Cyclical Demand Shifts and Inflation Inequality

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[1] Views are my own and not those of of the Federal Reserve Staff or the Federal Reserve Board.

Inflation rates tend to be higher for low-income households

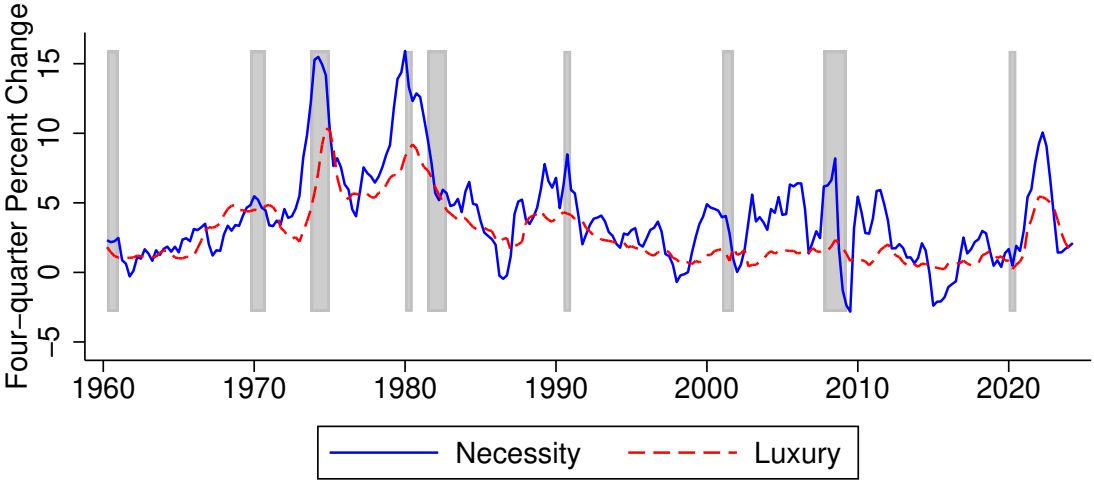
Pioneering work showing higher inflation for low-income households during the early 2000s using scanner data

- Jaravel (2019), Argente and Lee (2021)

Subsequent work showing that the early 2000s were not an anomaly

- Lashkari and Jaravel (2024) $\rightarrow$ 1955-2019

Inflation Rates of Luxuries and Necessities



Source: BLS, BEA, and Author's own calculations.
Notes: Necessities defined as sectors whose average expenditure share from 1980-2022 was higher for low-income than high-income households. Chained fisher price indices. Excludes housing and non-market consumption.

Why focus on the business cycle?

Over long periods, difficult to translate persistently different inflation rates for households of different income to welfare

- Oberfield (2024) $\rightarrow$ welfare growth can be equal across income distribution despite persistently different inflation rates
- Baqaae, Burstein and Koike-Mori (2024) , Lashkari and Jaravel (2024)

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Low-income households suffer more during recessions

- Higher employment loss: Low-Education and minority households

  Hoynes, Miller, Schaller 2012
- Larger decline in nominal consumption

  Krueger, Mitman, Perri 2016
- This paper: Large increase in price-index relative to other households

This Paper

1. **New Facts from U.S. CEX and PCE data (1960-2024)**
   - CEX Interview and Diary micro-data (1980-2022) with disaggregate PCE price and quantity indices (1959-2024)
     - 148 product sectors consistent across time in CEX and PCE
   - Agg. consumption shifts to necessities in recessions
     - I define necessities in the household cross-section $\Longrightarrow$ these are also necessities in the aggregate time-series
   - Necessity relative inflation both counter-cyclical and correlated with oil prices

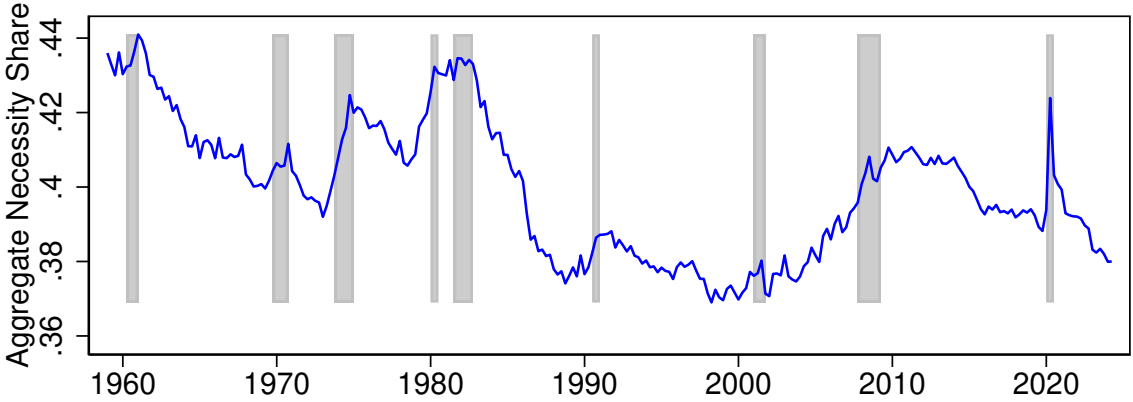
This Paper

1. **New Facts from U.S. CEX and PCE data (1960-2024)**

2. **Mechanism "Cyclical Demand Shifts"**

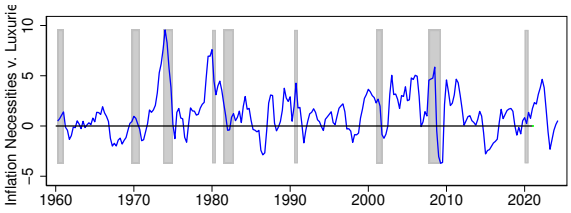
   - Key Features:
     - Aggregate Demand is Non-homothetic
     - Relative prices increase in expanding sector
   - Changes in aggregate expenditure directly lead to changes in relative prices
   - Test key features:
     - Empirically using demand (monetary) and supply (oil) shocks
     - Quantitatively in a New Keynesian Model with Non-homothetic preferences

Expenditure Shifts to Necessities in Recessions



Source: Consumer Expenditure Survey, BEA, and author's own calculations.
Note: The necessity share of aggregate expenditure is the total share of aggregate expenditure using the 148 included PCE categories and excludes non-market and housing products.

Relative Necessity Inflation



	Difference Necessity v. Luxury Inflation				
	(1)	(2)	(3)	(4)	(5)
Right hand side variables:					
NBER Recession	1.16	0.67**			
	(0.72)	(0.29)			
Unemployment Rate			0.15*		
			(0.090)		
Output Gap				−3.79	
				(9.22)	
Δ Real PCE					−1.24**
					(0.59)
Δ Oil Price		0.054***	0.057***	0.056***	0.055***
		(0.0043)	(0.0042)	(0.0043)	(0.0035)
Observations	258	258	258	258	258

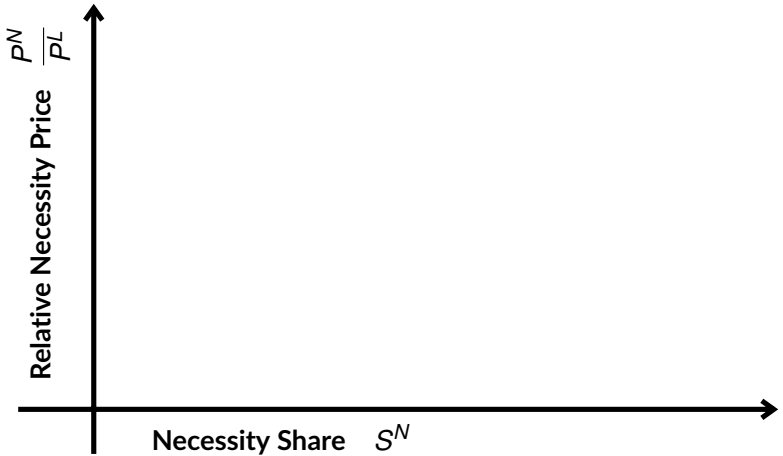
Notes: Newey-West HAC Standard errors in parentheses. $^{*}p < 0.1$, $^{**}p < 0.05$, $^{***}p < 0.01$. The dependent variable is the difference between the Four-quarter Fisher Necessity Inflation rate and the 4-quarter Fisher Luxury Inflation rate.

Panel Regressions

Control for sector oil share, price change frequency, and whether the product is a durable or service:

- Necessity relative share $\uparrow$ 1.9 pp. with a 1 pp. increase in the unemployment rate
- Necessity relative price $\uparrow$ $0.1 - 0.4$ pp. with a 1 pp. increase in the unemployment rate

Expenditure Elasticity of Relative Prices



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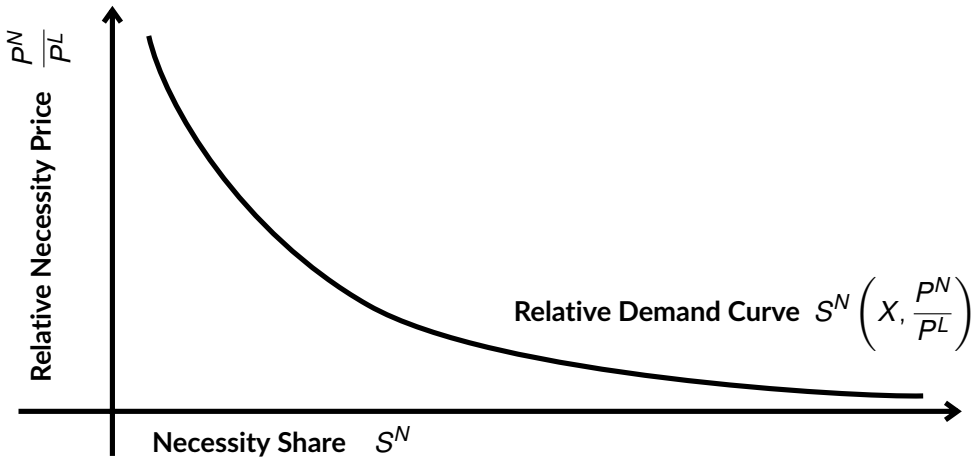

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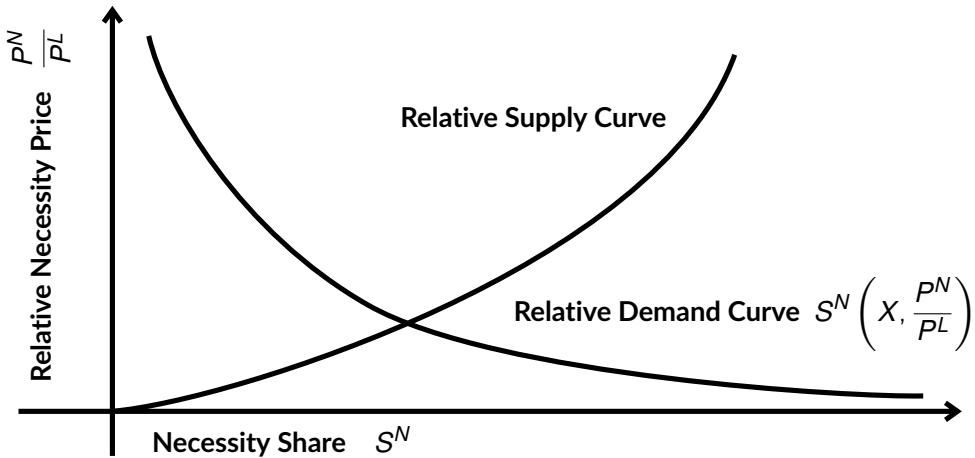

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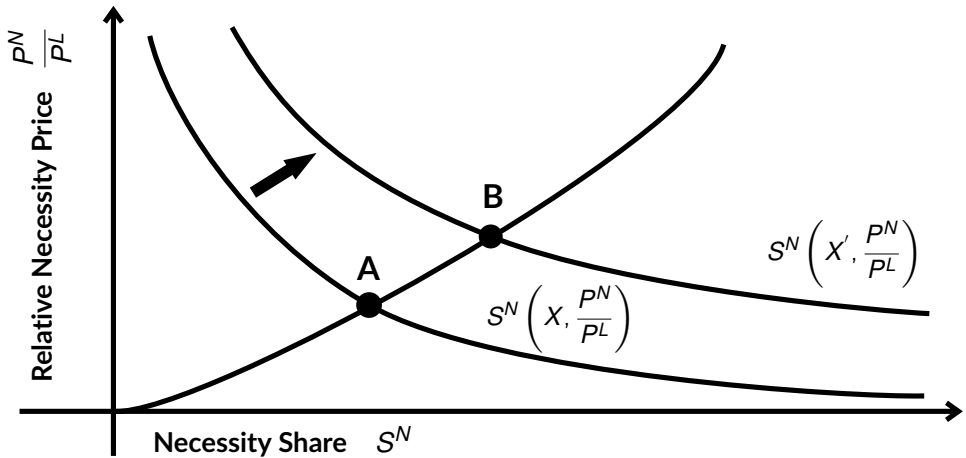
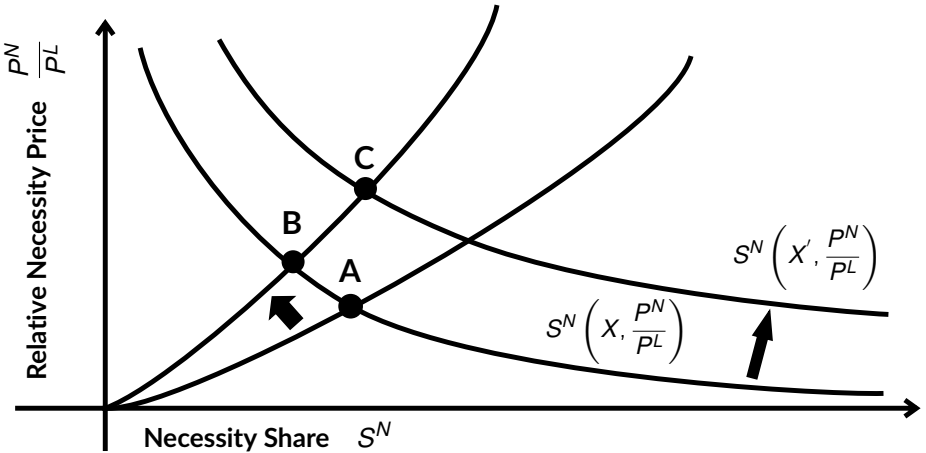


Relative Supply Shock



Empirical Questions

1. How does the aggregate necessity share respond to a shock that affects expenditure?
2. What is the slope of the relative price curve?

Need exogenous shock to expenditure. Must hold relative supply curve constant.

Shocks to expenditure

For each shock, I make different assumptions for how to hold the relative supply curve constant.

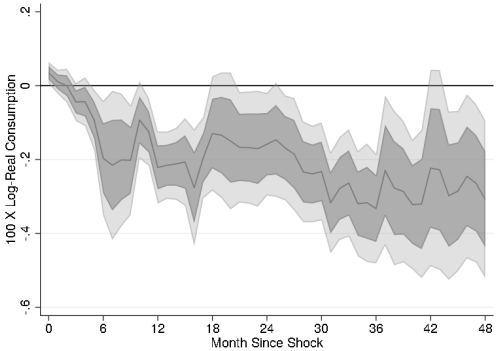
Demand Shock: Monetary News

- Bauer and Swanson (2022) HF with Fed-Chair orthogonal to news (1988-2019)
  - Assume that monetary policy shock does not directly affect relative costs across sectors.
  - Robustness checks with uncertainty shocks, which have a similar effect on expenditure, but lead to lower interest rates.

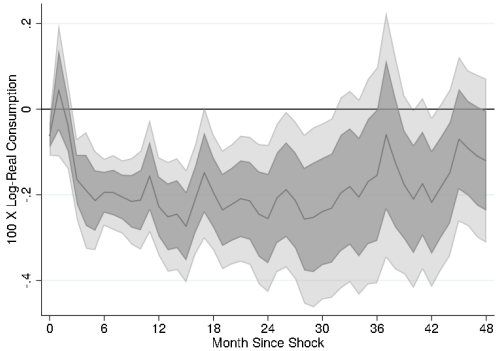
Supply Shock: Oil News

- Känzig (2021): Oil price response to OPEC announcements (1976-2023)
  - Control for the shift in the relative supply curve using sector level oil shares from BEA total requirument I-O tables.

First Stage: Expenditure



a) Monetary Shock

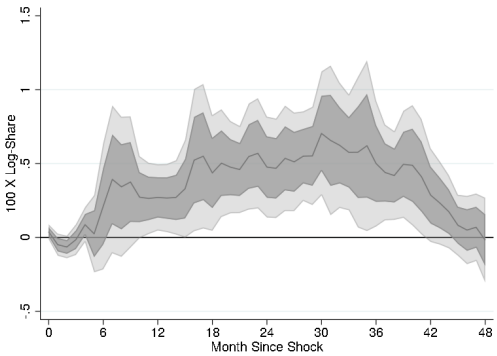


b) Oil Shock

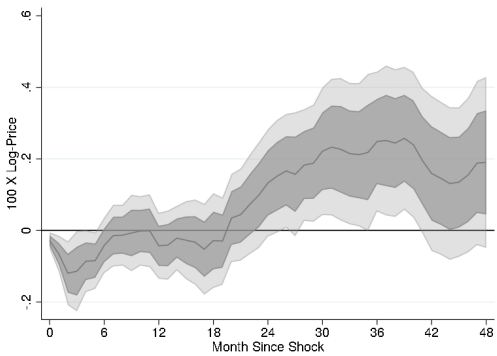
Note: Panel A: data from 1989-2019, Panel B: data from 1976-2023. Estimated coefficients,from Local Projections represent the response of 100 times log-real PCE expenditure to a one-standard deviation monetary contraction or oil price shock using the Bauer and Swanson (2022) monetary shocks or Känzig (2021) oil shocks respectively. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation.

Monetary: Interest Rates, Oil Price, and Aggregate Inflation | Oil: Interest Rates, Oil Price, and Aggregate Inflation | Uncertainty: Interest Rates and Real PCE

Monetary Shock



a) Log-Necessity Share

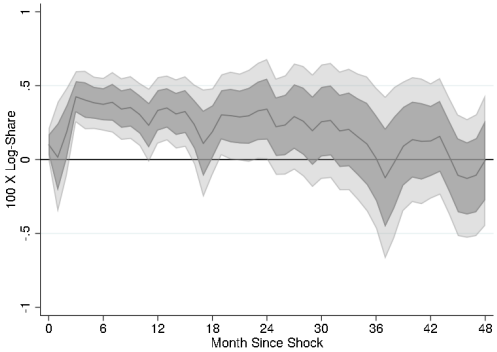


b) Log-Necessity Price

Note: Data from 1989-2019. Estimated coefficients from Local Projections represent the response of the dependent variable to a one-standard deviation monetary contraction using the Bauer and Swanson (2022) monetary shocks interacted with R_j. The unit of observation is the PCE sector-month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation and are clustered at the monthly level. PCE sectors weighted by their share in pooled aggregate expenditure.

Alternative Specifications | Alternative Monetary Policy Shocks | Binary Necessity Definition | Uncertainty Shocks

Total Effect of an Oil Shock on Necessity Relative Shares and Prices



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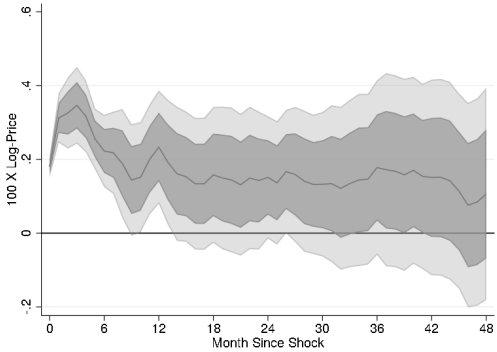


b) Log-Necessity Price

Note: Data from 1976-2023. Estimated coefficient from Local Projections represent the response of the dependent variable to a one-standard deviation Känzig (2021) oil shock interacted with R_j. The unit of observation is the PCE sector-month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation and are clustered at the monthly level. PCE sectors weighted by their share in pooled aggregate expenditure.

Indirect (expenditure induced) Effect of an Oil Shock

a) Log-Necessity Share

b) Log-Necessity Price

Note: Data from 1976-2023. Estimated coefficient from Local Projections represent the response of the dependent variable to a one-standard deviation Känzig (2021) oil shock interacted with R_j. The unit of observation is the PCE sector-month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation and are clustered at the monthly level. PCE sectors weighted by their share in pooled aggregate expenditure.

Quantitative Model

Engine: Two-sector New Keynesian Model

- Households choose consumption and savings
- Sticky wages via labor union
- Central bank follows a Taylor Rule

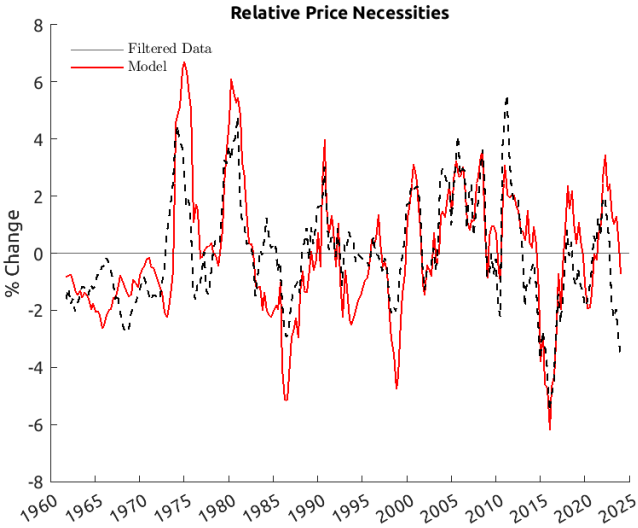
This paper's additions

- **Non-homothetic Consumption (AIDS)**
- Firm production function over labor is DRS (not-unique)
- Firms fully pass-through input costs (wage and oil) to consumers

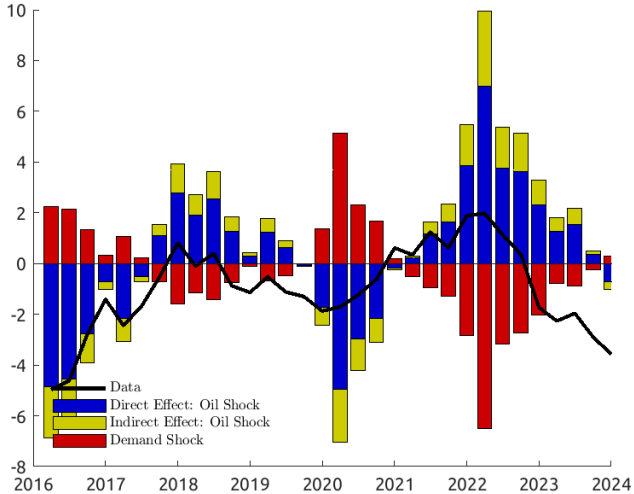
Historical Simulation

- Choose series of oil shocks and discount rate shocks so the oil price and real expenditure in the model match the data
- Compare model S_N and $\frac{P^N}{P^L}$ with data

Historical Simulation



COVID Necessity Relative Inflation

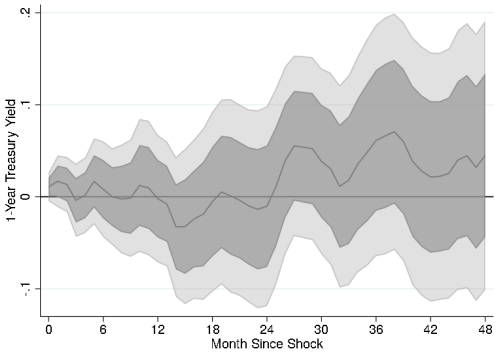


Conclusion

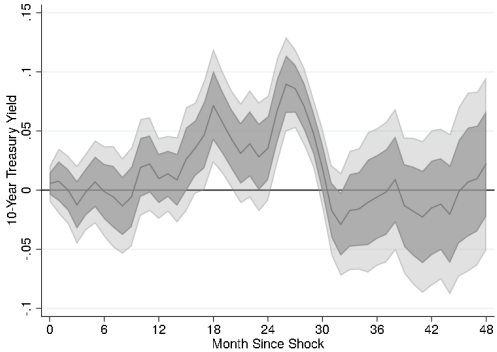
Cyclical Demand Shifts $\rightarrow$ Inflation Inequality

- **Demand and Supply shocks that affect expenditure**
  - Real Consumption: $\downarrow$ 1 percent
  - Relative necessity shares: $\uparrow$ 1-2 percent
  - Relative necessity prices: $\uparrow$ 0.5-1 percent
- **Adverse shocks affect inflation rates of low-income households more than high-income households**
  - Higher share of their budget on necessities
  - One pp. higher relative necessity inflation $\rightarrow$ 0.2 pp. higher low-income inflation

Interest Rate Response to Monetary Policy Shock



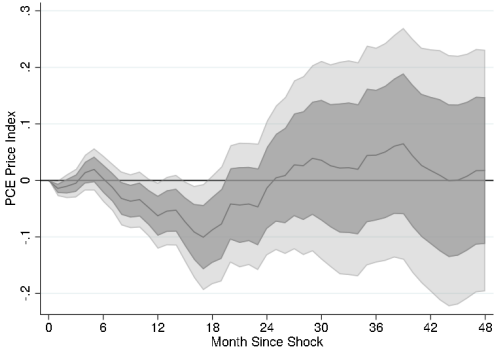
a) 1-Year Treasury Yield



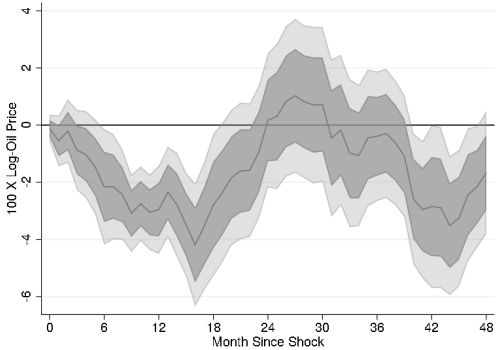
b) 10-Year Treasury Yield

Note: Data from 1989-2019. Estimated coefficients, from Local Projections represent the response of the dependent variable to a one-standard deviation Bauer and Swaonson (2022) monetary shock. The unit of observation is the month. The unit of observation is the month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation. Return

Inflation and Oil Price Response to Monetary Policy Shock



a) PCE Price Index



b) Log-Oil Price

Note: Data from 1989-2019. Estimated coefficients, from Local Projections represent the response of the dependent variable to a one-standard deviation Bauer and Swaonson (2022) monetary shock. The unit of observation is the month. The unit of observation is the month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation. Return

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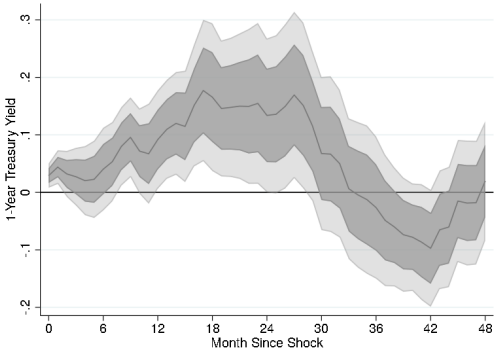

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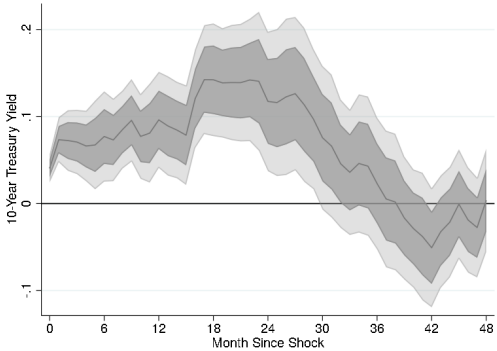
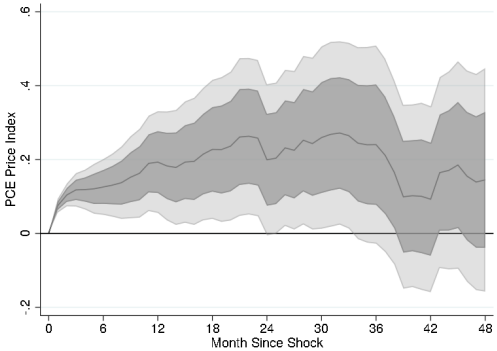


b) 10-Year Treasury Yield

Note: Data from 1976-2023. Estimated coefficients, from Local Projections represent the response of the dependent variable to a one-standard deviation [?] oil shocks . The unit of observation is the month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation. Return

Inflation and Oil Price Response to Monetary Policy Shock



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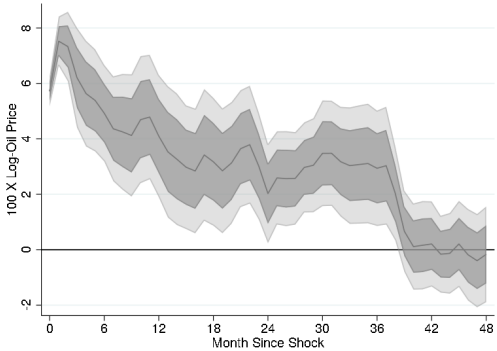

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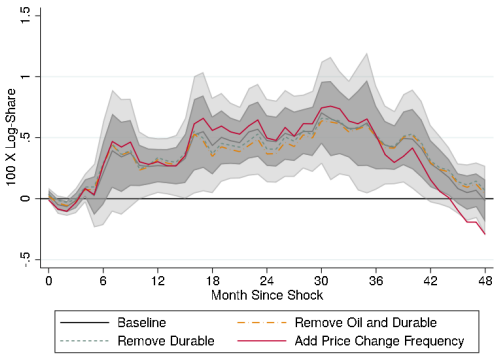
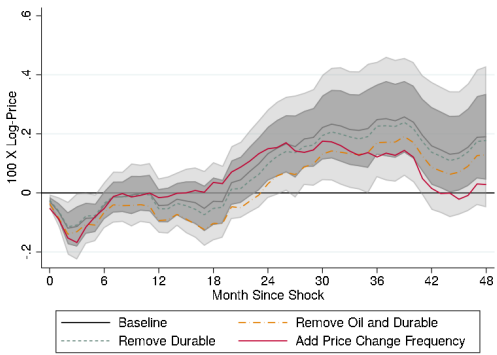
Monetary Policy Shock: Alternate Specifications



a) Log-Necessity Share

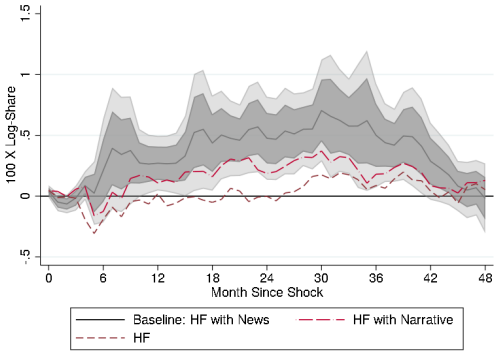


b) Log-Necessity Price

Note: Data from 1989-2019. Estimated coefficients from Local Projections represent the response of the dependent variable to a one-standard deviation monetary contraction using the Bauer and Swanson (2022) monetary shocks interacted with R_j. The unit of observation is the PCE sector-month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively. Standard errors are robust to auto-correlation and are clustered at the monthly level. PCE sectors weighted by their share in pooled aggregate expenditure.

Return

Alternate Monetary Policy Shocks



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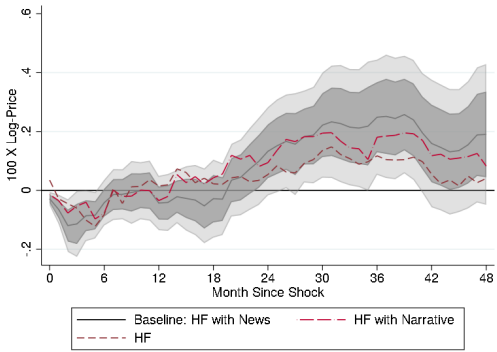
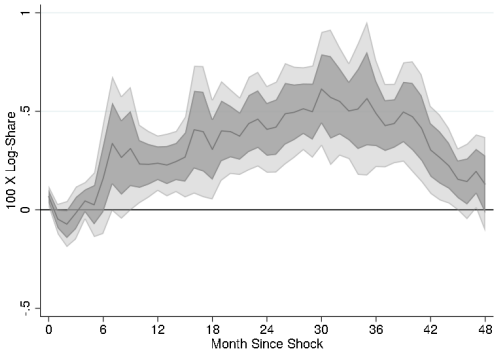


b) Log-Necessity Price

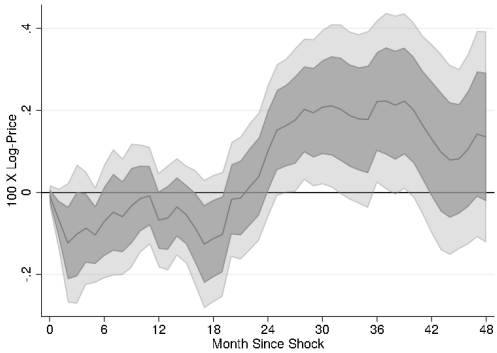
Note: Estimated coefficients from Local Projections represent the response of the dependent variable to a one-standard deviation monetary contraction using the Bauer and Swanson (2022), Gertler and Karadi (2015), or Miranda Agrippino-Rico (2021) monetary shocks interacted with R_j. The unit of observation is the PCE sector-month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively for the [?] shock. Standard errors are robust to auto-correlation and are clustered at the monthly level. PCE sectors weighted by their share in pooled aggregate expenditure. Monetary Policy shock normalized to be mean zero and standard deviation of one.

Return

Monetary Shock: Binary Definition of Necessity



a) Log-Necessity Share



b) Log-Necessity Price

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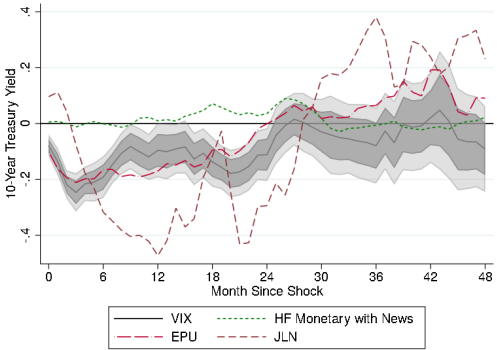
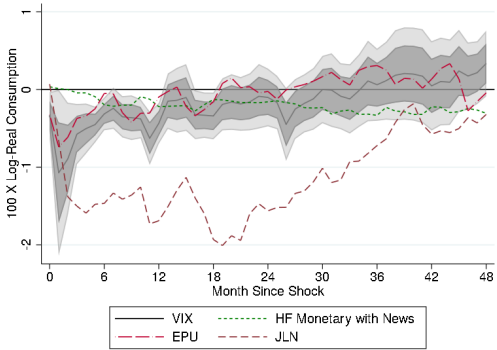
Return

Interest Rate and Expenditure Response to Uncertainty Shock



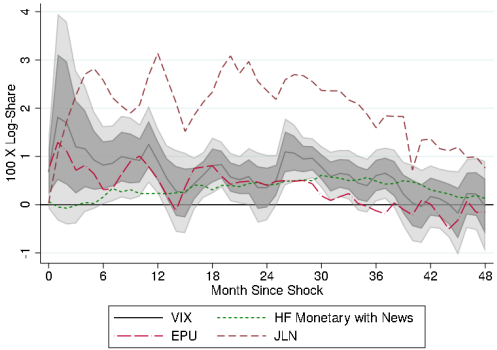
a) 10-Year Treasury Yield



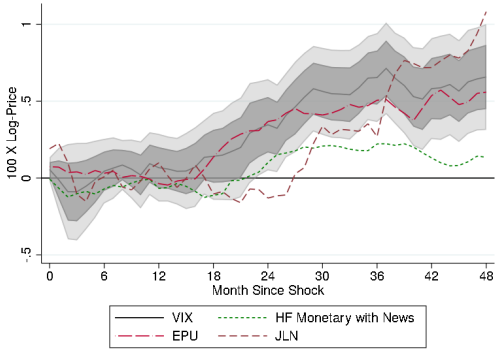
b) Real PCE

Note: Data from: 1989-2019 (Monetary Policy Shock), 1990-2024 (VIX), 1985-2024 (EPU), and 1960-2023 (JL). Estimated coefficients, from Local Projections represent the response of the dependent variable to a one-standard deviation uncertainty or monetary shock. The unit of observation is the month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively for the VIX shock. Standard errors are robust to auto-correlation. Return

Uncertainty Shocks



a) Log-Necessity Share



b) Log-Necessity Price

Note: Data from: 1989-2019 (Monetary Policy Shock), 1990-2024 (VIX), 1985-2024 (EPU), and 1960-2023 (JLN). Estimated coefficients from Local Projections represent the response of the dependent variable to a one-standard deviation uncertainty or monetary shocks interacted with R_j. The unit of observation is the PCE sector-month. The dark and light shaded areas represent 90 and 68 percent confidence bands respectively for the VIX shock. Standard errors are robust to auto-correlation and are clustered at the monthly level. PCE sectors weighted by their share in pooled aggregate expenditure. Monetary Policy shock normalized to be mean zero and standard deviation of one.

Return