Environmental Policy Instruments Across Uncertainties in an Open Economy

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Research Questions

- Is the existing literature on the choice of environmental policy instruments robust to open economy?

- How do different environmental policy instruments fare on trade flows and emission leakage across uncertainties?

Contribution

- We develop a small open economy (SOE) DSGE model that incorporates three environmental policies: cap-and-trade, pollution tax and intensity target.
- Two sources of uncertainty: economic growth and abatement cost
- We compare dynamic impacts on welfare, pollution levels, outputs, consumption, investment, supply of labor and trade flows in economies.

The Model

A representative household maximizes:

$$Max \;\; E_t \sum_{t=0}^{\infty} \beta^t \; \frac{[c_t^{\alpha}(1-h_t)^{1-\alpha}]^{1-\sigma} - 1}{1-\sigma} - D\frac{S_t^{1+\sigma} - 1}{1+\sigma} \tag{1}$$

budget constraint:

$$d_t = (1 + r_{t-1})d_{t-1} - e_t^{\xi} \; y(A_t, k_{t-1}, h_t)^{1-\xi} + c_t + i_t + \Phi(k_t - k_{t-1}) \tag{2}$$

Trade balance:

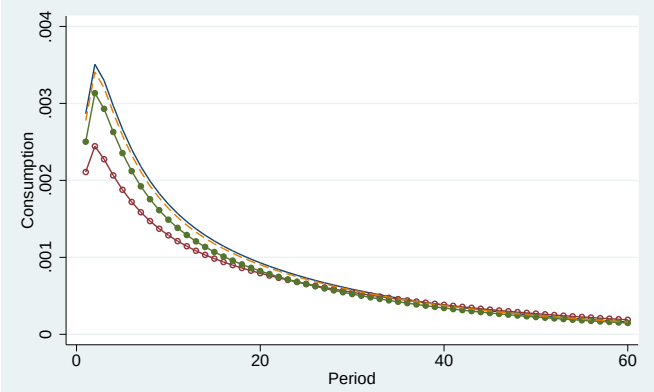
$$tb_t = e_t^{\xi} \; y(A_t, k_{t-1}, h_t)^{1-\xi} - c_t - i_t - \Phi(k_t - k_{t-1}) \tag{3}$$

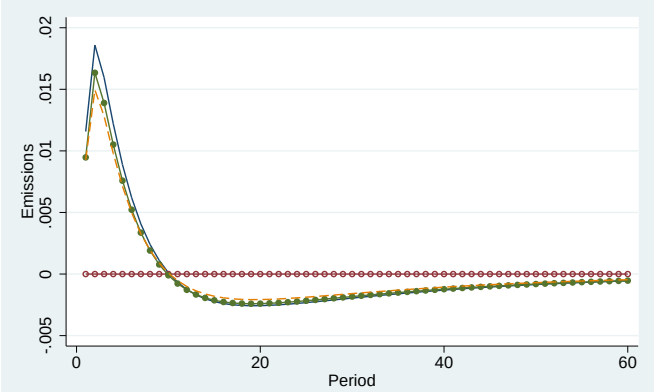
Role of government:
Imposes an environment policy CAP, redistributes any proceed to households in lumpsum:

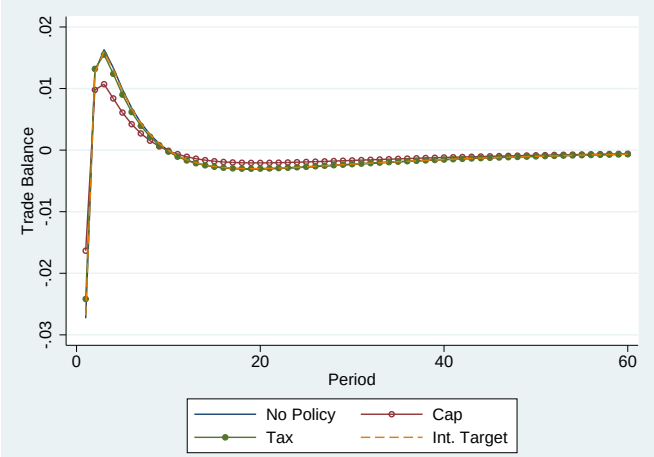
$$e_t = CAP(y_t) \tag{4}$$

Persistence of shocks are calibrated to the Canadian economy!

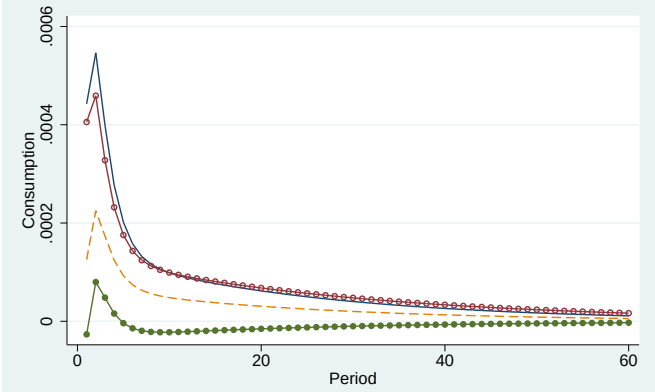
Uncertain Economic Growth

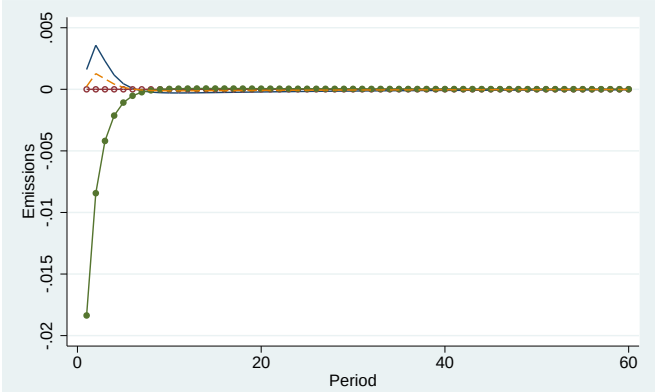


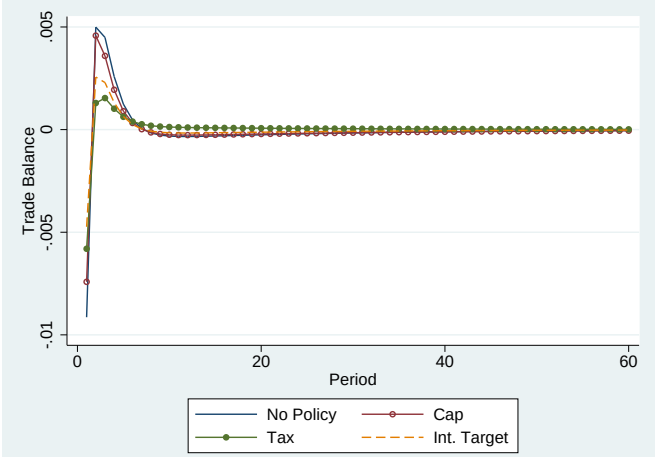




Uncertain Abatement Cost







Findings

- Choice of instruments under closed economy is consistent with open economy.
- The cap-and-trade policies smooth the business cycle while pollution taxes and intensity targets smooth abatement cost shocks.
- The cap-and-trade policy leads to lowest leakage under the productivity shock but the cap-and-trade policy has higher leakage under an abatement cost shock.

Conclusions

- The best environmental policy instrument depends crucially on policy maker priorities.
- Policies that perform best across the business cycle are less flexible in response to abatement cost shocks and vice versa.
- Impact of productivity shock is dominating to the impacts of abatement cost shock.
- Optimizing environmental policy with respect to the business cycle provides a greater benefit: a cap-and-trade policy should be preferred in most cases.

THANKS!

Comments and suggestions are welcome!!!

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