



Can Energy Subsidies Help Slay Inflation?

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MCM

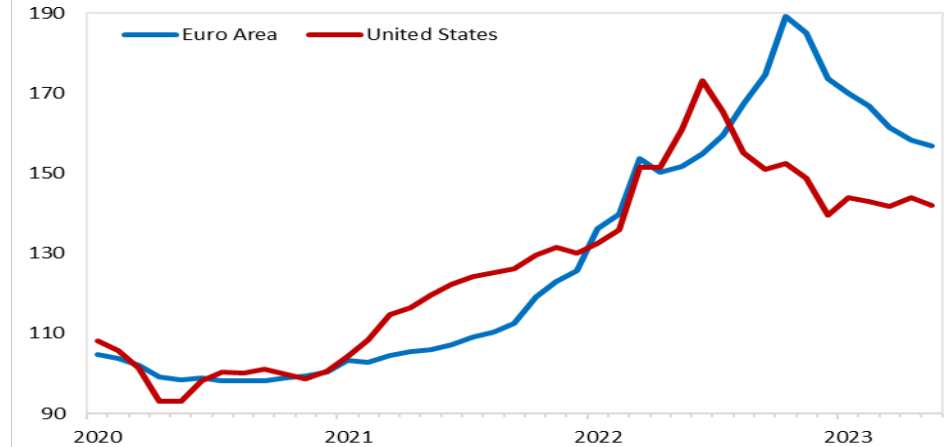
more than
50 years of
experience

IMF

Motivation

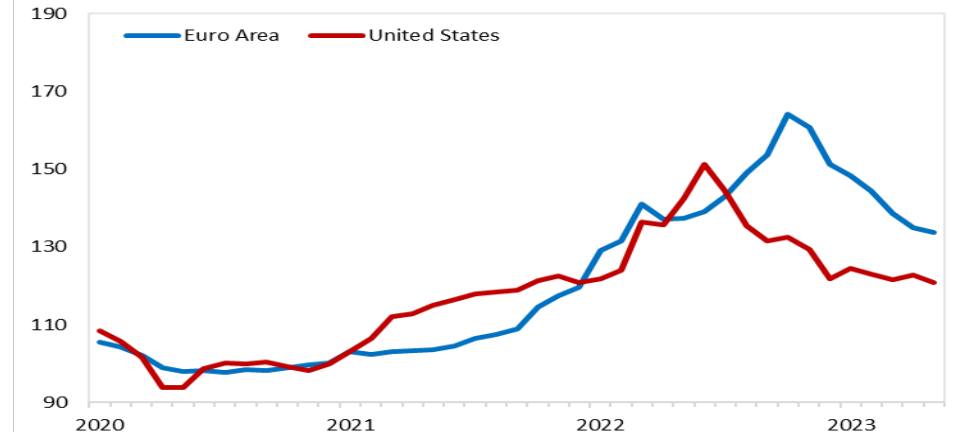
- Sharp increase in energy prices in 2021 and 2022 following Russia's invasion of Ukraine.
- Many European countries responded with energy subsidies to households and firms.
- Aim was both to support households, and to help reduce inflation.
- The idea: By reducing headline inflation, subsidies would curb compensatory wage demand and lower core inflation.

Euro Area and United States: Energy Price Levels
(Index: 2020 = 100)



Notes: Euro Area is using HICP for Electricity, Gas and Other Fuels. United States is using All Urban Consumers (CPI-U) U.S. City Average: Energy.

Euro Area and United States: Real Energy Price
(Index: 2020 = 100)



Notes: Euro area (US) Real Energy Price calculated as energy price component of HICP (CPI) divided with overall HICP (CPI).

What We Do

- Study transmission of energy price shocks **empirically**.
 - Use Känzig (2021) oil supply shocks as proxies in a VAR extended with nominal wage growth and policy rates
 - Report results for US and the Euro Area.
 - (**Work in progress.**)
- Study transmission of energy price shocks and subsidies in a **New Keynesian macro model** with explicit role for energy.
 - Energy consumed directly by households and used in production by firms.
 - Allow us to differentiate between subsidies to households and firms.
 - Start with closed economy setup (i.e. energy subsidies affect world non-subsidy energy price).
 - Then move to SOE open economy (world energy price is subsidy invariant).

What We Find

- **Empirical evidence** on transmission of oil prices show no evidence in favor of large spillovers on wages in the US; but for the Euro area we find evidence of transmission to higher wages.
- **Key insights from model analysis:**
 1. Consumer energy subsidies not likely to reduce core inflation much if many countries adopt similar policies or in segmented energy markets (natural gas).
 2. Energy subsidies to firms appear more effective to reduce core inflation.
 3. More scope for consumer energy subsidies work if only affect small share of global energy market and wages “indexed”, but targeted transfers to vulnerable households still be more effective for given fiscal cost.

Rest of Talk

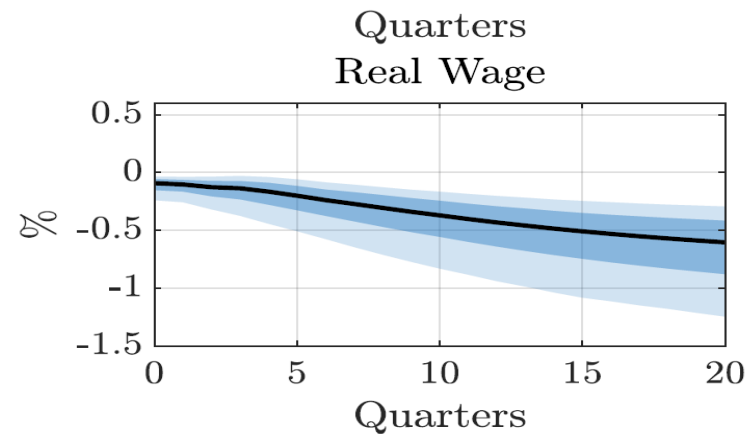
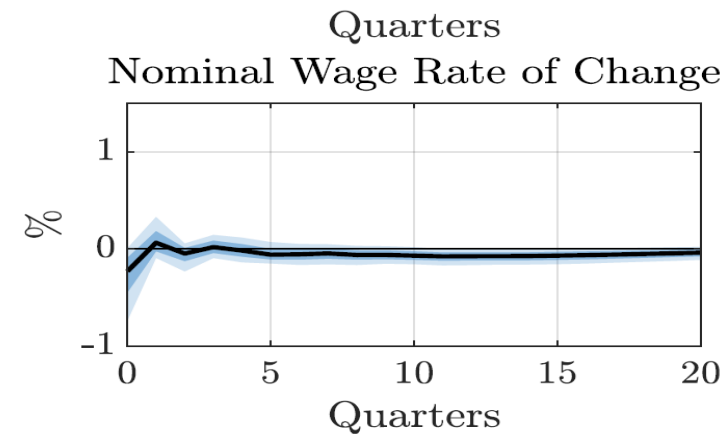
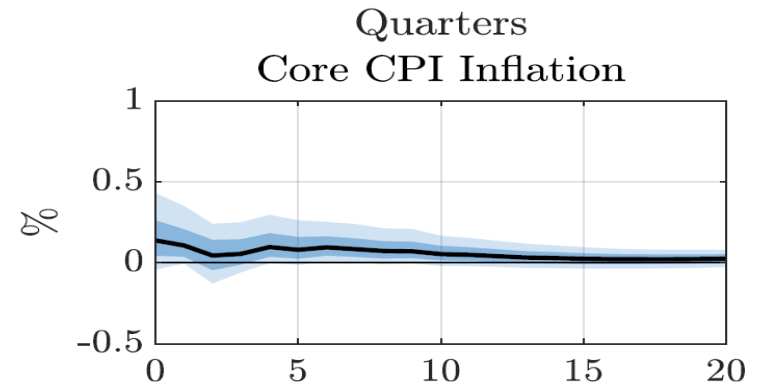
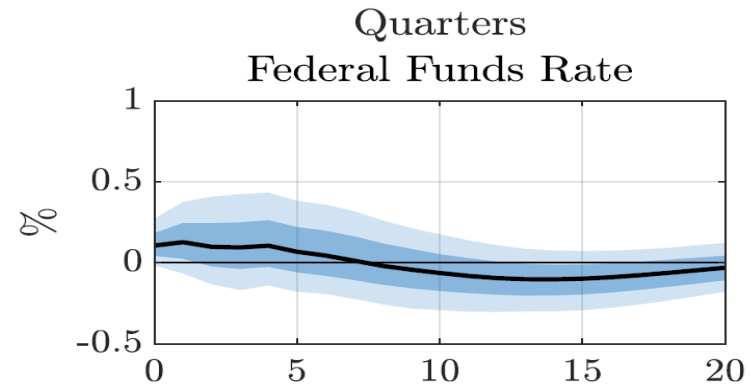
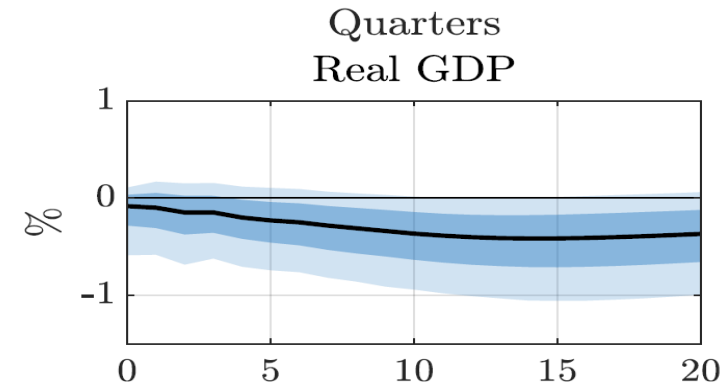
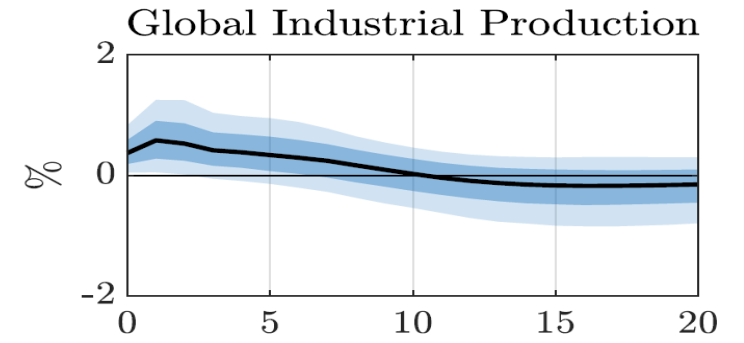
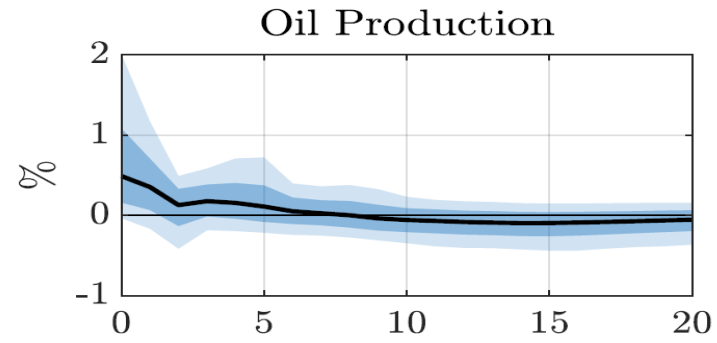
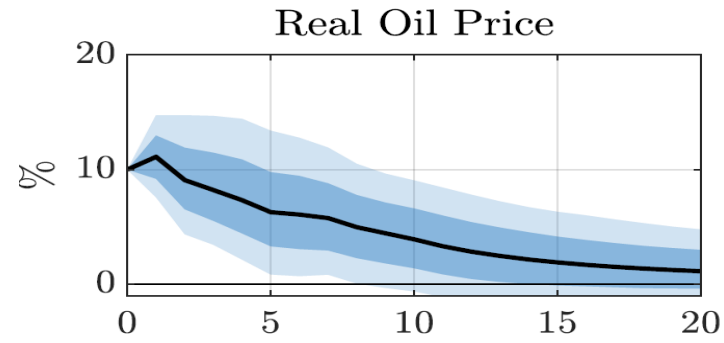
1. Empirical Evidence
2. A Simple Model with Energy
3. Global Energy Price Shocks and Subsidies (Closed Economy)
4. Energy Price Shocks and Subsidies in Small Open Economies
5. Concluding Remarks

1. Empirical Evidence

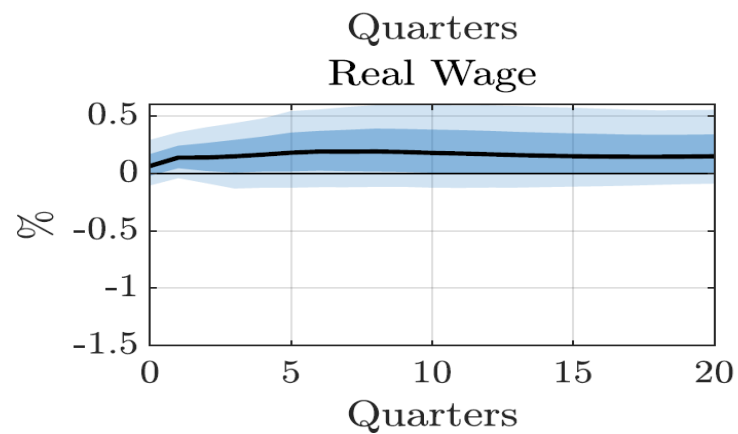
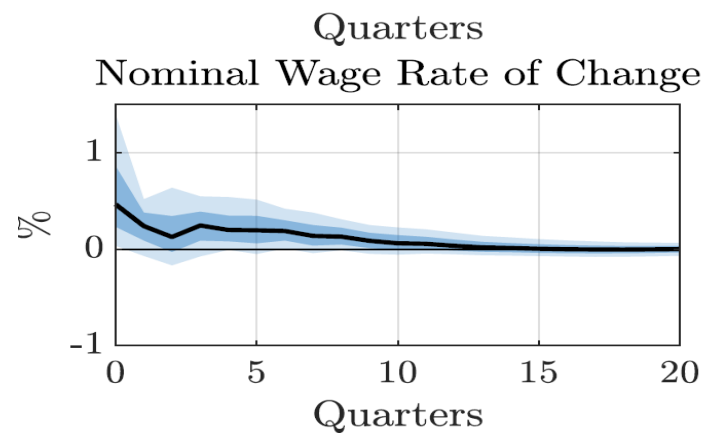
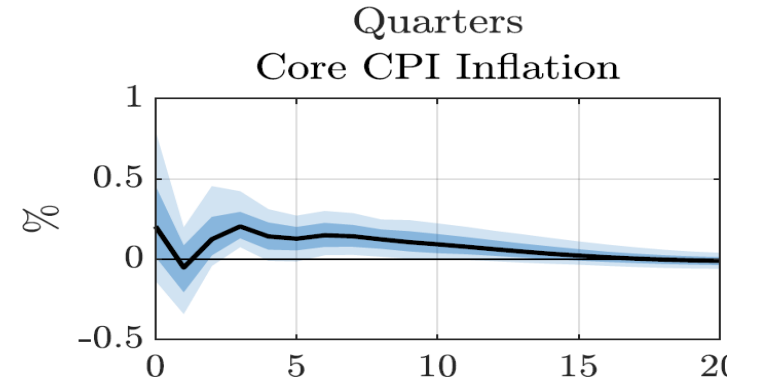
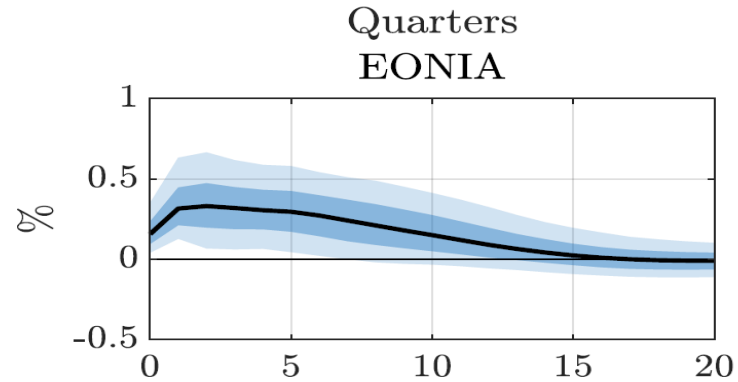
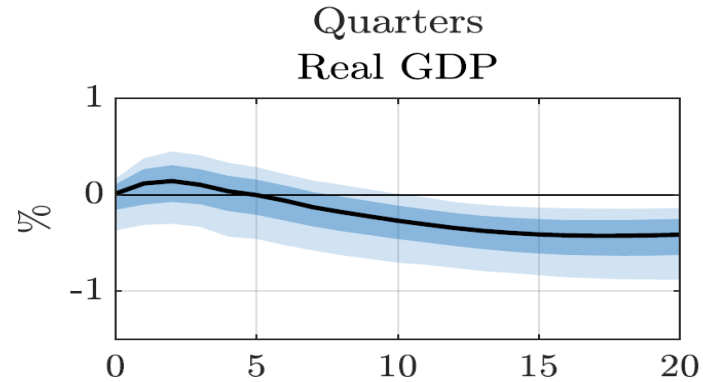
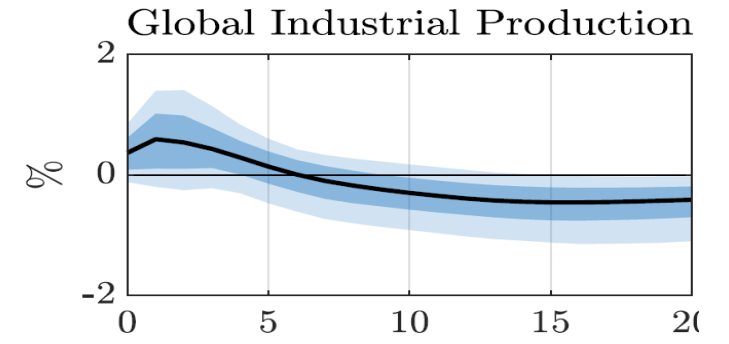
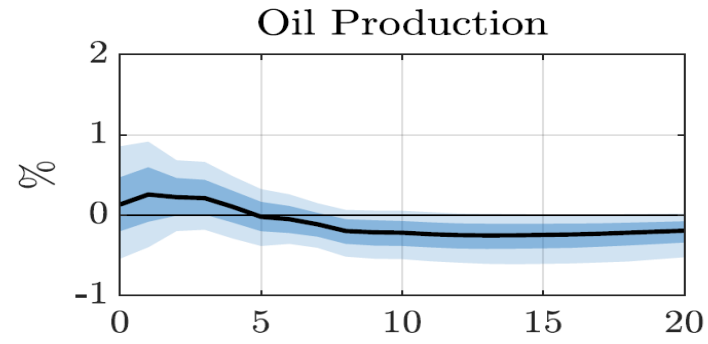
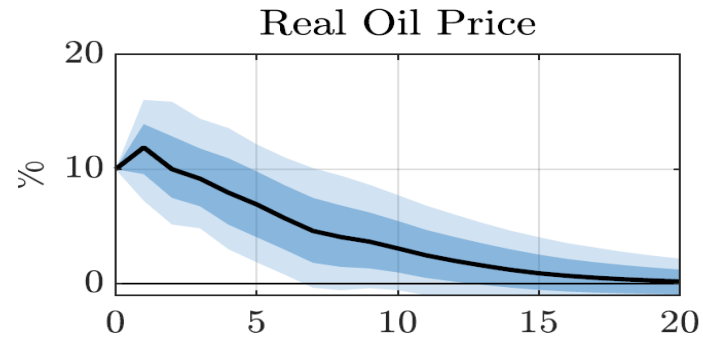
Empirical Setup

- We build on Känzig (2021, AER) work who uses OPEC announcements to identify oil supply shocks.
- His sample period is 1975-2017, but our sample starts at the beginning of the great moderation 1983 when OPEC moved from price fixing to a quota system.
- Deviate from Känzig (2021, AER) by transforming variables in accordance with their stationarity in the model (i.e. inflation instead of price levels).
- Add some more variables not included by Känzig (2021): Nominal policy rates and nominal wage inflation.
 - Adding wage inflation allows us to assess the impact on real wages.
- Estimate proxy VAR for both US and Euro area, neglect ELB episode.

Transmission of Oil Supply Shocks: US 1983-2019

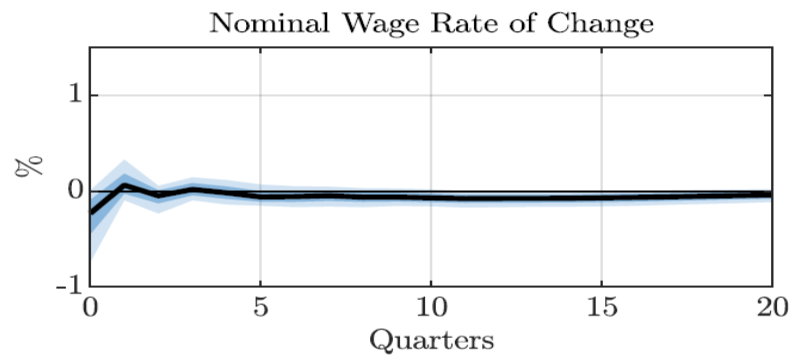
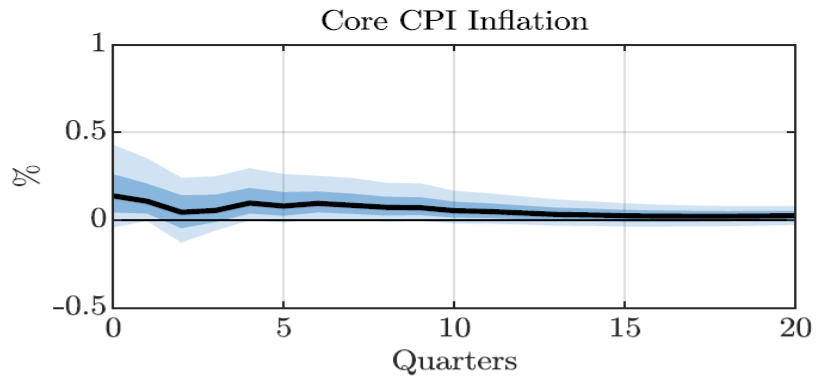


Transmission of Oil Supply Shocks: Euro Area 1983-2019

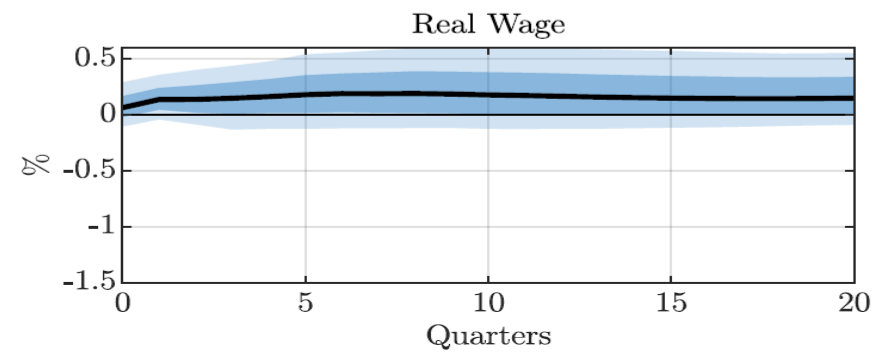
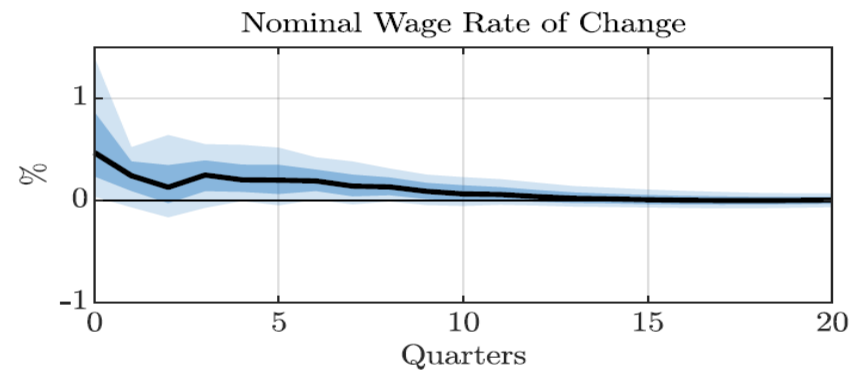
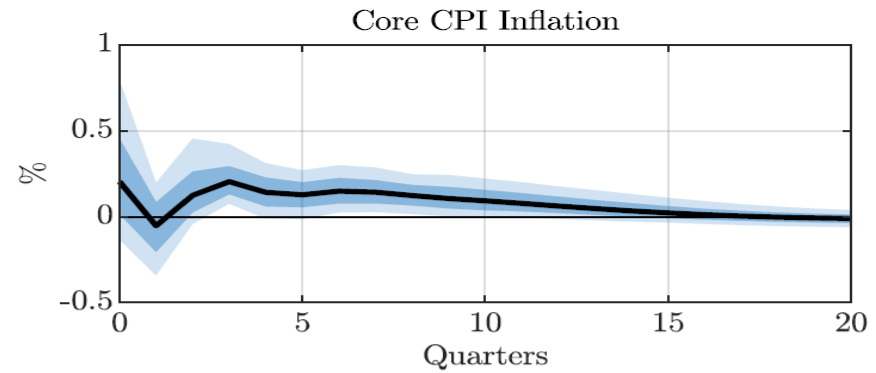


Comparing US and Euro Area Results

US results



Euro Area Results



2. The Model

Model - Households

- Standard utility maximization

$$\mathbb{E}_t \sum_{s=0}^{\infty} \beta^s \left(\frac{(C_{t+s} - \kappa C_{t+s-1})^{1-\frac{1}{\sigma}}}{1 - \frac{1}{\sigma}} - \chi_0 \frac{N_{t+s} (h)^{1+\chi}}{1 + \chi} \right)$$

- Sticky wages and gradual wage adjustment following Erceg-Henderson-Levin.
- Non-optimized wages indexed to either core, headline or SS inflation

$$W_t(h) = \Pi_{Y,t-1}^{\iota_y} \Pi_{C,t-1}^{\iota_c} \Pi^{1-\iota_y-\iota_c} W_{t-1}(h)$$

Model – Final Goods Producer

- Perfective competitive final good firms with production function:

$$C_t = \left((1 - \omega_c)^{\frac{1}{\eta_c}} Y_t^{\frac{\eta_c - 1}{\eta_c}} + \omega_c^{\frac{1}{\eta_c}} O_{C,t}^{\frac{\eta_c - 1}{\eta_c}} \right)^{\frac{\eta_c}{\eta_c - 1}}$$

- Profit maximization is hence static and given by:

$$P_{C,t}C_t - P_{Y,t}Y_t - (1 - \tau_{C,t})P_{O,t}O_{C,t}$$

- where $P_{O,t}$ is the non-subsidy oil price,
- $\tau_{C,t}$ is the consumption subsidy.

Model – Intermediate goods producers

- Monopolistically competitive with production function:

$$Y_t(f) = \left((1 - \omega_y)^{\frac{1}{\eta_y}} V_t(f)^{\frac{\eta_y - 1}{\eta_y}} + \omega_y^{\frac{1}{\eta_y}} O_{Y,t}(f)^{\frac{\eta_y - 1}{\eta_y}} \right)^{\frac{\eta_y}{\eta_y - 1}}$$

- where production of non-oil value added: $V_t(f) = K_t(f)^\alpha N_t(f)^{1-\alpha}$

- These firms set prices taking into account that they will not be able to reset them each period, with period profits given by:

$$(1 + \tau)P_{Y,t}(f)Y_t(f) - R_{K,t}K_t(f) - W_tN_t(f) - (1 - \tau_{Y,t})P_{O,t}O_{Y,t}(f)$$

- where $\tau_{Y,t}$ is the subsidy to firms.

Closing the Model

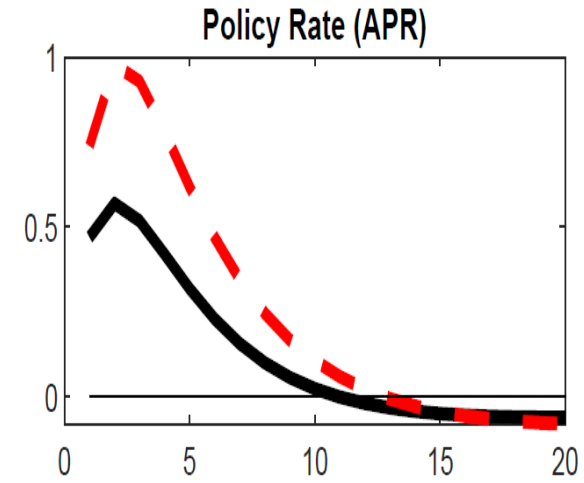
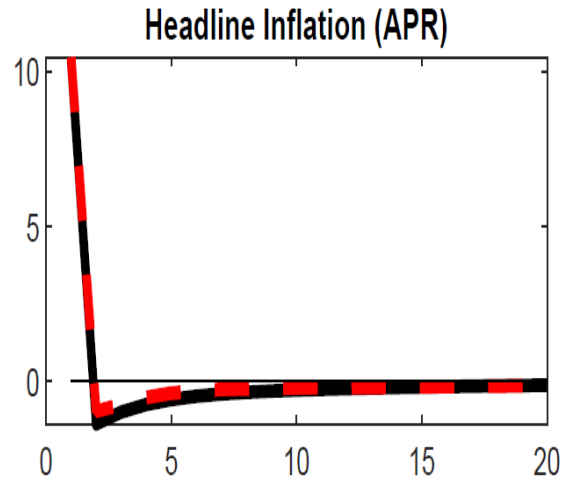
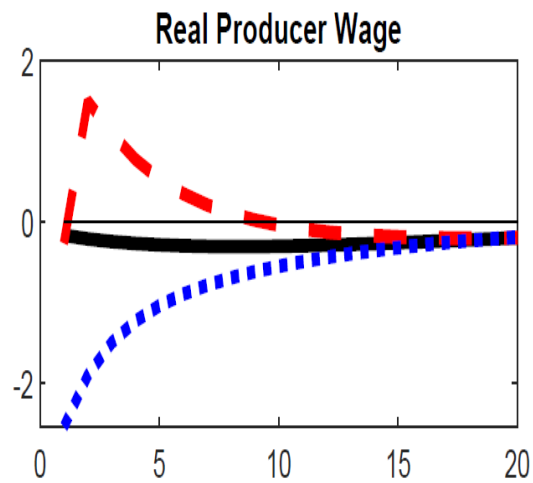
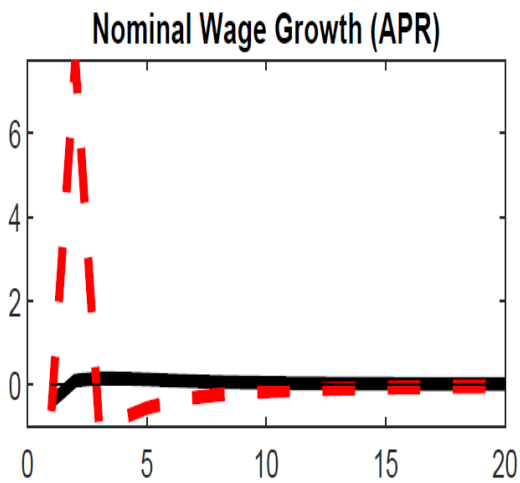
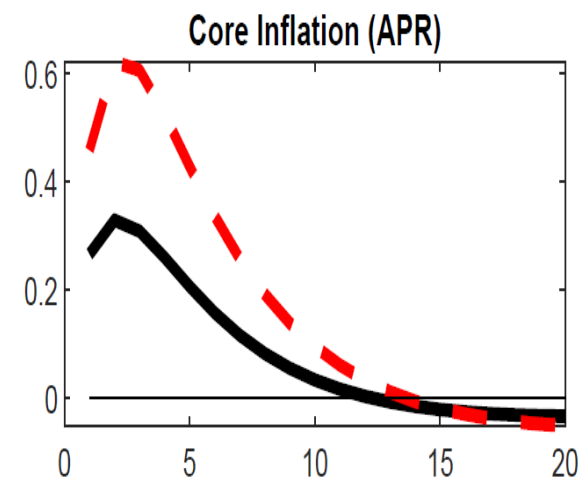
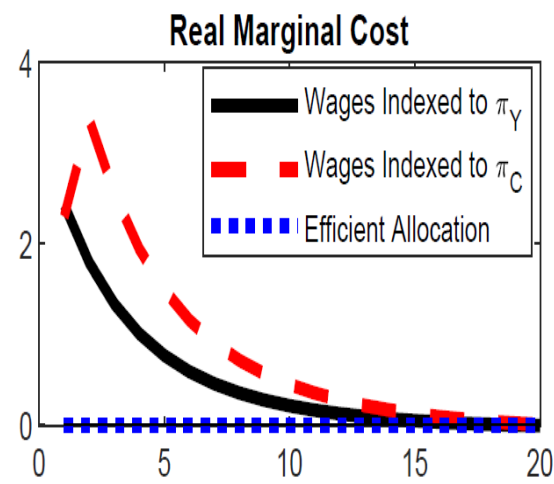
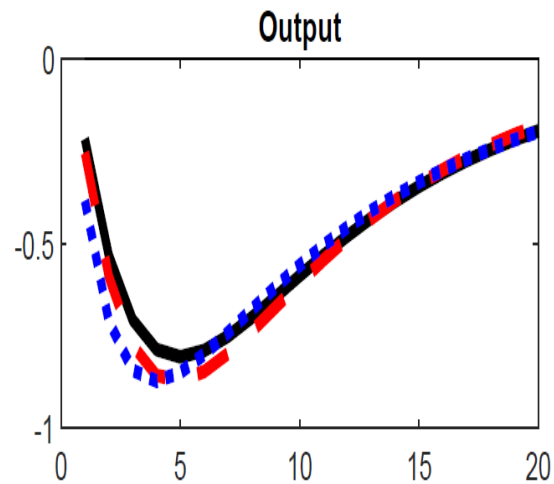
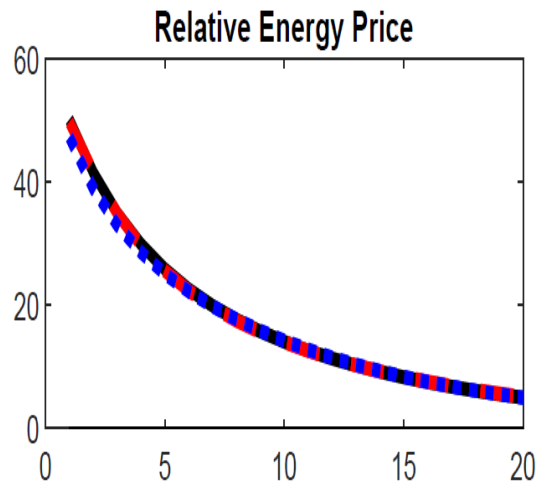
- Clearing on the energy market requires:

$$Y_{O,t} = O_{C,t} + O_{Y,t}$$

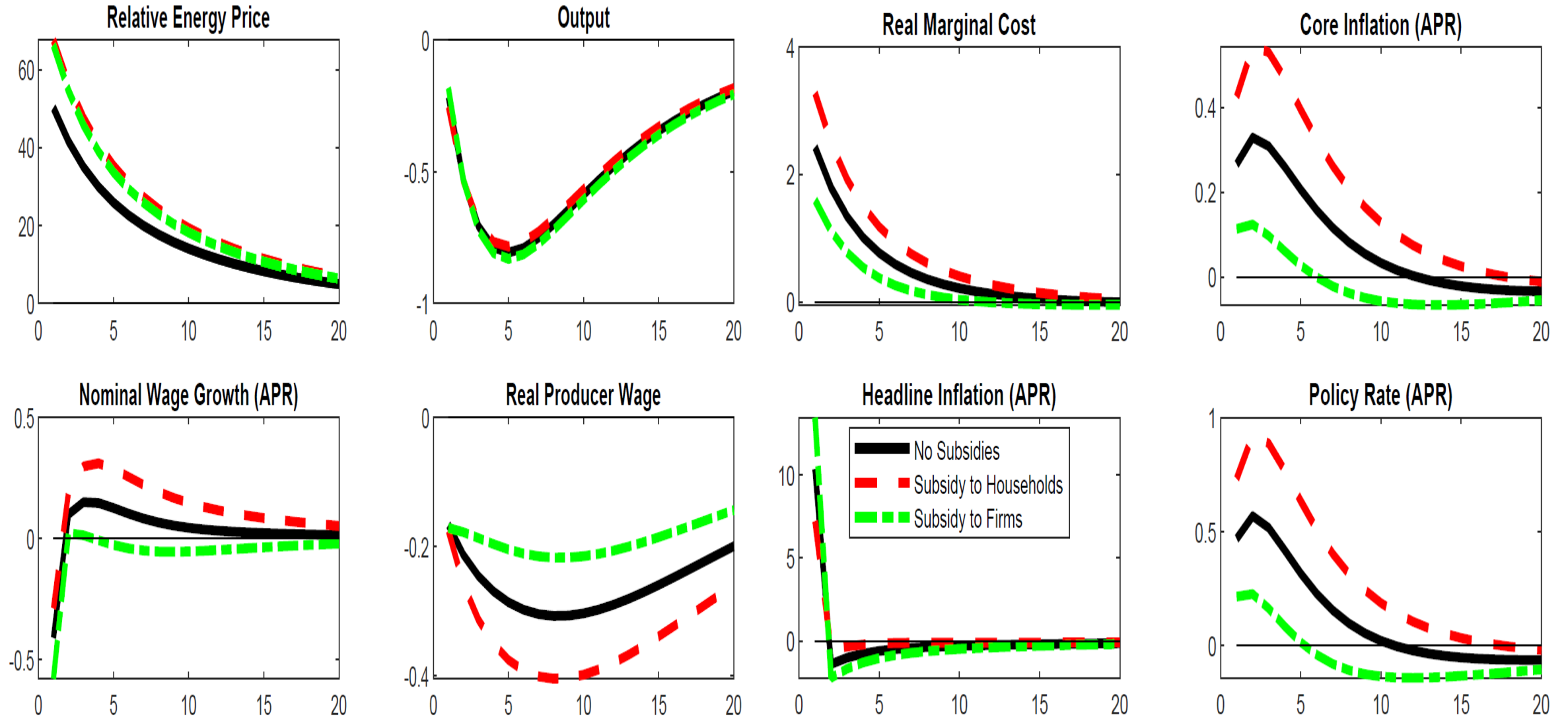
- where $Y_{O,t}$ is an exogenous energy endowment (that we vary).
- Monetary policy is assumed to follow a simple Taylor-type rule:
$$I_t = I + \psi_\pi (\Pi_{Y,t} - \Pi) + \psi_y \left(\frac{Y_t}{Y_t^{pot}} - 1 \right)$$
- Fiscal authority finances subsidies with lump-sum taxes (so Ricardian equivalence holds).

3. Global Energy Price Shocks and Subsidies

Positive Energy Price Shock (Negative $Y_{O,t}$ shock)

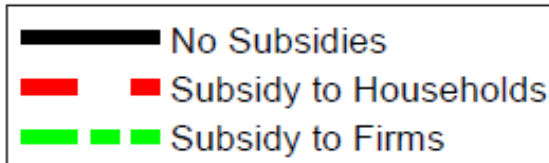
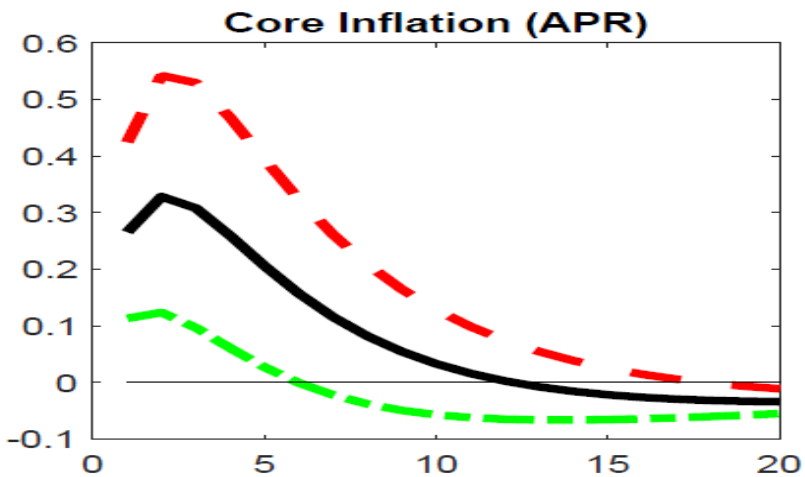
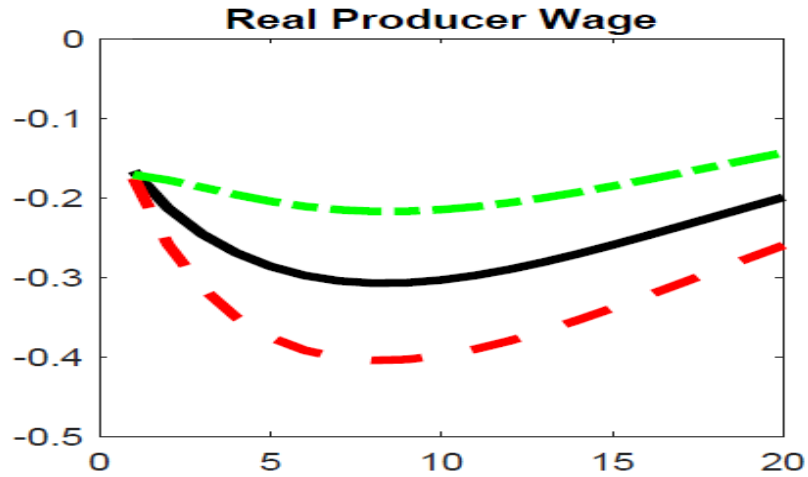


Effects of Subsidies: Wages Indexed to Core Inflation

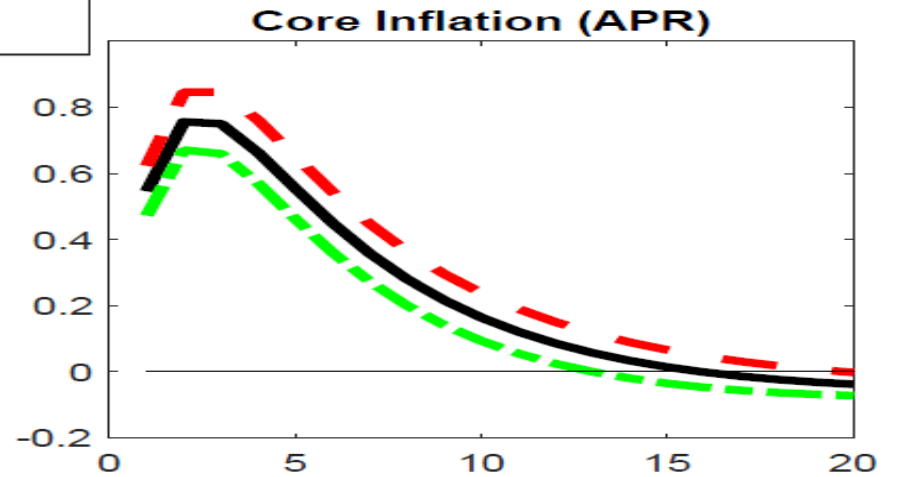
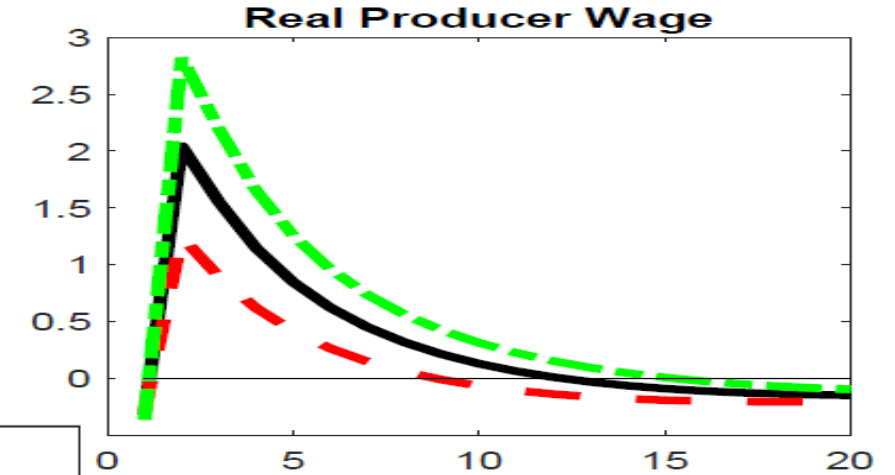


Subsidies Under Alternative Wage Setting Assumptions

Indexation to Core Inflation

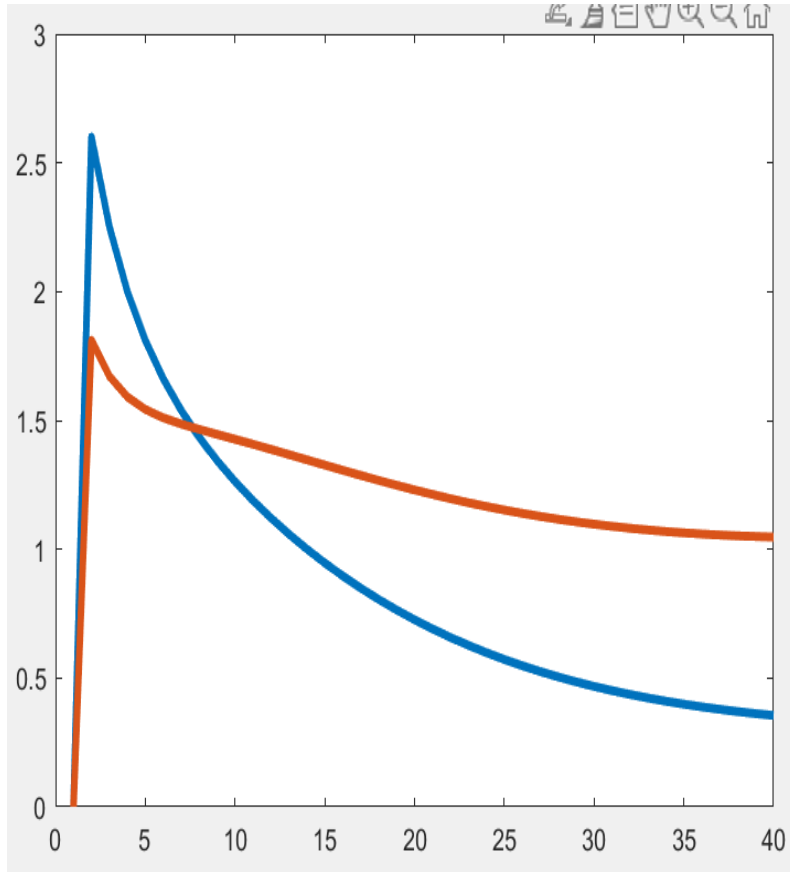


Indexation to Headline Inflation

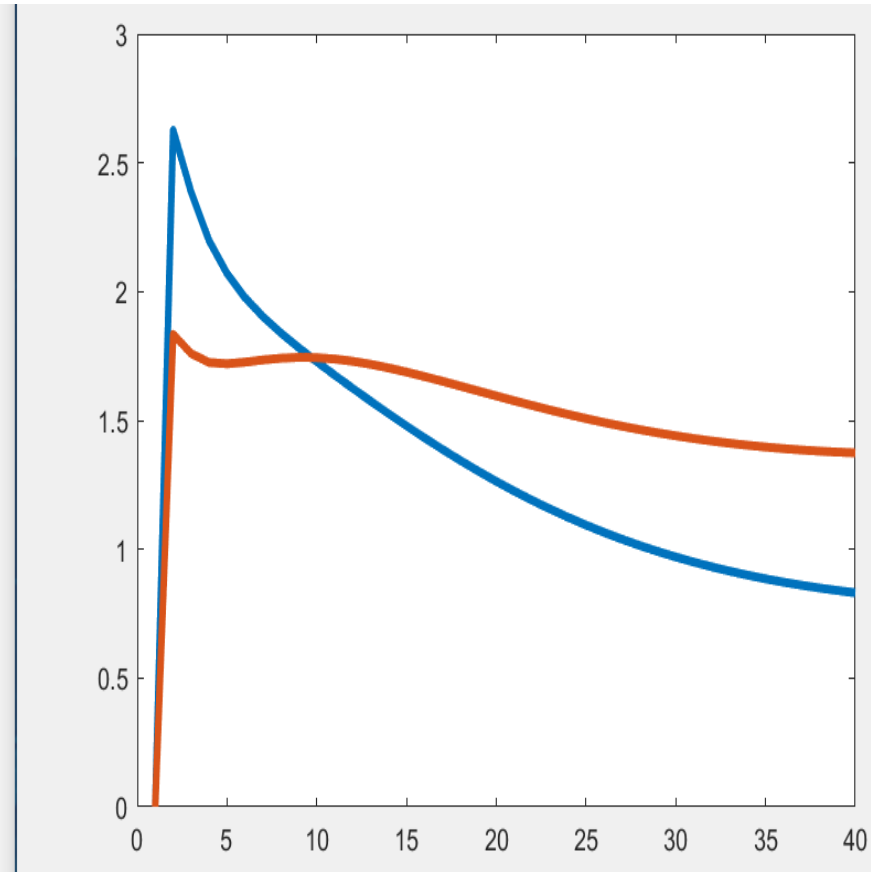


Headline Price level Effects of Subsidies Under Alt. Wage Setting Assumptions

Indexation to **Core Inflation**



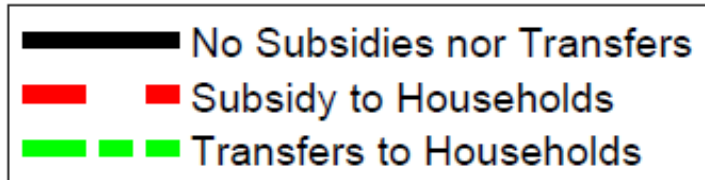
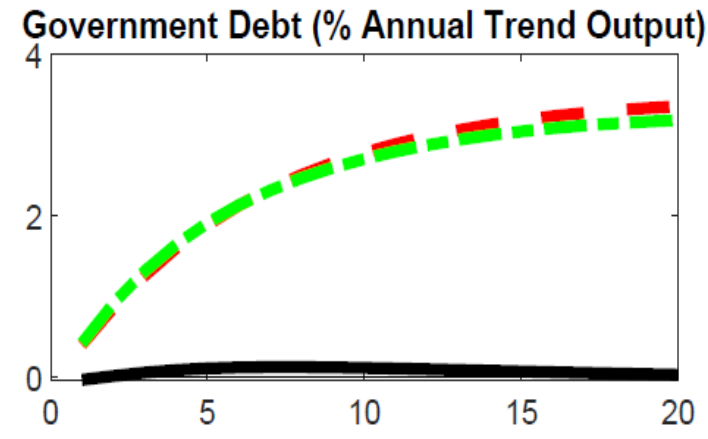
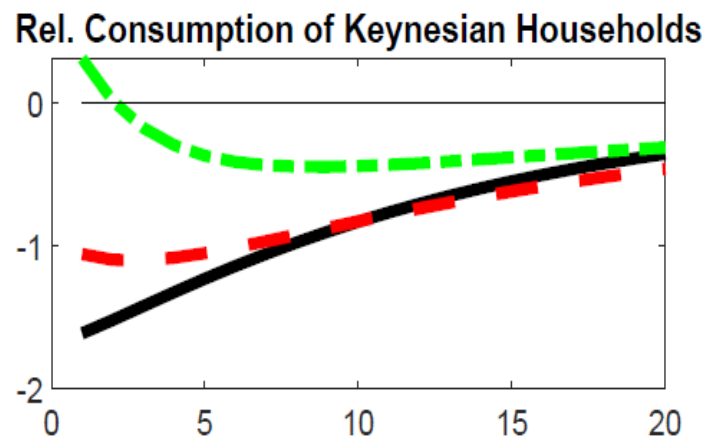
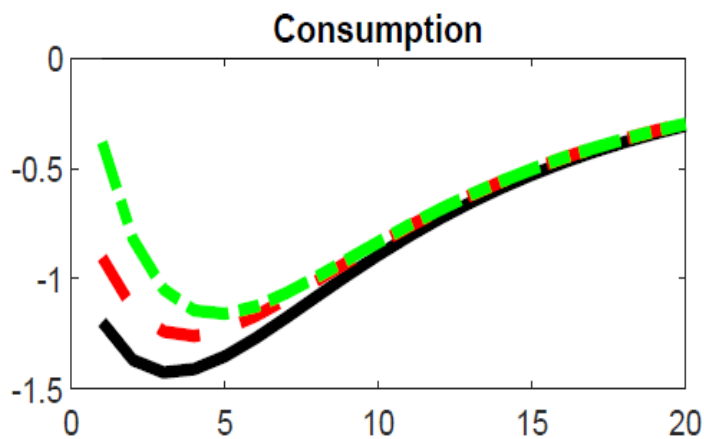
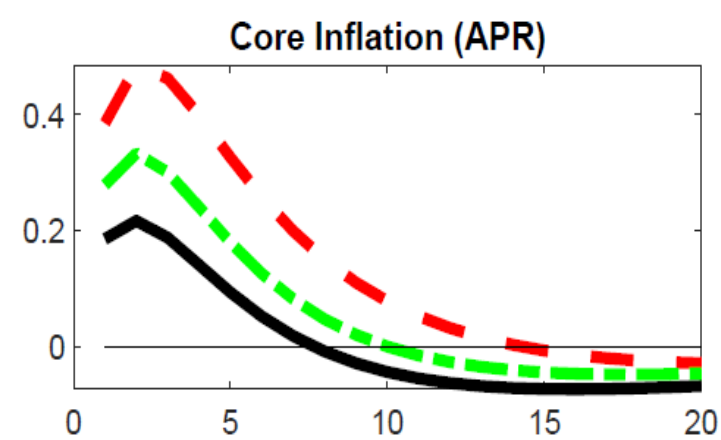
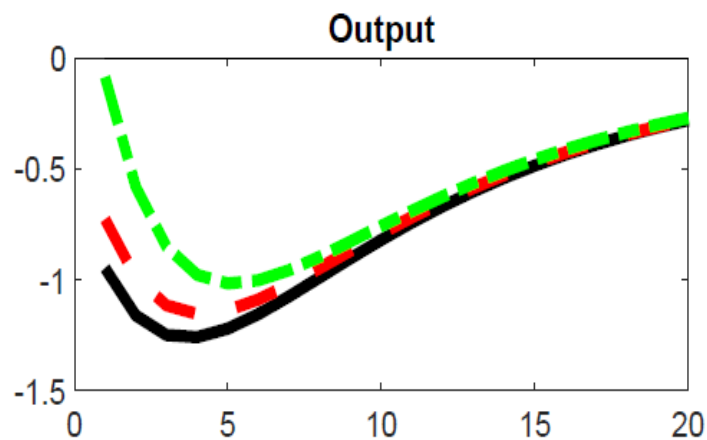
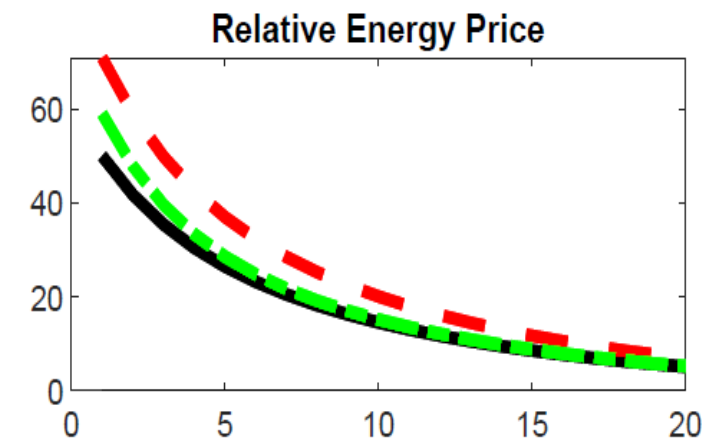
Indexation to **Headline Inflation**



Blue = no subsidies

Orange = with Subsidies

Energy Subsidies Vs. General Transfers to Households: Same Fiscal Cost



4. Energy Price Shocks and Subsidies in Small Open Economies

Model - Open Economy Extension

- World energy market clearing (we focus on case when $\zeta \rightarrow 0$ case):

$$\zeta Y_{O,t} + (1 - \zeta) Y_{O^*,t} = \zeta (O_{C,t} + O_{Y,t}) + (1 - \zeta) (O_{C^*,t} + O_{Y^*,t})$$

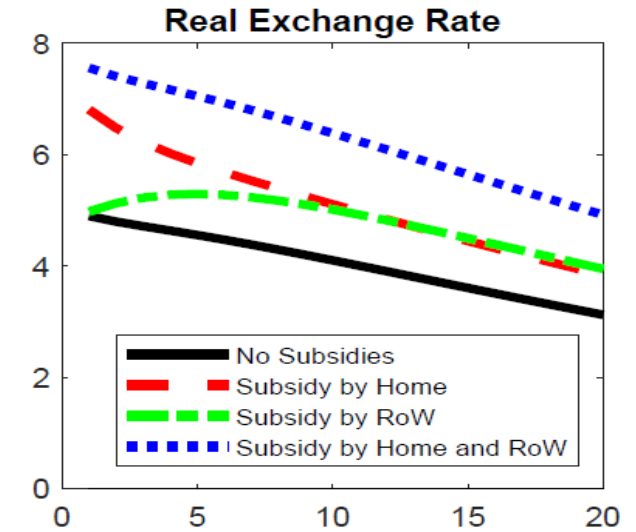
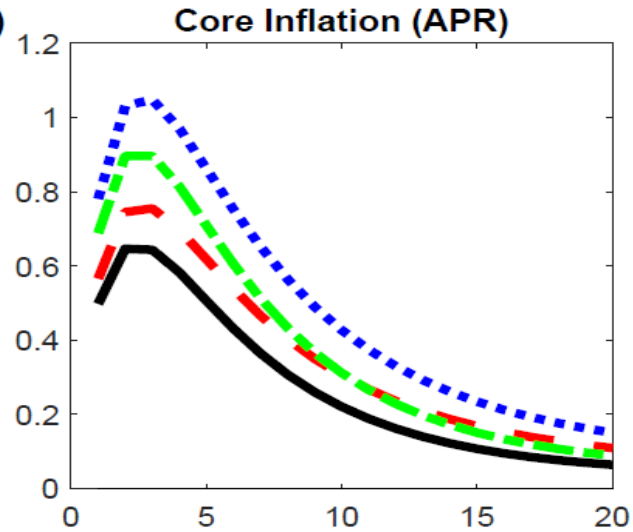
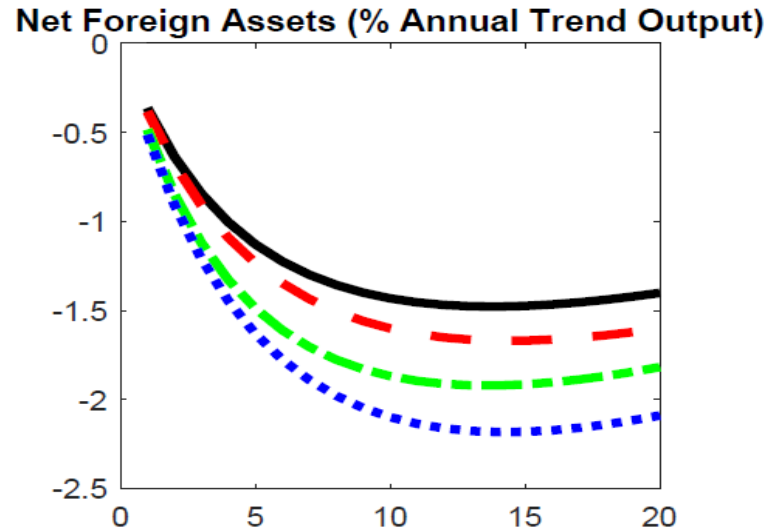
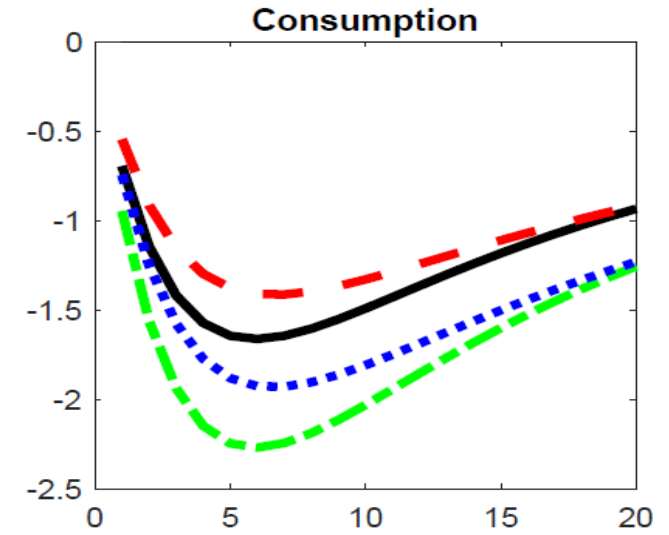
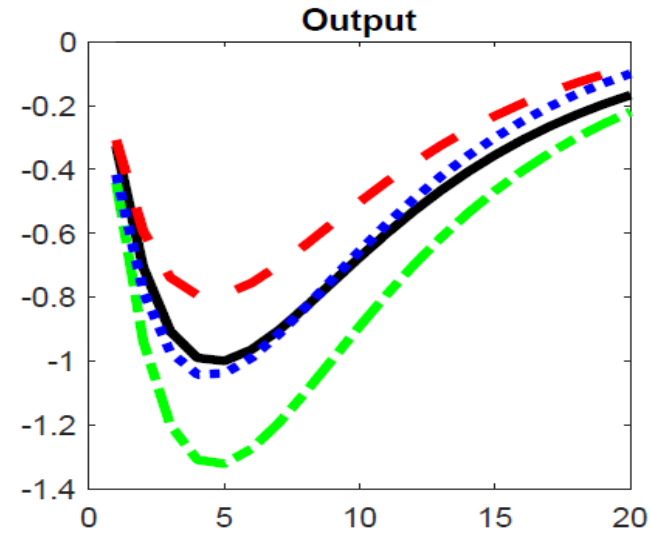
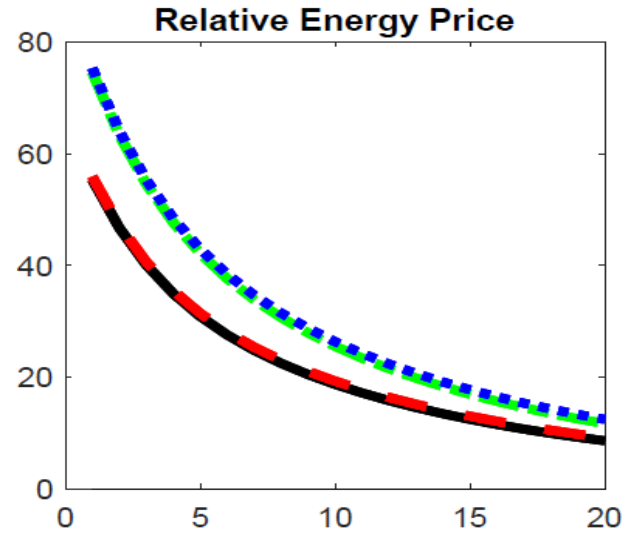
- Net foreign assets evolve according to:

$$B_t = \underbrace{\varepsilon_t P_{M,t}^* M_t^* - P_{M,t} M_t}_{\text{non-energy trade balance}} + \underbrace{P_{O,t} (Y_{O,t} - O_{Y,t} - O_{C,t})}_{\text{energy trade balance}} + \underbrace{\left((1 - \zeta) I_{t-1} + \zeta \frac{\varepsilon_t}{\varepsilon_{t-1}} I_{t-1}^* \right)}_{\text{gross interest payment on foreign assets}} B_{t-1}$$

- UIP condition allow for shallow currency markets as in GM (2015):

$$I_t = \mathbb{E}_t \left\{ I_t^* \frac{\varepsilon_{t+1}}{\varepsilon_t} \right\} - \Gamma I_t \frac{B_t}{P_{Y,t}}$$

Household Energy Subsidies in Home and RoW (Wages indexed to Core Inflation)



5. Concluding Remarks

Concluding Remarks

- Consumer energy subsidies likely to be ineffective to fight inflation globally and in segmented markets.
 - Key mechanism: raise pre-subsidy energy price.
- More scope for energy subsidies to be effective in small open economies well connected to world energy markets.
 - Leaves pre-subsidy prices unaffected.
 - Gains limited by exchange rate depreciation.
- Energy subsidies by large economies have strong negative spillovers to small energy importers, and positive spillovers to small energy exporters.
- Transfers to households more effective than energy subsidies to support vulnerable households for given fiscal cost.

Thank you!