Monopoly Power in the Oil Market and the Macroeconomy

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literature:

- oil price depends on supply & demand shocks
- origin of shocks matters for macroeconomy

our paper:

- oil market lacks competition:

  $\rightarrow$ oil producers possess monopoly power and set the price

$$price = (1 + markup) \cdot marginal\ cost$$

$\Rightarrow$ oil price is also driven by innovations in monopoly power (markup shocks)

How do markup shocks in the oil market affect the macroeconomy?

contributions:

1. develop novel strategy to identify unanticipated markup shocks based on OPEC meetings
2. show that markup shocks have unique macroeconomic consequences compared to supply & demand shocks
3. find that global real economic activity expands when oil producers' monopoly power rises
4. build general equilibrium model that rationalizes empirical evidence through investments in oil producing capital

Identification Strategy I/II

markup estimation:

- common approaches use data from NIPA tables (e.g. Hall (1988))
- data is backward-looking, aggregated on sector-level, country-specific, and available at low frequency only

→ not suitable for identifying unanticipated markup shocks in the global oil market at monthly frequency

OPEC meetings:

- idea: OPEC is representative for oil market
- inspiration: literature on monetary policy shocks (e.g. Kuttner (2001))
- approach: oil futures price movements around OPEC meetings

$$\underbrace{\log\left(\frac{price_{after}}{price_{before}}\right)}_{=CR} = \underbrace{\log\left(\frac{1+markup_{after}}{1+markup_{before}}\right)}_{\text{innovation in monopoly power}} + \underbrace{\log\left(\frac{marginal\ cost_{after}}{marginal\ cost_{before}}\right)}_{\text{change of marginal costs}}$$

Identification Strategy II/II

SVAR model:

- oil production, real economic activity & real price of oil are determined *endogenously* (Kilian (2009))
- include cumulative returns as another variable and order it last

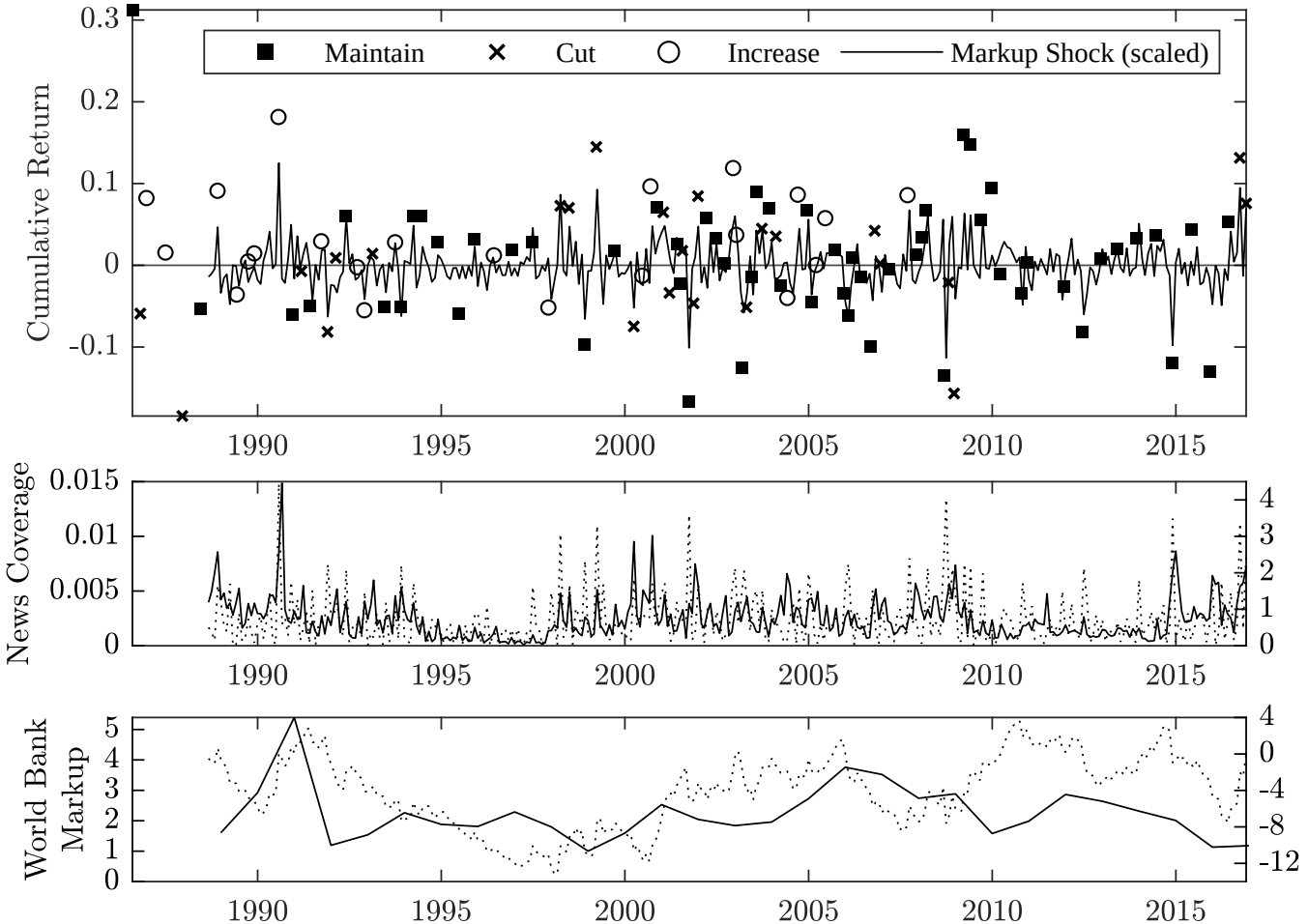
$$\mathbf{A}_0\mathbf{y}_t = \mathbf{c} + \mathbf{A}_1\mathbf{y}_{t-1} + \ldots + \mathbf{A}_{24}\mathbf{y}_{t-24} + \mathbf{u}_t$$

$$\mathbf{A}_0^{-1}\mathbf{u}_t = \begin{bmatrix} a_{11,0} & 0 & 0 & 0 \\ a_{21,0} & a_{22,0} & 0 & 0 \\ a_{31,0} & a_{32,0} & a_{33,0} & 0 \\ a_{41,0} & a_{42,0} & a_{43,0} & a_{44,0} \end{bmatrix} \begin{bmatrix} u_t^{\text{oil supply shock}} \\ u_t^{\text{aggregate demand shock}} \\ u_t^{\text{oil-specific demand shock}} \\ u_t^{\text{markup shock}} \end{bmatrix}$$

- separate out contemporaneous marginal cost changes
- oil production remains unchanged because quota is not yet effective
- real economic activity reacts sluggishly to oil (futures) price changes
- real price of oil is only affected once the oil is booked into the refinery, i.e. after transportation (EIA (2018))

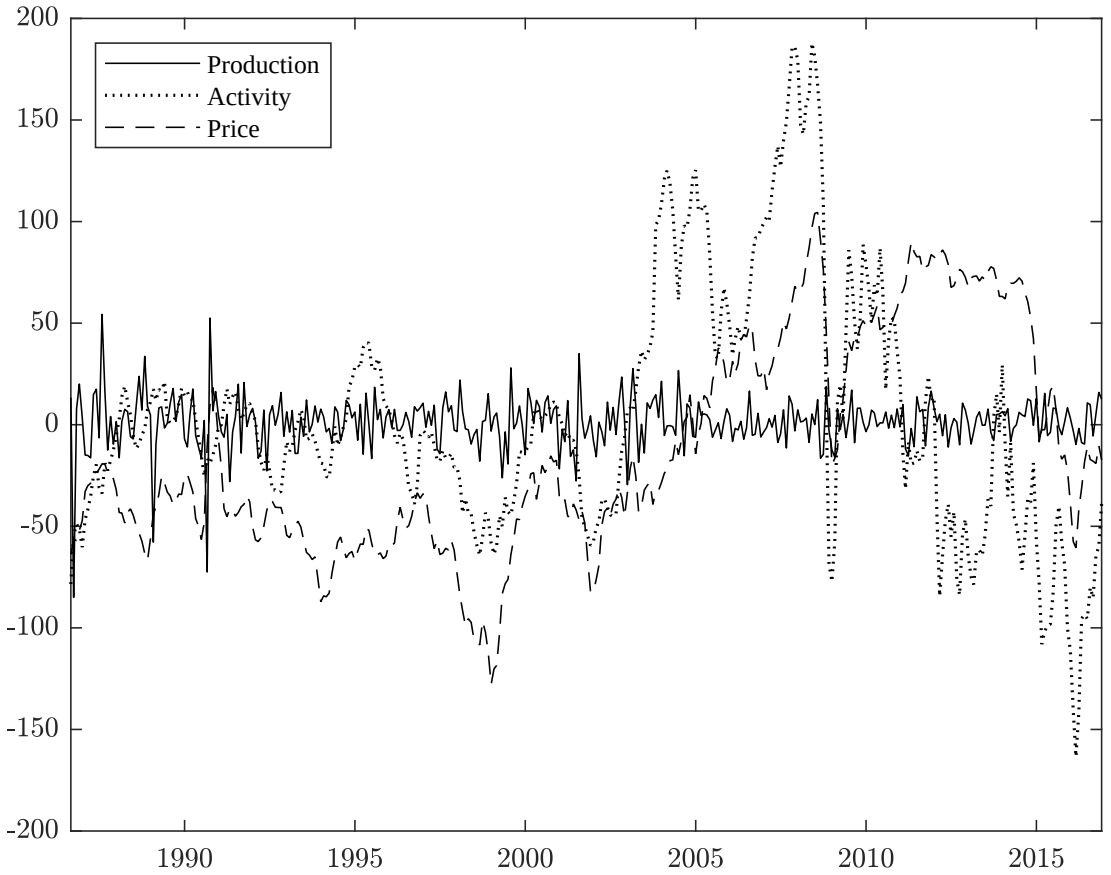
Markup Shocks

- 3-month NYMEX futures (August 5, 1986 – November 30, 2016)
- 104 decisions (24 cut, 22 increase, 58 maintain)



Macroeconomic Quantities

- *monthly* macroeconomic quantities:
  1. global oil production (EIA)
  2. global real economic activity (Kilian (2019))
  3. real price of oil (EIA, BLS)



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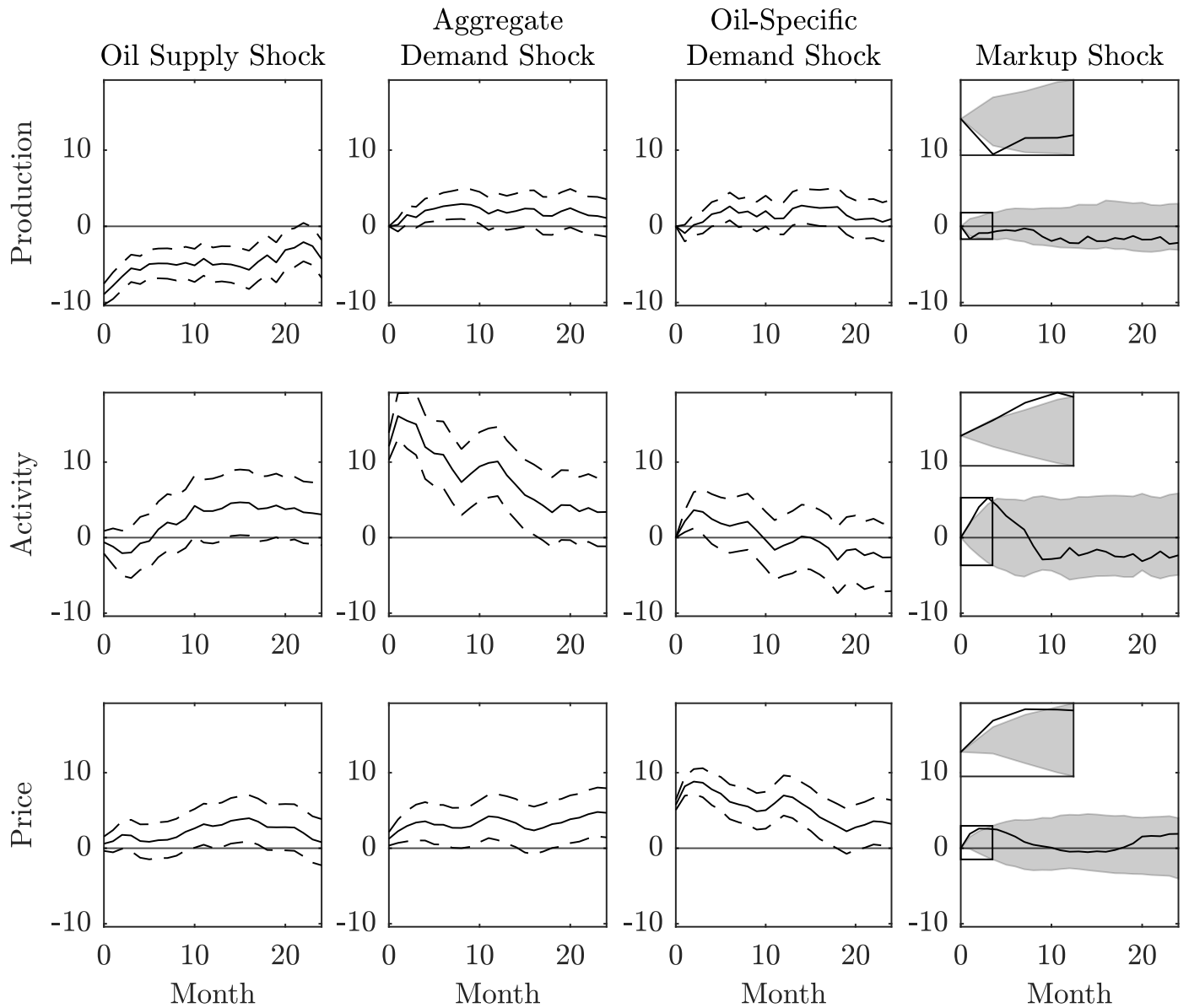
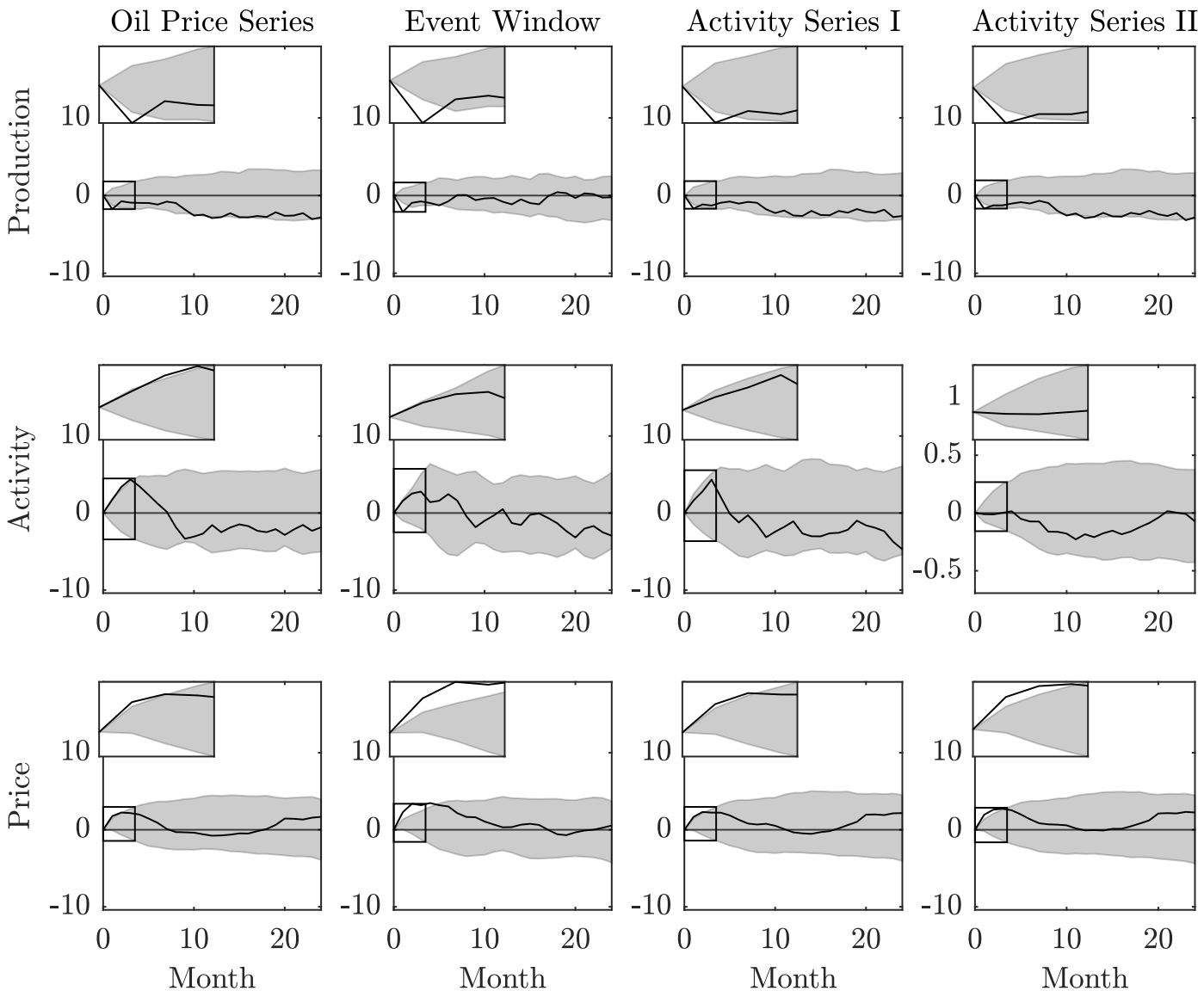
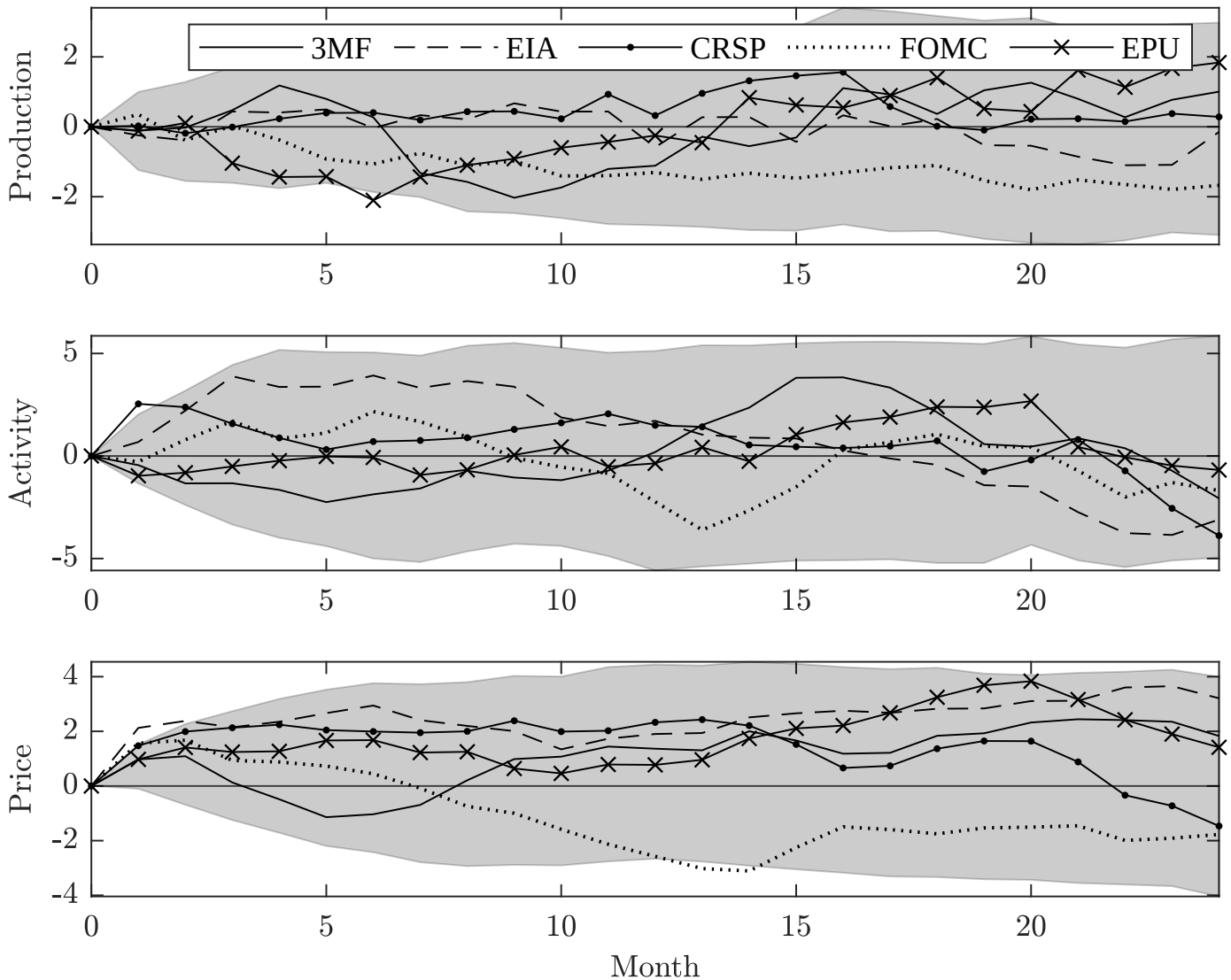
Impulse Responses



Robustness I/II



Robustness II/II



DSGE model with endogenous growth:

(Kung and Schmid (2015))

- oil sector is in monopolistic competition

$$O_t = \left[\int_{j\in[0,1]} \left(K_{o,j,t}^{\alpha_o} E_{j,t}^{1-\alpha_o}\right)^{\nu_{o,t}} dj\right]^{\frac{1}{\nu_{o,t}}}$$

$$P_{o,t} = \frac{1}{\nu_{o,t}} mc_{o,t}$$

- oil is *complementary* input to final good production
- 3 different types of shocks:
  - oil supply shock to depreciation rate of oil capital
  - aggregate demand shock to productivity of final good sector
  - **markup shock** to oil price (directly)

$$\nu_{o,t} = \bar{\nu}_o e^{-m_t}$$

$$m_t = \rho_m m_{t-1} + \sigma_m \varepsilon_{m,t}$$

Solution, Calibration & Quantitative Implications

solution:

- use projection method
- approximate general equilibrium policy functions on a five-dimensional grid

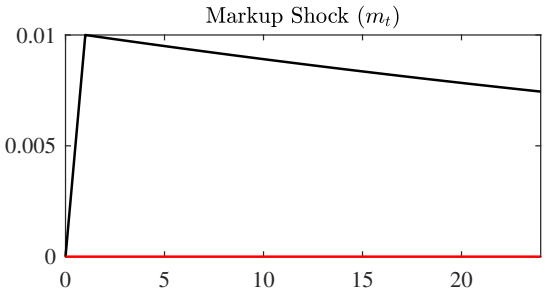
calibration:

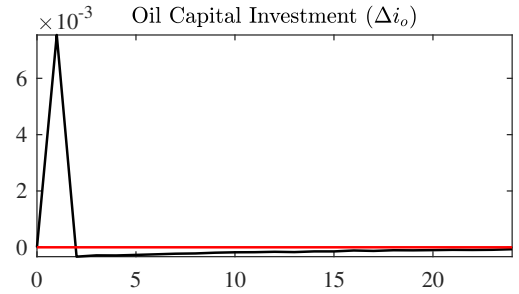
- choose standard parameters...
- ...to match $\mathbb{E}[R_f]$, $\mathbb{E}[\Delta y]$, $\sigma[\Delta y]$, $\sigma[\Delta c]$

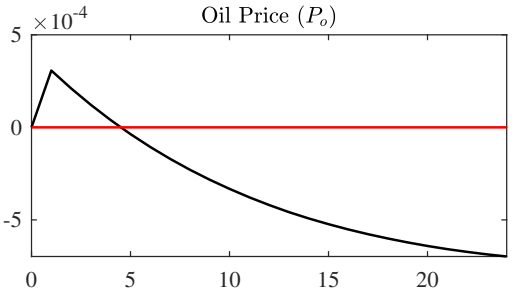
(some) **quantitative implications:**

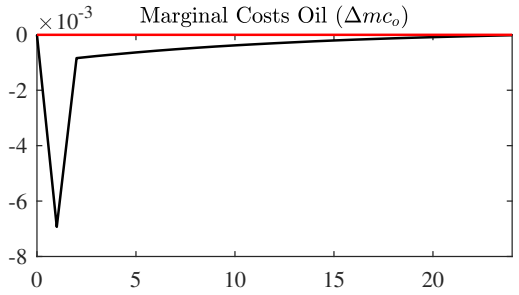
Variable	Description	Model	Data
$\mathbb{E}[\Delta y]$	Output (%)	1.93	1.95 [1.50,2.40]
$\sigma[\Delta y]$	Output (%)	1.88	1.88 [1.74,2.05]
$\sigma[\Delta c]$	Consumption (%)	0.99	1.01 [0.93,1.10]
$\sigma[\Delta i_o]$	Investment in Oil Capital (%)	2.77	16.61 [15.24,18.27]
$\mathbb{E}[R_f]$	Risk-Free Rate (%)	0.93	0.90 [0.62,1.18]
$\mathbb{E}[R_m - R_f]$	Levered Equity Premium (%)	3.13	6.09 [2.12,10.17]

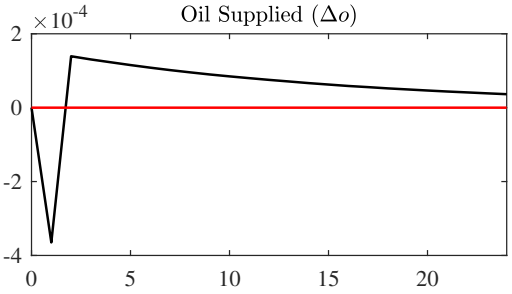
Impulse Responses

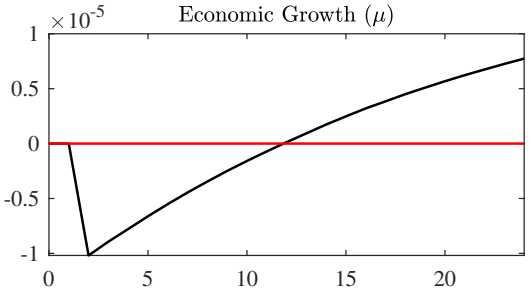


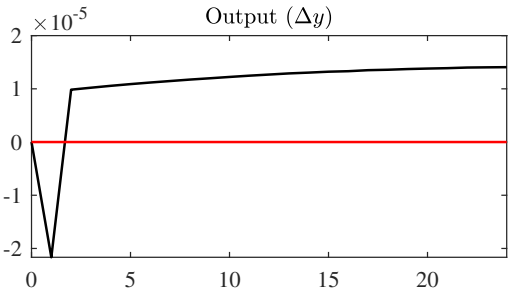


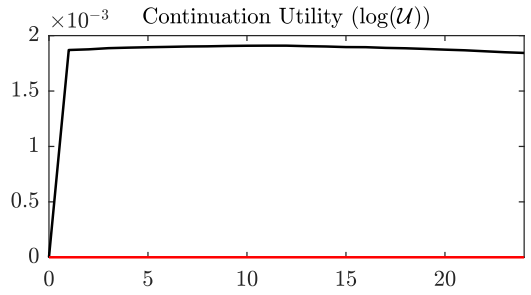












How do markup shocks in the oil market affect the macroeconomy?

- changes in the markup charged by oil producers represent another important source of oil price shocks
- markup shocks imply significant macroeconomic movements which can be explained by investments in oil producing capital

policy implications:

- monopoly power should be taken into account when evaluating policies aimed at moving the oil price to boost the economy
- policies that weaken oil producers' monopoly power bring about negative markup shocks and would hurt real economic activity

$\rightarrow$ measures intended to exploit free oil production capacities must be taken with caution

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