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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 classification: E31, E52, Q43.

Resumen

En este documento se analiza la transmisión asimétrica de *shocks* adversos sobre la oferta de petróleo en la distribución de la inflación en Estados Unidos, la zona del euro y el Reino Unido. Utilizando proyecciones locales por cuantiles e identificación de alta frecuencia, documentamos una marcada asimetría entre estas tres grandes economías avanzadas: mientras que las respuestas de la mediana son transitorias, el cuantil 90 muestra aumentos significativos y persistentes que se prolongan más de un año. Esta sensibilidad de la cola superior, coherente con una fijación de precios condicionada al estado de la economía, sugiere que los *shocks* de la oferta constituyen innovaciones estructurales que modifican la asimetría de la distribución de la inflación. En consecuencia, la política monetaria debería vigilar activamente estos riesgos persistentes en la cola de la inflación para mantener ancladas las expectativas.

Palabras clave: *shocks* de oferta de petróleo, inflación en riesgo, proyecciones locales por cuantiles, no linealidades, fijación de precios condicionada al estado de la economía.

Códigos JEL: E31, E52, Q43.

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—related to strong inflationary outcomes. We identify these shocks using high-frequency surprises around OPEC announcements, following the external-instrument strategy of Känzig (2021).

Our results document a stark and robust asymmetry. We find that a negative oil supply news shock triggers a significant and remarkably persistent increase in the 90th quantile of the inflation distribution, which substantially exceeds the response observed at the median and the 10th quantile. This upside tail sensitivity is consistent across the United States, the Euro Area, and the United Kingdom, suggesting a fundamental feature of the inflationary process across large advanced economies. While the median response reverts to the steady state relatively quickly, inflationary pressure at the right tail remains elevated beyond the first year, indicating that oil disruptions act as structural innovations to the skewness and persistence of inflation risks.

Our findings provide evidence that oil supply shocks do not merely shift inflation,

but reshape its conditional distribution. We discuss the theoretical underpinnings that can generate such effects. Borrowing from the state-dependent pricing literature (Golosov and Lucas, 2007), upside pressures get amplified through the nonlinearity of price-setting. We argue that persistent upside risks can further stress expectations anchoring. Taken together, these mechanisms suggest that the appropriate object of monetary policy is the full distribution of future inflation, rather than its central tendency, and that managing oil-driven inflation can 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 use the oil supply news shocks from Känzig (2021), relying on the author's publicly available shock series, updated through 2025M06.[1] Identification is based 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 the monthly frequency by summing shocks within each month and are used to identify the corresponding structural innovation in a monthly proxy-SVAR comprising global oil-market and U.S. macroeconomic variables.

In Känzig (2021), the oil supply news shocks are identified in a baseline proxy-SVAR comprising six variables: the real oil price, world oil production, world oil inventories, world industrial production, U.S. industrial production, and the U.S. CPI.[2] The real oil

[1] Available at `https://github.com/dkaenzig/oilsupplynews`.

[2] The monthly data span 1974M01–2025M06, although the identification sample is shorter, 1983M04–2025M06, reflecting the availability of the futures-price data underlying the external instrument.

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), which covers OECD economies and six additional major countries.[3]

We use these shocks to estimate their effects on inflation in the United States, the Euro Area and the United Kingdom through quantile local projections (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 of the dependent variable, but no further controls. This choice preserves the identifying assumption that oil supply news shocks are orthogonal to other structural innovations relevant for macroeconomic outcomes. The coefficient $\beta_{h,\tau}$ measures the quantile-specific impulse response of the outcome to a one-unit increase in the identified oil supply news shock, normalized to generate a 10 percent increase in the real price of oil on impact. Following Montiel Olea and Plagborg-Møller (2021), we adopt a rich lag structure for inference in local projections, including twelve lags of both the shock and the dependent variable; that is, $L_s = 12$ and $L_y = 12$. The sample ranges from 1975M1 to 2025M6 for all the economies.[4] Inference is based on 1000 replications from a moving-block bootstrap procedure with 8-month block length which accounts for serial dependence in the

[3] In his linear SVAR estimated on the original sample ending in 2017M12, Känzig (2021) finds that a negative oil supply news shock raises U.S. consumer prices immediately and significantly, with the CPI response peaking at about 0.4 percent and remaining elevated for roughly one year before gradually returning to baseline.

[4] Official HICP data for the Euro Area are only available from 1996M1. We extend the sample back in time by aggregating the inflation indices of Germany, France, Italy, Spain, the Netherlands and Belgium from 1975M1. Country weights are based on the average country-weight obtained from Eurostat, normalized to sum to one. For the U.K. CPI data are extended back to 1975M1 using the official data available on the Office for National Statistics website.

regression residuals.

3 The Asymmetric Transmission of Oil Supply Shocks

In this section, we present the dynamic effects of oil supply news shocks on the conditional distribution of macroeconomic outcomes in the United States, the Euro Area and the United Kingdom. Using the quantile local projection (QLP) framework, we document a profound asymmetry in the transmission mechanism. Our main empirical contribution is the identification of a significant and persistent impact on the right tail of the inflation distribution that substantially exceeds the response observed at the median and the left tail.

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 response of the median, we document the well established result of a persistent increase of about 0.20 to 0.25 percentage points, which dies out over the course of a year. Moving to the dynamic response in the tail, we observe a positive movement on impact in both the 10th and the 90th quantiles. This joint movement implies that the conditional distribution of future inflation has effectively shifted to the right. This shift is illustrated in Panel (a) of Fig. 2, where the red distribution shifts right of the baseline one, reported in blue. In this case, not only the central scenario moves up by about 0.25 percentage points, but also the associated risks move in lockstep. Such an effect is consistent with the propagation of a shock that affects the mean (or median) but does not affect the volatility of a symmetric distribution (e.g., Gaussian).

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 three economies. Similarly, the left

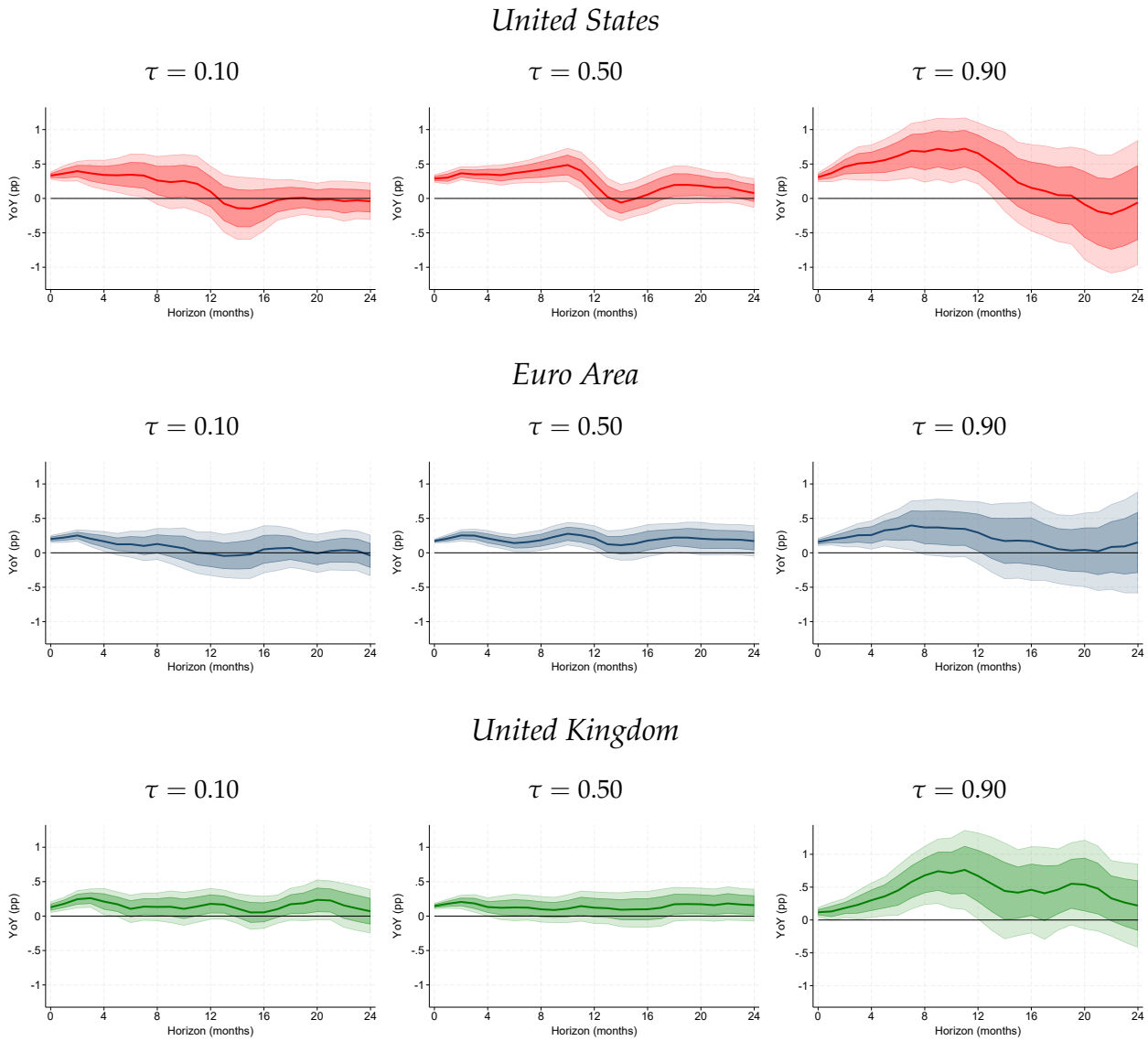

Figure 1: Quantile Responses of Inflation to Oil Supply News Shocks

Notes: Quantile local projection estimates of the dynamic effects of an identified oil supply news shock on inflation in the United States, the Euro Area, and the United Kingdom at the 10th, 50th, and 90th quantiles. The top, middle, and bottom rows report results for the United States, the Euro Area, and the United Kingdom, respectively. Impulse responses are shown for horizons $h = 0, 1, \ldots, 24$ months. Quantile-specific 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, obtained from a block bootstrap with 8-month blocks and 1000 replications. The estimation sample is 1975M01–2025M06.

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 right-most 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 conse-

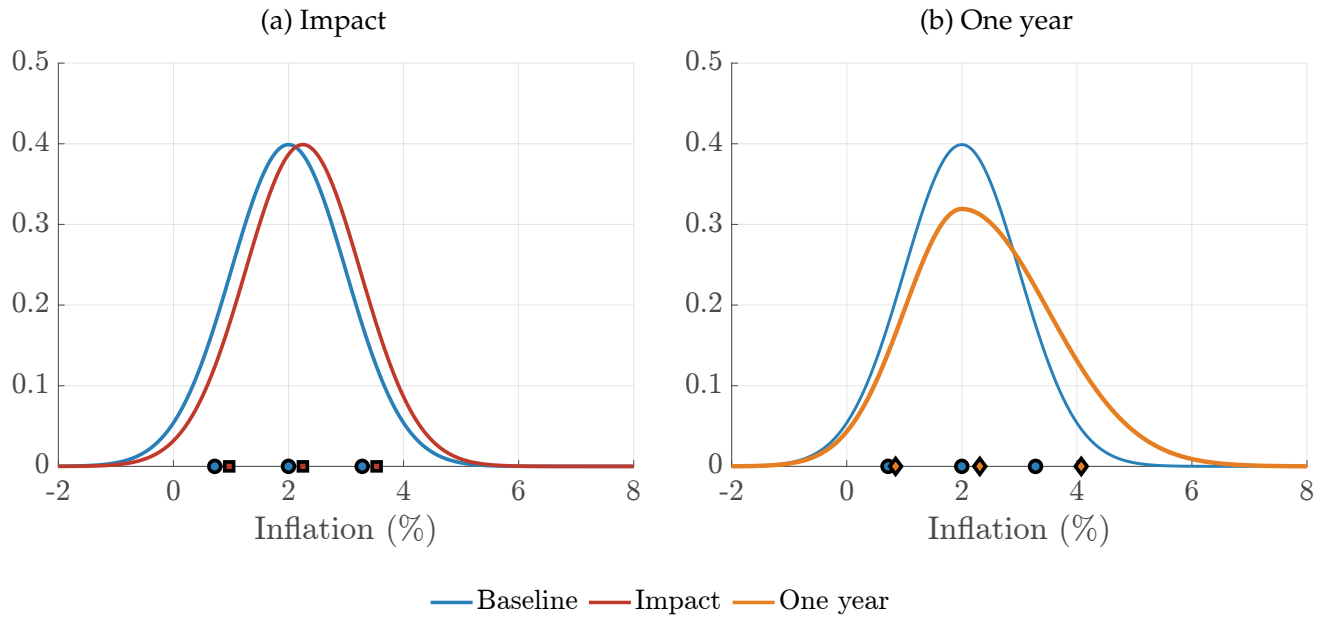

Figure 2: Distribution shifts

Notes: The figures report the conditional distributions of year-on-year inflation implied by the QLP in response to an oil supply news shock. Panel (a) illustrates the linear shift from the baseline distribution (blue) in response to the shock (red) on impact of about 0.5 percentage points. Panel (b) illustrates the conditional distribution after about 12 months (orange), when the right tail response remains elevated, whereas the response of the left tail and the median have broadly died out. The quantiles match the dynamics reported in Fig. 1. Colored dots indicate the 10th, 50th and 90th quantiles.

quential. 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 economy. 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.

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: while the initial response is broadly symmetric, after about a year the right tail remains elevated even as the median and the left tail have mean-reverted. 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 inflation–cost relationship varies with the state of the economy.

State-dependent pricing provides a natural microfoundation. In this setting, firms update nominal prices only when it is convenient to pay 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 – through the propagation of an oil supply disturbance in our case – more firms cross the (S, s) threshold. As more repricing takes place, the slope of the Phillips curve steepens, amplifying the inflationary effect of the oil price increase (Karadi and Reiff, 2019). In such theoretical settings, the implication for monetary policy follows directly: a steeper Phillips curve reduces the sacrifice ratio, such that a monetary policy tightening delivers more disinflation per unit of output cost, as argued by Karadi et al. (2025). This prescription can be approximated by a Taylor rule that smoothly reacts to inflation:

$$i_t = \rho i_{t-1} + (1-\rho)\phi_\pi(\pi)\hat{\pi}_t + \phi_y \hat{y}, \tag{2}$$

where ρ regulates the degree of interest rate smoothing, and the coefficients ϕ_π and ϕ_y determine the responsiveness of the central bank to inflation deviations from target and the output gap, respectively. Specifically, the authors show that $\phi_\pi = \phi_{\pi,1} + \phi_{\pi,2}\pi_t^2$ can tightly reproduce the Ramsey optimal policy rule under state-dependent pricing. A forceful response is therefore relatively less costly precisely in states in which inflationary

pressure is strong. This characterization of optimal policy captures how the slope of the Phillips curve evolves with cost pressures, but it is silent on the formation of expectations. That is, a steeper Phillips curve alone cannot account for the persistence of the right tail. If upside pressures persist long enough to be incorporated into expectations, they can significantly reshape the conditional distribution of inflation, shifting the relevant object for policy from the central tendency to its upper quantiles.

3.2 Policy Implications

The conventional prescription to look through supply-side shocks (Clarida et al., 1999) rests on an approximately linear and stable Phillips curve. The right-tail dynamics we document, and the broader evidence on state-dependent transmission, suggest that persistent upside risks can do more than just amplify current inflation: they can erode the inflation anchor before realized inflation broadens (Reis, 2022). When upside pressures prove persistent rather than transitory, Erceg et al. (2024) show that the conventional prescription to look through supply shocks becomes suboptimal: expectations drift and wage- and price-setting come to track inflation in ways the central bank cannot easily undo — precisely the kind of mechanism that can sustain the right-tail persistence we document.

In such an environment, the relevant policy object is the full conditional distribution of future inflation rather than its central tendency (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 pre-committing to 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. The fact that the inflationary impact at the 90th quantile is more persistent than at the median suggests that oil supply shocks can trigger

second-round effects in the major world economies. By internalizing these Inflation-at-Risk dynamics, 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 responses.

3.3 Additional results and robustness

We complement the main results with four additional exercises. We first validate our QLP approach by estimating the response of real activity to an oil supply shock. Second, we show that our results remain robust to the identification approach of Mori and Peersman (2024). Third, we verify that the main findings are not driven by the post-COVID period. Finally, for the Euro Area, we check that the results are robust to restricting the inflation sample to the period starting in 1996M01.

Real activity. To complement the results on inflation, we estimate the quantile local projection for real activity. The outcomes of interest are year-on-year industrial production growth for the United States, the Euro Area, and the United Kingdom. The results for real activity, reported in Fig. 3, align with the canonical literature on the contractionary effects of oil supply disruptions (Kilian, 2009). Industrial production growth declines across the three economies, with particularly strong effects in the lower tail of the distribution. Notably, we recover the conventional "growth-at-risk" pattern (Adrian et al., 2019), whereby the left tail of real economic growth responds more than the upper tail to recessionary signals. Again, we observe a remarkable persistence mismatch in the response of the tails, with downside risks remaining elevated for longer. It is worth noting, however, that these results are subject to higher uncertainty compared to inflation.

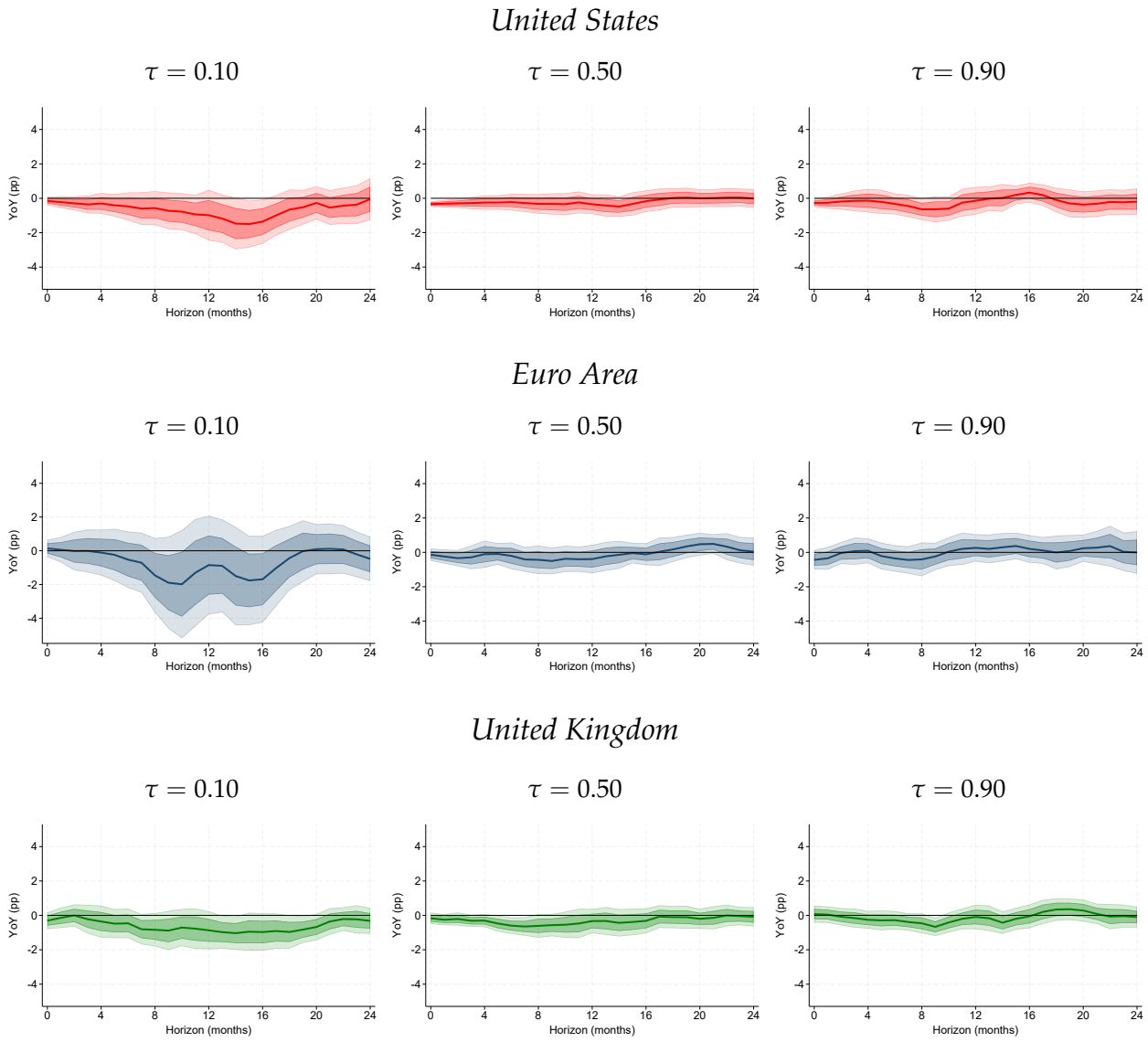

Figure 3: Quantile Responses of Industrial Production to Oil Supply News Shocks

Notes: Quantile local projection estimates of the dynamic effects of an identified oil supply news shock on industrial production in the United States, the Euro Area, and the United Kingdom at the 10th, 50th, and 90th quantiles. The top, middle, and bottom rows report results for the United States, the Euro Area, and the United Kingdom, respectively. Impulse responses are shown for horizons $h = 0, 1, \ldots, 24$ months. Quantile-specific 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, obtained from a block bootstrap with 8-month blocks and 1000 replications. The estimation sample is 1975M01–2025M06 for the United States and the United Kingdom, and 1996M01–2025M06 for the Euro Area.

Alternative identification with extended information set. We conduct an additional exercise to address the role of information deficiencies in the identification of oil supply news shocks. Following Mori and Peersman (2024), we assess whether our results are

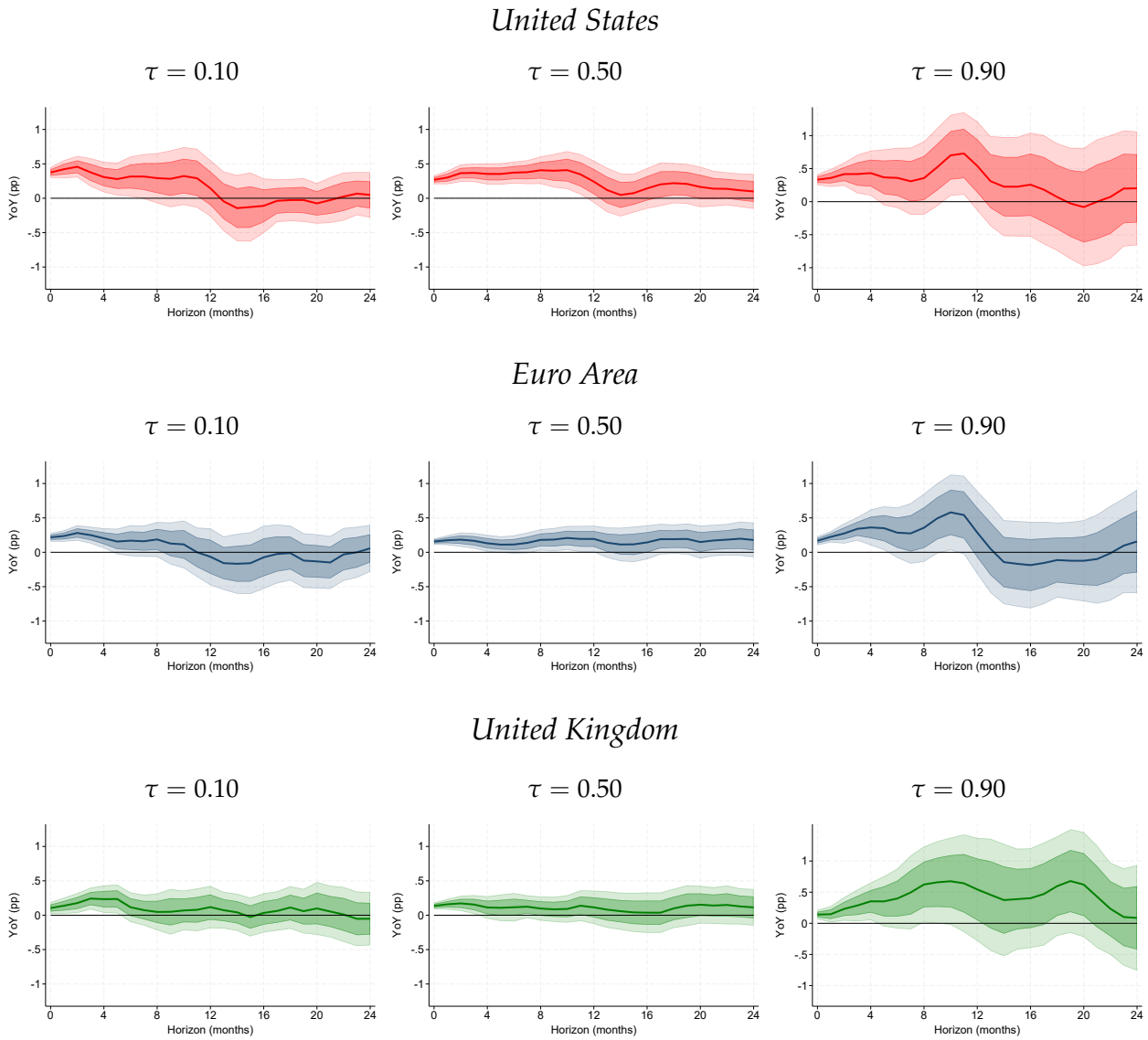

Figure 4: Quantile Responses of Inflation to Oil Supply News Shocks: Robustness Using Mori and Peersman (2024) Oil Supply Shocks

Notes: Quantile local projection estimates of the dynamic effects of an identified oil supply news shock on inflation in the United States, the Euro Area, and the United Kingdom at the 10th, 50th, and 90th quantiles, using the alternative oil news shock measure constructed by Mori and Peersman (2024). The top, middle, and bottom rows report results for the United States, the Euro Area, and the United Kingdom, respectively. Impulse responses are shown for horizons $h = 0, 1, \ldots, 24$ months. Quantile-specific 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, obtained from a block bootstrap with 8-month blocks and 1000 replications. The estimation sample is 1975M01–2024M08.

sensitive to the information set used to identify oil supply news shocks. To this end, we use their alternative shock series, obtained by augmenting the baseline SVAR in Känzig

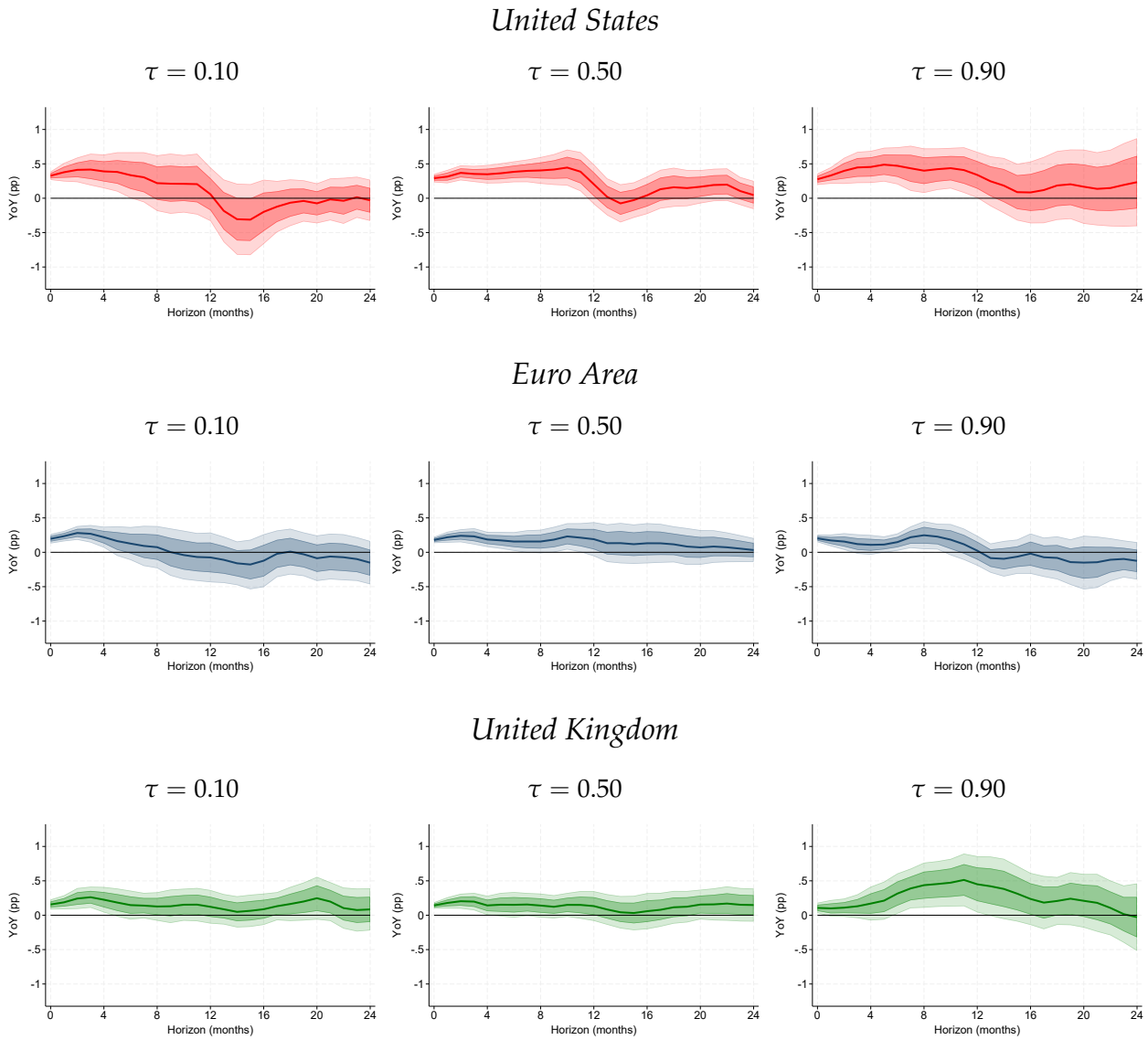

Figure 5: Quantile Responses of Inflation to Oil Supply News Shocks: Robustness Excluding the Post-COVID Period

Notes: Quantile local projection estimates of the dynamic effects of an identified oil supply news shock on inflation in the United States, the Euro Area, and the United Kingdom at the 10th, 50th, and 90th quantiles, excluding the post-COVID period. The top, middle, and bottom rows report results for the United States, the Euro Area, and the United Kingdom, respectively. Impulse responses are shown for horizons $h = 0, 1, \ldots, 24$ months. Quantile-specific 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, obtained from a block bootstrap with 8-month blocks and 1000 replications. The estimation sample is 1975M01–2019M12.

(2021) with three additional financial variables in the econometrician's information set.[5]

[5] Mori and Peersman (2024) argue that identification can be improved by enlarging the VAR information set. In particular, they show that the invertibility requirement and the limited lead–lag exogeneity condition can be satisfied in oil supply news SVAR-IV models by augmenting the information set with three financial indicators: the U.S. one-year interest rate, the S&P 500, and the VXO.

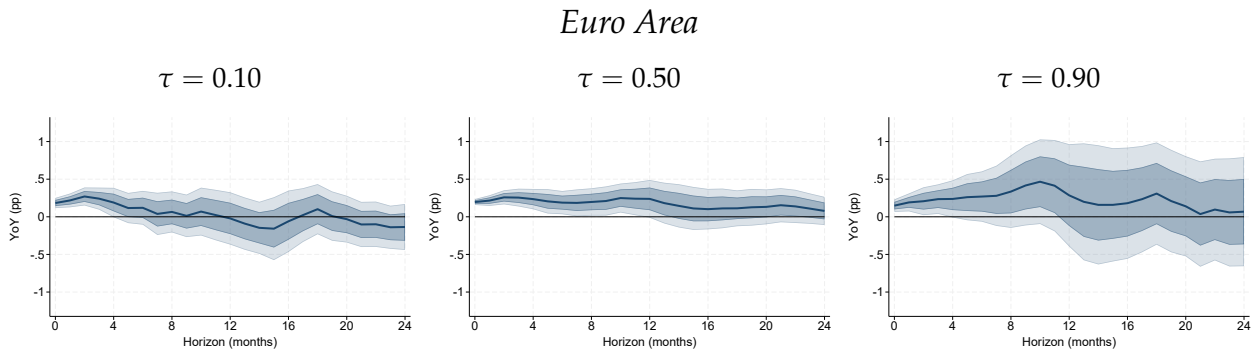

Figure 6: Quantile Responses of Euro Area Inflation to Oil Supply News Shocks: Robustness Using the 1996–2025 Sample

Notes: Quantile local projection estimates of the dynamic effects of an identified oil supply news shock on Euro Area inflation at the 10th, 50th, and 90th quantiles. This robustness uses Euro Area inflation data over the sample period 1996M01–2025M06. Impulse responses are shown for horizons $h = 0, 1, \ldots, 24$ months. Quantile-specific 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, obtained from a block bootstrap with 8-month blocks and 1000 replications.

Overall, the main results remain broadly unchanged and statistically significant, suggesting that our findings are not driven by omitted financial information.

Excluding the post-COVID period. We next examine whether the results are contaminated by the exceptional inflationary dynamics observed after the COVID-19 pandemic and the Russian invasion of Ukraine. These episodes led to unusually high inflation rates across the United States, the Euro Area, and the United Kingdom, and may therefore raise concerns that the baseline estimates are disproportionately shaped by this period. To address this concern, we re-estimate the baseline specification using a sample that ends in 2019M12. The results, reported in Fig. 5, are qualitatively similar to the baseline estimates, although the point estimates are somewhat smaller. This indicates that the post-COVID inflation episode and the subsequent energy-price shock associated with the war in Ukraine contribute to the magnitude of the total effects estimated in the baseline. Importantly, however, the main conclusions remain unchanged: oil supply news shocks still generate asymmetric inflationary responses across quantiles, with stronger effects in the upper tail of the inflation distribution.

Euro Area sample starting in 1996. Finally, we assess the robustness of the Euro Area inflation results to using the shorter sample that starts in 1996M01. In the baseline analysis, we extend the Euro Area inflation series back to 1975M01 using HICP data for the six largest Euro Area economies. This allows us to work with a longer sample, but it may raise the concern that the results are affected by the construction of the pre-1996 Euro Area inflation measure. We therefore re-estimate the Euro Area inflation responses using only the period for which aggregate Euro Area HICP data are directly available. As shown in Fig. 6, the results remain qualitatively unchanged, with oil supply news shocks generating stronger responses in the upper tail of the inflation distribution. This reinforces the conclusion that the baseline findings are not sensitive to the construction of the longer Euro Area inflation sample.

4 Conclusion

We document a stark asymmetry in the response of the right tail of the conditional distribution of inflation to oil supply news shocks across three large advanced economies: the United States, the Euro Area, and the United Kingdom. Initially, the shock shifts the distribution to the right, implying a broadly symmetric movement in the expected distribution of future inflation. About one year into the propagation, however, the right tail of the predictive distribution remains significantly elevated, whereas the left tail and the median revert back to pre-shock levels. This asymmetry generates a positive balance of risks, which can in turn contribute to a de-anchoring of inflation expectations over the medium to long term, thus underscoring the policy relevance of our findings.

We maintain that, in an environment of frequent and large supply-side disruptions, maintaining price stability requires a distributional perspective. Monetary policy must be calibrated not only to the central tendency of inflation, but also to the entire distribution of possible outcomes, with a particular focus on the persistent upside tail risks documented in this study across the United States, the Euro Area, and the United Kingdom.

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