"When a National Cap-and-Trade Policy with a Carve-out Provision May Be Preferable to a National CO2 Tax."

Megan H. Accordino* and Deepak Rajagopal**

*Ph.D. Candidate, Department of Economics, University of California, Los Angeles, maccordino@ucla.edu.

**Assistant Professor, Institute of the Environment and Sustainability, University of California, Los Angeles, and School of Public and Environmental Affairs, Indiana University, Bloomington

Greenhouse gas (GHG) emissions are widely regarded as a textbook case of a global externality warranting coordinated global action. However, what appears to be emerging from international negotiations is a weaker agreement whereby countries set their own targets for emission reduction. One impediment to a stronger global commitment is the lack of national consensus within some large industrialized countries, including the U.S. and Canada. In such countries, lower levels of government are undertaking various measures to reduce GHG emissions.

This paper analyzes the interaction of climate policies at multiple levels of jurisdiction, specifically at the federal and state level, to identify the effect on pollution and the relative costs and benefits of national CO_2 taxes vis-a-vis cap-and-trade when combined with overlapping

state-level climate policies (specifically, CO_2 taxes[1] or renewable portfolio standards (RPS)).[2] This research is motivated by the premise that in countries where national opinion on climate change is divided, in the near to medium-term, any national agreement, should it be achieved, would likely be viewed by some states as insufficiently stringent and such states would likely pursue overlapping state-level policies. While an emission tax and a cap-and-trade program are *ex ante* equivalent (Jaffe et al., 2003), we show that when states enact additional emission control policies, the two national policies could yield different results.

Several authors have analyzed the effect of combining state and federal emissions reduction policies. One common conclusion is that under a national cap-and-trade regime, additional state policies have little to no effect on national emissions as any additional emission reduction at the state or local-level only allows emissions from the rest of the nation to rise back to the level of the national cap. The offsetting increase in consumption outside the state under a national cap could, however, be avoided by either "carving-out", i.e. exempting states from the national policy provided they set a stricter state policy, or through price-based regulations, e.g. a CO_2 tax.

We, however, show that even price-based regulations (specifically a CO_2 tax) are not necessarily immune to a completely offsetting increase in emissions elsewhere when states adopt an additional CO_2 tax on top of the national CO_2 tax. We also show that, for relatively small

1 At the level of lower jurisdiction, CO_2 taxes and cap-and-trade are equivalent but we will show that these two policies exhibit some differences at the level of the higher jurisdiction.

2 For a detailed discussion of the motivation for state-level policies for addressing climate change see Rabe (2008).

states[3] that are subject to a national CO_2 tax, a state-level RPS is able to further reduce national emissions while a state-level CO_2 tax cannot. However, if a carve-out provision is added to the national cap-and-trade program, and a state decides to set a tighter cap, emissions must decline regardless of the size of the state as the sum of permitted national and state emissions is now lower. Furthermore, because any reshuffling[4] or leakage[5] of emissions within the market caused by a tighter state cap would increase the national emissions permit price (to keep emissions outside the state constant), a cap-and-trade policy with a carve-out limits reshuffling and leakage within the market and reduces the cost of achieving a given reduction in emissions with a state policy relative to the cost under a national CO_2 tax coupled with an additional state CO_2 tax. However, a tighter state cap under a national cap-and-trade policy with a carve-out raises electricity costs for consumers outside the market relative to the costs before the tighter state cap was implemented and relative to those under equivalent national and state CO_2 taxes, which may impede support for state carve-outs from the national regime.

Our findings result from the following key features of our model: (i) the commodity (or commodities) can be produced with inputs (say, energy) from different sources or using different

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3 Relatively small states are those whose current consumption is less than the quantity of existing zero-carbon resources in the market.

4 Defined here as the reallocation of existing emissions across jurisdictions.

5 Defined here as an increase in emissions outside the state caused by an increase in consumption of carbon-intensive resources outside the state due to the reduction in demand for carbon-intensive resources within the state.

technologies resulting in different emissions per unit of output and at least one such input or process results in zero emissions. In our example, the commodity is electricity derived from coal, natural gas, nuclear, hydro and renewable resources, the latter three being considered zero emission resources; (ii) the commodity is traded at negligible transportation cost within a specified geographic region that spans multiple jurisdictions. In our example, it refers to the free flow of electricity within a regional interconnected grid; (iii) under any state-level climate policy, retailers are accountable for emissions *attributable* to final in-state sales regardless of where emissions arise in the supply chain, which may be outside the policy jurisdiction. In our example, this implies that even though electricity consumption is pollution free, regulated state retailers are accountable for CO_2 emitted during generation of the electricity imported into the state.

While our illustrations are for a single commodity, specifically electricity, the simplified model allows for more general conclusions about emission policies spanning multiple economic activities. As the scope of the policy at either the state or national level or both widens to include emissions from multiple sectors, so does the scope of reshuffling and leakage, causing the efficacy of state-level emissions policies to depend on how the size of the state changes relative to the broader market(s) across which resources can be reshuffled. The comparisons of the various state and national policy combinations are, however, unaffected. Given the global effects of CO_2 emissions, our results also speak to the interactions that occur when global policies overlap national policies or state policies overlap local policies and product markets are larger than the smaller jurisdiction. Finally, although we focus on only three policies – CO_2 taxes, cap-and-trade, and RPS, our framework can be extended to consider many other policies such as emission intensity standards, subsidies for renewable energy and border adjustment policies.