

Modeling changes in technology-mixes due to climate policy

Topic: (6.5) Methodological aspects of IO analysis (2)

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Climate policies are commonly assessed based on aggregated economic models such as computational general equilibrium models. These models capture the effect of climate policies on the whole economy or individual sectors, but cannot determine changes in technology mixes used to produce individual products. Determining such changes, however, is crucial to understand the impact of climate policies on the potential introduction of novel environmentally friendly technologies. Building on the Rectangular Choice-of-Technology (RCOT) model by Duchin and Levine (2011), KÄTELHÄN et al (2016) developed a stochastic model that helps understand changes in technology mixes at an engineering-level detail: the Technology Choice Model (TCM). In TCM, technology mixes are determined by a cost minimization objective, considering constraints in factor availability and uncertainties in process parameters, factor requirements, and factor prices.

In this work, we adapt TCM for climate policy assessment, and demonstrate its application in a hypothetical case study on the production of biofuels and corn. We show the model's ability to determine changes in technology mixes in response to the introduction of an emissions trading scheme. We further illustrate the interdependence between technology mixes and production volumes of fuel and corn within the model, and discuss their impact on land use and climate. The case study results in a non-linear relationship between potential climate impact reductions and the price of emissions certificates within the emissions trading scheme.

References:

Duchin, F.; Levine, S. H. Sectors May Use Multiple Technologies Simultaneously: The Rectangular Choice-of-Technology Model with Binding Factor Constraints. *Econ. Systems Res.* 2011, 23 (3), 281–302.

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