

Models for Applied Environmental Economics

EDCE course ENV-723

Spring 2023

The course

- 6 sessions, 5 papers
 - main activity: discussing the papers
 - brief introductions
 - to each paper
 - to each model type (planned for the previous session)
- today
 - round of introductions
 - brief introduction to models in applied environmental economics
 - paper selection
 - “all models are wrong” (G. Box), but some are useful
 - brief introduction to linear programming

Models for Applied Environmental Economics

- models
 - mathematical models: optimization or simulation
- applied
 - with numbers
 - usually: computer-based (programming software and algorithms)
 - usually: case
- environmental
 - environmental topics
 - multi-disciplinary: natural sciences, engineering, ...
- economics
 - based on (mostly micro-)economic theory
 - as opposed to “economical”

Working steps in applied economic modeling

- research question
- literature review: theory, numerical applications
- approach: type of model, data, software tools
- model structure and data treatment
- calibration
- solution and reporting
- interpretation, validation
- presentation

Model types

- *Linear programming*
- Microsimulation
- *Agent-based*
- *Game-theoretic*
- *Partial equilibrium*
- *General equilibrium*
- Overlapping generations
- Endogenous growth
- (Macro-)econometric
- Input output
- System dynamics
- ...

Model features (examples)

- Equilibrium or disequilibrium
- Static or dynamic
- Myopic or forward-looking
- Full or bounded rationality
- Deterministic or stochastic
- Perfect competition or market power
- Spatial explicitness
- Technological progress
- Machine learning
- Integrated assessment
- ...

Papers to be discussed

	Author(s)	Title	Journal	Year	Vol.	Pages	Model type	Env. topic	Study area
1	Cofala, J. et al.	Cost-effective control of SO ₂ emissions in Asia	Journal of Environmental Management	2004	72	149-161	Linear programming	Air pollution, acid deposition (SO ₂)	South, East and Southeast Asia
2	Nalle, D.J. et al.	Modeling joint production of wildlife and timber	Journal of Environmental Economics and Management	2004	48	997-1017	Partial equilibrium	Habitat protection	West side of the Cascade Range, Oregon, USA
3	Beck, M. Rivers, N. Wigle, R. Yonezawa, H.	Carbon tax and revenue recycling: Impacts on households in British Columbia	Resource and Energy Economics	2015	41	40-69	General equilibrium	Climate change	The Province of British Columbia, Canada
4	Carraro, C. Eyckmans, J. Finus, M.	Optimal transfers and participation decisions in international environmental agreements	The Review of International Organizations	2006	1	379-396	Game theory	Climate change	global
5	Rai, V. Robinson, S.A.	Agent-based modeling of energy technology adoption: Empirical integration of social, behavioral, economic, and environmental factors	Environmental Modelling & Software	2015	70	163-177	Agent-based	Air pollution, climate change (adoption of renewables)	The City of Austin Texas, USA