Oil Price Shocks and Inflation

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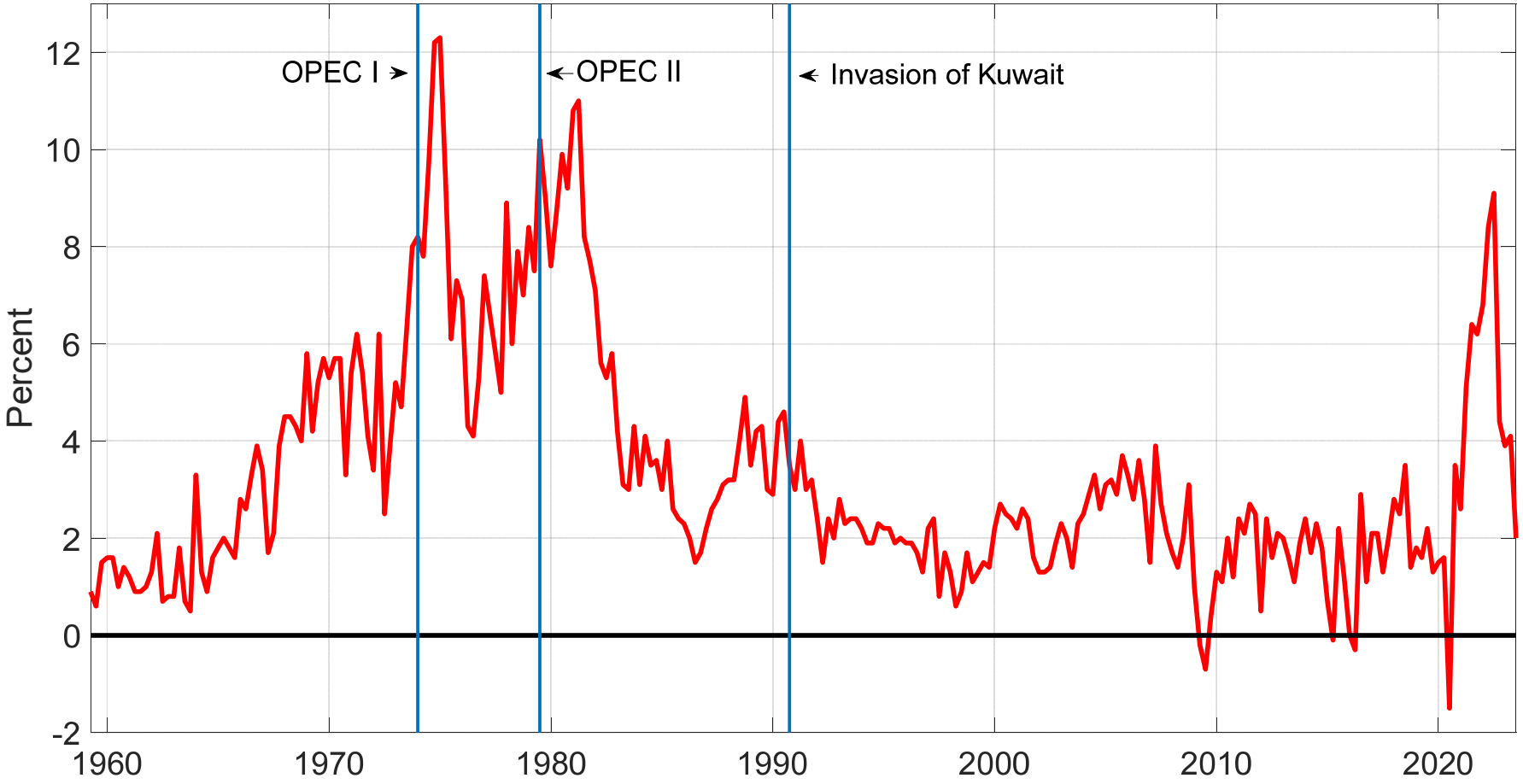
Motivation

- Interest in the link between oil prices and inflation dates back to the 1970s and early 1980s, which saw two unprecedented surges in the price of oil and persistently high consumer price inflation.

- A natural conjecture at the time was that this sustained inflation occurred in response to the increases in the price of oil (e.g., Blinder 1982).

- Implicit in this view is the premise that the price of oil is determined by geopolitical events that are exogenous with respect to U.S. inflation.

Quarterly Inflation Rate in Implicit GDP Deflator, 1959.I-2023.II



NOTES: FRED.

The Data Do Not Support the Traditional View

- The surges in inflation started long before the OPEC I and OPEC II oil price shocks, contradicting this narrative.
- Geopolitically driven OPEC oil supply disruptions fail to explain the increases in the price of oil (Kilian 2008).
- Structural models that allow for both demand and supply shifts in global oil markets indicate that these oil price increases were driven largely by oil demand shocks (e.g., Kilian 2009; Kilian and Murphy 2014; Zhou 2020; Kilian and Zhou 2022).
- This also explains similar surges in other industrial commodity prices (e.g., paper and pulp, scrap metal, lumber) in the early 1970s. These increases predated the surge in the price of oil, given the regulatory and contractual constraints on the price of oil at the time (Kilian 2008).

The Modern Interpretation of these Events

- Worldwide shifts in monetary policy regimes in the early 1970s played a major role in causing both oil price increases and the high inflation in many OECD economies (Barsky and Kilian 2002, 2004; Kilian 2010).
- The oil price increases reflected surges in global demand for industrial commodities ultimately caused by expansionary monetary policy.
- Rising oil prices were a symptom rather than the cause of high U.S. inflation.
- Not only did U.S. inflation share a common demand component with oil prices, but higher U.S. inflation motivated increases in the price of oil in 1973/74, as OPEC oil producers saw their real FX earnings erode.

Why Oil Prices Matter for Inflation

Unexpected changes in the price of oil may affect consumer prices only indirectly:

- Crude oil does not enter the consumer basket directly.

- The oil price matters because the price of refined products such as gasoline, diesel fuel, jet fuel, or heating oil depends on the cost of crude oil acquired by refiners.
  - Of these products only gasoline is **directly** consumed by most U.S. households.
  - However, higher fuel prices may also feed **indirectly** into consumer prices, as producers pass on rising fuel costs.

The Pass-through from Fuel Prices to Core CPI Inflation

Much depends on the ability of producers to pass on these cost increases to consumers:

- For example, farmers in the United States purchase diesel fuel to run agricultural machinery, but tend to lack the ability to pass on higher diesel fuel costs, given the market power of the intermediaries purchasing corn and wheat (Baumeister-Kilian 2014).
- In contrast, 70% of energy price-driven changes in the input costs of manufacturing firms are passed through to consumers in the short to medium run (Ganapati, Shapiro and Walker 2020).

Thus, the extent and timing of the passthrough from fuel price shocks to inflation is an empirical question.

Digression: The Wage-Price Spiral

- Normally, one would expect a one-time permanent unexpected increase in the oil price to raise the level of consumer prices permanently, while increasing inflation only temporarily.
- Some economists are concerned that oil price shocks may trigger persistent inflation as nominal wages respond to the consumer price increases caused by oil price shocks.
- Such feedback effects can take on a life of their own, once higher inflation becomes embedded in inflation expectations.
- Blanchard (1986) coined the term **wage-price spiral** for this phenomenon.

Early Literature on Inflation and Energy Prices

- Much of the literature has focused on the impact of **oil price shocks** on the macroeconomy.

  Examples: Bernanke-Gertler-Watson (1997), Kilian (2009), Clark-Terry (2010), Kilian-Lewis (2011), Wong (2015), Conflitti-Luciani (2019).

- This literature ignores the fact that the prices of refined products such as gasoline do not necessarily move proportionately with percent changes in the price of oil.
  - One reason is events such as Rita and Katrina in 2005.
  - The other reason is that the price of gasoline also depends on the costs of refining, marketing and distribution as well as gasoline taxes that are all subject to time variation.
  - The cost share of crude oil moves around over time.

More Recent Literature

- Recent research instead has focused on **gasoline price shocks** for this reason and because of the perceived salience of gasoline prices to consumers, which makes it more likely that inflation expectations would respond to gasoline price shocks.
- This distinction is important:

  Replacing the price of oil in a VAR model of inflation with the price of gasoline may substantially affect the responses of inflation and inflation expectations (Kilian and Zhou 2022).

Baseline Empirical Model for the United States

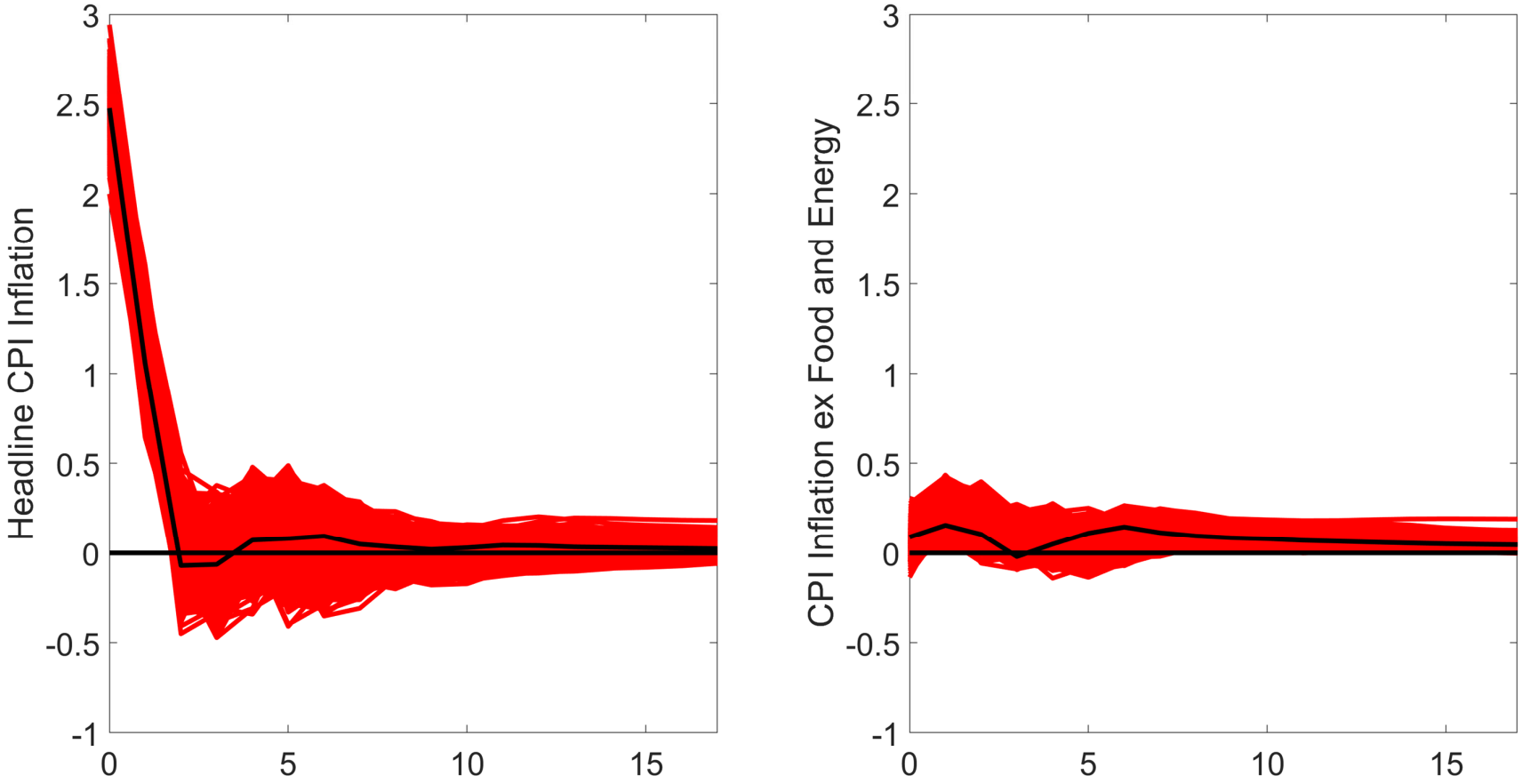
Empirical Model

- VAR(6) for seasonally adjusted data for percent change in gasoline price, headline CPI inflation, core CPI inflation, 1 yr and 5-10 yr household inflation MSC expectations.
- The gasoline price shock is identified based on the assumption that the nominal price of gasoline is predetermined with respect to the other model variables:

  Surprise changes in inflation or in inflation expectations do not feed back into gasoline prices within one month, but gasoline price shocks are allowed to feed into inflation and expectations immediately (Kilian and Vega 2011).

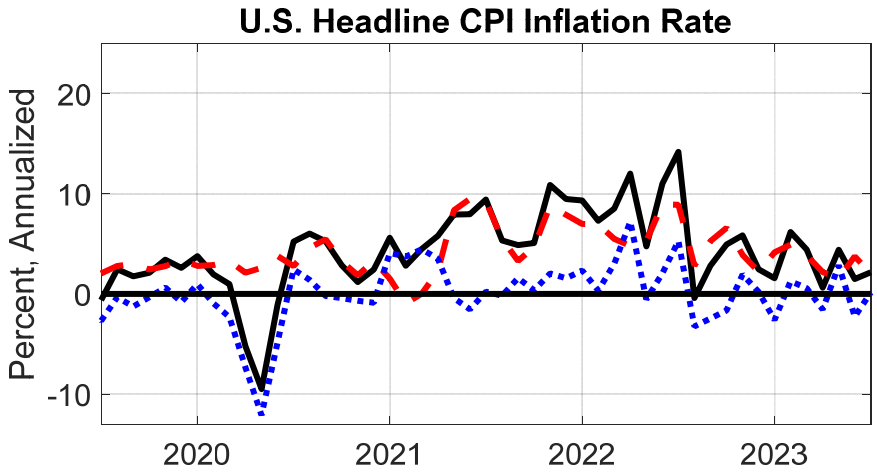
- Michigan Survey of Consumers expectations preferred (representative for economy, long- and short-horizon, available at monthly frequency).

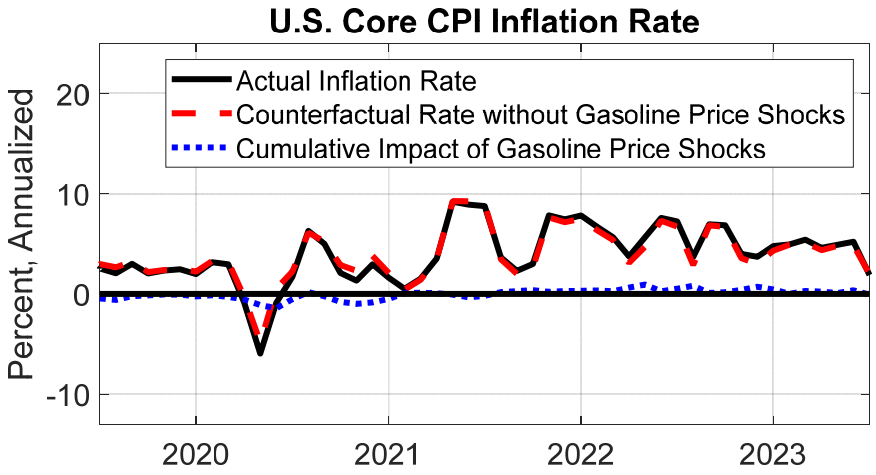
Responses to a 10% Gasoline Price Shock in the U.S., 1990.4-2023.6



NOTES: Estimate and joint 68% error band. Inflation responses annualized.

Cumulative Contribution of U.S. Gasoline Price Shocks, 2019.6-2023.6





- ⇨ Our results based on data since 1990 are robust to alternative identifying strategies, model specifications, lag order choices and price measures.
- ⇨ Similar results when allowing for additional shocks specific to high-way diesel fuel, jet fuel, natural gas, and electricity markets.

Digression: Were the 1970s and 1980s different?

- Almost no one disputes that the impact of oil price shocks on inflation has been modest and short-lived in recent decades.

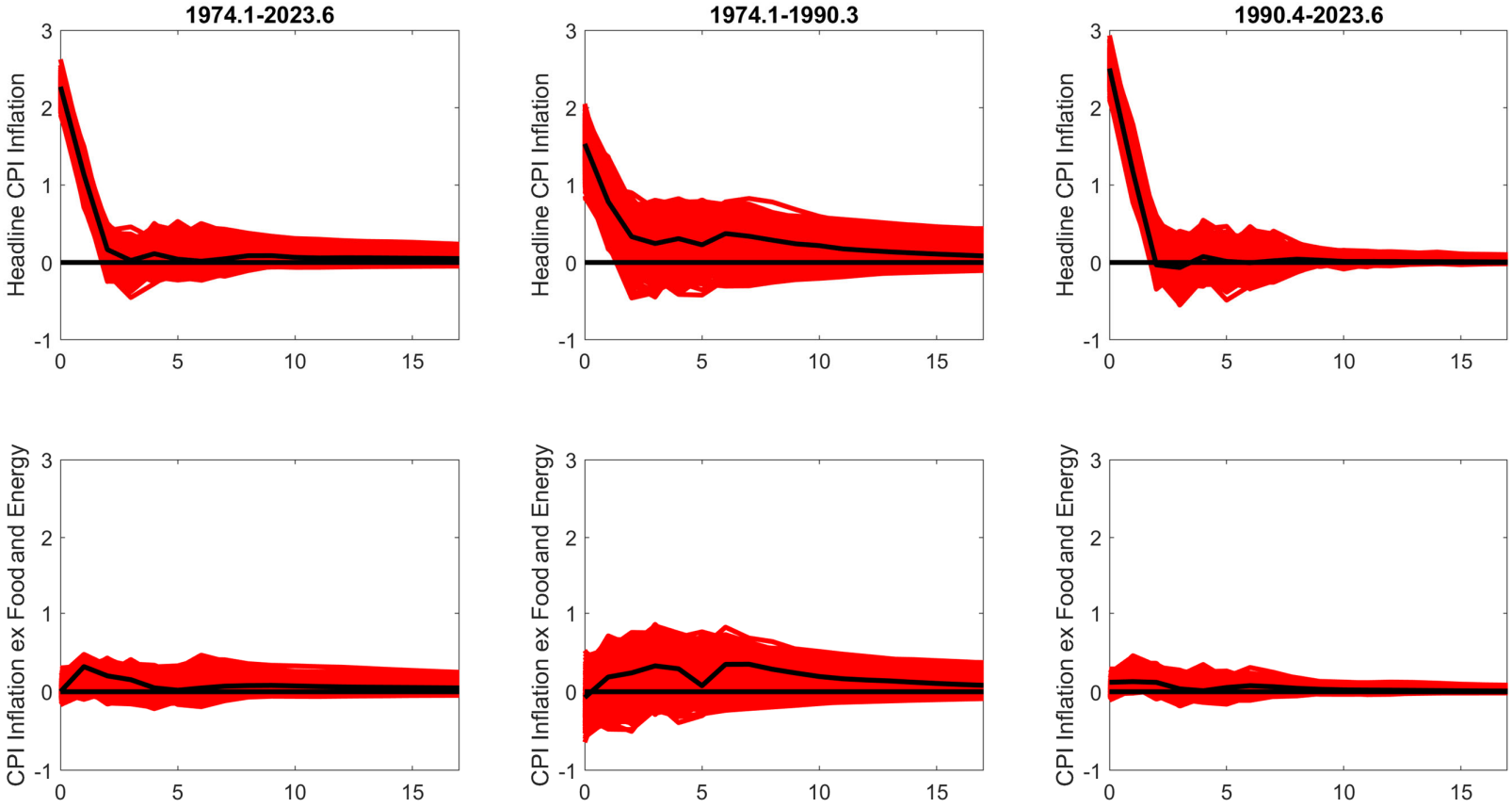
- However, it has been suggested that the response of inflation to oil price shocks was much more persistent in the 1970s and early 1980s than it is today (e.g., Blanchard and Gali 2009; Clark and Terry 2010).

Potential explanations for the reduced persistence of inflation responses:

1. **The U.S. economy has become less oil dependent.**
   Working with expenditure share-weighted nominal gasoline price shocks does not change the responsiveness of inflation (Kilian and Zhou 2022).
2. **The response of monetary policymakers to oil price shocks has improved.**
   Difficult to reconcile with theory and evidence (Kilian and Lewis 2011, Bodenstein et al. 2012).
3. **U.S. real wage rigidities have declined.**
   Does not seem to hold in the data (Bachmeier and Cha 2011).
4. **The reduced persistence of inflation responses to oil price shocks may be explained by changes in the mix of oil demand and oil supply shocks.**
   Kilian (2009a,b), among others.

How much the inflation responses to gasoline price shocks have changed since the 1970s may be examined using our baseline model without the expectations variables that only extend back to early 1990.

Temporal Stability of the Responses to a 10% Gasoline Price Shock



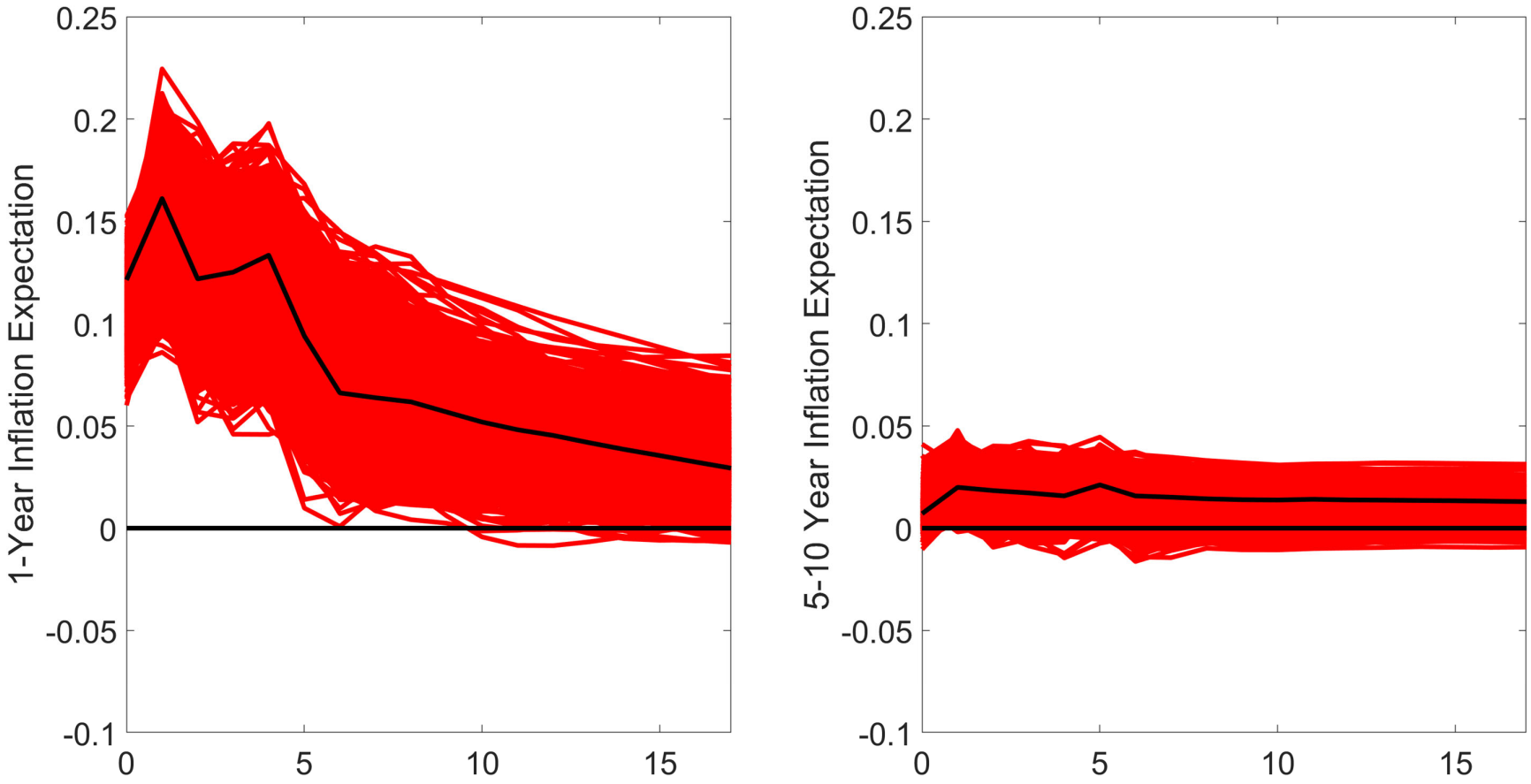
These estimates contradict the view that the inflationary responses to oil price shocks were persistently large before 1990.

Responses of U.S. Inflation Expectations to Gasoline Price Shocks

Preview: What's Driving the Transmission to Inflation Expectations?

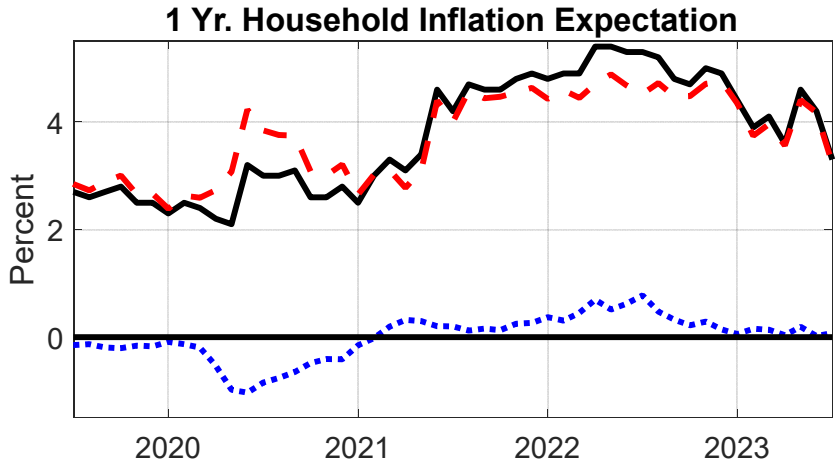
- Anderson et al. (2011, 2013) show that household gasoline price expectations are well approximated by a random walk.
- This implies that households would not expect gasoline prices to increase following an unexpected surge in gasoline prices.
- Thus, if inflation expectations rise in response to a gasoline price shock, this response must reflect expectations of other consumer prices responding to the gasoline price shock.

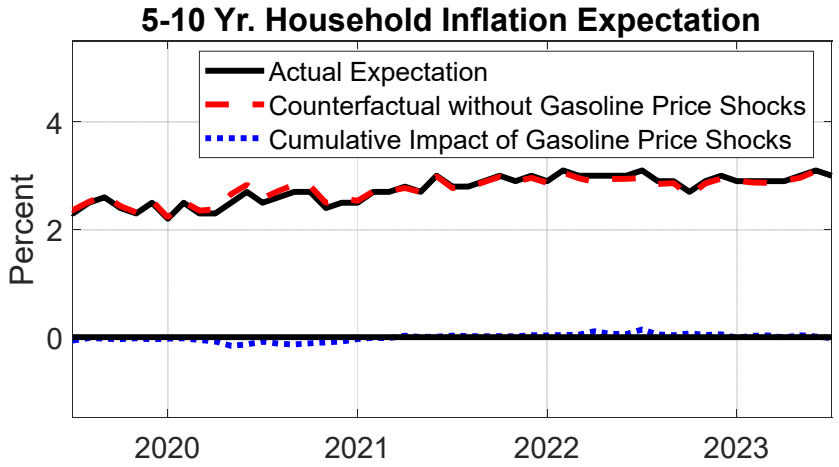
Responses to a 10% Gasoline Price Shock in the U.S., 1990.4-2023.6



NOTES: Estimate and joint 68% error band for baseline model. The expectations data are from the Michigan Survey of Consumers.

Cumulative Contribution of U.S. Gasoline Price Shocks, 2019.6-2023.6



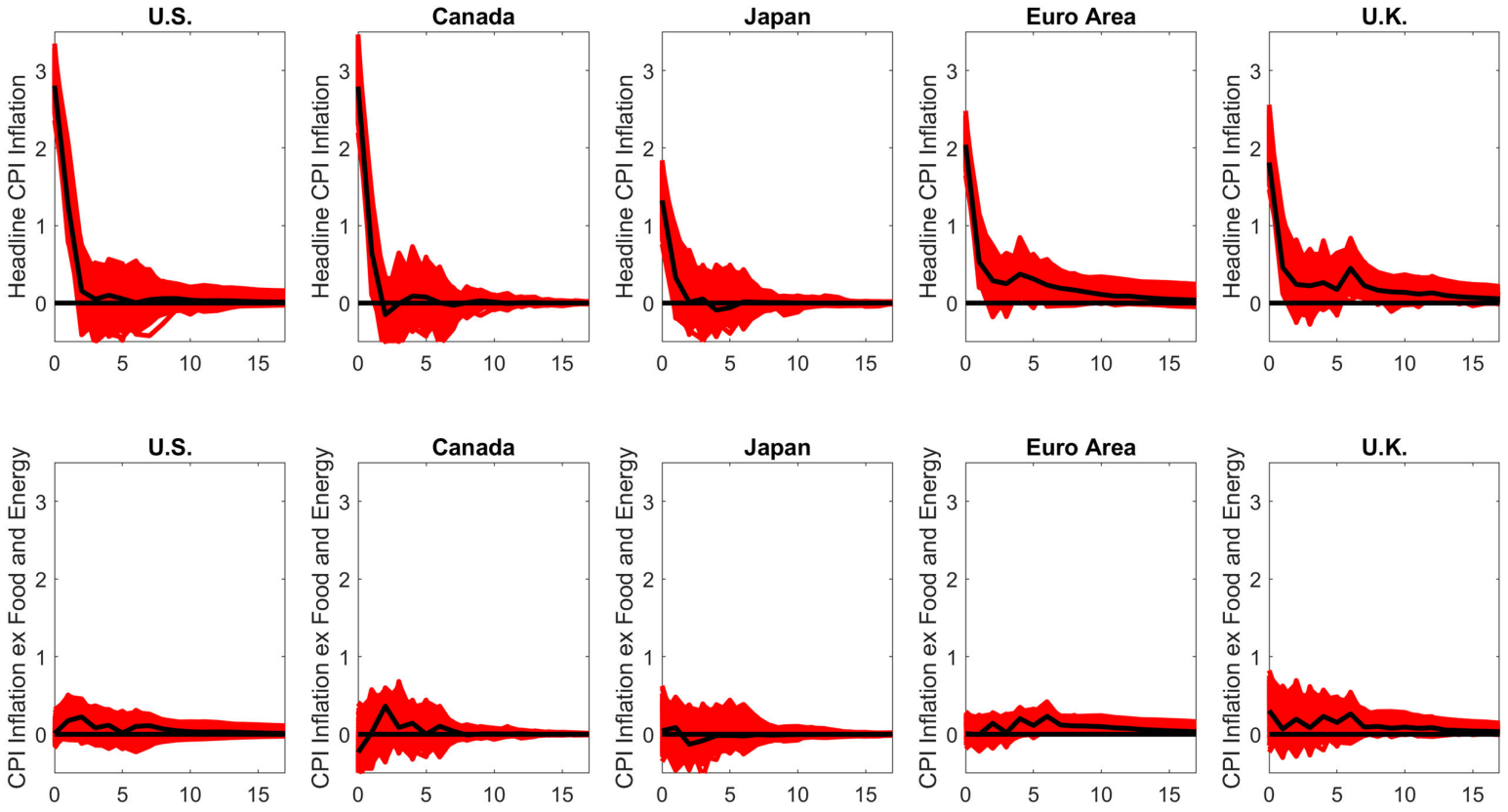


Remark:

- Very similar results are obtained using the Cleveland Fed inflation expectations for horizons of 1, 3, 5, 10, 20 and 30 years.
- Very similar results based on U.K. bond market inflation expectations (Kilian and Zhou 2023).

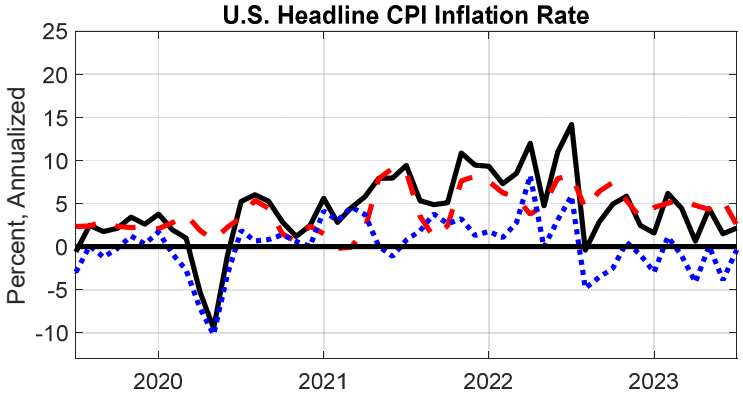
International Evidence Based on a Broader Model of Consumer Energy Price Shocks

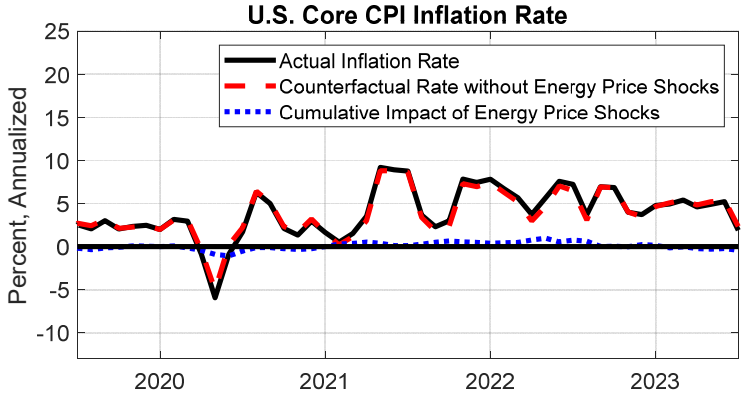
Inflationary Impact of a 10% Consumer Energy Price Shock, 1997.2-2023.6

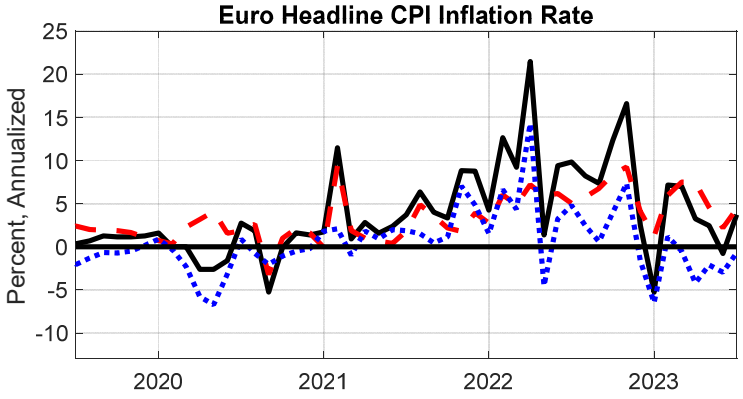


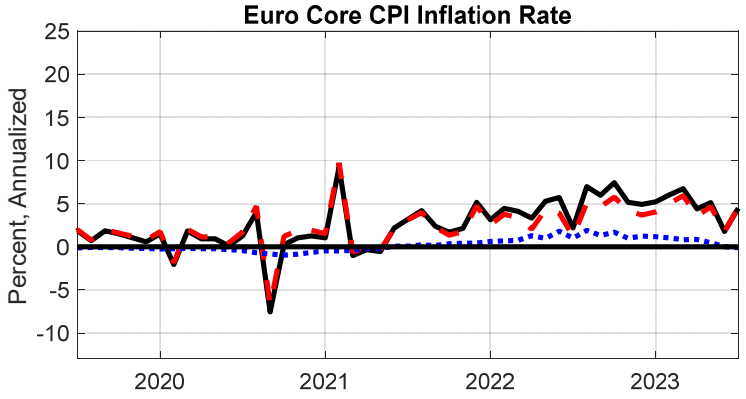
NOTES: The core CPI for the U.K. also excludes tobacco and alcohol.

Cumulative Contribution of Consumer Energy Price Shocks in the United States and Euro Area, 2019.1-2023.6









Take-Away Points

- No support for traditional view that oil price shocks caused high and sustained inflation
- A one-time oil price shock causes a blip in the headline inflation rate and has negligible effects on core inflation
- Inflation expectations to date have been robust to oil and gasoline price shocks, especially at longer horizons
- No support for the notion of a wage-price spiral