Vertical fiscal externalities and the environment

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\textsuperscript{1}joint with Chris Böhringer, Andreas Lange, and Nic Rivers
Paper is focused on adoption of sub-national environmental (climate change) policy in a federation

Existing literature on environmental federalism focuses on two issues:

- Which level of government is best-suited for implementing environmental policy (Oates, 2001)
- Does adoption of environmental policy cause a race to the bottom? (Oates and Schwab, 1988; Konisky, 2007; Levinson, 2003) (sometimes considered a horizontal fiscal externality)

This paper is focused on vertical fiscal externalities

These have not been addressed in an environmental policy setting
VERTICAL FISCAL EXTERNALITIES

- Vertical fiscal externalities arise in a federation for two reasons:
  1. Concurrent taxation by multiple levels of government - national and sub-national
  2. Government budget constraints and difficulty for national government in differentiating taxes by states
- When one level of government implements a tax, it affects the tax base that both levels of government tax
- Normally, an increase in a tax rate shrinks the base. With concurrent taxation, when one government increases tax, the other government loses revenue.
- This is an externality. Tax base is like a common property resource.
We aim to examine the impact of vertical fiscal externalities in an environmental setting.

In this paper, we examine implications of state-level environmental policies. Increasingly, climate change policies are being pursued at this level (Lutsey and Sperling, 2008; Rabe, 2008)

We use a calibrated, multi-region, multi-sector, computable general equilibrium model of the Canadian economy.

We formally decompose welfare impact to estimate importance of vertical fiscal externalities.
THE MODEL

- We use a multi-sector, multi-region, static, computable general equilibrium model.
- Model is calibrated to Canadian system of National Accounts, as well as energy and emissions data for six main greenhouse gases.
- Production in each sector/region is by a profit maximizing firm.
- Representative household in each region earns income from endowments and allocates income to maximize utility.
- Both federal and provincial governments are represented. Collect revenue from taxes on factors of production (labour, capital, natural resources); production; sales. Disburse revenue through expenditures and transfers.
Paper is focused on welfare impact of unilateral adoption of environmental policy by a single state in a federation

Scenarios examine adoption of a market-based (tax/cap and trade) climate change mitigation policy by a single Canadian province

Tax is set to achieve a 10 percent cut in emissions in implementing province (illustrative example)

Revenue from tax is collected by implementing province. Provincial government maintains real expenditure and constant deficit and returns surplus revenue to household.

Federal government maintains real expenditure in each province and constant deficit and adjusts tax rates to balance budget
DECOMPOSITION OF RESULTS

- Changes in welfare following introduction of carbon tax can be decomposed into:

  **home market effect** effect of carbon tax on small open economy (i.e., holding external prices and federal government balance fixed)

  **terms of trade effect** effect of carbon tax on external prices facing implementing region

  **fiscal externality effect** effect of carbon tax on balance of federal government in implementing region

- Our decomposition aggregates **home market effect** and **terms of trade effect** into a **carbon policy effect**

- We re-cast multi-region model as single-region model and imposing external effects parametrically (Böhringer and Rutherford (2002)).
DECOMPOSITION: RESULTS FOR ONTARIO
STRINGENCY: RESULTS FOR ONTARIO

![Graph showing percent welfare change vs. percent reduction in emissions for different variables: fiscal externality effect, carbon policy effect, and total welfare. The graph illustrates the relationship between the reduction in emissions and the welfare impact.]
Fiscal externalities can have important implications for environmental policy in a federation:

- Part of the cost of environmental policy in a state can be offloaded to other states.
- Our calibrated model suggests that greenhouse gas reductions of 5 to 15 percent can be welfare-improving for a state because of the fiscal externality effect. Benefits to a province are maximized for GHG reductions of about 10 percent.
There are a number of ways in which we can extend the research presented here:

- Include a theoretical model to better understand the vertical fiscal externality
- Consider implementing model in a strategic setting (treat government environmental policy as endogenous)
REFERENCES


REVENUE RECYCLING: RESULTS FOR ONTARIO
Recycling revenue to reduce pre-existing distortions can increase efficiency.

However, in a federation, part of the efficiency gain spills over to other jurisdictions.

Not clear whether fiscal externality effect can overwhelm welfare improvement.

Results suggest that change in fiscal externality is important, but revenue recycling still optimal.