LOW CARBON ECONOMY

Designing carbon policy: Modelling the implications for Canada

Appropriate economic incentives are essential for realizing most breakthrough innovations. As such, the absence of a meaningful price on carbon across Canada is a major impediment to low carbon innovation, technology deployment and behavioural change. These factors are critical for cost-effectively reducing Canadian greenhouse gas (GHG) emissions over time. But what are the economic and social implications of implementing policies to price carbon and achieve emissions reductions? How does policy affect innovation, particularly in fossil fuel sectors?

To investigate the economic implications of carbon pricing and related policies, Randy Wigle from Wilfrid Laurier University, Nicholas Rivers from University of Ottawa and Hidemichi Yonezawa from University of Ottawa, with a team of other researchers, are applying computable general equilibrium (CGE) models of the Canadian economy. CGE models are a critical decision support tool for analysis of climate change mitigation and other policy options. The CGE approach considers how firms and households respond to changes in prices in order to explore the market equilibrium conditions that emerge from policy changes. The rigorous microeconomic foundation of market interactions within an economy-wide setting makes it possible to address both efficiency as well as distributional impacts of policies.

The research team is building on an existing CGE model developed by Environment Canada. The model captures characteristics of provincial production and consumption patterns through detailed input-output tables and links provinces via bilateral trade flows. The model also incorporates rich detail in energy use and GHG emissions related to the combustion of fossil fuels. The team is extending the model in order to consider several important issues that have not yet been addressed at sufficient depth to effectively inform policy development. Key issues include distributional effects across society, carbon revenue recycling, technological change and pricing non-carbon GHG emissions.

So far, the research team has applied the modelling framework to three main policy issues:

The first application considers how the burden for GHG abatement amongst the provinces might be divided. Because of the substantial heterogeneity amongst Canadian provinces, different burden sharing rules imply significantly different relative abatement effort and different welfare implications amongst provinces. These findings have important implications for Canada given shared provincial and federal jurisdiction over climate policy.

The second application examines the importance of 'learning by doing' for the evaluation of renewable electricity policy (i.e., how the costs of new technologies and practices that can reduce GHG emissions decline as more firms implement these actions and learn how to improve and refine them). This analysis finds that learning by doing reduces the cost of promoting renewable energy, but does not change the ranking of the alternative policy approaches we considered.

The third application examines interprovincial carbon leakage, which is defined as the increase in emissions in other provinces following the imposition of an emission-reducing policy in one province. The analysis finds that the seriousness of leakage is significantly different depending on which province is regulated.

This research will enable Canadian policy-makers to develop policies that will drive innovation in technology and practices required to achieve major GHG reductions, particularly in fossil fuel sectors, while minimizing the economic and social costs of achieving these reductions.

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