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Keywords

economic policy uncertainty, export dynamics, local projections, United States

JEL Classification

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When Policy Uncertainty Crosses Borders: Evidence from U.S. Export Dynamics

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Abstract

This paper examines how economic policy uncertainty shapes U.S. export dynamics, focusing on energy, food, and industrial exports. Using monthly U.S. data from 1995 to 2025, we first identify structural uncertainty shocks through structural vector autoregressions, then trace their effects using conventional and time-varying parameter local projections models, controlling for trade policy uncertainty, supply chain pressures, and macro-financial factors. Economic, monetary, and fiscal policy uncertainty all reduce exports, but monetary policy uncertainty leads to the deepest and most persistent contractions, while fiscal policy uncertainty has milder effects. Energy, food, and industrial exports display distinct, strongly state-dependent patterns, with responses amplified during the Global Financial Crisis and the Covid-19 pandemic. By jointly analyzing multiple uncertainty dimensions, export aggregates, and time variation in transmission, the paper reveals significant sectoral and regime dependence, offering actionable insights for policymakers, exporting firms, investors, and scholars of open-economy macroeconomics.

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1. Introduction

Uncertainty refers to situations in which future outcomes are unknown and cannot be assigned reliable probabilities. Its analytical foundations are based on Knight's distinction between measurable risk and true uncertainty, and Keynes's emphasis on fragile expectations in investment and macroeconomic instability (Keynes, 1921; Knight, 1921). As economic structures, policy regimes, technologies, and global interdependencies evolve, the sources and forms of uncertainty also change. Understanding uncertainty is important because it shapes expectations, influences decision-making, and affects economic stability and performance, with broader social, political, and environmental implications.

A large body of literature shows that uncertainty has broad macroeconomic and firm-level effects. By increasing the option value of waiting and weakening aggregate demand, credit creation, and risk-taking, uncertainty reduces output, investment, and hiring (Bernanke, 1983; Bloom, 2009; Jurado et al., 2015; Baker et al., 2016). It also provides predictive information for real activity and interacts with institutional and policy settings in shaping business cycle dynamics (Yıldırım-Karaman, 2017; Junttila and Vataja, 2018). At the micro level, uncertainty affects corporate investment, capital structure, firm value, and the labor income share (Zhang et al., 2015; Zhu et al., 2020; Azimli, 2022; Liu and Si, 2025).

Evidence from international trade points in the same direction. Uncertainty discourages export participation, reduces trade growth, and lowers welfare by weakening firms' incentives to enter or expand into foreign markets. In models and empirical studies with sunk export-entry costs, uncertainty acts like a tax on internationalization by increasing the value of postponement (Handley and Limão, 2015, 2017). Trade-policy uncertainty also affects import and export adjustment at both the extensive and intensive margins (Imbruno, 2019; Carballo et al., 2022), while cross-country evidence shows that uncertainty in destination markets is systematically associated with weaker export performance (Jia et al., 2020). Agricultural exports appear particularly vulnerable because of their exposure to logistics constraints, trade agreements, and commodity market conditions (Gignarta et al., 2024). Firm-level evidence further suggests that perceived uncertainty impairs export performance through channels operating within the firm, not only through macroeconomic or bilateral policy conditions (Zhao et al., 2026).

Despite growing evidence, the effects of different forms of uncertainty on total and sectoral exports remain underexplored. Much of the uncertainty literature focuses on domestic macroeconomic aggregates or firm outcomes, treating exports as secondary. The relevant literature mainly addresses trade policy uncertainty, even though exporters operate in a broader policy environment where monetary and fiscal uncertainty may be equally important. Sectoral differentiation is also limited. Food, energy, and industrial exports are rarely analyzed together, despite their distinct exposure to policy, prices, inventories, and external demand. Existing evidence is further constrained by time-invariant empirical approaches, which are restrictive during major regime shifts such as the Global Financial Crisis, the pandemic, and the post-2021 inflation-tightening cycle.

In light of these gaps, this paper addresses three important questions. Specifically, for the United States, we examine (1) how economic policy uncertainty, monetary policy uncertainty, and fiscal policy uncertainty affect exports; (2) whether these effects differ across total, food, energy, and industrial exports; and (3) whether these responses are stable over time or vary across macroeconomic regimes. Addressing these questions moves the analysis beyond the broad claim that uncertainty harms trade and identifies which form of uncertainty matters most, for which export category, and over what horizon.

To address these questions, we employ a three-step empirical strategy. First, we extract structural uncertainty shocks from a structural vector autoregression, isolating exogenous innovations rather than relying on raw uncertainty movements. Second, we estimate conventional local projections following Jordà (2005) to trace the responses of total and sectoral exports. Third, we use time-varying-parameter local projections following Inoue et al. (2024), which allow the transmission of uncertainty shocks to evolve smoothly over time. This framework combines structural identification, the flexibility of local projections, and the realism of time variation. It is therefore well suited to a long monthly U.S. sample spanning January 1995 to June 2025 and covering multiple episodes of macroeconomic and policy instability.

Our key findings are as follows. First, policy uncertainty is a significant source of external-sector weakness in the United States. Increases in policy uncertainty reduce exports and cause contractionary responses across the main export categories. Second, these effects are heterogeneous. Energy exports are the most episodic and state-contingent, reflecting their sensitivity to regulatory changes, geopolitical risk, and commodity price fluctuations. Third, the type of uncertainty matters. Monetary policy uncertainty is the most disruptive source of export weakness.

The United States is a particularly salient case for this analysis. In 2025, it ranked as the world's second-largest merchandise exporter, behind the European Union when treated as a bloc, with merchandise exports of $2.185 trillion, while remaining the largest commercial services exporter, with exports of $1.209 trillion (World Trade Organization, 2026). Its export base is also exceptionally broad. The U.S. Census Bureau reports 270,001 identified U.S. exporters in 2024, while manufacturing firms alone accounted for roughly $954 billion in known goods exports. U.S. agricultural exports reached $176 billion, and the United States exported about 30% of its domestic primary energy production in 2024 (U.S. Department of Agriculture, Economic Research Service, 2025; U.S. Energy Information Administration, 2025). These figures make the United States not merely a convenient case, but an analytically powerful setting for examining whether uncertainty shocks propagate differently across aggregate, food, energy, and industrial exports. Moreover, cross-country evidence indicates that U.S. uncertainty shocks spill over strongly into foreign real and financial markets, reinforcing the broader relevance of uncertainty originating in the United States (Gomez-Gonzalez et al., 2024).

We envisage a three-fold contribution. First, we employ a unified empirical framework to analyze total, food, energy, and industrial exports in relation to three conceptually distinct uncertainty shocks. Second, we connect macroeconomic and trade approaches by linking structurally identified shocks to horizon-specific export responses, enabling the analysis to capture dynamic adjustment rather than static correlations. Third, we extend the literature by allowing these responses to vary over time, which is essential if export sensitivity to policy uncertainty differs between normal periods and extraordinary periods such as the Global Financial Crisis, the Covid-19 pandemic, or the recent inflation regime shift.

The remainder of the paper is organized as follows. Section 2 describes the data set. Section 3 outlines the empirical strategy. Section 4 presents the empirical findings, followed by concluding remarks in Section 5.

2. The Data

The dataset covers the period from January 1995 to June 2025. The monthly frequency offers a clearer view of the impact of policy uncertainty on trade indicators. The time period is determined by data availability.

Consistent, seasonally adjusted real export indices for the United States are not available before January 1995.

The dependent variables, compiled from Bloomberg, are total exports of goods and services, energy exports, food exports, and industrial exports. Sectoral disaggregation is central to the analysis because total exports may conceal substantial heterogeneity in the transmission of uncertainty. Energy exports are closely linked to commodity price cycles, geopolitical tensions, storage dynamics, and regulatory conditions. Food exports are more exposed to seasonality, sanitary and phytosanitary requirements, transport frictions, and shifts in global food demand. Industrial exports, by contrast, are more closely connected to manufacturing cycles, imported intermediates, global value chains, inventory adjustment, and the sensitivity of durable goods trade to expected demand and financing conditions. All series are seasonally adjusted real indices and are transformed into natural logarithms, so estimated responses can be interpreted approximately as percentage changes. The log transformation also reduces scale differences across export categories and improves comparability across sectors.

For shock variables, we use three uncertainty series. To measure policy-related uncertainty, the baseline specification uses the U.S. Economic Policy Uncertainty (EPU) index developed by Baker et al. (2016). This widely used, newspaper-based measure proxies changes in the policy environment relevant to households, firms, and financial markets. It is constructed from the frequency of articles in major U.S. newspapers that jointly contain terms related to the economy, public policy, and uncertainty. The text-search procedure captures references to the economy, uncertainty, and policy institutions or actions, including Congress, legislation, regulation, the Federal Reserve, the White House, taxation, deficits, and public spending. The resulting series reflects periods when economic agents face heightened ambiguity about the direction, timing, or consistency of policy decisions. This is particularly relevant for exports because policy uncertainty may affect exchange rate expectations, financing conditions, investment planning, trade credit, and firms' willingness to enter or expand into foreign markets.

To move beyond an aggregate notion of uncertainty, the analysis also includes monetary policy uncertainty (MPU) and fiscal policy uncertainty (FPU), constructed analogously to the EPU index following Baker et al. (2016). MPU captures uncertainty surrounding central bank actions and the future path of monetary conditions. This dimension matters for exports because uncertainty about policy rates, liquidity conditions, and Federal Reserve communication may influence exchange rates, borrowing costs, external competitiveness, and intertemporal production decisions. In contrast, FPU reflects ambiguity regarding taxation, government spending, budget negotiations, deficits, and public debt. It may shape domestic demand, sovereign risk perceptions, public procurement, and the broader business environment in which exporters operate. Distinguishing among EPU, MPU, and FPU allows the analysis to assess whether export dynamics respond differently to uncertainty arising from monetary policy, fiscal policy, or the broader policy environment (Husted et al., 2020; Hong et al., 2024).

The specification includes three layers of controls to isolate the effect of policy uncertainty from other determinants of export performance. First, it includes the shortage index (SI) proposed by Caldara et al. (2025), which captures supply-side disruptions and bottlenecks in industry, labor, food, and energy markets. This control is important because weaker exports may reflect not only uncertainty-induced retrenchment but also physical constraints on production, transportation, and delivery. Second, the model controls for trade policy uncertainty (TPU) using the measure developed by Caldara et al. (2020). Because exporters are directly exposed to uncertainty regarding tariffs, trade barriers, negotiations, customs procedures, and market access, omitting TPU would risk attributing trade-specific disturbances to broader economic policy uncertainty. Third, the specification includes eight latent macro-financial factors, denoted F1–F8, following Ludvigson and Ng (2009). These factors summarize common movements in a large set of macroeconomic and financial variables, including real activity, inflation, interest rates, credit conditions, and asset prices. Compared to a long list of observed controls, the factor approach is more parsimonious and helps limit multicollinearity and overparameterization.

Table 1 presents the descriptive statistics. Total exports (EX) and industrial exports (EXI) display moderate dispersion, indicating they move with the business cycle but are less volatile than commodity-sensitive categories. Energy exports (EXE) are the most volatile export category, reflecting their exposure to commodity price fluctuations, geopolitical events, and changes in global energy demand and regulation. Food exports (EXF) are comparatively more stable, though this does not imply immunity from policy shocks, given the sensitivity of agricultural and food trade to logistics, sanitary restrictions, and trade policy developments. Among the uncertainty measures, EPU, MPU, FPU, TPU, and SI exhibit substantial variation, with TPU showing particularly sharp spikes, consistent with episodic trade policy events. As expected, the macro-financial factors are centered near zero, while the greater dispersion of the first factors indicates they capture the dominant common variation in the underlying macroeconomic dataset. The descriptive statistics indicate sufficient variation for identification and also point to structural change, nonlinear adjustment, and unusually large disturbances. This characteristic of the data further supports supplementing conventional local projections with a time-varying framework in the subsequent analysis.

Variable	Mean	Std. Dev.	Min	Max
EX	4.572	0.314	3.783	5.053
EXE	1.541	0.804	0.360	2.833
EXF	2.161	0.187	1.744	2.593
EXI	3.354	0.343	2.657	4.037
EPU	4.550	0.465	3.618	6.286
MPU	4.358	0.625	2.808	6.115
FPU	4.518	0.600	3.138	6.535
SI	4.172	0.584	3.399	6.317
TPU	3.714	0.652	2.425	7.049
F1	0.053	0.354	-1.431	2.125
F2	0.036	0.317	-1.407	1.389
F3	0.068	0.239	-0.758	1.227
F4	0.045	0.196	-0.454	0.697
F5	-0.040	0.192	-0.911	1.184
F6	-0.029	0.199	-0.551	0.586
F7	0.007	0.185	-1.281	0.465
F8	0.031	0.148	-0.850	0.488

Table 1: Descriptive statistics.

3. Empirical Strategy

This paper employs a three-step empirical strategy to identify policy-uncertainty shocks, trace their dynamic effects on exports, and allow these effects to vary over time. The uncertainty measures, including economic policy uncertainty, monetary policy uncertainty, and fiscal policy uncertainty, are observed indices rather than structural innovations and may therefore move contemporaneously with broader macroeconomic, financial, and trade-related disturbances. The transmission of uncertainty to exports is also unlikely to remain stable over the sample period from January 1995 to June 2025, which includes the late-1990s expansion, the Global Financial Crisis, the shale energy transformation, the Covid-19 shock, and the post-2021 inflationary tightening cycle. To address these issues, the empirical strategy separates shock identification from shock propagation. First, structural innovations in policy uncertainty are recovered from a parsimonious structural vector autoregression. Second, these identified shocks are used in local projections to estimate the horizon-specific responses of aggregate, energy, food, and industrial exports. Third, the fixed-parameter local projection framework is extended to a time-varying setting, allowing export responses to uncertainty to evolve smoothly with the macro-financial environment.

3.1. Structural VAR Model and Identification of Structural Shocks

The first step of the empirical strategy is to recover structural innovations in policy uncertainty that are orthogonal to other macroeconomic disturbances. To this end, we estimate a set of structural vector autoregressions (SVARs) following Sims (1980) and the subsequent structural VAR literature. For each uncertainty dimension $u \in EPU, MPU, FPU$, we consider a standard VAR of the form:

$$z_t = c + \sum_{i=1}^{p} A_i z_{t-i} + u_t \tag{1}$$

where z_t is the vector of endogenous variables, including the logarithm of the export indices, relevant uncertainty indices and key real-side indicators, and a subset of macro-financial factors. A_i are coefficient matrices, c is a vector of intercepts, and u_t is the vector of reduced-form residuals. The structural representation is as follows.

$$u_t = B\varepsilon_t \tag{2}$$

where B maps structural shocks ε_t into reduced-form disturbances. We use a recursive identification scheme in which the policy uncertainty variable is ordered first, implying that uncertainty can contemporaneously affect other variables in z_t, while the reverse feedback operates only with a lag. This assumption is consistent with the idea that policy announcements, central bank communication, legislative disputes, and news coverage can shift perceived uncertainty almost immediately, whereas export quantities typically adjust more gradually because production, shipment scheduling, customs clearance, invoicing, and delivery involve timing frictions. This identification strategy therefore follows a conventional and economically interpretable timing restriction in applied macroeconomics.[1]

For each specification, the structural uncertainty shock ε_t^u is obtained as the appropriately scaled first element of ε_t. These shocks are normalized to have unit variance and are then used as identified exogenous impulses in the local projection stage. The SVARs are estimated by ordinary least squares equation-by-equation; the identification and interpretation of structural shocks follow the guidelines in Kilian and Lütkepohl (2017).

3.2. Local Projections Model

The second step uses the extracted structural shocks to analyze their dynamic impact on U.S. exports. Instead of relying on the VAR's internal impulse responses, we use the local projections (LP) approach of Jordà (2005), which estimates horizon-specific regressions for each variable of interest. This strategy is robust to model misspecification, easily accommodates additional controls, and facilitates extension to time-varying coefficients.

For each horizon $h = 0, 1, ..., H$, we estimate equations of the following form.

$$y_{t+h} = \alpha_h + \Phi_h(L)y_t + \theta_h\varepsilon_t^u + \gamma_h^{'}x_t + \eta_{t+h} \tag{3}$$

where y_t is the vector of current export variables: total exports, energy exports, food exports, and industrial exports; ε_t^u is the structural uncertainty shock (EPU, MPU, or FPU); and x_t includes the control variables: the shortage index, trade policy uncertainty, and the eight macro-financial factors with their lags. The lag polynomial $\Phi_h(L)$ includes lags of exports to capture intrinsic dynamics, and H is set to 24 months to trace effects up to two years after the shock.

The coefficient θ_h represents the impulse response of the export variable y_t at horizon h to a normalized uncertainty shock. For each horizon and export series, we estimate the regression using ordinary least squares and report impulse responses with standard errors that are robust to heteroskedasticity

[1] For the sake of clarity, we do not provide robustness checks based on different specifications. However, they can be provided by the authors upon request.

and autocorrelation. As is standard in the local projection literature, we use a uniform lag structure across horizons to avoid overfitting and maintain comparability across specifications.

The baseline analysis examines aggregate EPU shocks, while additional sets of LPs are estimated using MPU and FPU shocks. This approach allows comparison within a unified framework of how different dimensions of policy uncertainty affect total, energy, food, and industrial exports after controlling for common macro-financial and supply-side influences.

3.3. Time-varying Parameter Local Projections Model

To account for structural changes in the relationship between policy uncertainty and export dynamics, we extend the baseline LP framework to a time-varying setting. Specifically, we implement the time-varying-parameter local projections (TVP-LP) estimator proposed by Inoue et al. (2024). This method serves as the local projection counterpart to time-varying-parameter VARs, allowing coefficients and error variances to evolve smoothly over time without imposing a specific parametric law of motion.

Formally, the LP equation is as follows.

$$y_{t+h} = \alpha_h(t) + \Phi_h(t; L)y_t + \theta_h(t)\varepsilon_t^u + \gamma_h(t)' x_t + \eta_{t+h} \tag{4}$$

where all coefficients may depend on calendar time t. In practice, the estimator constructs path-specific impulse responses by reweighting observations near a given date, assigning higher weights to data points closer in time. This produces a sequence of horizon-h responses $\theta_h(t)$ that can be plotted as spaghetti diagrams across the sample. These diagrams provide a visual summary of how the magnitude and even the sign of export responses to uncertainty shocks have changed across episodes such as the late-1990s expansion, the Global Financial Crisis, and the Covid-19 period.

We apply this TVP-LP estimator separately to shocks in EPU, MPU, and FPU. For each uncertainty dimension and each export variable, we compute the distribution of time-specific responses and the corresponding average path, along with pointwise confidence bands obtained from a residual bootstrap that preserves the dependence structure of the data. This approach provides a detailed characterization of the state-dependent nature of uncertainty–export linkages, surpassing what fixed-parameter models offer.

3.4. Estimation Procedure

For all VAR and LP specifications, the lag length p is set to twelve monthly lags. The VARs are estimated over the full sample under the assumption of piecewise-stable parameters, and the resulting structural shocks are used in both the baseline and time-varying LP estimations. To address residual serial correlation and heteroskedasticity in the LP regressions, we employ Newey–West heteroskedasticity- and autocorrelation-consistent standard errors, following Newey and West (1987) and verify robustness to alternative choices of lag truncation.

In the time-varying parameter local projections, the bandwidth parameter governing temporal smoothing is selected based on the Monte Carlo guidance in Inoue et al. (2024) and the stability of the estimated response profiles. Impulse responses are reported for a one-standard-deviation policy uncertainty shock, with shaded 68 percent confidence bands shown in the figures. This approach allows the analysis to capture both the average and time-varying responses of U.S. exports to economic, monetary, and fiscal policy uncertainty.

4. Empirical Findings

This section presents the short- and medium-term effects of policy uncertainty shocks on export dynamics. We begin by examining the response of total exports to economic policy uncertainty shocks using conventional and time-varying local projection models. Next, we analyze export components – energy, food, and industrial exports – and then assess the effects of monetary and fiscal policy uncertainty shocks on total exports. The section concludes with robustness checks.

4.1. Economic Policy Uncertainty and Export Dynamics

Figure 1 shows that a positive shock to U.S. economic policy uncertainty causes an immediate and economically significant decline in total exports. The response remains negative over the 24-month horizon and gradually converges to zero at longer horizons. This pattern suggests that higher policy uncertainty leads firms to delay investment, postpone export decisions, and reduce new contract formation, resulting in both immediate and persistent effects. The confidence band lies mostly below zero during the first year, indicating that the decline reflects a systematic macroeconomic response rather than a temporary fluctuation. This result is consistent with the broader literature showing that policy uncertainty weakens real activity and trade by discouraging export market entry and delaying production adjustment (Baker et al., 2016; Handley and Limão, 2017; Yayi, 2024; Zhu and Ye, 2024).

Figure 2 illustrates that the time-varying impulse responses of total exports to EPU shocks are negative for most of the sample, confirming that higher economic policy uncertainty is generally contractionary for U.S. exports. However, the magnitude of the effect varies across periods: in some episodes, exports decline by more than 2 percent, while in others the response is notably smaller. In the framework of Inoue et al. (2024), this variation indicates that the export effect of uncertainty is state-dependent. This interpretation is consistent with evidence that uncertainty shocks have stronger real effects during recessions than during expansions (Caggiano et al., 2014, 2018), and with studies showing that the impact of EPU on real activity and exports changes over time (Handley and Limão, 2017).

Figure 3 highlights this time variation by tracing the short-run export response across historical episodes. The estimated decline is modest in the mid-1990s, stronger during the Global Financial Crisis, and most pronounced during the Covid-19 period, before easing in recent years. The main implication is that the short-run response of exports to policy uncertainty is highly state-dependent: shocks of similar size generate much larger contractions during crisis periods than in calmer environments. This pattern is economically plausible, as periods of elevated uncertainty are typically associated with tighter financial conditions, weaker demand expectations, and stronger incentives for firms to postpone export activity and limit exposure to foreign markets.

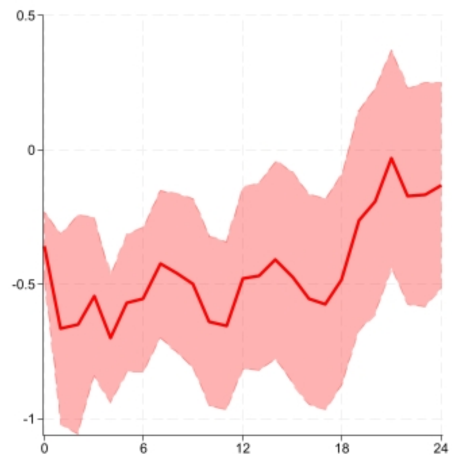

Figure 1: Responses of total exports to economic policy uncertainty shocks. Note: The figure shows impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP model. The solid line represents point estimates of the responses, while the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

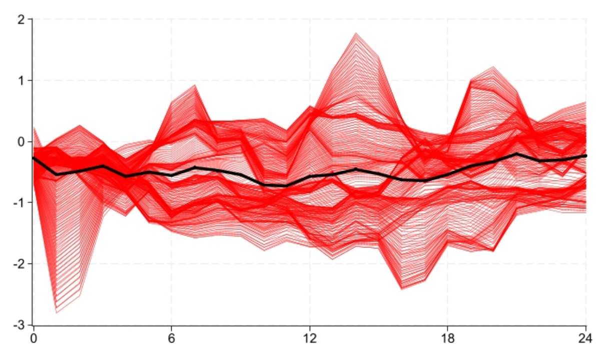

Figure 2: Time-varying responses of total exports to economic policy uncertainty shocks. Note: The figure shows conventional and time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

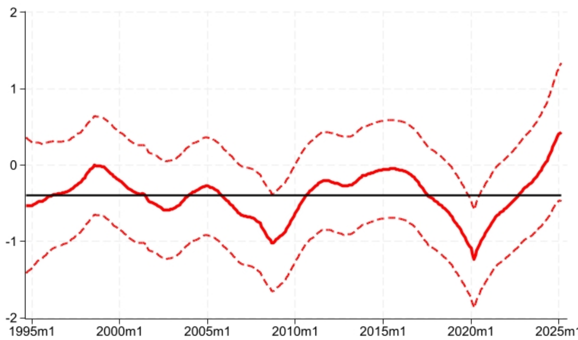

Figure 3: Time-varying responses of total exports to economic policy uncertainty shocks in the three months following the shock. Note: The figure shows time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

4.2. Sectoral Export Categories

4.2.1. Energy Exports

Figure 4 reveals that energy exports are the most responsive of the three sectoral series to an EPU shock. The response is negative on impact, deepens over the first six months, and reaches a trough of nearly 1.4 percent. It then remains below zero for an extended period before gradually converging toward zero at longer horizons. The estimates are most precise at short and medium horizons, while wider confidence bands reduce precision at longer horizons. This pattern is consistent with the structure of energy trade, shaped by irreversible investment, infrastructure constraints, regulatory uncertainty, and global price volatility. Higher uncertainty can therefore delay production, shipment, and contracting decisions, generating a large, front-loaded decline with persistent effects in the point estimates. This interpretation aligns with the trade-uncertainty literature, which emphasizes sunk export costs, delayed market participation, and the sensitivity of energy trade to uncertainty shocks (Handley and Limão, 2017; Kohlscheen et al., 2025; Doan and Nguyen, 2025).

Figure 5 shows that the response of energy exports to EPU shocks varies substantially over time. Although the average response is contractionary, the time-varying estimates are widely dispersed, with declines approaching 4 percent at medium horizons. This indicates considerable heterogeneity across episodes: in some periods, the decline is modest, while in others it is much larger and more persistent. EPU is therefore not uniformly contractionary; its effects appear stronger when combined with adverse commodity market or macro-financial conditions (Cai and Saadaoui, 2025).

Figure 6 displays that this time variation is especially pronounced across major historical episodes. The estimated response fluctuates around zero early in the sample, turns clearly negative around the Global Financial Crisis, becomes weaker through much of the 2010s, and declines sharply again during the pandemic before moving back toward zero at the end of the sample. The negative effect is most precisely identified during major stress episodes, when the confidence bands are below zero; outside these periods, the estimates are less precise and often include zero. The evidence therefore points to strong state dependence rather than a stable effect over time. As a result, policy uncertainty is especially damaging when it interacts with broader macro-financial or geopolitical stress, but less so in more stable periods.

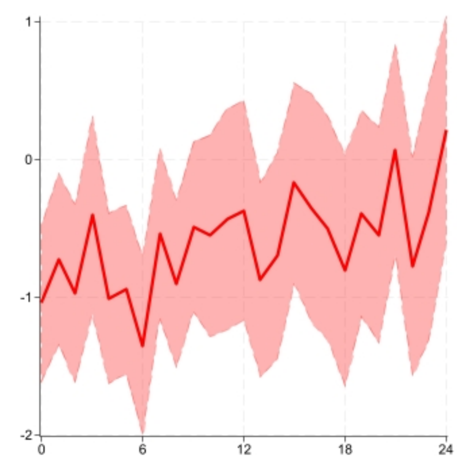

Figure 4: Responses of energy exports to economic policy uncertainty shocks. Note: The figure shows impulse responses of energy exports to a one-standard-deviation EPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

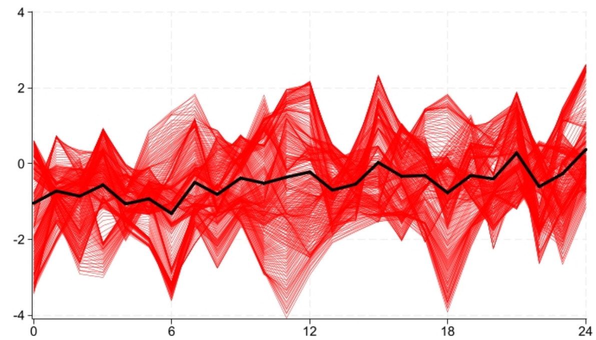

Figure 5: Time-varying responses of energy exports to economic policy uncertainty shocks. Note: The figure shows conventional and time-varying impulse responses of energy exports to a one-standard-deviation EPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

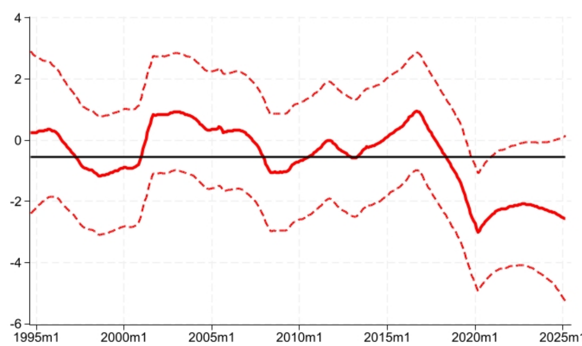

Figure 6: Time-varying responses of energy exports to economic policy uncertainty shocks in the three months following the shock. Note: The figure shows time-varying impulse responses of energy exports to a one-standard-deviation EPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

4.2.2. Food Exports

Figure 7 exhibits a distinct adjustment pattern for food exports. Unlike energy exports, the response is not uniformly negative on impact: the very short-run reaction is mixed, with a brief positive movement before turning clearly negative. From the middle of the first year onward, however, the response becomes persistently negative, and the confidence band remains below zero over several medium-term horizons. The trough also occurs later than in the energy case, suggesting that food exports respond to uncertainty less through immediate contraction and more through delayed effects on orders, shipment scheduling, and trade finance. This pattern is economically plausible. Although food demand is relatively stable, food exports remain sensitive to logistics frictions, border procedures, sanitary and phytosanitary measures, and uncertainty over trade conditions. Consistent with recent evidence, the figure indicates that EPU exerts a delayed but persistent drag on food exports, with the strongest effects emerging in the medium run rather than on impact (Gignarta et al., 2024; Yayi, 2024; Aslan and Açikgöz, 2025).

Figure 8 reveals substantial time variation in the response of food exports, especially at intermediate horizons, where mildly positive and strongly negative estimates coexist across periods. As the horizon lengthens, however, the distribution shifts downward, indicating that food exports are less prone than energy exports to an immediate collapse but are more exposed to a delayed and persistent drag. Thus, food exports may not represent the sharpest margin of adjustment, but they remain systematically vulnerable once uncertainty disrupts contracting, financing, and delivery arrangements.

Figure 9 shows the response of food exports three months after an economic policy uncertainty shock. The point estimate is negative for most of the sample, with particularly pronounced declines from the late 1990s through the first decade of the 2000s. This indicates that food exports remain persistently exposed to policy uncertainty, although their vulnerability has moderated over time. A plausible interpretation is that food exporters continue to be affected by logistics, shipment scheduling, border procedures, sanitary regulations, and trade finance conditions, but institutional learning, market diversification, and improvements in logistics have reduced the severity of short-run disruptions. Compared to energy exports, food exports appear less episodically sensitive but more structurally exposed to uncertainty, while becoming more resilient over time.

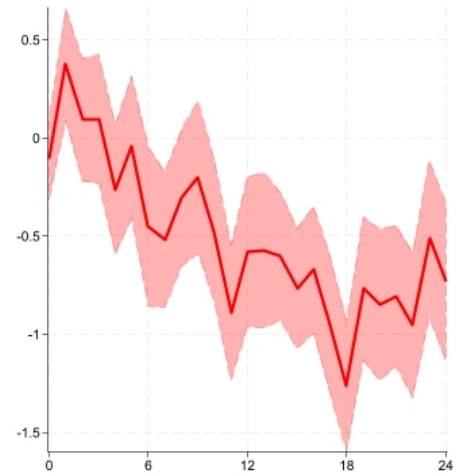

Figure 7: Responses of food exports to economic policy uncertainty shocks. Note: The figure shows impulse responses of food exports to a one-standard-deviation EPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

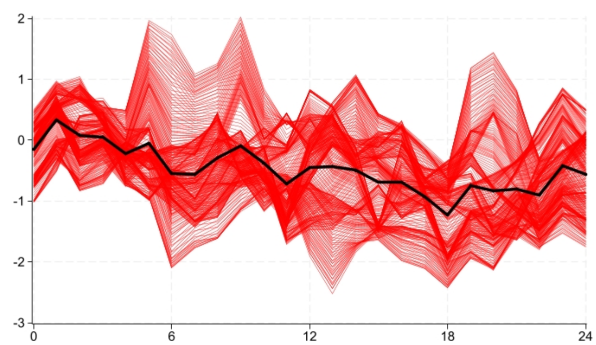

Figure 8: Time-varying responses of food exports to economic policy uncertainty shocks. Note: The figure shows conventional and time-varying impulse responses of food exports to a one-standard-deviation EPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

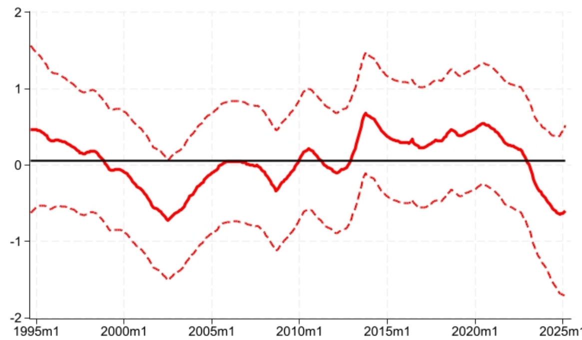

Figure 9: Time-varying responses of food exports to economic policy uncertainty shocks in the three months following the shock. Note: The figure shows time-varying impulse responses of food exports to a one-standard-deviation EPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

4.2.3. Industrial Exports

Figure 10 illustrates that industrial exports respond negatively to an EPU shock over almost the entire horizon, although more smoothly than energy and food exports. The point estimates remain below zero throughout, reaching a moderate trough near the end of the first year before gradually recovering. Because industrial exports depend on investment planning, imported intermediate inputs, inventory adjustment, and global value chains, heightened uncertainty tends to weaken production commitments and export expansion even when the initial response is less abrupt than in commodity-related sectors. The evidence therefore suggests that EPU imposes a persistent but gradual drag on industrial exports through deferred investment and softer external demand, rather than a sharp dislocation. This interpretation is consistent with evidence that policy uncertainty slows trade growth, weakens trade linked to global value chains, and affects export participation at both the intensive and extensive margins (Feng et al., 2017; Constantinescu et al., 2020; Zhou and Wen, 2022).

Figure 11 points to substantial dispersion in the time-varying responses of industrial exports across nearly all horizons, including both large negative and positive values. This suggests that the conventional response only partially summarizes the underlying dynamics. Industrial exports are not simply more or less sensitive to EPU; rather, their response depends on the prevailing macroeconomic and production environment. The figure thus supports a regime-dependent interpretation in which industrial exports are structurally exposed to EPU, but the magnitude and even the direction of the response vary with global value chain conditions and the broader trade environment.

Figure 12 traces the response of industrial exports three months after an EPU shock and indicates that regime dependence becomes especially pronounced in the later part of the sample. Before 2020, the three-month response fluctuates around zero, with alternating positive and negative values and generally wide confidence bands, indicating limited precision. From the pandemic period onward, however, the estimate turns sharply negative and remains well below zero. This pattern suggests that industrial exports are not uniformly vulnerable to policy uncertainty in normal times but become highly sensitive when uncertainty coincides with disruptions to investment, imported intermediates, inventories, and cross-border production networks. The persistent negative response after 2020 therefore indicates that policy uncertainty can have a stronger and more lasting effect on manufacturing exports when it interacts with broader supply chain stress.

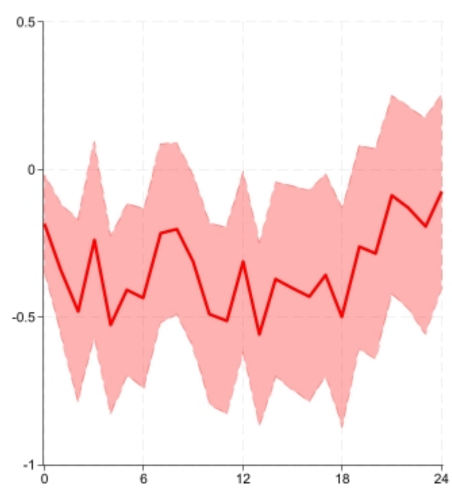

Figure 10: Responses of industrial exports to economic policy uncertainty shocks. Note: The figure shows impulse responses of industrial exports to a one-standard-deviation EPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

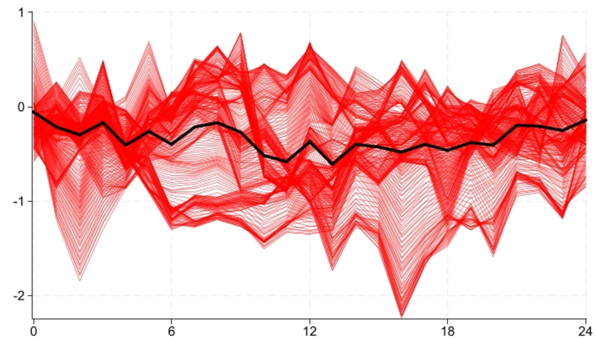

Figure 11: Time-varying responses of industrial exports to economic policy uncertainty shocks. Note: The figure shows conventional and time-varying impulse responses of industrial exports to a one-standard-deviation EPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

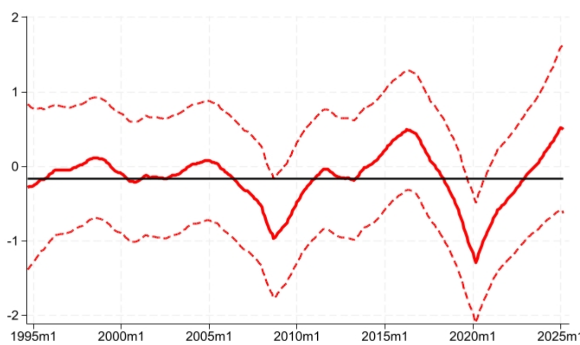

Figure 12: Time-varying responses of industrial exports to economic policy uncertainty shocks in the three months following the shock. Note: The figure shows time-varying impulse responses of industrial exports to a one-standard-deviation EPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

4.3. Dimensions of Policy Uncertainty

4.3.1. Monetary Policy Uncertainty

Figure 13 shows that a shock to monetary policy uncertainty (MPU) is followed by a large and persistent decline in exports. The response turns negative almost immediately, continues to deteriorate, and reaches a trough of more than 1 percent after roughly one year, with no clear return to baseline by the 24-month horizon. A rise in MPU can increase exchange rate volatility, elevate trade finance risk premia, and weaken the predictability of interest rates and borrowing costs relevant to exporters' pricing and investment decisions. The sustained negative response therefore suggests that uncertainty about the future path of interest rates and the dollar depresses export activity more strongly and persistently than broader EPU shocks. This interpretation is consistent with evidence that monetary policy uncertainty weakens monetary transmission and reduces output and investment (Aastveit et al., 2017; Creal and Wu, 2017; Mumtaz and Surico, 2018).

Figure 14 exhibits that the export response to MPU shocks is also strongly time-varying. The estimated paths are widely dispersed, and many indicate deep and persistent export losses, suggesting that some periods are characterized by substantially stronger transmission. These episodes likely correspond to heightened uncertainty about the future path of the federal funds rate or to unconventional monetary policy regimes.

Figure 15 illustrates that the response is close to zero or only mildly negative in the late 1990s and mid-2000s, becomes more adverse around the Global Financial Crisis, and reaches its most negative values during the Covid-19 period before moderating as the monetary policy framework normalizes. This pattern suggests that MPU exerts a stronger drag on exports when monetary policy is less predictable and the policy framework is under stress. The time-varying local projection results therefore indicate that the trade effects of monetary policy depend not only on the policy stance but also on the clarity and credibility of the central bank's reaction function.

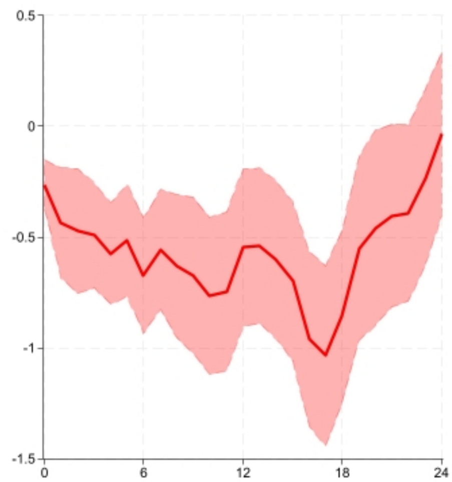

Figure 13: Responses of total exports to monetary policy uncertainty shocks. Note: The figure shows impulse responses of total exports to a one-standard-deviation MPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

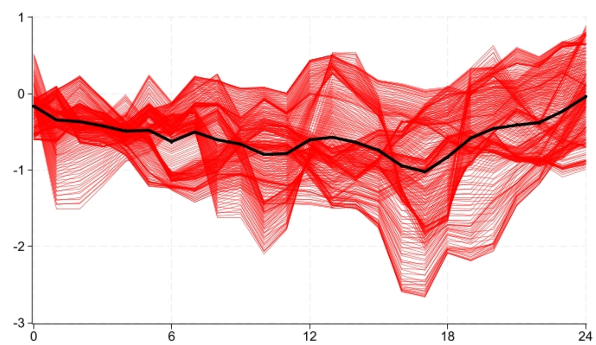

Figure 14: Time-varying responses of total exports to monetary policy uncertainty shocks. Note: The figure shows conventional and time-varying impulse responses of total exports to a one-standard-deviation MPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

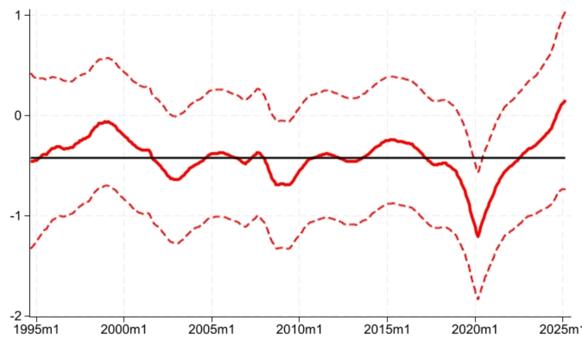

Figure 15: Time-varying responses of total exports to monetary policy uncertainty shocks in the three months following the shock. Note: The figure shows time-varying impulse responses of total exports to a one-standard-deviation MPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

4.3.2. Fiscal Policy Uncertainty

Figure 16 reveals that fiscal policy uncertainty reduces exports, but follows a different pattern from monetary policy uncertainty. The response is initially negative, deepens during the first year, and then more clearly returns toward zero in the second year. This milder but persistent effect is economically intuitive. Uncertainty about taxes, government spending, and debt sustainability affects exporters mainly through expectations of future demand, cost conditions, and the broader macroeconomic environment, rather than through the more direct trade-finance and exchange-rate channels associated with monetary uncertainty. Firms may delay investment in export capacity and reduce shipments while awaiting fiscal clarity, but these effects tend to ease once policy measures are implemented and gain credibility. This interpretation aligns with evidence that fiscal policy uncertainty is contractionary, although often less immediate or less pronounced than monetary policy uncertainty or broader EPU shocks (Fernández-Villaverde et al., 2015; Mumtaz and Surico, 2018; Anzuini et al., 2020).

Figure 17 traces that fiscal policy uncertainty generates predominantly negative, but milder and more stable, export responses than monetary policy uncertainty. The conventional response remains below zero at all horizons, while the distribution of time-varying estimates is more concentrated and extreme negative responses are less frequent. This pattern suggests that uncertainty about taxes, spending, and debt sustainability affects exports through expected demand, cost structures, and macroeconomic expectations, but less erratically than monetary policy uncertainty.

Figure 18 points to the three-month response of exports to fiscal policy uncertainty shocks. Compared to MPU, the pattern is smoother and smaller in magnitude. The response is modestly negative during periods of intense fiscal debate, including the early 2000s and late 2000s tax and spending reforms and the pandemic-era fiscal packages, and becomes slightly positive near the end of the sample. This suggests that fiscal uncertainty affects exporters through expected demand, production costs, and broader macroeconomic conditions, but its short-run trade effects are generally limited. This result aligns with evidence that fiscal policy uncertainty is contractionary but often more gradual in its effects, with stronger impacts during periods of financial stress or elevated volatility (Glocker et al., 2019; Fritsche et al., 2021).

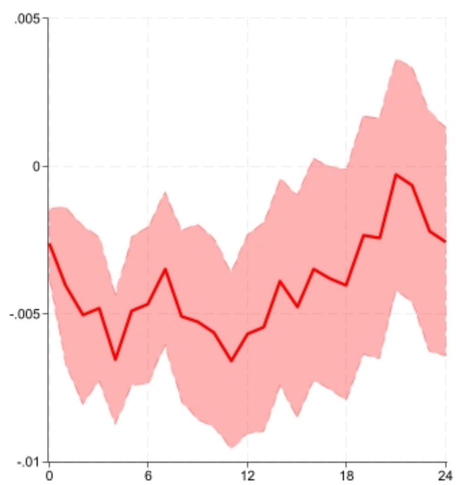

Figure 16: Response of total exports to fiscal policy uncertainty shocks. Note: The figure shows impulse responses of total exports to a one-standard-deviation FPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

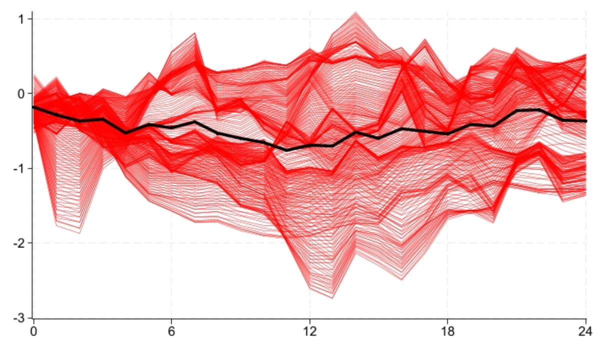

Figure 17: Time-varying responses of total exports to fiscal policy uncertainty shocks. Note: The figure shows conventional and time-varying impulse responses of total exports to a one-standard-deviation FPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

Figure 18: Time-varying responses of total exports to fiscal policy uncertainty shocks in the three months following the shock. Note: The figure shows time-varying impulse responses of total exports to a one-standard-deviation FPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

4.4. Robustness Checks

To assess the robustness of the baseline results, we conduct two additional exercises. First, we re-estimate the model using six lags instead of twelve. Second, we split the sample into two subsamples.

Figures 19-21 exhibit that the main results are robust to the shorter lag specification. Total exports continue to decline following a policy uncertainty shock, and the response remains time-varying rather than constant over the sample. Although the shorter lag structure slightly smooths the dynamics and may shift the timing of the trough, it does not alter the central finding that policy uncertainty has a contractionary effect on total exports. These results indicate that the baseline findings are not driven by the choice of lag length.

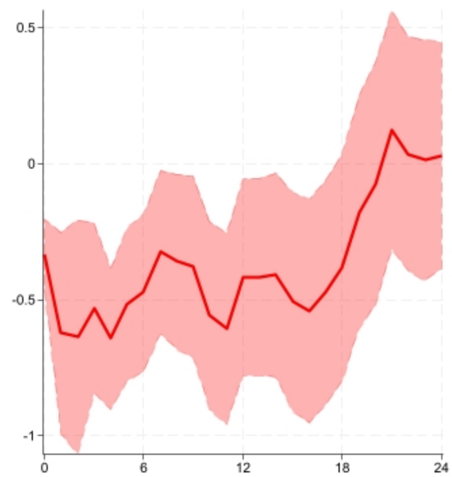

Figure 19: Response of total exports to economic policy uncertainty shocks with a shorter lag specification. Note: The figure shows impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

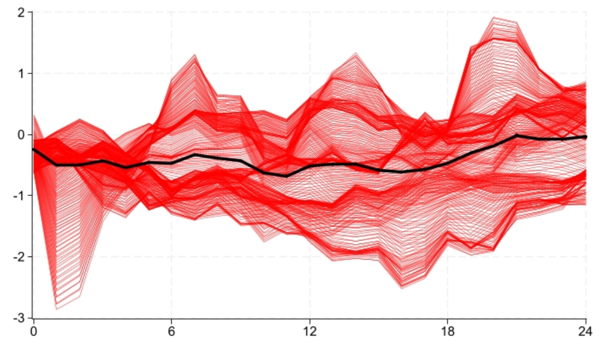

Figure 20: Time-varying responses of total exports to economic policy uncertainty shocks with a shorter lag specification. Note: The figure shows conventional and time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

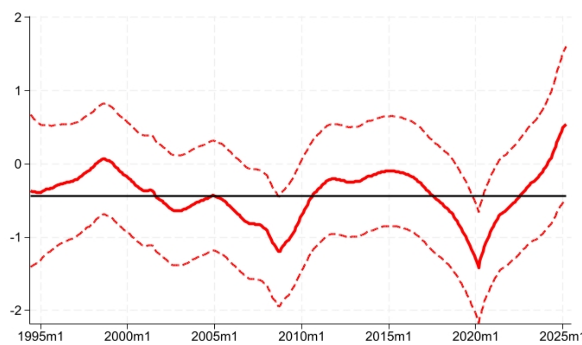

Figure 21: Time-varying responses of total exports to economic policy uncertainty shocks in the three months following the shock with a shorter lag specification. Note: The figure shows time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

Figures 22–27 assess the robustness of the baseline result across subsamples. The estimates for the pre-2010 and post-2010 periods both show a negative export response to policy uncertainty, although the magnitude and time variation differ. The earlier subsample is shaped by the dot-com adjustment and the Global Financial Crisis, while the later period reflects the shale revolution, the pandemic, and the post-2021 monetary tightening cycle. The persistence of a negative response in both subsamples indicates that the effect of uncertainty is not confined to a single historical episode. At the same time, differences in amplitude reinforce the paper's central argument that the uncertainty–export relationship evolves with economic structure and the prevailing macro-financial regime.

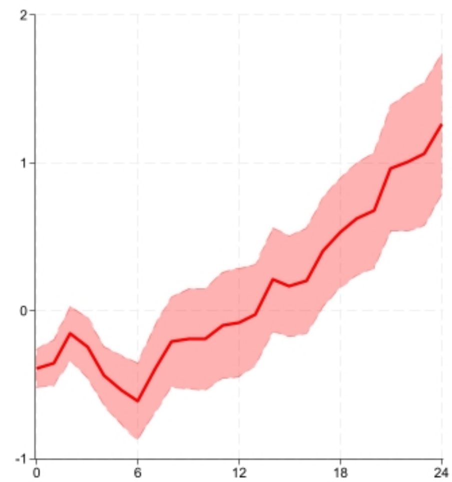

Figure 22: Response of total exports to economic policy uncertainty shocks for the period 1995-2010. Note: The figure shows impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

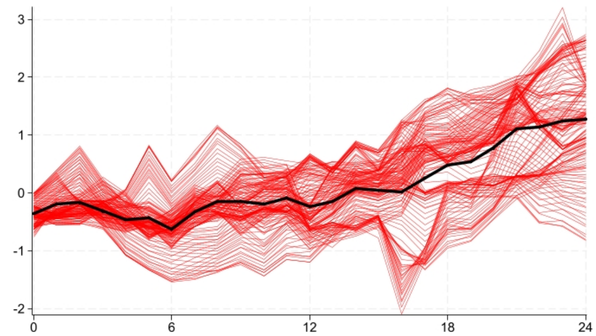

Figure 23: Time-varying responses of total exports to economic policy uncertainty shocks for the period 1995-2010. Note: The figure shows conventional and time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

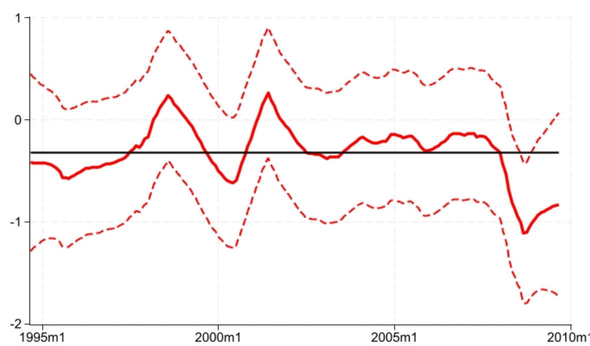

Figure 24: Time-varying responses of total exports to economic policy uncertainty shocks in the three months following the shock for the period 1995-2010. Note: The figure shows time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

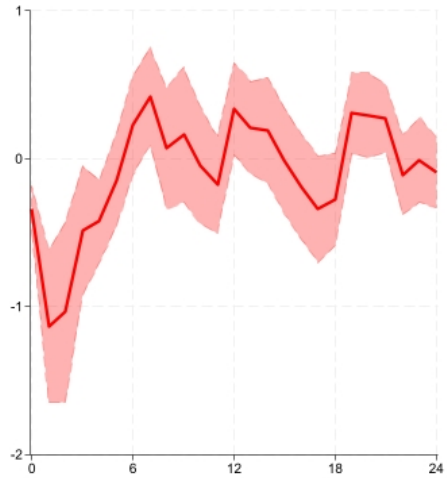

Figure 25: Response of total exports to economic policy uncertainty shocks for the period 2010-2025. Note: The figure shows impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP model. The solid line represents point estimates of the responses, and the shaded region indicates 68% confidence intervals based on Newey–West heteroskedasticity and autocorrelation-consistent standard errors.

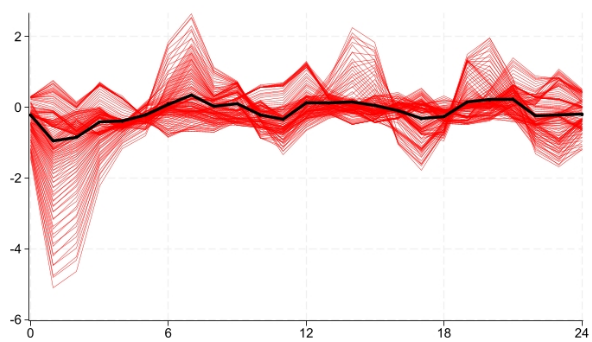

Figure 26: Time-varying responses of total exports to economic policy uncertainty shocks for the period 2010-2025. Note: The figure shows conventional and time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the LP and TVP-LP models. The red lines indicate the time-varying point estimates from the TVP-LP model, while the black line represents the point estimates from the LP model.

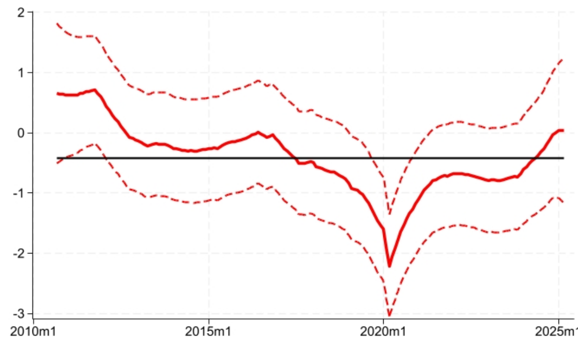

Figure 27: Time-varying responses of total exports to economic policy uncertainty shocks in the three months following the shock for the period 2010-2025. Note: The figure shows time-varying impulse responses of total exports to a one-standard-deviation EPU shock, estimated using the TVP-LP model. The solid red line represents the time-varying point estimates, the solid black line represents the conventional point estimates, and the dashed red lines indicate 68% confidence intervals based on Newey–West heteroskedasticity- and autocorrelation-consistent standard errors.

5. Concluding Remarks

This paper examines how U.S. policy uncertainty affects total exports and three strategically important categories: energy, food, and industrial exports. Using monthly data from January 1995 to June 2025, it combines structurally identified uncertainty shocks with conventional local projections in the tradition of Jordà (2005) and time-varying parameter local projections following Inoue et al. (2024). This framework identifies both the average effects of uncertainty on exports and their variation across policy domains, sectors, and macroeconomic regimes.

The results yield three main conclusions. First, policy uncertainty is a significant source of external-sector weakness in the United States. Increases in aggregate economic policy uncertainty reduce exports and cause contractionary responses across the export categories examined. Second, these effects are heterogeneous. Energy exports are the most episodic and state-contingent, reflecting their sensitivity to regulation, geopolitical risk, and commodity prices. Food exports also decline after uncertainty shocks but recover more strongly, indicating greater medium-run resilience. Industrial exports show more persistent negative responses, consistent with their dependence on investment planning, imported intermediates, inventories, and global production networks. Third, the source of uncertainty matters. When aggregate policy uncertainty is separated into monetary and fiscal components, monetary policy uncertainty is the most disruptive source of export weakness, while fiscal policy uncertainty has milder but still negative effects.

Monetary policy uncertainty affects exporters through financing conditions, discount rates, exchange rate expectations, and risk premia, all of which are central in a financially integrated economy. In contrast, fiscal policy uncertainty tends to operate more gradually through expectations about taxation, public spending, and broader macroeconomic conditions. Sectoral evidence also shows that uncertainty does not act as a uniform shock. Its effects are filtered through sector-specific characteristics: the capital intensity and regulatory sensitivity of energy, the logistical structure and essential demand features of food, and the investment and supply chain dependence of industrial exports. In this sense, the paper reinforces the view that uncertainty is not a homogeneous macroeconomic disturbance, but a transmission mechanism whose effects depend on both policy origin and sectoral exposure.

Another contribution is to show that the export effects of uncertainty vary over time rather than remain constant. Impulse responses become significantly more negative during periods of macro-financial stress, especially around the Global Financial Crisis and the Covid-19 disruption. This suggests that uncertainty is most damaging when economic conditions are already fragile. It does not simply accompany downturns; it amplifies them. This finding is consistent with the broader literature showing that the real effects of uncertainty are state-dependent and intensify during recessions or episodes of financial stress. For exports, this means that policy unpredictability is especially costly when firms face weak demand, tighter credit, supply chain disruptions, and greater relative price volatility.

These findings have important policy implications. If monetary policy uncertainty is especially harmful to exports, central bank communication, policy transparency, and a predictable reaction function are important not only for domestic stabilization but also for external performance. Similarly, if fiscal uncertainty weakens exports through expectations about taxation and public spending, credible medium-term fiscal planning and reduced institutional confrontation may help stabilize trade outcomes. The sectoral results also indicate the need for differentiated policy responses. Energy exports require regulatory stability and predictable infrastructure conditions; food exports depend heavily on logistics, customs efficiency, and consistent market access; industrial exports benefit from stable investment conditions and resilient supply chains. More broadly, export resilience depends not only on competitiveness and external demand but also on the credibility and coherence of macroeconomic policy.

Like most studies, this paper has limitations that suggest directions for future research. First, because the analysis focuses on the United States and three export aggregates, the external validity of the findings is limited. The results reflect specific features of the U.S. economy, including relatively low export dependence, a large domestic market, an advanced financial system, and a central role in global monetary and financial arrangements. Therefore, the estimated effects may not generalize to more export-dependent or financially vulnerable economies. Second, standard aggregate uncertainty indices may not capture firm-level perceptions or sector-specific regulatory risks. Future research could incorporate survey-based or text-based measures tailored to trade, energy, or agriculture. Third, although time-varying parameter local projections allow gradual evolution in impulse responses, they do not fully capture abrupt regime shifts, threshold effects, or interactions with financial frictions. Finally, the focus on export quantities excludes adjustment through prices, quality, and firm entry and exit, which exporter-level and bilateral trade data could clarify.

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