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Vertical fiscal externalities and the environment

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ABSTRACT

We show that imposition of a state-level environmental tax in a federation crowds out pre-existing federal taxes. We explain how this vertical fiscal externality can lead unilateral state-level environmental policy to generate a welfare gain in the implementing state, at the expense of other states, even absent any environmental benefits. Using a computable general equilibrium model of the Canadian federation, we show that vertical fiscal externalities can be the major determinant of the welfare change following environmental policy implementation by a state government. Our numerical simulations indicate that – as a consequence of vertical fiscal externalities – state governments can reduce greenhouse gas emissions by over 20 percent without any net cost to themselves.

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Introduction

This paper considers the interaction between state and federal taxation in the context of environmental regulation. We show that a state can levy taxes on its carbon emissions and thereby generate a net economic welfare gain for the state (at the expense of the rest of the country), even absent any environmental benefits. The mechanism behind this result is that the state-level emission tax reduces the federal tax base and thus reduces the payment of federal taxes by this state; to make up the revenue, the federal tax rate must increase thereby shifting the net burden to the other states in the federation.

In the literature on fiscal federalism this mechanism is referred to as a vertical fiscal externality. While the theory on vertical fiscal externality is well established (Dahlby and Wilson, 2003), to date, analysis of vertical fiscal externalities in an environmental context is missing. We apply the theory of vertical fiscal externality to the implementation of sub-national carbon taxes in Canada. Building on a multi-province computable general equilibrium (CGE) model of the Canadian federation, we show that the vertical fiscal externality is the dominant driver of the welfare change associated with the introduction of carbon taxes by a single state: a state can fully pass on the economic cost of carbon emissions abatement to other states in the Canadian federation. Our analysis provides important insights into how vertical fiscal externalities affect the economic impacts of environmental regulation for federations such as Canada or the US where a significant proportion of environmental policy-setting occurs at the state level.

The remainder of this paper is organized as follows. In Section “Literature review”, we locate our paper’s contribution into the broader literature on vertical fiscal externalities. In Section “Partial equilibrium model”, we develop a simple partial equilibrium model to convey the reasoning behind the results that we produce with the numerical CGE simulations for the Canadian federation. In Section “Numerical general equilibrium model”, we describe the structure and parameterization of

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the CGE model underlying our numerical simulations. In Section “Welfare decomposition”, we explain how we decompose the general equilibrium results to gain deeper insights into the relative importance of vertical fiscal externalities. In Section “Scenarios and results”, we discuss model results. In Section “Conclusion”, we conclude.

Literature review

Classic models of fiscal federalism offer guidance for dividing government's responsibilities between federal and state levels. The federal government is generally considered best-suited for providing pure public goods that cross state boundaries, which is the case for climate change mitigation and other transboundary environmental problems (Oates, 1999, 2001). National implementation helps to avoid a potential ‘race to the bottom’ that could occur with state implementation, since each state faces an incentive to weaken environmental policies to attract mobile factors of production from other states.

In practice, however, some sub-national governments have been active in implementing climate change policies, especially during the last decade (Rabe, 2008; Lutsey and Sperling, 2008; Williams, 2012). State implementation of climate policies raises the possibility of vertical fiscal externalities.¹ While vertical fiscal externalities in a non-environmental context have received significant attention – among others from Keen and Kotsogiannis (2002); Brühlhart and Jametti (2006); Dahlby and Wilson (2003); Esteller-Moré and Solé-Ollé (2001), and Devereux et al. (2007),² – an assessment of the importance of vertical fiscal externalities in the context of environmental regulation is missing.

Vertical fiscal externalities arise due to the shared tax bases of state and federal governments, where a new tax by a state government has implications for revenue raised by the federal government. There are two basic conditions for the creation of vertical fiscal externalities. First, there needs to be joint occupation of tax bases by the federal and state governments. As noted in Keen (1998), a vertical fiscal externality does not require formal concurrency (i.e., federal and state governments occupying the same statutory tax base) since even when the statutory tax bases are different, the economic incidence of federal and state taxes can overlap. Second, for a fiscal externality to arise, the federal government cannot respond to a new state-level tax by changing revenue or expenditure decisions in a way that discriminates against that state. Considerations of fairness and political economy generally induce federal governments to impose similar tax rates throughout states in a federation and to divorce expenditure decisions from sources of revenue, such that this condition typically holds in policy practice.

As for other taxes and policies, vertical fiscal externalities can have important implications for environmental policy, and these – to our best knowledge – have not been explored in the literature. In this paper, we use a computable general equilibrium model to assess the importance of vertical fiscal interactions in a climate policy setting where we focus on gross welfare effects – not accounting for potential environmental benefits of emission reduction. Focusing on the environment is useful, since the motivation for environmental taxes is typically to reduce externalities, while other taxes focus on raising revenue. Thus, the policy context is qualitatively different in our setting compared to prior work on fiscal federalism. In addition to our expanding the literature on vertical fiscal externalities to address the environment, the other novel aspect of our paper is a quantitative assessment of the importance of vertical fiscal externalities. Most other papers in the literature focus on theoretical (qualitative) results or on identifying response to a tax change by another level of government, and do not quantify welfare implications of fiscal externalities. We believe that these two contributions are especially valuable given the importance of climate change as a policy issue and the recent trend towards decentralization of climate policies.

Aside from the literature on vertical fiscal externalities, our paper is related to a number of other strands of economic research. First, there is the literature on environmental federalism, summarized by Oates (2001). Most of this literature examines interjurisdictional competition for mobile factors, sometimes referred to as the ‘race to the bottom.’ Recent papers examining interjurisdictional competition and environmental regulation in federations include Kuncze and Shogren (2005), Konisky (2007), and Levinson (2003). Williams (2012) compares incentive-based to command-and-control regulations in a federation, and finds that under incentive-based regulations, states are able to offload some cost by increasing regulatory stringency. Second, there is the literature on interactions between environmental policies set by multiple levels of government. For example, Böhringer and Rosendahl (2010) examine the interaction between the EU-wide emission trading system and Member State support schemes for renewable electricity production; in a similar vein, Roth (2014) investigates interactions between federal and state-level transport regulations. Third, our paper is closely related to the literature on environmental policy design in a second-best setting (for a review see Goulder et al., 1999).

Partial equilibrium model

We present a theoretical partial equilibrium model to provide guidance to the numerical findings that we produce with our more complex computable general equilibrium model.

Assume that there are R identical states (or regions) in the federation, indexed by $r = 1 \dots R$. Consider the market for a good in state r , which for simplicity is characterized by linear demand and supply functions. Inverse demand and supply

¹ We interchangeably use the terms state, province, and region to refer to a sub-national government.

² For a summary of the early literature see Keen (1998).

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