

Managing an Energy Shock with Heterogeneous Agents: Fiscal and Monetary Policy

Adrien Auclert, Hugo Monneray, Matthew Rognlie, and Ludwig Straub

Bank of Canada, November 2022

Q How do **rising energy prices** affect consumption, aggregate demand?

What is the role for **monetary and fiscal policy** in this situation?

Q How do **rising energy prices** affect consumption, aggregate demand?

What is the role for **monetary and fiscal policy** in this situation?

- Existing models to answer these are **representative Agent (RA) NK-SOE**:
[Clarida-Gali-Gertler 02, Gali-Monacelli 05, Schmitt-Grohe-Uribe 17, Bodenstein et al 2011 ...]
 - shock leads to **expenditure switching, raising demand**
 - magnitude governed by the elasticity of substitution χ
 - **weak or no real income effects**
 - little trade-off for monetary policy: raise rates to limit boom & inflation

Heterogeneous agents provide a new perspective

Today: Revisit by embedding **Heterogeneous Agents (HA)** in NK-SOE model

[Part of fast growing literature: De Ferra-Mitman-Romei, Zhou, Guo-Ottonello-Perez, Oskolkov, Auclert-Rognlie-Souchier-Straub, Pironi ...]

- high MPCs: much **larger negative income effects**

Heterogeneous agents provide a new perspective

Today: Revisit by embedding **Heterogeneous Agents (HA)** in NK-SOE model

[Part of fast growing literature: De Ferra-Mitman-Romei, Zhou, Guo-Ottonello-Perez, Oskolkov, Auclert-Rognlie-Souchier-Straub, Pironi ...]

- high MPCs: much **larger negative income effects**
- when χ is low \Rightarrow income effect dominates, consumption + demand fall!
 - \rightarrow “stagflationary shock”: recession, imported inflation, wage-price spiral

Heterogeneous agents provide a new perspective

Today: Revisit by embedding **Heterogeneous Agents (HA)** in NK-SOE model

[Part of fast growing literature: De Ferra-Mitman-Romei, Zhou, Guo-Ottonello-Perez, Oskolkov, Auclert-Rognlie-Souchier-Straub, Pironi ...]

- high MPCs: much **larger negative income effects**
- when χ is low \Rightarrow income effect dominates, consumption + demand fall!
 - \rightarrow “stagflationary shock”: recession, imported inflation, wage-price spiral
- **monetary policy**: hard to influence energy prices when used in isolation!

Heterogeneous agents provide a new perspective

Today: Revisit by embedding **Heterogeneous Agents (HA)** in NK-SOE model

[Part of fast growing literature: De Ferra-Mitman-Romei, Zhou, Guo-Ottonello-Perez, Oskolkov, Auclert-Rognlie-Souchier-Straub, Pironi ...]

- high MPCs: much **larger negative income effects**
- when χ is low \Rightarrow income effect dominates, consumption + demand fall!
 - \rightarrow “stagflationary shock”: recession, imported inflation, wage-price spiral
- **monetary policy**: hard to influence energy prices when used in isolation!
 - \rightarrow but **positive externalities**: more effective if all countries raise rates

Heterogeneous agents provide a new perspective

Today: Revisit by embedding **Heterogeneous Agents (HA)** in NK-SOE model

[Part of fast growing literature: De Ferra-Mitman-Romei, Zhou, Guo-Ottonello-Perez, Oskolkov, Auclert-Rognlie-Souchier-Straub, Pironi ...]

- high MPCs: much **larger negative income effects**
- when χ is low \Rightarrow income effect dominates, consumption + demand fall!
 - \rightarrow “stagflationary shock”: recession, imported inflation, wage-price spiral
- **monetary policy**: hard to influence energy prices when used in isolation!
 - \rightarrow but **positive externalities**: more effective if all countries raise rates
- **fiscal policy**: powerful in isolation ...

Heterogeneous agents provide a new perspective

Today: Revisit by embedding **Heterogeneous Agents (HA)** in NK-SOE model

[Part of fast growing literature: De Ferra-Mitman-Romei, Zhou, Guo-Ottonello-Perez, Oskolkov, Auclert-Rognlie-Souchier-Straub, Pironi ...]

- high MPCs: much **larger negative income effects**
- when χ is low \Rightarrow income effect dominates, consumption + demand fall!
 - \rightarrow “stagflationary shock”: recession, imported inflation, wage-price spiral
- **monetary policy**: hard to influence energy prices when used in isolation!
 - \rightarrow but **positive externalities**: more effective if all countries raise rates
- **fiscal policy**: powerful in isolation ...
 - \rightarrow but may have huge **negative externalities!**

- 1 The model in 1 slide
- 2 The energy shock
- 3 Managing the energy shock: Monetary policy
- 4 Managing the energy shock: Fiscal policy

The model in 1 slide

Model overview: Gali-Monacelli + Energy + HANK

Start with Gali-Monacelli model of a small open economy (SOE). Three changes:

Model overview: Gali-Monacelli + Energy + HANK

Start with Gali-Monacelli model of a small open economy (SOE). Three changes:

1: Introduce one additional good: **energy E**

- Large ROW is endowed with E , SOE is part of a continuum of E importers
- SOE households consume E , elasticity of sub. χ . E not used in production
- Energy trades at world price P_{Et}^* — this is what we shock

Model overview: Gali-Monacelli + Energy + HANK

Start with Gali-Monacelli model of a small open economy (SOE). Three changes:

1: Introduce one additional good: **energy E**

- Large ROW is endowed with E , SOE is part of a continuum of E importers
- SOE households consume E , elasticity of sub. χ . E not used in production
- Energy trades at world price P_{Et}^* — this is what we shock

2: Households face **borrowing constraint + idiosyncratic income risk**

- Generates high (intertemporal) **marginal propensities to consume** (MPCs)

Model overview: Gali-Monacelli + Energy + HANK

Start with Gali-Monacelli model of a small open economy (SOE). Three changes:

1: Introduce one additional good: **energy E**

- Large ROW is endowed with E , SOE is part of a continuum of E importers
- SOE households consume E , elasticity of sub. χ . E not used in production
- Energy trades at world price P_{Et}^* — this is what we shock

2: Households face **borrowing constraint + idiosyncratic income risk**

- Generates high (intertemporal) **marginal propensities to consume** (MPCs)

3: Wage rigidity with indexation to past CPI inflation (Blanchard-Gali)

[+ slow pass through of P_{Et}^* into domestic E prices]

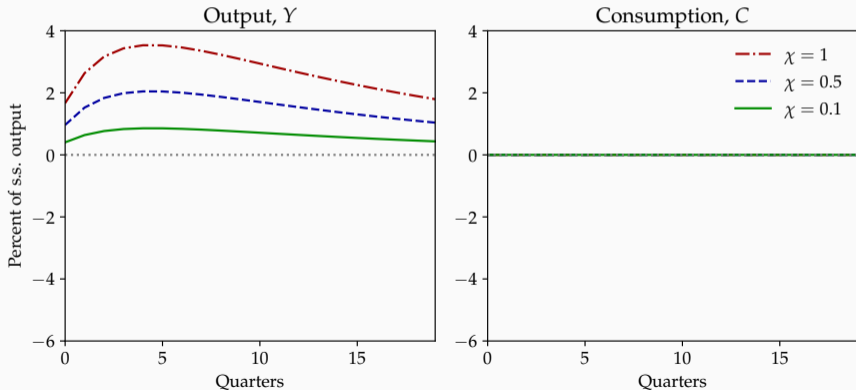
The energy shock

Feeding in the shock

- Preliminary calibration to a European country
- AR(1) shock to P_{Et}^*
- Simulate:
 - **Representative agent (RA)**
 - **Heterogeneous agents (HA)**
- Monetary policy: raises nominal rate to stabilize real rate (for now)

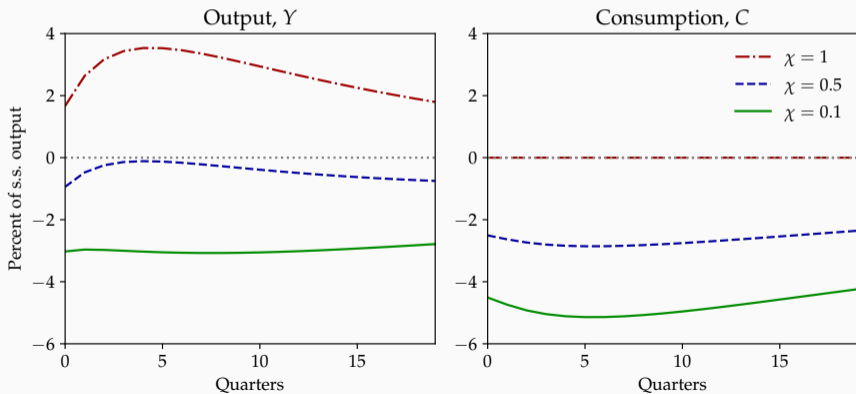
RA: Output and consumption

- **RA: boom** due to expenditure switching!
- If energy was used in production: same hours + consumption. Only Y lower.



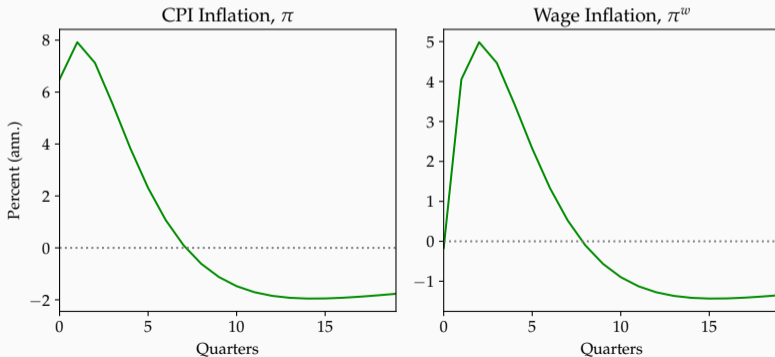
HA: Output and consumption

- **HA**: Higher MPCs \Rightarrow negative income effect; any movement in Y is amplified.
- $\chi = 1$: those forces offset each other **HA = RA** ! Lower $\chi \Rightarrow$ bust.



- Blanchard-Gali Phillips curve generates wage-price spiral ...

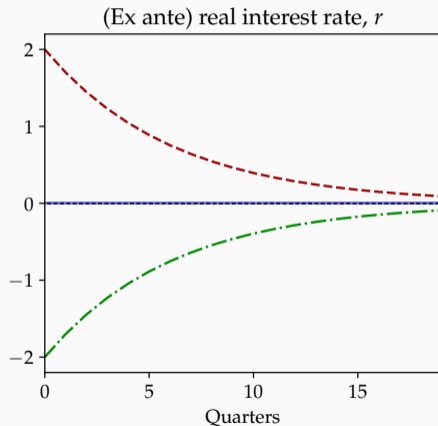
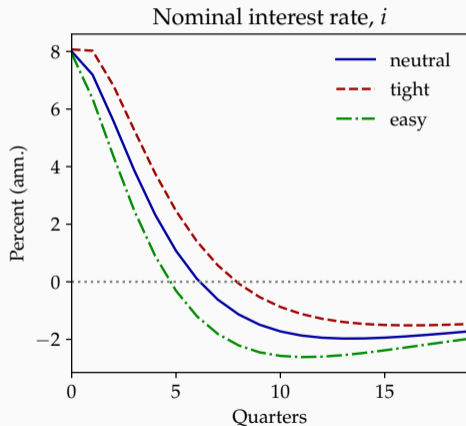
$$\pi_{wt} = \eta\pi_{t-1} + \kappa_w \left(\frac{v'(N_t)}{u'(C_t)\mu_w W_t/P_t} - 1 \right) + \beta(\pi_{wt+1} - \eta\pi_t)$$



Managing the energy shock: Monetary policy

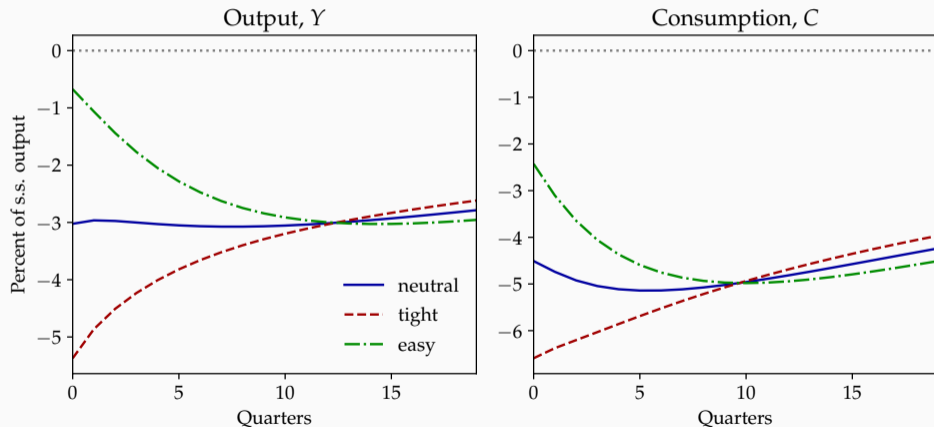
Monetary policy: three scenarios

- Three scenarios for monetary policy



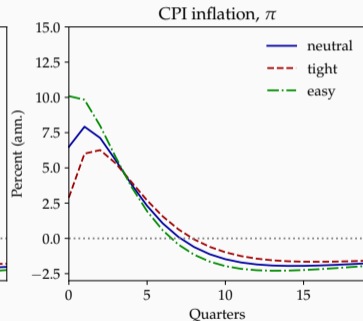
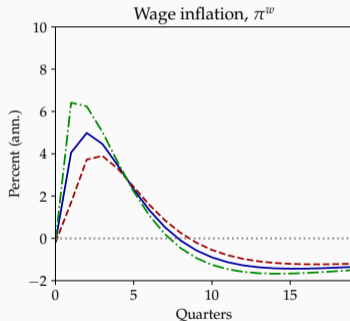
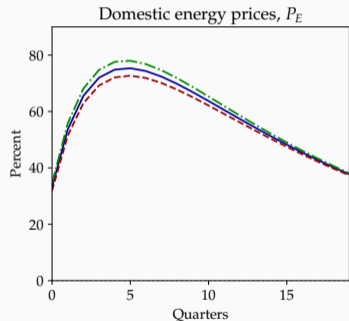
Monetary policy: Output and consumption

- Tight monetary policy causes deeper recession (as expected)



Monetary policy: Inflation

- Tight monetary policy not that effective against imported inflation.

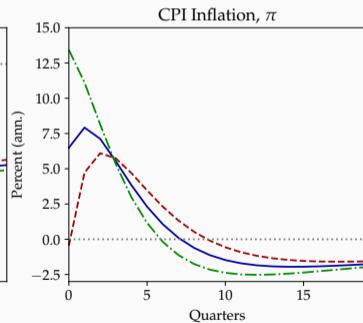
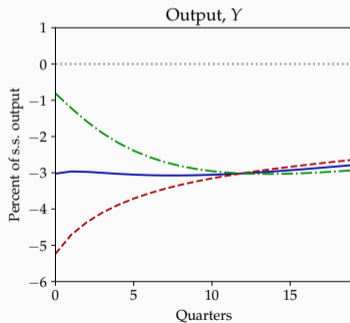
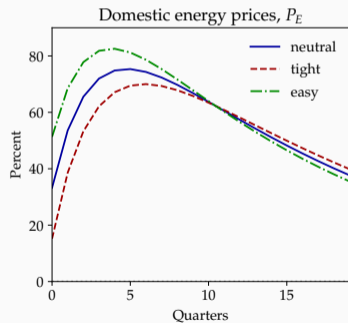


Monetary policy: Coordination

- **Positive spillovers:** Brings down P_E^* for everyone else.

Monetary policy: Coordination

- **Positive spillovers:** Brings down P_E^* for everyone else.
- Coordination problem. If continuum of SOE's consume E and all hike:

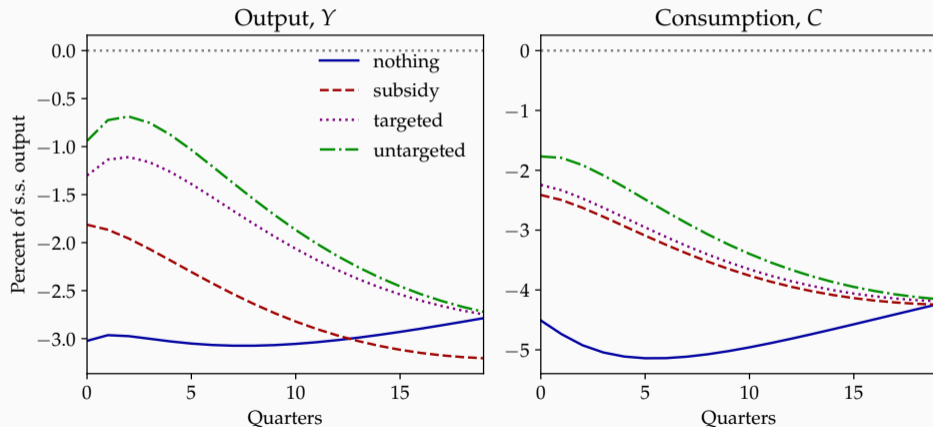


Managing the energy shock: Fiscal policy

- Next: **fiscal policy**
- Compare:
 - price subsidy
 - targeted transfers (based on previous E consumptions)
 - untargeted transfers
- All initially deficit financed

Fiscal policy (uncoordinated): output and consumption

- All three policies effectively mitigate output loss...

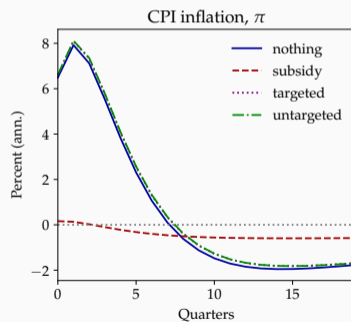
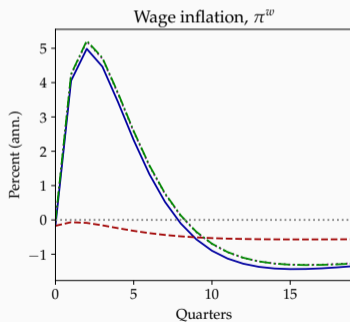


Fiscal policy (uncoordinated): inflation

- Transfer programs do not raise inflation by much...

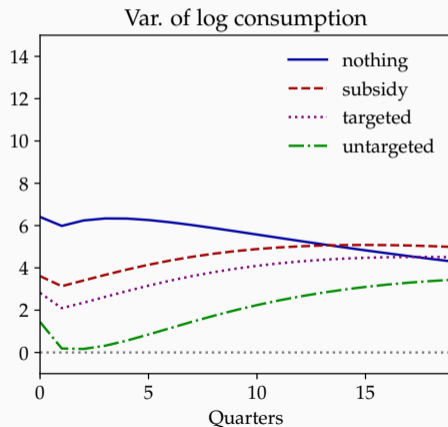
Fiscal policy (uncoordinated): inflation

- Transfer programs do not raise inflation by much...
- ... but subsidy seems like a silver bullet?



Fiscal policy (uncoordinated): inequality

- All programs seem to reduce inequality (var of log consumption)

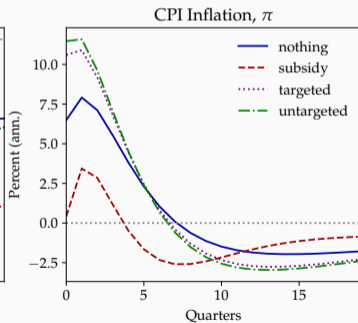
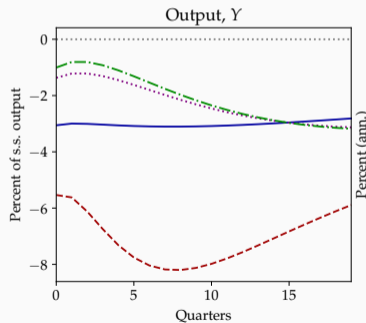
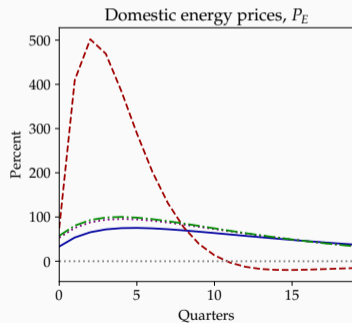


Fiscal policy (coordinated): inflation

- Subsidy is a disaster if everyone uses it. No one adjusts E consumption!
- Huge **negative externalities** on everyone else.

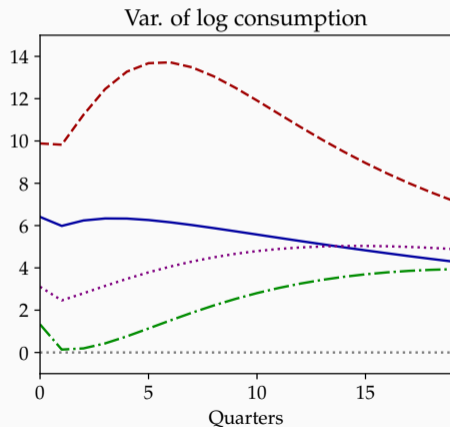
Fiscal policy (coordinated): inflation

- Subsidy is a disaster if everyone uses it. No one adjusts E consumption!
- Huge **negative externalities** on everyone else.



Fiscal policy (coordinated): inequality

- Even the inequality benefits are gone if everyone subsidizes energy.



Conclusion

- Use **open economy HA model** to speak to current energy price shock.
- Shock is **stagflationary** in our HA model.
- **Monetary tightening** alone does little, but has **positive externalities**.
 - Want major countries to hike together.
- **Fiscal support** alone is very powerful, but hugely **negative externalities**.
 - Developing countries with less fiscal space will bear the cost. Do less?