respectively. Beyond these core variables, we include real imports and real exports as well as a terms-of-trade index to capture international trade dynamics. Lastly, we include real investment, macroeconomic uncertainty from Jurado, Ludvigson, and Ng (2015), and an import tariff measure. All variables are in logs except for the federal funds rate, the CPI inflation rate, and the tariff rate measure. The sample period spans 1990Q1-2024Q4 and is determined by the availability of disaggregated tariff data. We also view it as favorable to use a comparatively recent sample to capture the typical propagation of tariffs in today's economy. Finally, we estimate the VAR using conventional Bayesian techniques by imposing inverse-Wishart priors on the reduced-form VAR parameters.[7]

Tariff measurement. We consider three distinct import tariff measures. First, we use the trade-weighted average import tariff rate, given by customs duties divided by dutiable imports. The advantage is that it captures not only statutory tariff rates but also weighs them by their aggregate importance. However, it has the disadvantage that its variation can be partly driven by changes in import composition and import prices, both across origin countries and product categories. Thus, as an alternative, we consider an unweighted average import tariff rate as a second measure.[8] Both of these tariff rates focus on the aggregate. Yet, tariffs can induce distortions and misallocation even if the (weighted or unweighted) average tariff rate remains unchanged. To address this, we use the tariff restrictiveness index originally proposed by Feenstra (1995) and expanded by Schmitt-Grohé and Uribe (2025) as a third tariff measure. This index has the advantage of capturing distortions due to cross-sectional variation in import tariff rates, but has the drawback of being a trade-weighted import tariff measure. Overall, every tariff measure has distinct advantages and disadvantages. This motivates the use of all three approaches to investigate whether we obtain consistent results across measures.

[7]All reported results are based on 20,000 draws from the posterior distribution.

[8]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 times 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.

Tariff shock identification. The tariff shock is identified based on two assumptions. First, we assume partial invertibility of the VAR so that we can recover the tariff shock (Forni, Gambetti, and Sala, 2019).[9] Given that our baseline VAR includes nine macroeconomic variables, we view this as a reasonable assumption. Moreover, Forni and Gambetti (2014) show that this assumption can be evaluated by testing whether lagged principal components estimated from a large macroeconomic and financial data set predict the tariff shock. Following their testing procedure, we find strong evidence that partial invertibility holds. We provide these complementary results in the Supplemental Appendix.

Second, we impose the timing restriction that a tariff shock affects all macroeconomic variables only with a one-period lag, except for the federal funds rate and the tariff measure. In turn, we allow other macroeconomic shocks to affect the tariff measure contemporaneously. This is important because variation in (trade-weighted) tariff measures 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. Importantly, we allow the federal funds rate to respond to tariff shocks contemporaneously, remaining agnostic about the monetary response to tariffs, which we eventually perturb in the counterfactual exercises.

The second identifying assumption could be restrictive. Thus, we carefully evaluate the imposed zero restrictions with four alternative identification approaches. First, we relax each zero restriction individually by allowing the tariff rate to affect the corresponding variable contemporaneously. Second, we employ a block-recursive identification along the lines of Christiano et al. (2005). That is, we relax the zero restrictions jointly on all "fast-moving" variables, which are the terms of trade, macroeconomic uncertainty, and the inflation rate. Third, we relax all zero restrictions jointly by identifying the tariff shock via the penalty function approach of Uhlig (2005). Specifically, we identify the tariff shock as the one that increases the tariff rate the most over the first four quarters after a shock. This is

[9] 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.

sufficient to achieve point identification, and no other restrictions are required. Fourth, we adopt a narrative identification strategy and identify quarters in which changes in tariffs are primarily due to policy changes.[10] Based on this, we compute a time series of quarter-on-quarter changes in the trade-weighted average tariff rate, which takes zero values in all quarters without narratively identified policy changes. We include this as an exogenous series in the VAR and trace out the associated responses.

2.2 Monetary policy counterfactuals

Counterfactual method. We construct monetary policy counterfactuals following McKay and Wolf (2023) (MW, henceforth). Their method relies on the core assumption of *instrument sufficiency*, i.e., private agents do not care about the monetary rule per se, but only about the movements in the policy instrument, which is the federal funds rate in our application. This assumption holds in a broad class of macroeconomic models, including conventional New Keynesian theory. With this assumption, MW prove that many monetary policy (news) shocks can be used to correctly identify impulse responses to a macroeconomic shock that would prevail under a counterfactual monetary policy rule. To conserve space, we omit a formal description of the method and refer interested readers to the original paper for details. Instead, we focus on the empirical implementation of the counterfactual method.

Counterfactual implementation. The aim is to compute counterfactual responses when the central bank tries to stabilize a given variable of interest i, e.g., inflation. To expound the computation of counterfactuals, we denote the impulse response of variable i to shock j by vector IRF_i^j. In anticipation of our empirical implementation, we assume that we have two distinct monetary shocks, s^1 and s^2, and the associated impulse responses at our disposal. Similarly, we assume to possess a baseline response to a tariff shock, IRF_i^τ. Given these inputs, the counterfactual is constructed by choosing the sizes of both monetary shocks that

[10] For example, these events cover the 2018 Trump trade war and the establishment of the WTO. The full list of events is provided in the Supplemental Appendix.

materialize simultaneously with the tariff shock. Formally, we solve

$$(\hat{s}^1, \hat{s}^2) = \underset{s^1, s^2}{\arg\min} \parallel IRF_i^{\tau} + s^1 IRF_i^{s^1} + s^2 IRF_i^{s^2} \parallel_{\omega}, \tag{1}$$

where $\| \cdot \|_{\omega}$ denotes a weighted Euclidean norm. Our baseline weights decay at a quadratic rate, placing more weight on the short-run responses in the above minimization.[11] Intuitively, we pick both monetary shocks, $\hat{s}^1$ and $\hat{s}^2$, so that variable i is as unresponsive as possible. Given these shocks, we can compute the implied counterfactual responses for any variable k as $IRF_k^{\tau} + \hat{s}^1 IRF_k^1 + \hat{s}^2 IRF_k^2$, provided that all three impulse responses are available. Our counterfactuals consider a monetary authority that aims to (i) not respond to the tariff shock with its policy rate, (ii) strictly stabilize inflation, or (iii) strictly stabilize output. These counterfactuals are implemented by solving (1), with variable i being (i) the federal funds rate, (ii) CPI inflation, and (iii) real GDP, respectively.

Monetary VAR model. We follow MW and estimate a separate monetary VAR model that uses the high-frequency identified monetary policy shock from Miranda-Agrippino and Ricco (2021) (MAR) and the Taylor rule residuals from Romer and Romer (2004) (RR) as two distinct shocks. For maximal consistency with the baseline tariff VAR, we use the same VAR variables, lag specification, and estimation method. Following the internal-instruments approach from MW, we further include both monetary shocks in the VAR vector. The MAR shock is ordered first, and the RR shock is ordered before the federal funds rate, but after all other variables, and identification is achieved via a lower-triangular Cholesky decomposition.[12] The estimation sample is 1969Q1-2014Q4 and determined by the availability of the

[11]This assumption is not restrictive. It only reflects our preference for the counterfactual being more accurate at shorter horizons. Effectively, one can solve the minimization problem by weighted least squares in impulse response space. The baseline sequence of weights is proportional to $(H+1)^2, (H)^2, (H-1)^2, .., (1)^2$, where H is the maximum response horizon that we report.

[12]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).

monetary policy shocks, which we take directly from MW.[13] Finally, to obtain valid inference for the counterfactual, we take the baseline response to the tariff shock as given and account for joint estimation uncertainty of both monetary shocks by solving the minimization in (1) for each posterior draw of the monetary VAR.

3 The macroeconomic effects of tariff shocks

3.1 Baseline estimates

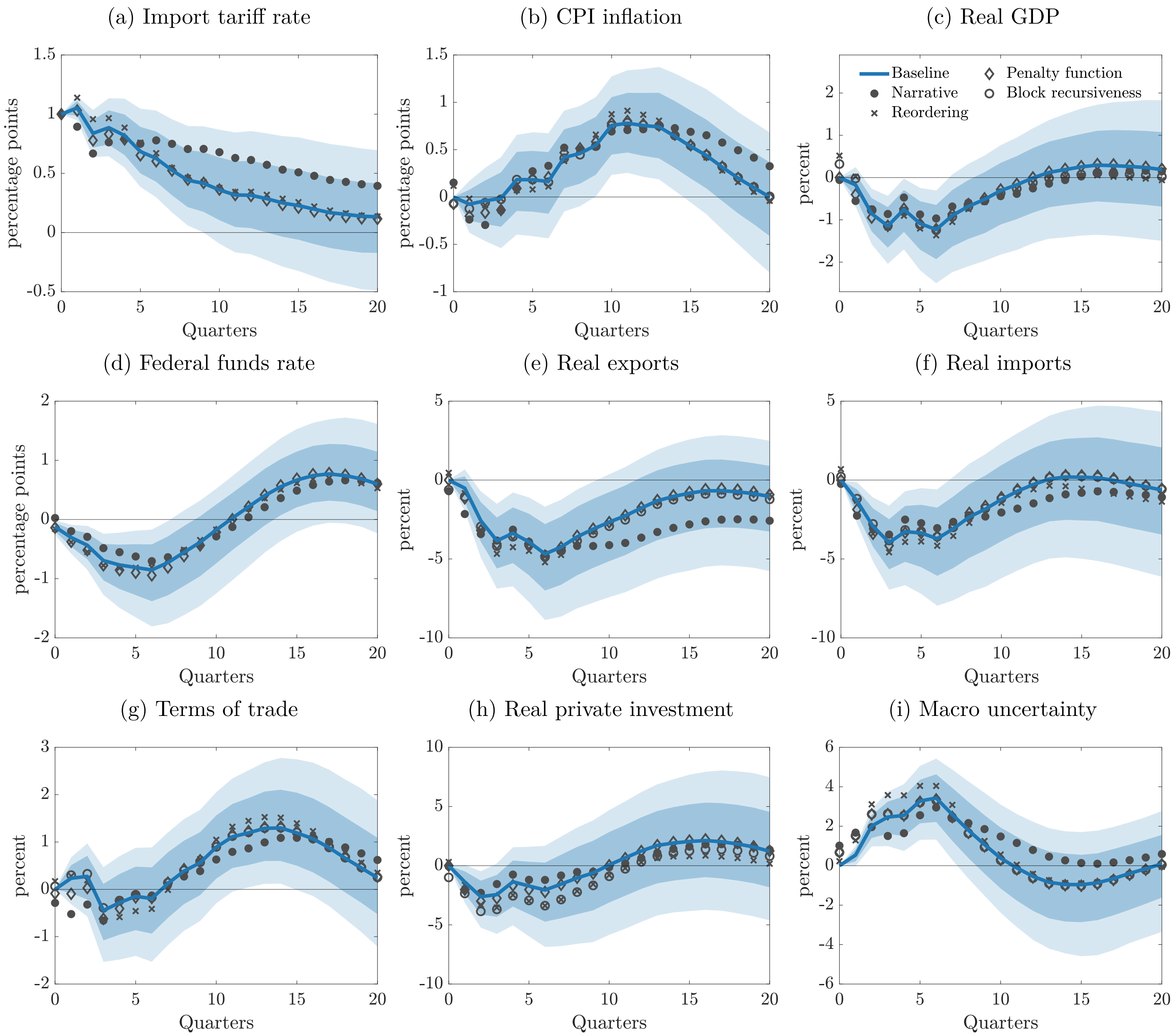
In Figure 1, we present impulse responses to a shock that raises the import tariff rate by 1 percentage point on impact. The baseline estimates use the trade-weighted average import tariff rate, and the medians of the posterior distribution are reported as blue solid lines. The shaded areas indicate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

Core outcomes. Panels (b)-(d) show the responses of CPI inflation, real GDP, and the federal funds rate. 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 only after 17 quarters. In contrast, real GDP declines more quickly. The trough is reached 6 quarters after the shock, with output being 1.23% lower. This decline is more transitory and vanishes after the second year, when even the 68% credible set overlaps the zero line. Lastly, we find partial monetary accommodation of the tariff shock. The federal funds rate responds negatively for two years. Quantitatively, at the trough, the federal funds rate is 0.85 percentage points lower after 6 quarters and starts to revert thereafter.

Additional outcomes. The responses of the remaining VAR variables are displayed in Panels (e)-(i) of Figure 1. These variables enable us to further understand the mechanism

[13]The MAR shock is available from 1980Q1-2014Q4, and the RR shock from 1969Q1-2007Q4. We set missing values within the estimation sample to zero. In the Supplemental Appendix, we provide additional results by changing the sample period and using alternative monetary policy shock measures.

Figure 1: Responses to the import tariff rate shock



Notes: This figure shows impulse responses estimated based on a Bayesian VAR, as specified in Section 2. The solid blue line represents the posterior median, and the shaded areas are 68% and 90% credible sets. The baseline estimates impose the identifying restriction that the shock affects only the import tariff rate and the federal funds rate contemporaneously. The gray markers show the posterior medians using alternative identification approaches that relax the baseline assumptions. Reordering: We relax each zero restriction individually by reordering the VAR vector. Block recursiveness: Along the lines of Christiano et al. (2005), we jointly relax the zero restrictions for all "fast moving" variables, which are macro uncertainty, terms of trade, and CPI inflation. Penalty function: Following Uhlig (2005), we identify the tariff shock by maximizing the impact on the tariff rate for the first four quarters after the shock and imposing no zero restrictions at all. Narrative: We compile a time series that captures changes in tariffs due to narratively identified tariff policy changes, include this series as additional exogenous variable to the VAR, and present responses to a shock to this series.

by which tariff shocks are transmitted. Focusing on trade, we find declining real exports and imports, and a more delayed increase in the terms of trade. Macroeconomic uncertainty increases and real investment declines transitorily, consistent with real-option theory.

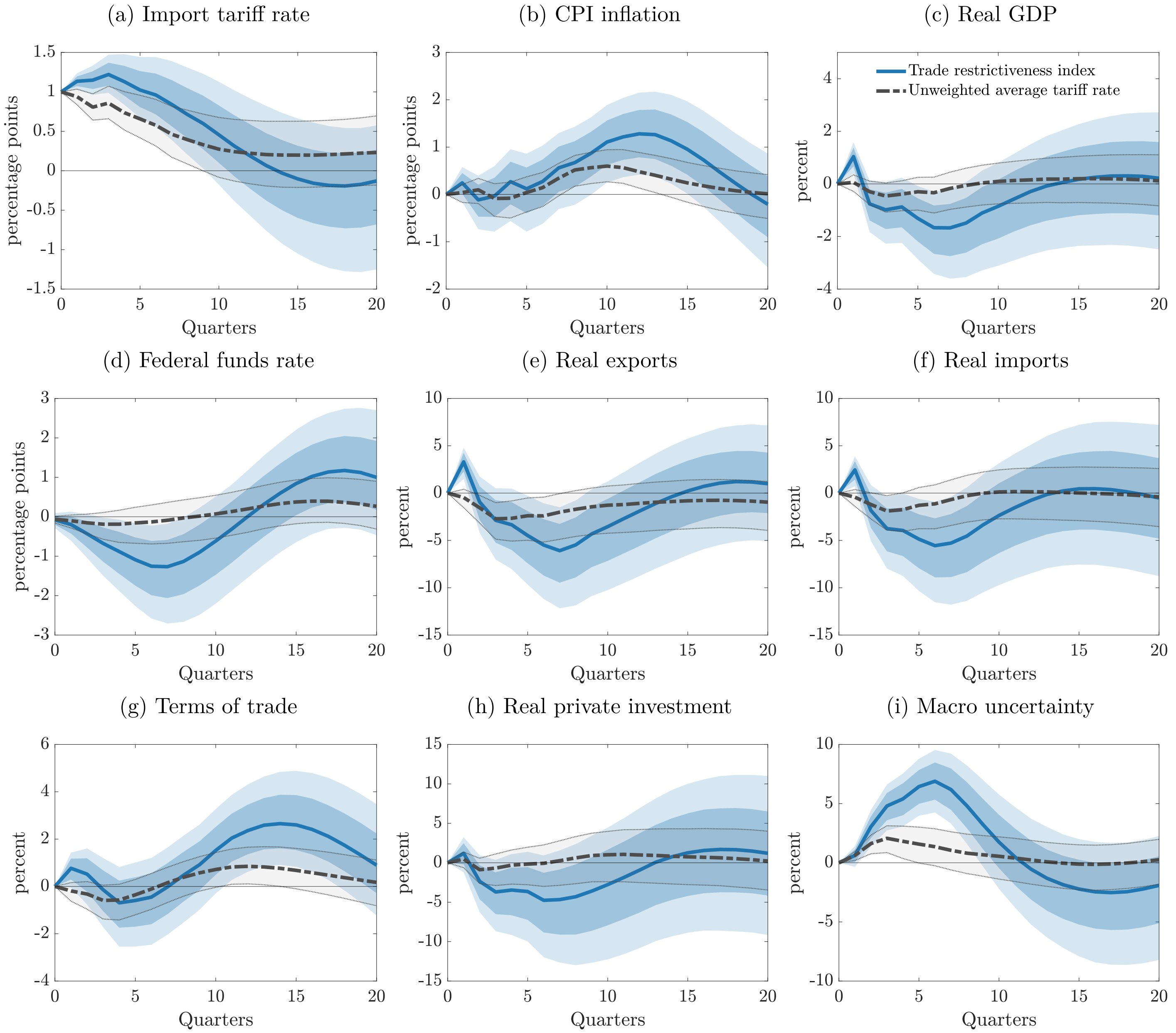
Discussion. The responses align well with the theoretical literature. First, we confirm that tariff shocks are contractionary, in line with, e.g., Auclert et al. (2025).[14] Second, tariffs are inflationary and, as a result, act as supply shocks, consistent with Werning et al. (2025). Third, we find that monetary policy partially accommodates the contractionary tariff shock to cushion its effect 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).

Relaxing identifying assumptions. Next, we carefully evaluate the bite of our identifying assumptions by considering four alternative identification approaches, as explained in Section 2.1. We show the corresponding median posteriors as gray markers in Figure 1. We suppress the posterior credible sets because they are very similar to the baseline, but provide them in the Supplemental Appendix. Across all alternative approaches, we find that our results are close to the baseline. Importantly, the unrestricted impact effects are remarkably close to zero, even without imposing a short-run zero restriction. Additionally, we emphasize that even the narrative approach delivers similar effects, suggesting that our estimates are unlikely to be confounded by changes in import prices or composition due to other macroeconomic shocks. In summary, this confirms that our baseline identification approach is not unduly restrictive.

Alternative tariff measures. In Figure 2, we provide the responses when using two alternative tariff measures, as introduced in Section 2.1. We normalize both tariff series to have the same variance as the trade-weighted average tariff rate to make them as comparable as possible. The estimates are broadly similar to the baseline. The trade restrictiveness index delivers slightly larger magnitudes, plausibly because it also captures distortions due to

[14] 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 to the import tariff shock using alternative tariff measures



Notes: This figure shows impulse responses estimated based on a Bayesian VAR, as specified in Section 2. The solid blue line represents the posterior median using the trade restrictiveness index from Schmitt-Grohé and Uribe (2025), and the shaded areas are 68% and 90% credible sets. The dashed-dotted gray line represents the posterior median using an unweighted average import tariff rate, and the thin dotted lines indicate the 90% credible sets. Identification is achieved via our baseline approach.

cross-sectional tariff variation. In contrast, the unweighted tariff rate yields smaller effects, suggesting that weighting tariffs by aggregate importance is important. Nevertheless, we view it as reassuring that these results confirm that tariff shocks are inflationary, recessionary, and, if anything, partly accommodated by monetary policy.

Further sensitivity analysis. We further investigate the sensitivity of our results to various modeling choices and present this complementary analysis in the Supplemental Appendix. We relax VAR assumptions by adjusting the lag order or by estimating local projections, as recommended by Montiel Olea, Plagborg-Møller, Qian, and Wolf (2025). We account for the Covid-19 pandemic in our sample by dummying out the pandemic period, as recommended by Lenza and Primiceri (2022). Lastly, we include higher-order deterministic time trends to account for slow-moving trends in international trade. None of these extensions changes our conclusions. Moreover, in the next subsection, we augment the VAR with various additional variables to further study the propagation of tariff shocks. When doing so, we find that the responses of the baseline variables remain similar, suggesting that our results are not driven by the omission of important variables from the VAR.

3.2 A further look at the propagation of tariff shocks

In Figure 3, we present the responses of various additional variables to the baseline tariff shock to further understand the propagation mechanisms.[15]

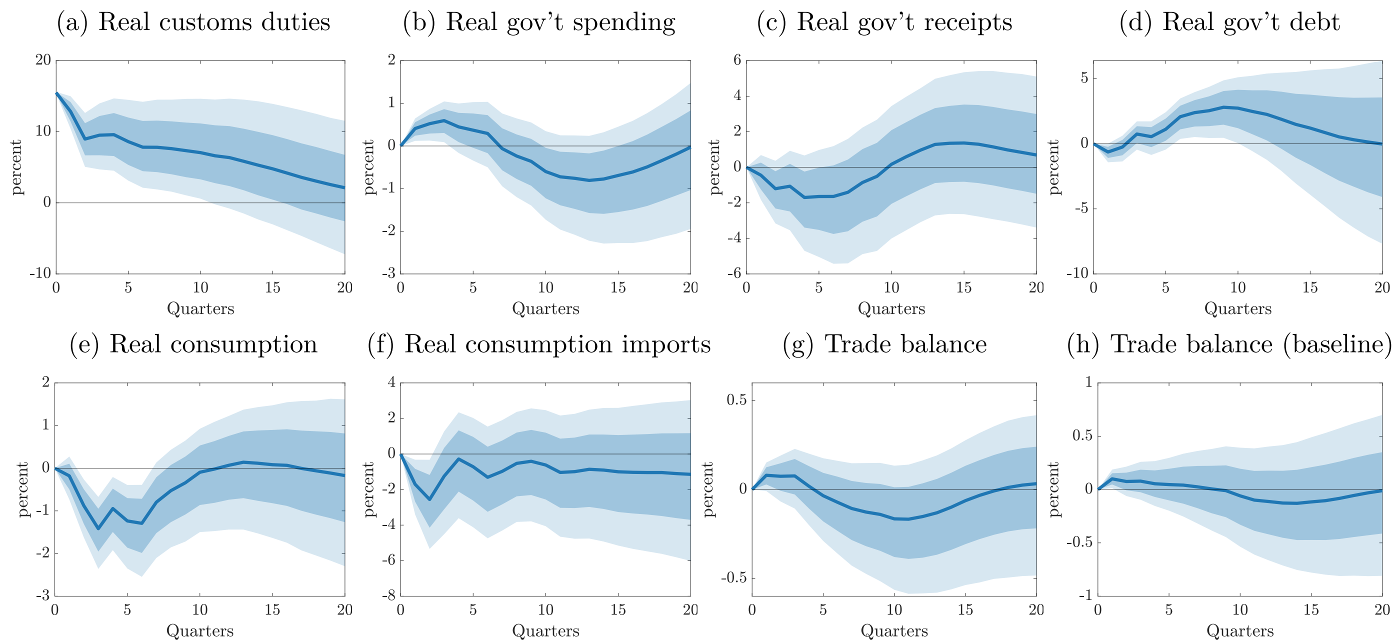
Fiscal implications. Motivated by Alessandria et al. (2025), we focus on the implications for the government budget constraint. In the first row of Panel A, we show that tariff shocks generate revenues via customs duties and induce a corresponding transitory increase in government spending, consistent with the narratives of some tariff proponents. However, government receipts tend to decline due to the contractionary impact. Overall, we find that tariffs have a negative effect on the government budget, and real federal debt increases.

Consumption. Since the main mechanism in Auclert et al. (2025) operates via consumption, we study the effects on private consumption and on imports of consumption goods and report the responses in Panel A. The former confirms that the contractionary effects are

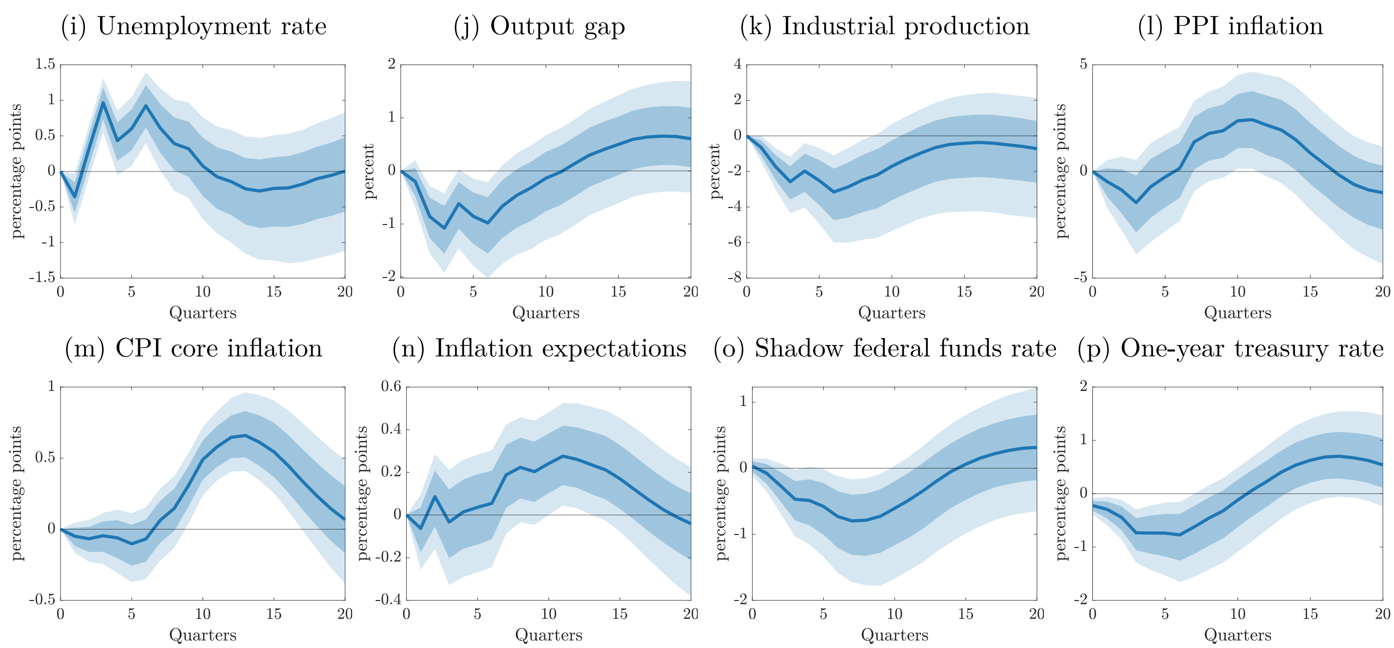
[15]We impose a zero impact effect on all additional variables in Panel A, except for customs duties.

Figure 3: Responses of further macroeconomic variables to the import tariff shock

Panel A: Additional variables



Panel B: Alternative core variables



Notes: This figure shows impulse responses estimated based on a Bayesian VAR, as specified in Section 2. The solid blue line represents the posterior median, and the shaded areas are 68% and 90% credible sets. Identification is achieved via our baseline approach. In Panel A, (a)-(f), we augment the baseline VAR by each variable individually and re-estimate the model. In Panel (g), we include the trade balance relative to GDP instead of real imports and exports in the VAR. In Panel (h), we use our baseline VAR and compute the implied trade balance response, as described in the text. In Panel B, we replace individual variables from the baseline VAR by alternative measures. We replace real GDP by alternative measures of real activity in Panels (i) to (k). We replace CPI inflation by other price measures in Panels (l) to (n). We replace the federal funds rate by alternative interest rates in Panels (o) to (p).

partly driven by consumption, while the latter shows that imports of consumption goods decline only very transitorily.

Trade balance. Tariffs are often justified with protectionist arguments claiming they shield domestic producers from foreign competition, which would suggest an improvement in the trade balance. To investigate this effect, we include exports minus imports, divided by GDP, instead of real imports and exports in the VAR; see Panel (g). Alternatively, we use our baseline estimates and compute the implied trade balance effects, presented in Panel (h).[16] If anything, we find that the trade balance improves only transitorily, indicating there is, at best, limited evidence for the above protectionist argument.

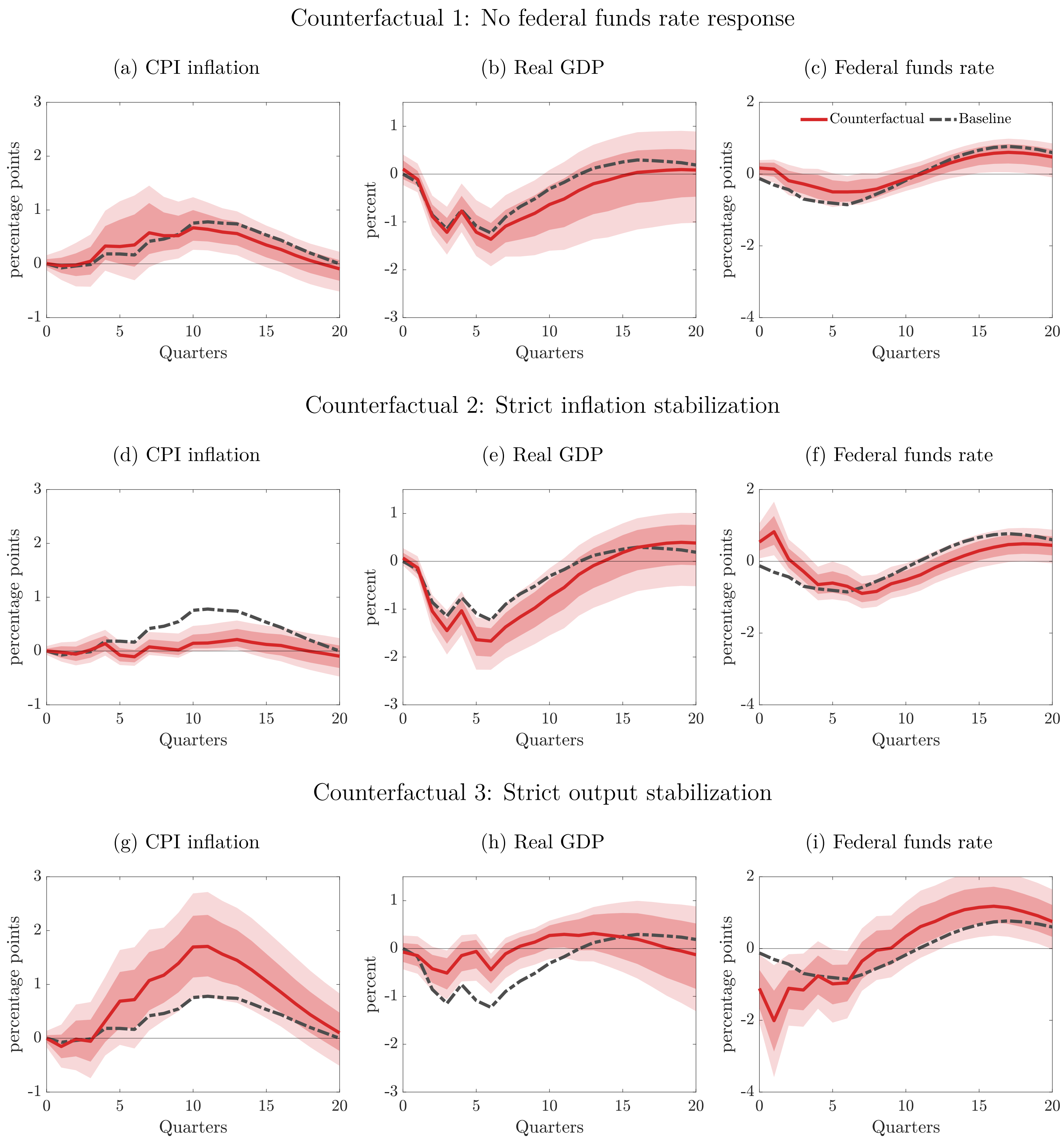
Alternative core variables. In Panel B of Figure 3, we consider alternative measures of real activity, prices, and interest rates. Throughout, we replace each baseline variable in the VAR with the corresponding alternative measure. All measures of real activity – unemployment rate, output gap, and industrial production – indicate that a tariff hike is recessionary. Similarly, all price measures – PPI inflation, CPI core inflation, and one-year inflation expectations from the Michigan survey – indicate that tariffs are inflationary. Finally, we consider alternative interest rates that account for the zero lower bound in our sample. Both the one-year Treasury yield and the shadow federal funds rate from Wu and Xia (2016) confirm partial monetary accommodation of tariff shocks.

4 The monetary policy response to tariff shocks

We construct three distinct monetary policy counterfactuals using the methodology from McKay and Wolf (2023), as outlined in Section 2.2. The counterfactuals use the baseline responses to the tariff shock shown in Figure 1.

[16] 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 to obtain the trade balance.

Figure 4: 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 2. 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 1. For comparison, we keep the vertical axis for each variable across counterfactuals fixed.

We focus our discussion on the counterfactual responses of the core variables, which we present in Figure 4. The displayed 68% and 90% credibility sets account for the joint estimation uncertainty of both monetary shocks. For comparison, we also show the baseline responses to the tariff shock as a gray dashed line. Finally, we also discuss the remaining variables and the sensitivity of the results.

No interest rate response. The baseline responses from Section 3 suggest that U.S. monetary policy partly accommodates tariff shocks by reducing interest rates. Such an easing is consistent with a Taylor rule that puts relatively more weight on stabilizing real activity. However, a natural benchmark is a scenario in which nominal interest rates do not respond to a temporary tariff shock, as considered by Auclert et al. (2025). Therefore, we construct a corresponding counterfactual in which the federal funds rate responds as little as possible to the tariff shock. The counterfactual is in the first row of Figure 4. Panel (c) shows that the federal funds rate is considerably less responsive than in the baseline.[17] 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 pays off via a 14% lower peak inflation effect (0.11 percentage points lower) and a less persistent inflation response. Thus, we confirm that the inflationary impact of tariffs is partly driven by the 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. To this end, we consider a counterfactual in which CPI inflation responds as little as possible and show the results in the second row of Figure 4. This policy requires a short-lived interest rate hike that peaks at 0.82 percentage points only 1 quarter

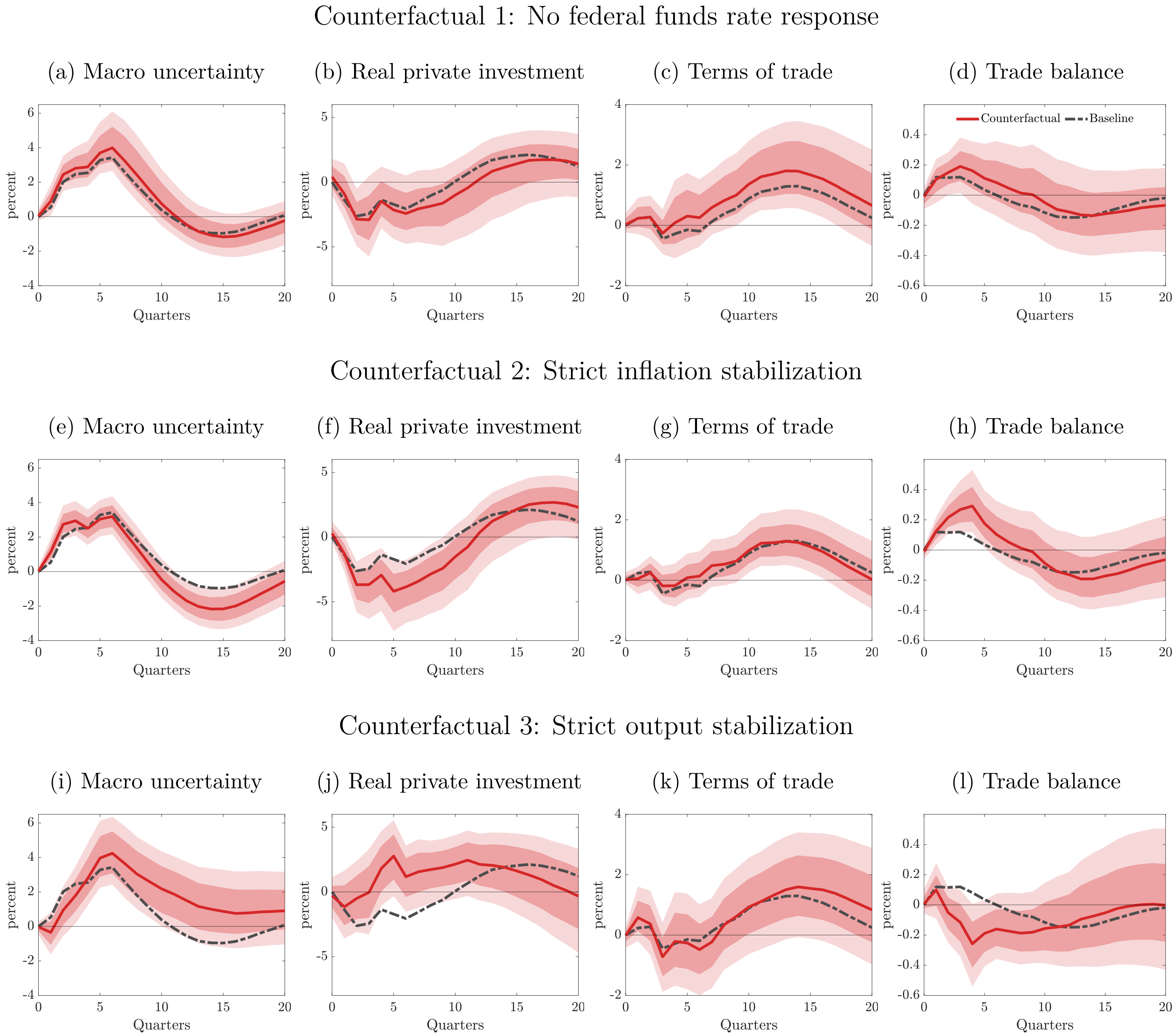
[17] A perfectly unresponsive federal funds rate would require not only two but infinitely many distinct monetary shocks. Alternatively, one would require more structural assumptions to extrapolate from the existing empirical evidence (Caravello et al., 2024). We refrain from doing so to keep the structural assumptions to a minimum.

after the shock. Then, the policy rate falls quickly, reaching the baseline response after 7 quarters and undershooting thereafter. Such a sharp and short-lived rate hike is sufficient to tame inflation, with peak inflation being reduced from 0.78 to only 0.21 percentage points. However, this policy amplifies the recessionary impact of the shock considerably. The counterfactual real GDP trough is 0.44 percentage points lower than the baseline. In comparison, 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 output effects.

Strict output stabilization. As the last counterfactual, we estimate the alternative policy scenario in which monetary policy aims to fully stabilize real activity while ignoring inflation. This counterfactual is given in the third row of Figure 4 and 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. Specifically, the peak inflation effect almost 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, which is strongly dampened. However, the interest rate cut is not large enough to fully undo the adverse GDP effects. Thus, even stronger monetary easing may be necessary to achieve full output stabilization. This suggests that the increase in inflation is likely a lower bound for the strict output stabilization counterfactual.

Additional counterfactual outcomes. We present counterfactual responses of the additional outcome variables in Figure 5. The results suggest that real investment is an important channel through which counterfactual interest rate responses are transmitted. Instead, macro uncertainty is less affected by the different monetary responses over the first part of the response horizon. Further, we find that output stabilization reverses the effects on the trade balance, whereas inflation stabilization amplifies the trade balance improvement.
This pattern is consistent with the dominant currency paradigm (Gopinath, Boz, Casas, Díez,

Figure 5: 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 2. 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 1. For comparison, we keep the vertical axis for each variable across counterfactuals fixed.

Gourinchas, and Plagborg-Møller, 2020), in which muted expenditure-switching effects imply that monetary policy primarily influences the trade balance through its impact on domestic demand. This illustrates that there is a tradeoff between avoiding the recessionary impact of tariffs and improving the trade balance. Finally, we detect no meaningful differences in the terms of trade.

The role of monetary policy shocks. Following McKay and Wolf (2023), there are only two reasons why one may disagree with our estimated counterfactuals. The first reason is that the class of models for which their counterfactual method is valid may be too small. While this is a legitimate concern, we view the class of models as sufficiently broad since they include conventional New Keynesian theory. The second reason for disagreement pertains to the impulse responses to monetary policy shocks that are used to construct the counterfactuals. Therefore, we provide a complementary analysis of these responses in the Supplemental Appendix. We show the responses to both monetary shocks, which conform well with economic theory. We also construct counterfactuals using only one of the two monetary policy shocks. Regardless of which shock we pick, we can only partly achieve our baseline counterfactuals. This suggests that both shocks contribute meaningfully to the counterfactuals. Beyond this, we also vary the sample period and use a shock identified via a heteroskedasticity-based approach (Jarociński, 2024) and an augmented Romer and Romer (2004) regression that accounts for time variation in systematic monetary policy (Hack, Istrefi, and Meier, 2024).

5 Conclusion

We show that tariff increases act as adverse supply shocks, which monetary policy partially accommodates by lowering interest rates. This insight aligns well with economic theory and is robust to several tariff measurement and identification approaches. Our monetary policy counterfactuals further demonstrate that the systematic response of monetary policy crucially shapes the macroeconomic effects of tariff shocks. While this finding is expected, we view the quantification of these scenarios without imposing a fully-specified structural model as a key contribution.

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, National Bureau of Economic Research.

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, National Bureau of Economic Research.

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.

Barnichon, R. and A. Singh (2025): "What Is a Tariff Shock? Insights from 150 years of Tariff Policy," Working Paper 2025-26, Federal Reserve Bank of San Francisco.

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

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

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, National Bureau of Economic Research.

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, National Bureau of Economic Research.

Cavallo, A., P. Llamas, and F. Vazquez (2025): "Tracking the Short-Run Price Impact of US Tariffs," *Mimeo*.

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, National Bureau of Economic Research.

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

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.

Furceri, D., S. A. Hannan, J. D. Ostry, and A. K. Rose (2018): "Macroeconomic Consequences of Tariffs," Working Paper 25402, National Bureau of Economic Research.

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, National Bureau of Economic Research.

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.

Kalemi-Özcan, S., C. Soylu, and M. A. Yildirim (2025): "Global Networks, Monetary Policy and Trade," Working Paper 33686, National Bureau of Economic Research.

Kocherlakota, N. R. (2025): "Optimal Tariffs When Labor Income Taxes Are Distortionary," Working Paper 33759, National Bureau of Economic Research.

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

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, National Bureau of Economic Research.

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, National Bureau of Economic Research.

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, National Bureau of Economic Research.

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, National Bureau of Economic Research.

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, National Bureau of Economic Research.