COMPARISION OF CARBON TAXES VS. CAP-AND-TRADE POLICIES UNDER UNCERTAINTY

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Overview

The U.S. Congress is considering a set of bills designed to limit the nation's greenhouse gas (GHG) emissions. Several of these proposals call for a cap-and-trade system; others propose an emissions tax. While policy makers appear to prefer a cap-and-trade approach, economists generally prefer a carbon tax approach to better handle uncertainty in abatement cost technology. The Weitzman uncertainty model also points toward a preference for price instruments to address GHG emissions. This paper complements the analysis by Paltsev et al. (2007) of cap-and-trade bills and applies the MIT Emissions Prediction and Policy Analysis (EPPA) model to carry out an analysis of the emissions tax proposals.

Several lessons emerge from this analysis. First, a low starting tax rate combined with a low rate of growth in the tax rate will not reduce emissions significantly. Second, the costs of GHG reductions are reduced with the inclusion of non-CO2 gases in the carbon tax scheme. Third, welfare costs of the policies can be affected by the rate of growth of the tax, even after controlling for cumulative emissions. Fourth, a carbon tax — like any form of carbon pricing — is regressive. However, general equilibrium considerations suggest that the short-run measured regressivity may be overstated. Finally, the carbon tax bills that have been proposed or submitted are for the most part comparable to many of the carbon cap-and-trade proposals that have been suggested in terms of emission reductions over the first half of this century.

Methods

We used the MIT EPPA computable general equilibrium model to evaluate carbon tax proposals as a policy instrument to reduce greenhouse gas emissions. The EPPA model is a multi-region, multi-sector recursive-dynamic representation of the global economy. We specifically modelled the Dingell, Stark, and Larson carbon tax proposals and variations of each. These results can be compared to the cap-and-trade policies, including the Lieberman-Warner Bill, which were analyzed in the cap-and-trade study by Paltsev, et al. (2007).

Results

The costs of emissions reductions are reduced with the inclusion of non-CO2 gases in the carbon tax scheme. The costs of the Larson plan, for example, fall by 20% with inclusion of the other GHGs.

Welfare costs of the policies can be affected by the rate of growth of the tax, even after controlling for cumulative emissions. In our model, that suggests that a tax rising at the rate of interest over the control period will achieve a given cumulative emissions target at minimum cost.

	Price (CO_2-e)	**Welfare Change (%)**

Proposal	Cumulative Emissions	2015	2050	2020	2050	Total
Carbon Tax Proposals						
Dingell (CO2 only)	349	14	14	-0.09	0.49	0.10
Stark (CO2 only)	301	10	69	-0.09	-0.33	-0.30
Larson (CO2 only)	216	20	561	-0.16	-2.23	-1.21
Dingell (all GHGs)	349	13	13	-0.10	0.49	0.10
Stark (all GHGs)	301	2	60	-0.03	-0.13	-0.11
Larson (all GHGs)	216	13	374	-0.10	-2.13	-0.96
Larson (all GHGs + 4%)	216	38	152	-0.29	-1.38	-0.78
Cap-and-Trade Proposals						
287 bmt	287	18	70	-0.13	-0.18	-0.21
203 bmt	203	41	161	-0.32	-1.45	-0.89
167 bmt	167	53	210	-0.55	-1.79	-1.40
Lieberman-Warner (No Offsets)	190	55	217	-0.56	-1.72	-1.33
Lieberman-Warner (Offsets)	216	48	189	-0.42	-1.54	-0.96

*Cumulative emissions are measured in billions of metric tons of CO_2-e.

Conclusions

A low starting tax rate combined with a low rate of growth in the tax rate will not reduce emissions significantly. In all cases the welfare impacts are relatively modest ranging from a slightly positive impact for the Dingell plan to a small discounted welfare cost for the Larson plan. Policy and welfare costs can be minimized by including all GHGs and properly designing the tax growth rate.

A carbon tax is highly regressive. The regressivity can be offset with a carefully designed rebate of some or all of the revenue. Moreover, general equilibrium considerations suggest that the short-run measured regressivity may be overstated. Over time, a portion of the carbon tax is passed back to workers, owners of equity, and resource owners. To the extent that resource and equity owners bear some fraction of the tax burden, the regressivity will be reduced because these assets are disproportionately owned by those with higher incomes.

Finally the carbon tax bills that have been proposed or submitted lead to a range of emissions reductions that are comparable to many of the cap-and-trade proposals that have been suggested. The Stark Bill is comparable to the Bingaman-Specter Bill, if the savefty valve is triggered. Both the Larson Bill and the Liberman-Warner Bill result in about 216 bmt of cumulative emissions. Thus an emissions tax and a cap-and-trade system (or some hybrid of the two approaches) can be equally effective at reducing GHG emissions in the United States. Therefore the choice between the two approaches can be made on the basis of considerations other than their effectiveness at reducing emissions over some control period. Other such considerations may include efficiency, revenue generation, administrative costs, price volatility, and political feasibility, among other things.

References

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