Oil Supply Shocks and Inflation Tail Risks*

Andrea De Polis[†‡] Álvaro Fernández-Gallardo [§] José Nicolás Rosas [¶]

Abstract

We analyze the asymmetric transmission of oil supply news shocks to the inflation distribution in the United States, the Euro Area, and the United Kingdom. Using quantile local projections and high-frequency identification, we document a stark asymmetry across these three large advanced economies: while median responses are transitory, the 90th quantile exhibits significant and persistent increases beyond one year. This upside tail sensitivity, consistent with state-dependent pricing, suggests that supply shocks are structural innovations to the skewness of the inflation distribution. Monetary policy should actively monitor such persistent inflation tail risks to keep expectations anchored.

Keywords: Oil supply shocks, Inflation-at-risk, Quantile local projections, Non-linearities, State dependence.

JEL Codes: E31, E52, Q43.

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[†]Corresponding author.

[‡]Banco de España, Calle Alcalá 48, 28014 Madrid, Spain. Email: andrea.depolis@bde.es.

[§]Banco de España, Calle Alcalá 48, 28014 Madrid, Spain. Email: alvaro.fernandez-gallardo@bde.es.

[¶]Banco de España, Calle Alcalá 48, 28014 Madrid, Spain. Email: josenicolas.rosas@bde.es.

1 Introduction

Does the average response of inflation to oil supply shocks mask a more fundamental risk to price stability? While a vast literature has established the contractionary and inflationary effects of oil supply disruptions on macroeconomic aggregates (Kilian, 2009; Känzig, 2021), these studies typically focus on conditional means, implicitly assuming a symmetric and uniform transmission across the distribution. However, in an era characterized by large, frequent supply-side innovations and a "higher-for-longer" inflationary environment, understanding the risks concentrated in the tails of the distribution is paramount for both theoretical modeling and the conduct of monetary policy.

In this paper, we investigate the asymmetric transmission of oil supply news shocks to the conditional distribution of macroeconomic outcomes in the United States, the Euro Area, and the United Kingdom. Building on the frameworks of Adrian et al. (2019), Jordà et al. (2022), and Loria et al. (2025), we employ quantile local projections to assess whether oil supply disruptions disproportionately affect the right tail of the inflation distribution. We identify these shocks using high-frequency surprises around OPEC announcements, following Känzig (2021). We find that a positive oil supply news shock triggers a significant and remarkably persistent increase in the 90th quantile of the inflation distribution, substantially exceeding the response at the median and the left tail, across all three economies. While the median reverts quickly, the right tail remains elevated beyond the first year, indicating that oil disruptions act as structural innovations to the skewness of the inflation distribution.

Our findings suggest that oil supply shocks do not merely shift inflation, but reshape its conditional distribution. Borrowing from the state-dependent pricing literature (Golosov and Lucas, 2007), upside pressures are amplified through the nonlinearity of price-setting, and their persistence can erode expectations anchoring. These mechanisms imply that the appropriate object of monetary policy is the full distribution of future inflation, and that managing oil-driven inflation may warrant an active policy response

(De Polis et al., 2025) rather than looking through the shock.

2 Empirical Methodology

We investigate the transmission of oil supply news shocks across the full conditional distribution of inflation within a local projection framework (Jordà, 2005; Jordà and Taylor, 2025) augmented with quantile regressions (Koenker and Bassett Jr, 1978).

We rely on the oil supply news shocks of Känzig (2021), extracted from a proxy-SVAR comprising the real oil price, world oil production, world oil inventories, world industrial production, U.S. industrial production, and the U.S. CPI.[1] The identification rests on an external instrument constructed from high-frequency changes in oil futures prices around OPEC announcements. By focusing on narrow event windows, the instrument isolates exogenous revisions in oil-market expectations induced by news about global oil supply. The daily surprises are aggregated to monthly frequency and used to identify the structural innovation in the proxy-SVAR.

We estimate the effects of oil supply news shocks on inflation in the United States, the Euro Area and the United Kingdom through quantile local projections (QLP) (Adrian et al., 2019; Jordà et al., 2022; Loria et al., 2025). For the U.S. and the U.K., inflation is measured as year-on-year CPI inflation; for the Euro Area, it is measured as year-on-year HICP inflation. For each horizon $h = 0, \ldots, 24$ months and quantile $\tau \in \{0.1, 0.5, 0.9\}$, we estimate:

$$Q_\tau(y_{t+h} \mid \mathcal{I}_t) = \alpha_{h,\tau} + \beta_{h,\tau} s_t + \sum_{j=1}^{L_s} \gamma_{h,\tau,j} s_{t-j} + \sum_{j=1}^{L_y} \phi_{h,\tau,j} y_{t-j} \tag{1}$$

where $Q_\tau(y_{t+h} \mid \mathcal{I}_t)$ denotes the conditional τ-quantile of the outcome at horizon h, conditional on information available at time t. The specification includes lags of the shock and the dependent variable but no further controls, preserving the identifying assump-

[1] The identification sample is shorter, 1983M04–2025M06, reflecting the availability of the futures-price data underlying the external instrument. The real oil price is the WTI spot price deflated by the U.S. CPI, and world industrial production is measured using the index of Baumeister and Hamilton (2019).

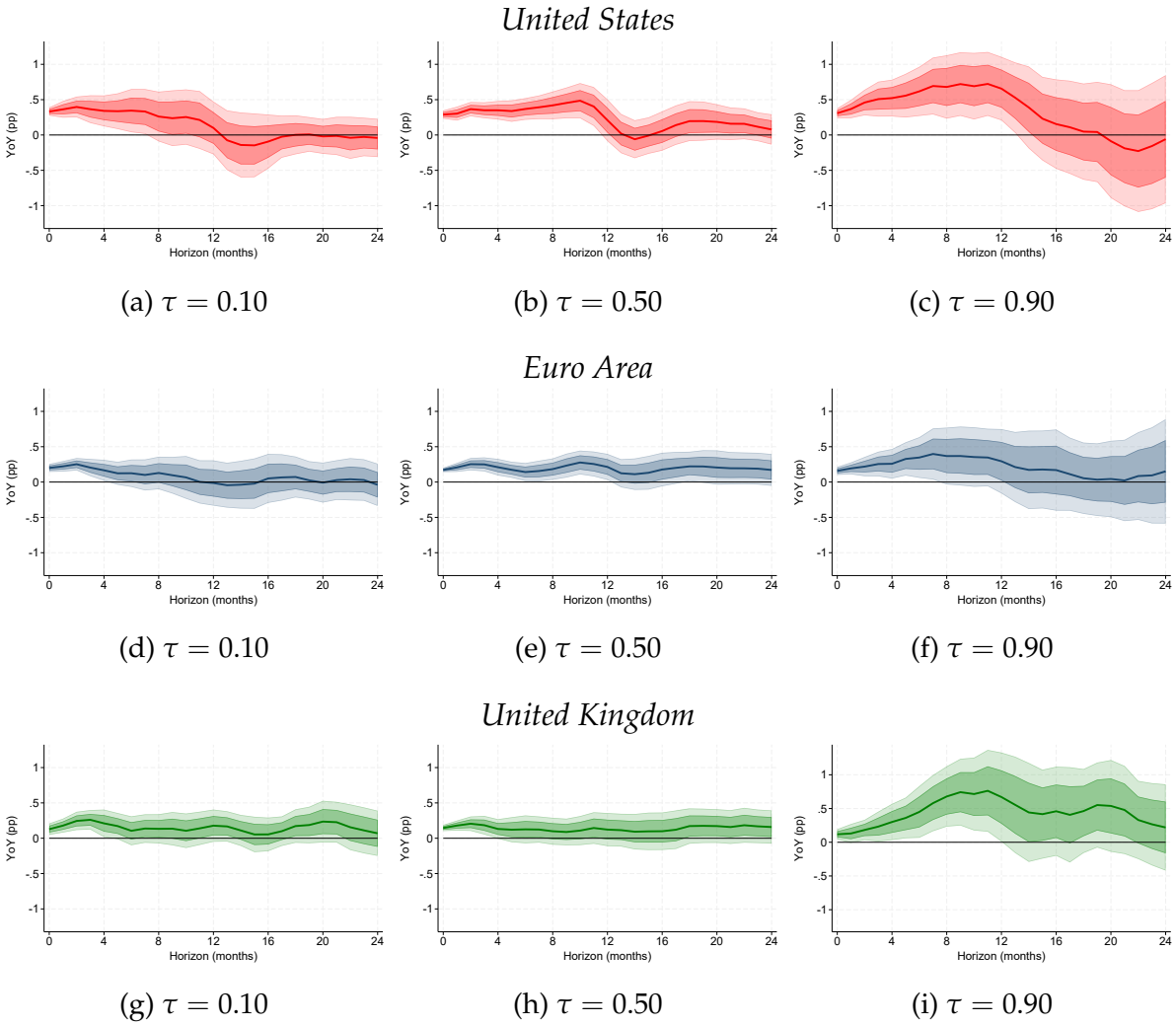
tion of orthogonality. $\beta_{h,\tau}$ measures the quantile-specific impulse response, normalized to a 10% increase in the real oil price on impact. Following Montiel Olea and Plagborg-Møller (2021), we consider a rich lag structure for inference, setting $L_s = L_y = 12$. The sample runs from 1975M1 to 2025M6.[2] Inference uses a moving-block bootstrap (1000 replications, 8-month blocks).

3 The Asymmetric Transmission of Oil Supply Shocks

The main result of our analysis is reported in Fig. 1. The panels report the response of the conditional distribution of year-over-year inflation measured at the 10th, 50th, and 90th quantiles, for the U.S. (top), the Euro Area (middle) and the U.K. (bottom). Focusing on the median response, we document a persistent increase of about 0.20–0.25 percentage points, dying out within a year. On impact, both the 10th and the 90th quantiles move jointly upward, implying a rightward location shift of the conditional inflation distribution—Panel (a) of Fig. 2—consistent with a shock that raises the mean without affecting the variance.

Moving along with the shock propagation, however, we document a striking heterogeneity in the response of inflation across its conditional distribution. After about 12 months, median inflationary pressures die off for all the economies. Similarly, the left tail recedes in lockstep with the median. The response at the 90th quantile, however, is both larger in magnitude and exhibits significantly greater persistence. As visible in the rightmost panels, the response of the 90th quantile remains elevated for longer, and increases over the first year. We argue that this stark non-linearity is economically consequential. In fact, such a dynamics implies a substantially different conditional distribution for inflation, which now features non-Gaussian features. Panel (b) of Fig. 2 shows the conditional distribution of inflation implied by the QRF about a year after the shock hit the econ-

[2] See Section A for details.



(a) $\tau = 0.10$ (b) $\tau = 0.50$ (c) $\tau = 0.90$

(d) $\tau = 0.10$ (e) $\tau = 0.50$ (f) $\tau = 0.90$

(g) $\tau = 0.10$ (h) $\tau = 0.50$ (i) $\tau = 0.90$

Figure 1: Quantile Responses of Inflation to Oil Supply News Shocks
Notes: Impulse responses have been smoothed using a three-month moving average, following Jordà and Taylor (2025). Shaded areas show 68% (darker area) and 90% (lighter area) confidence intervals.

omy. The orange distribution displays positive skewness, driven by a fatter and longer right tail. In this scenario, quantiles move differently: the 10th quantile is now at baseline levels, the median is still slightly moved to the right, and the 90th quantile is 0.5 to 0.7 percentage point higher than in the baseline. Under such a conditional distribution, risk implications are substantially different and can potentially affect policy decisions. Compared to baseline, the orange distribution implies a 10 percentage point increase in the probability of future inflation overshooting the 2% target.

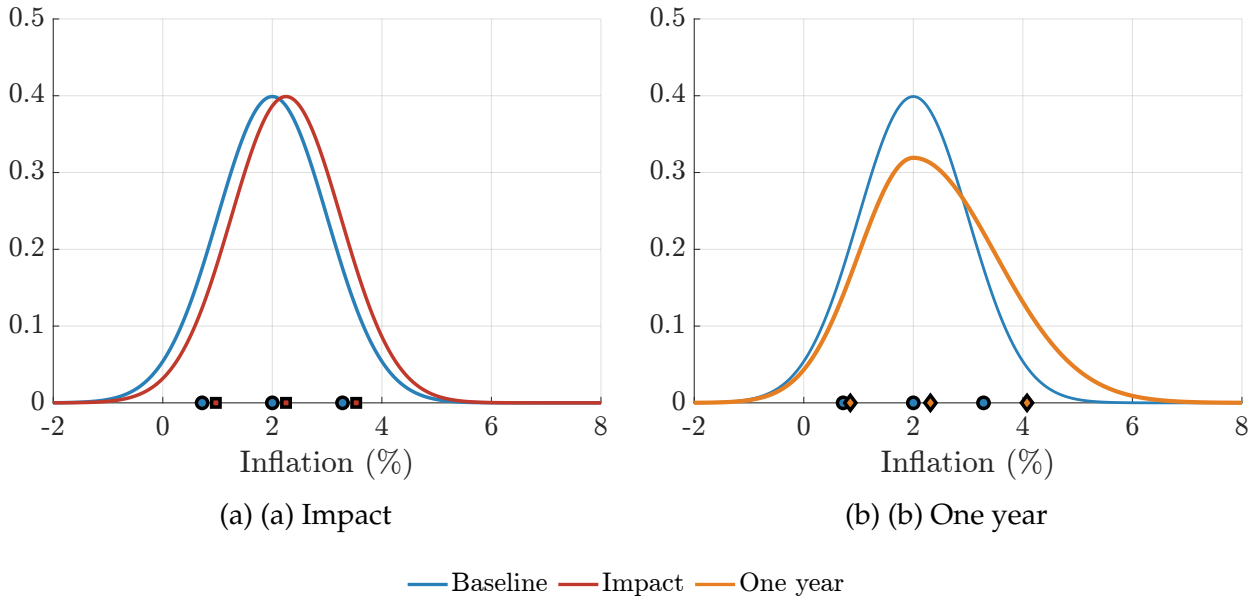


Figure 2: Conditional distributions
Notes: The quantiles match the dynamics reported in Fig. 1. Dots indicate the 10th, 50th and 90th quantiles.

3.1 Theoretical underpinnings

These results highlight that the impact of oil supply shocks is not a simple location shift of the inflation distribution, but rather a gradual distortion of its shape. Such a nonlinearity suggests that oil supply news shocks can generate significant "Inflation–at–Risk" dynamics (López-Salido and Loria, 2024). Rationalizing this pattern requires a framework in which the slope of the Phillips curve varies with the state of the economy.

State-dependent pricing provides a natural microfoundation. Firms update prices only when it is worth paying fixed menu costs, generating an endogenous inaction region (the so-called (S, s) model; Golosov and Lucas, 2007; Caballero and Engel, 2007). As cost pressures accumulate, more firms cross the (S, s) threshold, steepening the Phillips curve and amplifying the inflationary effect (Karadi and Reiff, 2019). A steeper Phillips curve reduces the sacrifice ratio, making a forceful policy response less costly (Karadi et al., 2025). Yet a steeper slope alone cannot account for the persistence of the right tail: if upside pressures persist long enough to feed into expectations, they further reshape the conditional distribution, shifting the relevant policy object from the mean to the upper

quantiles.

3.2 Policy Implications

The conventional prescription to look through supply-side shocks (Clarida et al., 1999) rests on a linear, stable Phillips curve. The right-tail dynamics we document suggest otherwise: persistent upside risks can erode the inflation anchor before realized inflation broadens (Reis, 2022), and Erceg et al. (2024) show that when this happens, looking through supply shocks becomes suboptimal—expectations drift in ways the central bank cannot easily undo.

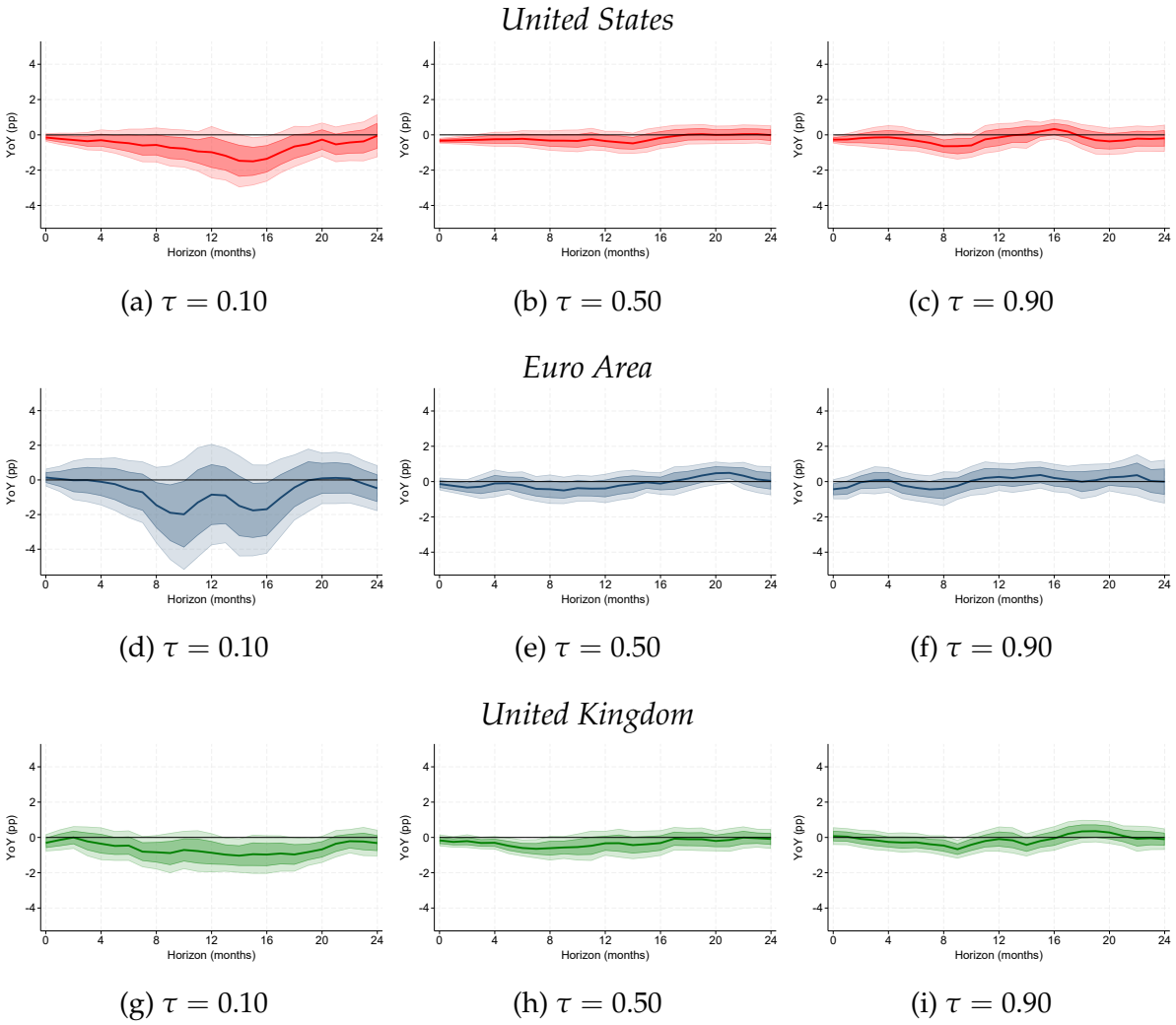
Hence, the relevant policy object is the full conditional distribution of future inflation (Adrian et al., 2020). De Polis et al. (2025) show that when the balance of inflation risks tilts to the upside, the optimal policy warrants a preemptive tightening that leans against the expected shift in the distribution, rather than waiting for a large realization to materialize. By anticipating a tighter stance contingent on upside risk, the central bank shapes expectations before realized inflation broadens; they name this approach the "Risk-Adjusted Inflation Targeting".

Our evidence reinforces this view. By internalizing the persistence of the 90th quantiles, policymakers can use real-time estimates of upside tail risk to adjust their policy signals and interest rate path. Such a proactive stance not only helps in anchoring expectations but also prevents the need for aggressive—and potentially disruptive—"catch-up" policy response.

3.3 Additional results and robustness

We complement the main results with two additional exercises.

Real activity. The results for industrial production growth, reported in Fig. 3, align with the canonical literature on the contractionary effects of oil supply disruptions (Kilian,



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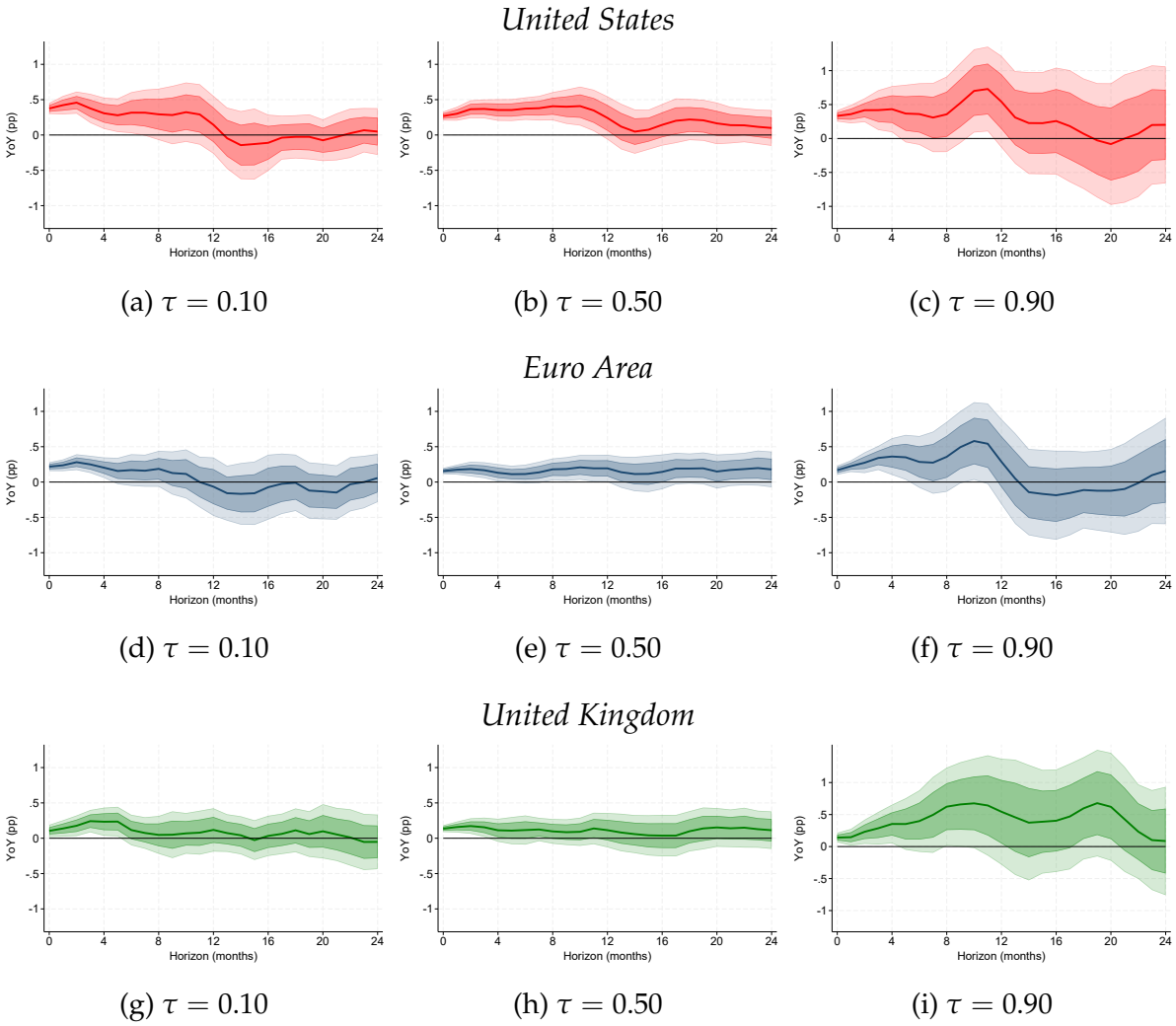
(d) $\tau = 0.10$ (e) $\tau = 0.50$ (f) $\tau = 0.90$

(g) $\tau = 0.10$ (h) $\tau = 0.50$ (i) $\tau = 0.90$

Figure 3: Quantile Responses of Industrial Production to Oil Supply News Shocks
Notes: Impulse responses have been smoothed using a three-month moving average, following Jordà and Taylor (2025). Shaded areas show 68% (darker area) and 90% (lighter area) confidence intervals.

2009): output declines across all three economies, with particularly strong effects in the lower tail—consistent with the "growth-at-risk" pattern (Adrian et al., 2019). Downside risks again exhibit greater persistence than upper-tail responses.

Alternative identification with extended information set. We use the Mori and Peersman (2024) shock series—which augments Känzig (2021)'s SVAR with the U.S. one-year



(a) $\tau = 0.10$ (b) $\tau = 0.50$ (c) $\tau = 0.90$

(d) $\tau = 0.10$ (e) $\tau = 0.50$ (f) $\tau = 0.90$

(g) $\tau = 0.10$ (h) $\tau = 0.50$ (i) $\tau = 0.90$

Figure 4: Quantile Responses of Inflation to Oil Supply News Shocks: Robustness Using Mori and Peersman (2024) Oil Supply Shocks

Notes: Impulse responses have been smoothed using a three-month moving average, following Jordà and Taylor (2025). Shaded areas show 68% (darker area) and 90% (lighter area) confidence intervals. The estimation sample is 1975M01–2024M08.

rate, the S&P 500, and the VXO—to address potential information deficiencies.[3] The main results remain broadly unchanged.

[3] Mori and Peersman (2024) show that this enlargement satisfies invertibility and limited lead–lag exogeneity in oil supply news SVAR-IV models.

4 Conclusion

We document a stark asymmetry in the response of the inflation distribution to oil supply news shocks across the United States, the Euro Area, and the United Kingdom. On impact, the shock shifts the distribution rightward symmetrically; after about one year, however, the right tail remains significantly elevated while the median and the left tail revert, generating a positive balance of risks that can contribute to a de-anchoring of inflation expectations.

In an environment of frequent supply-side disruptions, price stability requires a distributional perspective: monetary policy must be calibrated to the full distribution of inflation outcomes, with particular attention to persistent upside tail risks.

Declaration of generative AI and AI-assisted technologies in the manuscript preparation process.

During the preparation of this work the author(s) used Claude Opus 4.7 in order to improve the English language, readability, and flow of the text. After using this tool/service, the author(s) reviewed and edited the content as needed and take(s) full responsibility for the content of the published article.

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A Data

The following table reports the data used and the relative source.

Table 1: Data

Country	Series	Sample	Ticker	Source
United States				
	CPI for All Urban Consumers: All Items	1975M01 - 2025M6	CPIAUCSL	FRED
	Industrial Production: Total Index	1975M01 - 2025M6	INDPRO	FRED
Euro Area				
	HICP	1975M1 - 1996M12	Own calculation	Internal data
	HICP: Total for Euro Area (19 Countries)	1996M1 - 2025M6	CP0000EZ19M086NEST	FRED
	Production in industry	1996M1 - 2025M6	STS_INPR_M	EUROSTAT
United Kingdom				
	CPI Historical: All Items (1965=100)	1975M01 - 1988M12	JFDN	ONS
	CPI: All Items (2015=100)	1988M01 - 2025M6	D7BT	ONS
	Industrial Production	1975M01 - 2025M6	K222	ONS
Shocks				
Känzig (2021)	Oil supply news shock	1975M01 - 2025M06	-	Author's website
Mori and Peersman (2024)	Oil supply news shocks	1975M01 - 2024M08	-	Author's website