Regulating Greenhouse Gas Emissions in Sectors Exempt from Climate Policy

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This paper compares the performance of policy instruments for reducing greenhouse gas emissions (GHG) in sectors exempt from climate change regulations. The policy instrument choice problem in this context is inherently second best because it faces the same constraints that justified the sector's exemption from regulation in the first place. I focus on two prominent constraints: unobservable emissions and distributional concerns.

Using analytical and numerical general equilibrium models, I evaluate the costs of policies suitable for addressing an unobservable source of emissions under the requirement that the regulator must compensate producers for any change in profit induced by the environmental policy, which formalizes the distributional concern. To implement the numerical analysis I develop a comprehensive, yet spatially detailed, integrated economic and biophysical framework to estimate the costs of policies to reduce nitrous oxide (N_2O) emissions from cropland agriculture, the single largest source of agricultural GHGs. Leveraging the biophysical model allows for an accurate representation of the heterogeneity in productivity and emissions at the county scale, which could not be obtained from observational data, and more realistic cost estimates.

The compensation requirement dramatically changes the rankings of alternative policy options. In fact, for a 5% reduction in N_2O the emissions tax is the second highest cost policy with the compensation requirement in place. Despite having the lowest primary costs, the tax on emissions has a larger impact of regulated firms' profit than the alternative input taxes and restrictions. Distributional concerns complicate general advice regarding policy instrument choice when emissions are unobservable. Strategies suggested for reducing the primary costs of regulating unobservable emissions can increase or decrease mitigation costs when compensation is in place.

This paper also informs the debate regarding agriculture's role in climate policy by providing cost estimates for technically feasible national-scale policies for agricultural mitigation. I find that a 5% reduction in N_2O can be achieved at marginal primary costs of roughly 30 \$/tCO_2e if emissions could be taxed. Policies based on readily observable quantities can achieve the same reduction with only slightly higher marginal costs. While the costs of a uniform tax on nitrogen fertilizer are around 50% higher than an emissions tax, primary costs could be lowered substantially, to only 13% higher than the emissions tax, by allowing the tax rate to vary across regions. I also show that primary cost estimates, generally used to evaluate agri-environmental policies, can provide misleading estimates of the social cost of alternative mitigation policies. The relative inefficiency of input based policies can be significantly larger if gross costs are considered.