

## IAN SUE WING

Professor, Boston University Department of Earth & Environment  
675 Commonwealth Ave., Rm. 461, Boston MA 02215  
Phone: (617) 353-5741 • Fax: (617) 353-8399 • Email: [isw@bu.edu](mailto:isw@bu.edu)

### Professional Experience

2020-present	Professor, Department of Earth & Environment, Boston University
2008-2020	Associate Professor, Department of Earth & Environment, Boston University
2005-2006	Repsol-YPF Energy Fellow, Kennedy School of Government, Harvard University
2002-2008	Assistant Professor, Department of Geography & Environment, Boston University
2002-present	Research Affiliate, Joint Program on the Science & Policy of Global Change, MIT
2001-2002	Postdoctoral Associate, Joint Program on the Science & Policy of Global Change, MIT

### Education

1996-2001	Ph.D., Massachusetts Institute of Technology (Technology, Management & Policy)
1994-96	M.Sc., Oxford University (Development Economics)
1993-94	Bachelor of Engineering, Thayer School of Engineering, Dartmouth College
1989-93	B.A., Dartmouth College (Major: Engineering Sciences; Minor: Environmental Studies)

### Peer-Reviewed Articles, Book Chapters and Book Contributions

- P1. Jacoby, H.D. and I. Sue Wing (1999). Adjustment Time, Capital Malleability, and Policy Cost, *Energy Journal*, Special Issue: The Costs of the Kyoto Protocol, A Multi-Model Evaluation: 73-92.
- P2. Ellerman, A.D. and I. Sue Wing (2000). Supplimentarity: An Invitation to Monopsony? *Energy Journal* 21(4): 29-59.
- P3. Ellerman, A.D. and I. Sue Wing (2003). Absolute vs. Intensity-Based Emission Caps, *Climate Policy* 3(Supplement 2), S7-S20.
- P4. Sue Wing, I. (2006). Representing Induced Technological Change in Models for Climate Policy Analysis, *Energy Economics* 28: 539-562.
- P5. Sue Wing, I. (2006). The Synthesis of Bottom-Up and Top-Down Approaches to Climate Policy Modeling: Electric Power Technologies and the Cost of CO<sub>2</sub> Emission Limits, *Energy Policy* 34: 3847-3869.
- P6. Sue Wing, I. and W.P. Anderson (2007). Modeling Small Area Economic Change in Conjunction with a Multiregional CGE Model, in R.J. Cooper, K.P. Donaghy and G.J.D. Hewings (eds.), *Globalization and Regional Economic Modeling*, Springer-Verlag, 263-288.
- P7. Sue Wing, I. and R.S. Eckaus (2007). The Decline in U.S. Energy Intensity: Its Origins and Implications for Long-Run CO<sub>2</sub> Emission Projections, *Energy Policy* 35: 5267-5286.
- P8. Sue Wing, I. (2008). The Synthesis of Bottom-Up and Top-Down Approaches to Climate Policy Modeling: Electric Power Technology Detail in a Social Accounting Framework, *Energy Economics* 30: 547-573.
- P9. Sue Wing, I. (2008). Explaining the Decline in U.S. Energy Intensity, *Resource and Energy Economics* 30: 21-49.
- P10. Fisher-Vanden, K. and I. Sue Wing (2008). Accounting for Quality: Issues with Modeling the Impact of R&D on Economic Growth and Carbon Emissions in Developing Economies, *Energy Economics* 30(6): 2771-2784.
- P11. Sue Wing, I. A.D. Ellerman and J.M. Song (2009). Absolute vs. Intensity-Based Limits for CO<sub>2</sub> Emission Control: Performance Under Uncertainty, in H. Tulkens and R. Guesnerie (eds.), *The Design of Climate Policy*, MIT Press, 221-252.
- P12. Sue Wing, I. (2009). Computable General Equilibrium Models for the Analysis of Energy and Climate Policies, in J. Evans and L.C. Hunt (eds.), *International Handbook On The Economics Of Energy*, Cheltenham: Edward Elgar, 332-366.
- P13. Bauer, D.M. and I. Sue Wing (2010). Economic Consequences of Pollinator Declines: A Synthesis, *Agricultural and Resource Economics Review* 39: 368-383.
- P14. National Research Council (2010). *Hidden Costs of Energy: Unpriced Consequences of Energy Production and Use*, Washington DC: National Academies Press.

- P15. Sue Wing, I. and J.L. Walker (2010). The Geographic Dimensions of Electoral Polarization in the 2004 U.S. Presidential Vote, in A. Paez, J. Le Gallo, R. Buliung, and S. Dall'Erba (eds.) *Progress in Spatial Analysis: Theory and Computation, and Thematic Applications*, Springer.
- P16. Webster, M., I. Sue Wing and L. Jakobovits (2010). Second-Best Instruments for Near-Term Climate Policy: Intensity Targets vs. the Safety Valve, *Journal of Environmental Economics & Management* 59: 250-259.
- P17. Sue Wing, I. (2011). Computable General Equilibrium Models for the Analysis of Economy-Environment Interactions, in A. Batabyal and P. Nijkamp (eds.) *Research Tools in Natural Resource and Environmental Economics*, Hackensack: World Scientific, 255-305.
- P18. Fisher-Vanden, K., K. Daenzer, I. Sue Wing and K. Calvin (2012). Decomposing the Impact of Alternative Technology Sets on Future Carbon Emissions Growth, *Energy Economics* 34(Supp. 3): S359-S365.
- P19. Fisher-Vanden, K., I. Sue Wing, E. Lanzi and D.C. Popp (2013). Modeling climate change feedbacks and adaptation responses: recent approaches and shortcomings, *Climatic Change* 117: 481-495.
- P20. Sue Wing, I. and K. Fisher-Vanden. (2013). Confronting the Challenge of Integrated Assessment of Climate Adaptation: A Conceptual Framework, *Climatic Change* 117: 497-514.
- P21. Gately, C.K., L.R. Hutyra, I. Sue Wing and M.N. Brondfield. (2013). A bottom up approach to on-road CO<sub>2</sub> emissions estimates: improved spatial accuracy and applications for regional planning, *Environmental Science and Technology* 47: 2423-2430.
- P22. Lanzi, E. and I. Sue Wing (2013). Capital Malleability, Emission Leakage and the Cost of Partial Climate Policies: General Equilibrium Analysis of the European Union Emission Trading System, *Environmental and Resource Economics* 55: 257-289.
- P23. Baldwin, J. and I. Sue Wing (2013). The Spatiotemporal Evolution of U.S. Carbon Dioxide Emissions: Stylized Facts and Implications for Climate Policy, *Journal of Regional Science* 53: 672-689.
- P24. Daenzer, K., Ian Sue Wing and K. Fisher-Vanden (2014). Coal's medium-run future under atmospheric greenhouse gas stabilization, *Climatic Change* 123: 763-783.
- P25. Jacoby et al (2014). Ch. 27: Mitigation, in J.M. Melillo, T.C. Richmond, and G.W. Yohe (eds.), *Climate Change Impacts in the United States: The Third National Climate Assessment*, U.S. Global Change Research Program, 27-1–27-nn.
- P26. Keenan, T.F., et al (2014). Net carbon uptake has increased through warming-induced changes in temperate forest phenology, *Nature Climate Change* 4: 598–604.
- P27. Sue Wing, I. and E. De Cian (2014). Integrated assessment: Modelling agricultural adaptation, *Nature Climate Change* 4: 535–536.
- P28. Fisher-Vanden, K., D. Popp and I. Sue Wing (2014). Introduction to the Special Issue on Climate Adaptation: Improving the connection between empirical research and integrated assessment models, *Energy Economics* 46: 495-499.
- P29. Sue Wing, I., A.Z. Rose and A. Wein (2014). Economic Impacts of the ARkStorm Scenario, *Natural Hazards Review*, 10.1061/(ASCE)NH.1527-6996.0000173, A4015002.
- P30. Gately, C.K, L.R. Hutyra and I. Sue Wing (2015). Cities, traffic, and CO<sub>2</sub>: A multidecadal assessment of trends, drivers, and scaling relationships, *PNAS* 112: 4999–5004.
- P31. Sue Wing, I., E. Monier, A. Stern, and A. Mundra (2015). US major crops' uncertain climate change risks and greenhouse gas mitigation benefits, *Environmental Research Letters* 10: 115002-115013(12)
- P32. Rose, A., I. Sue Wing, D. Wei and A. Wein (2015). Economic Impacts of a California Tsunami, *Natural Hazards Review*, 10.1061/(ASCE)NH.1527-6996.0000212 , 04016002.
- P33. Bauer, D.M. and I. Sue Wing (2016). The Macroeconomic Cost of Catastrophic Pollinator Declines, *Ecological Economics* 126: 1-13.
- P34. Noeke, C., M. McGovern, D. Corsi, M. Pescador-Jimenez, A. Stern, I. Sue Wing and L. Berkman (2016). Increasing Ambient Temperature Reduces Emotional Well-Being, *Environmental Research* 151: 124-129.
- P35. Gately, C., L. Hutyra, S. Peterson and I. Sue Wing (2017). Urban Emissions Hotspots: Quantifying Vehicle Congestion and Air Pollution Using Mobile Phone GPS Data, *Environmental Pollution* 229: 496-504.
- P36. Mistry, M., I. Sue Wing and E. De Cian (2017). Simulated vs. empirical weather responsiveness of crop yields: US evidence and implications for the agricultural impacts of climate change, *Environmental Research Letters* 12: 075007.

- P37. Sue Wing, I. and E.J. Balistreri (2018). Computable General Equilibrium Models for Economic Policy Evaluation and Economic Consequence Analysis, in S.-H. Chen, M. Kaboudan and Y.-R. Du (eds.), *Oxford University Press Handbook on Computational Economics and Finance*, 139-203.
- P38. Sue Wing, I. and G. Timilsina (2018). Targeted Technology Strategies for Low-Carbon Economic Growth: Linking Bottom-Up and Top-Down Assessments, in R. Fouquet (ed.), *Handbook on Green Growth*, 139-164.
- P39. De Cian, E. and I. Sue Wing (2019). Global Energy Consumption in a Warming Climate, *Environmental and Resource Economics* 72: 365-410.
- P40. Van Ruijven, B., E. De Cian and I. Sue Wing (2019). Amplification of Future Energy Demand Growth due to Climate Change, *Nature Communications* 10, Art. 2762.
- P41. Waldhoff, S., I. Sue Wing, J. Edmonds, G. Leng and X. Zhang (2020). Future climate impacts on global agricultural yields over the 21st century, *Environmental Research Letters* 15: 114010.
- P42. Sue Wing, I. and A. Rose (2020). Economic consequence analysis of electric power infrastructure disruptions: General equilibrium approaches, *Energy Economics* 89: 104756.
- P43. Sue Wing, I., D. Wei, A. Rose and A. Wein (2021). Economic Consequences of the HayWired Scenario—Digital and Utility Network Linkages and Resilience, in S. Detweiler and A. Wein, *The HayWired Earthquake Scenario—Societal Consequences*, *USGS Scientific Investigations Report* No. 2017–5013–R–W, U.S. Dept. of the Interior.
- P44. Sue Wing, I., M. Mistry and E. De Cian (2021). Global Vulnerability of Crop Yields to Climate Change, *Journal of Environmental Economics and Management* 109: 102462.
- P45. Romitti, Y. and I. Sue Wing (2022). Heterogeneous climate change impacts on electricity demand in world cities circa mid-century, *Scientific Reports* 12: 4280.
- P46. Carbone, J., L. Bui, D. Fullerton, S. Paltsev and I. Sue Wing (2022). When and How to Use Economy-Wide Models for Environmental Policy Analysis, *Annual Review of Resource Economics* 14:447-465.
- P47. Pollack, A., I. Sue Wing and C. Nolte (2022). Aggregation bias and its drivers in large-scale flood loss estimation: A Massachusetts case study, *Journal of Flood Risk Management* 15: e12851. <https://doi.org/10.1111/jfr3.12851>
- P48. Romitti, Y., I. Sue Wing, K. Spangler and G. Wellenius (2022). Inequality in the availability of residential air conditioning across 115 US metropolitan areas, *PNAS Nexus* 1: pgac210. <https://doi.org/10.1093/pnasnexus/pgac210>
- P49. Colelli, F.P., I. Sue Wing and E. De Cian (2023). Air-conditioning adoption and electricity demand highlight climate change mitigation-adaptation tradeoffs, *Scientific Reports* 13: 4413. <https://doi.org/10.1038/s41598-023-31469-z>
- P50. Carr, D., G. Falchetta, and I. Sue Wing (2023). Population Aging and Heat Exposure in the 21<sup>st</sup> Century: Which U.S. Regions Are at Greatest Risk and Why? *The Gerontologist* gnad050. <https://doi.org/10.1093/geront/gnad050>
- P51. Pollack, A.B., D.H. Wrenn, C. Nolte and I. Sue Wing (2023). Potential Benefits in Remapping the Special Flood Hazard Area: Evidence from the US Housing Market, *Journal of Housing Economics* 61: 101956. <https://doi.org/10.1016/j.jhe.2023.101956>
- P52. Colelli, F.P., I. Sue Wing and E. De Cian (2023). Intensive and extensive margins of the peak load: Measuring adaptation with mixed frequency panel data, *Energy Economics* 126: 106923.
- P53. Sue Wing, I., D. Wei, A. Rose and A. Wein (2023). The Long Shadow of a Major Disaster: Modeled Dynamic Impacts of the Hypothetical HayWired Earthquake on California’s Economy, *International Regional Science Review*, forthcoming.
- P54. Webster, M., K. Fisher-Vanden and I. Sue Wing (2023). The Economics of Power System Transitions, *Review of Environmental Economics and Policy*, forthcoming.

#### Reports and Conference Proceedings

- R1. Harnisch, J., I. Sue Wing, H.D. Jacoby and R.G. Prinn (1998). Primary Aluminum Production: Climate Policy, Emissions, and Costs, *MIT Joint Program on the Science & Policy of Global Change Report* No. 44, Cambridge MA.
- R2. H.D. Jacoby, R. Schmalensee and I. Sue Wing (1998). Toward a Useful Architecture for Climate Change Negotiations, *Proceedings of the OECD Workshop on the Economic Modeling of Climate Change*, Paris, 17-18 September.

- R3. M.H. Babiker, J.M. Reilly, M. Mayer, R.S. Eckaus, I. Sue Wing and R.C. Hyman (2001). The MIT Emissions Prediction and Policy Analysis (EPPA) Model: Revisions, Sensitivities, and Comparison of Results, *MIT Joint Program on the Science & Policy of Global Change Report* No. 71, Cambridge MA.
- R4. Sue Wing, I. and R.S. Eckaus (2003). The Energy Intensity of U.S. Production: Sources of Long-Run Change, *Proceedings of the 23<sup>rd</sup> IAAE North American Conference*, Mexico City.
- R5. Sue Wing, I. (2004). Computable General Equilibrium Models and Their Use in Economy-Wide Policy Analysis, *MIT Joint Program on the Science & Policy of Global Change Technical Note* No. 6, Cambridge MA.
- R6. Sue Wing, I. and R.S. Eckaus (2004). Explaining Long-Run Changes in the Energy Intensity of the U.S. Economy, *MIT Joint Program on the Science & Policy of Global Change Report* No. 116, Cambridge MA.
- R7. Sue Wing, I. and D.C. Popp (2005). Representing Endogenous Technological Change in Models for Climate Policy Analysis: Theoretical and Empirical Considerations, invited chapter in M. Hanneman and A. Farrell (eds.), *Managing Greenhouse Gas Emissions in California*, California Climate Change Center at U.C. Berkeley.
- R8. Sue Wing, I., W.P. Anderson and T.R. Lakshmanan (2008). The Broader Benefits of Infrastructure Investment, *International Transport Forum Round Tables No. 140: The Wider Economic Benefits of Transport, Macro-, Meso- and Micro-Economic Transport Planning and Investment Tools*, Paris: OECD, 151-180.
- R9. Abler, D., K. Fisher-Vanden, M. McDill, R. Ready, J. Shortle, I. Sue Wing and T. Wilson (2009). *Economic Impacts of Projected Climate Change in Pennsylvania*, Report to the Pennsylvania Department of Environmental Protection.
- R10. Porter, K., et al (2010). Overview of the ARkStorm scenario, *U.S. Geological Survey Open-File Report 2010-1312*.
- R11. Wein, A., A. Rose, I. Sue Wing, and D. Wei (2013). Economic Impacts of the SAFRR Tsunami Scenario in California, in S. Ross and L. Jones (eds.), *The SAFRR (Science Application for Risk Reduction) Tsunami Scenario*, *USGS Open File Report 2013-1170*, Chapter H.
- R12. Sue Wing, I. (2013). Climate Change and US Electric Power, *American Economic Association 2013 Annual Meeting*, San Diego, CA.
- R13. Sue Wing, I. and E. Lanzi (2014). Integrated Assessment of Climate Change Impacts: Conceptual Frameworks, Modelling Approaches and Research Needs, *OECD Environment Working Paper* No. 66.
- R14. Sue Wing, I. and G. Timilsina (2016). Technology strategies for low-carbon economic growth: a general equilibrium assessment, *World Bank Policy Research Working Paper* WPS7742.
- R15. Moss, R., et al (2016). Understanding Dynamics and Resilience in Complex Interdependent Systems Prospects for a Multi-Model Framework and Community of Practice, *Report of the IA-IAV-ESM Workshop: Toward Multi-Model Frameworks Addressing Multi-Sector Dynamics, Risks, and Resiliency*, U.S. Global Change Research Program Interagency Group on Integrative Modeling.
- R16. US Environmental Protection Agency Science Advisory Board (2017). *SAB Advice on the Use of Economy-Wide Models in Evaluating the Social Costs, Benefits, and Economic Impacts of Air Regulations*, Washington DC: US. Environmental Protection Agency, EPA-SAB-17-012.
- R17. Sue Wing, I. and A. Rose (2018). Economic consequence analysis of electric power infrastructure disruptions: An analytical general equilibrium approach, *Frontiers in the Economics of Widespread, Long-Duration Power Interruptions*, Lawrence Berkeley National Laboratory, Washington DC, March 6.

#### **Working Papers and Manuscripts Under Review**

- W1. Sue Wing, I. (2004). Induced Technical Change and the Cost of Climate Policy.
- W2. Sue Wing, I. (2006). Induced Technological Change: Firm Innovative Responses to Environmental Regulation.
- W3. Sue Wing, I. (2007). The Regional Impacts of U.S. Climate Change Policy: A General Equilibrium Analysis.
- W4. Sue Wing, I. and M. Kolodziej (2008). The Regional Greenhouse Gas Initiative: Emission Leakage and the Effectiveness of Interstate Border Adjustments.
- W5. Lanzi, E., and I. Sue Wing (2010). Directed Technical Change in the Energy Sector: an Empirical Test of Induced Directed Innovation.

- W6. Sue Wing, I. (2010). The Regional Incidence of a National Greenhouse Gas Emission Limit: Title VII of the American Clean Energy and Security Act.
- W7. Sue Wing, I., A. Rose, D. Wei and A. Wein (2017). Economywide Consequences of Inherent Resilience to Disasters: Insights from the Economic Consequences of Tsunami Impacts on California's Major Ports.
- W8. Horing, J., I. Sue Wing, M. Lisk (2023). Economic Consequences of Wildfire Adaptation: Public Safety Power Shutoffs in California.
- W9. Kieffer, I., C. Springer and I. Sue Wing (2023). China's Clean Energy Transition Abroad.

#### Other Publications and Editorials

1. Coming to Terms..., in A. Garrod and J. Davis (eds.), *Crossing Customs: International Students Write on U.S. College Life and Culture*, Garland Studies in Higher Education No. 18., Falmer Press, New York: Taylor & Francis, 1999.
2. Sue Wing, I. and R.S. Eckaus (2003). Technological Change and the Continuing Puzzles and Implications for Climate Policy, *USAEF Dialogue* 11(3): 9-13.

#### Invited Presentations and Lectures

1. Energy Systems in a Warming Climate, *Yale School of Forestry & Environmental Studies*, Feb. 14, 2018; *Centro Euro-Mediterraneo sui Cambiamenti Climatici*, Venice, April 23, 2018.
2. Integrated Assessment of the Impacts of Climate Change: Reflections and Modest Proposals for Linking Empirical Approaches and IAMs, *ENGAGE: Understanding the impacts of climate change on growth and development*, Potsdam Institute for Climate Impact Research, June 20-21, 2016.
3. Robust Statistical Emulation of Process Model Crop Yield Responses to Climate Change, *Climate change impacts on agriculture: An inter-method comparison*, European Commission Joint Research Center, Seville, Spain, June 6-7, 2016.
4. IA-IAV-ESM Workshop: *Toward multi-model frameworks for addressing multi-sector dynamics, risk and resiliency*, U. Maryland Joint Global Change Research Institute, May 24-26, 2016.
5. Climate Change and US Electricity Demand: Micro-Consistent Aggregation of a Structural Model, *ETH Zurich Centre for Energy Policy and Economics Seminar*, April 8, 2016.
6. Climate Change and US Electricity Demand: Micro-Consistent Aggregation of a Structural Model, *International Energy Workshop*, Abu Dhabi, 4 June, 2015.
7. Cities, traffic, and CO<sub>2</sub>: A multidecadal assessment of trends, drivers, and scaling relationships, *Yale Forestry & Environmental Science Seminar*, Feb. 18, 2015.
8. Climate Change and US Electric Power, *Harvard Kennedy School Asia Energy Leaders Program*, Jun. 17, 2013; *International Food Policy Research Institute*, Apr 5., 2013; *Pennsylvania State University Geosciences Dept.*, 30 Jan., 2013; *American Economic Association 2013 Annual Meeting*, San Diego CA, 6 Jan, 2013.
9. Strengthening the Empirical Basis for Climate Policy Models, *International Workshop on Innovation in Energy Technologies: What Can We Learn from Patent Data?* Venice, 19-20 May, 2011.
10. Sectoral and Regional Disaggregation and Interactions, USEPA-DOE workshop on *Improving the Assessment and Valuation of Climate Change Impacts for Policy and Regulatory Analysis*, Washington DC, 18-19 Nov., 2010.
11. Panelist, *Energy Modeling Forum 24*, Washington DC, 24-25 Oct., 2010.
12. The Regional Incidence of U.S. Climate Policy, *Environmental Defense Fund Climate Economics Seminar*, 7 May, 2009.
13. The Regional Greenhouse Gas Initiative: Emission Leakage and the Effectiveness of Border Adjustments, *Arizona State University Economics of Climate Policy Workshop*, 19 Mar., 2008.
14. Economic Impacts of California's Greenhouse Gas Emission Target: Quantifying the Implications of Key Uncertainties *Dartmouth College Applied Statistics Working Group*, 29 Feb., 2008.
15. Using Computable General Equilibrium Models for Climate Policy Analysis, *Environmental Defense*, New York NY, 1 Feb., 2008.
16. The Regional Greenhouse Gas Initiative: Emission Leakage and the Effectiveness of Border Adjustments, *Regulatory Policy Program Seminar*, Harvard Kennedy School, 15 Feb., 2008.
17. Discussant, *Transport & Public Utilities Group Session at the 2008 Allied Social Science Associations Meeting*, New Orleans, LA, Jan. 5, 2008.

18. Discussant, *Yale One-Day Environmental Economics Meeting*, 16 Nov., 2007.
19. The Regional Greenhouse Gas Initiative: Emission Leakage and the Effectiveness of Border Adjustments, *Cornell University Regional Economics Seminar*, 14 Nov., 2007.
20. RGGI, Carbon Leakage, and the Influence of Border Measures, Environmental Modeling session at *INFORMS Annual Meeting 2007*, Seattle WA, 7 Nov., 2007.
21. The Broader Benefits of Infrastructure Investment, *OECD/ECMT Research Round Table on Macro-, Meso- and Micro-Infrastructure Planning and Assessment*, Boston University, 25-26 Oct., 2007.
22. Technology and Market Assumptions in Renewable Energy Models, *Renewable Energy Modeling Analysis Partnership Meeting*, U.S. Dept. of Energy, Washington DC, 3 Nov., 2006.
23. Panelist, *EPA Workshop on Characterizing, Quantifying, and Communicating Uncertainties: Assessment of the Effects of Global Change on U.S. Regional Air Quality*, Research Triangle Park, NC, 1-2 Nov., 2006.
24. The Decline in U.S. Energy Intensity: Its Origins and Implications for Long-Run CO<sub>2</sub> Emission Projections, in *"Climate Policy Without Cost: Can Technology Solve the Climate Problem?" An Inter-agency Workshop*, Washington DC, Jul. 18, 2006.
25. Explaining Long-Run Changes in the Energy Intensity of the U.S. Economy, *Western Economic Association 81<sup>st</sup> Annual Conference*, San Diego CA, Jun. 29-Jul. 3, 2006.
26. Explaining Long-Run Changes in the Energy Intensity of the U.S. Economy, *NBER Productivity Lunch*, Cambridge MA, Feb. 7, 2006.
27. Induced Technical Change: Firm Innovatory Responses to Environmental Policy, *Yale Environmental Economics Seminar*, Feb. 28, 2007.
28. Induced Technical Change: Firm Innovatory Responses to Environmental Policy, *Rensselaer Polytechnic Institute Economics Dept.*, Apr. 24, 2006.
29. Induced Technical Change: Firm Innovatory Responses to Environmental Policy, *Ohio State University Agricultural Economics Dept.*, Apr. 20, 2006.
30. Induced Technical Change: Firm Innovatory Responses to Environmental Policy, *Dartmouth College Workshop on Technical Change and the Environment*, Mar. 25, 2006.
31. Discussant, *NBER Environmental Economics Working Group Meeting*, Cambridge MA, Apr. 7-8, 2006.
32. New Developments in Macroeconomic Modeling Using Computational General Equilibrium (CGE) Models for Climate Change Studies, *California Energy Commission*, Sacramento CA, Feb. 9, 2006.
33. Discussant, *IAEE Session at the 2006 Allied Social Science Associations Meeting*, Boston MA, Jan. 6-8, 2006.
34. Discussant, *EPA/WRI/JED/SAGE Colloquium on Socioeconomic Drivers of Greenhouse Gases*, Washington DC, Sep. 29-30, 2005.
35. The role of technological change in reducing energy intensity, *NCCR Climate Symposium 2005: Interfaces between Climate and Economic Dynamics*, Interlaken, Switzerland, Mar. 3-5, 2005.
36. Using CGE Models for Economy-wide Policy Analysis, *MIT Laboratory for Energy and the Environment*, Sep. 13 and 20, 2006.
37. Using CGE Models for Economy-wide Policy Analysis, *MIT Laboratory for Energy and the Environment*, Oct. 11, 2005.
38. Representing Induced Technical Change in Climate Policy Models. *Energy Modeling Forum Climate Change Impacts and Integrated Assessment Meeting*, Snowmass CO, Aug. 5-8, 2003.
39. Induced Technical Change and the Cost of Climate Policy, in Representing Technological Change in Models for Climate Policy Analysis: Lessons from Different Approaches, *AERE Session at the 2004 Allied Social Science Associations Meeting*, San Diego CA, Jan. 3, 2004.
40. Induced Technical Change and the Cost of Climate Policy, *University of Colorado Environmental and Resource Economics Workshop*, Boulder CO, Jul. 17-18, 2003.
41. Induced Technical Change and the Cost of Climate Policy, *Center for the Integrated Study of the Human Dimensions of Global Change, Carnegie Mellon University*, Pittsburgh PA, Mar. 7, 2003.
42. Cost Reduction in Solar Photovoltaics: David vs. Goliath or Bambi vs. Godzilla? *Hewlett Foundation Workshop on Learning-by-Doing in Energy Technologies*, Resources for the Future, Washington DC, June 17-18, 2003.
43. Climate Change: The Current Policy Landscape. *Luncheon Meeting of the U.S. Association for Energy Economics New England Chapter*, Cambridge MA, June 6, 2002.

#### **Presentations and Papers at Conferences and Workshops**

1. Robust Amplification of Future Energy Consumption Growth due to Climate Change, *International Energy Workshop 2017*, College Park, MD, 13 July, 2017.
2. Climate Change and US Electricity Demand: Micro-Consistent Aggregation of a Structural Model, *International Energy Workshop 2015*, Abu Dhabi, 4 June, 2015.
3. Regional Electricity Market Impacts of GHG Emission Limits: Evidence from a Bottom-Up Top-Down Model, *INFORMS Annual Meeting 2011*, Charlotte NC, Nov. 16, 2011.
4. The Changing Regional Structure of U.S. Carbon Dioxide Emissions, 1963-2002 (with James Baldwin), *56th Annual North American Meeting of the Regional Science Association International*, New York NY, Nov. 20, 2008.
5. Regional Adjustment to Rising Energy Costs, *56th Annual North American Meeting of the Regional Science Association International*, New York NY, Nov. 21, 2008.
6. Understanding the Drivers of U.S. Carbon Dioxide Emissions: A Regional Approach (with James Baldwin), *56th Annual North American Meeting of the Regional Science Association International*, New York NY, Nov. 21, 2008.
7. A Spatial Perspective on the 2004 Election, *54th Annual North American Meeting of the Regional Science Association International*, Savannah GA, Nov. 9, 2007.
8. Limiting CO<sub>2</sub> Emissions in a Federal System: Understanding and Mitigating the Cost of U.S. Climate Policy at the State Level, *53rd Annual North American Meeting of the Regional Science Association International*, Toronto, Canada, Nov. 17-18, 2006.
9. Limiting CO<sub>2</sub> Emissions in a Federal System: Understanding and Mitigating the Cost of U.S. Climate Policy at the State Level, *ECOMOD International Conference on Regional and Urban Modeling*, Free University of Brussels, June 1-3, 2006.
10. A Spatial Perspective on the 2004 Election, *Midwest Political Science Association Meeting*, Chicago IL, Apr. 21-23, 2006.
11. Absolute vs. Intensity-Based Limits for CO<sub>2</sub> Emission Control, Performance Under Uncertainty, *David Bradford Memorial Conference on the Design of Climate Policy*, Venice, Italy, Jul. 22-23, 2005.
12. The Synthesis of Bottom-Up and Top-Down Approaches to Climate Policy Modeling: Electric Power Technologies and the Cost of CO<sub>2</sub> Emission Limits, *11<sup>th</sup> Annual Conference on Computing in Economics and Finance*, Washington DC, 24 June 2005.
13. The Synthesis of Bottom-Up and Top-Down Approaches to Climate Policy Modeling: Electric Power Technologies and the Cost of CO<sub>2</sub> Emission Limits, Environment and Development Workshop, Rockefeller Center, Dartmouth College, Mar. 28, 2005.
14. The Energy Intensity of U.S. Production: Sources of Long-Run Change. *IAEE Session at the 2003 Allied Social Sciences Association Meeting*, Washington DC, Jan. 4, 2003.
15. Primary Aluminum Production: Projected Greenhouse Gas Emissions and the Costs of Climate Policy. *99th Annual Meeting of The Minerals, Metals and Materials Society*, San Diego CA, March 3, 1999.

#### **Conferences and Workshops Organized**

- O1. Representing Technological Change in Models for Climate Policy Analysis: Lessons from Different Approaches, AERE Session at the Allied Social Science Associations Meeting, San Diego, Jan. 3, 2004.
- O2. Workshop on Technical Change and the Environment, Dartmouth College, Mar. 25-26, 2006.
- O3. Workshop on "Climate Adaptation: Improving the Connection Between Empirical Research and Integrated Assessment Models", National Bureau of Economic Research, Cambridge, May 17-18, 2012.
- O4. Science Steering Group, IA-IAV-ESM Workshop, U.S. Global Change Research Program Interagency Group on Integrative Modeling, U. Maryland Joint Global Change Research Institute, May 24-26, 2016.
- O5. Snowmass XXIV: Workshop on Analyses of Multi-Sector Energy and Environmental Dynamics, Biological and Environmental Research U.S. Dept of Energy Office of Science, Snowmass CO, July 18-20, 2018.

#### **Panel and Advisory Board Memberships**

- A1. Integrated Assessment for Climate Change Research Panel, U.S. Department of Energy, Washington DC, Jun. 2004.
- A2. Second Generation Model Advisory Panel, Science Advisory Board, U.S. Environmental Protection Agency, 2004-2006.

- A3. Renewable Energy Modeling Analysis Partnership, U.S. Department of Energy, 2005-2007.
- A4. National Research Council Panel on the Health, Environmental, and Other External Costs and Benefits of Energy Production and Consumption, 2008-2010.
- A5. National Science Foundation Decision, Risk and Management Sciences Review Panel, 2011-2013.
- A6. Intergovernmental Panel on Climate Change Fifth Assessment Report Working Group III, contributing author (Chapter 6: "Assessing Transformation Pathways")
- A7. 2013 National Climate Assessment Report, lead author (Chapter 27: "Mitigation").
- A8. Mitigation Indicators Technical Team for the US Global Change Research Program National Climate Assessment, 2013-2015.
- A9. Advisory Panel on the Economy-wide Modeling of the Benefits and Costs of Environmental Regulation, U.S. Environmental Protection Agency, 2015-2017.
- A10. U.S. Dept. of Energy, Energy-Water Nexus Knowledge Discovery Framework Experts Panel, Jun. 13, 2017.

#### **Grants and Research Awards**

- F1. Representing Endogenous Technological Change in Climate Policy Models: General Equilibrium Approaches. U.S. Dept. of Energy Office of Science (BER), 2002-2005, \$321,000.
- F2. Empirical and Computational Investigations of International Technology Spillovers: Effects on Income Convergence, Greenhouse Gas Emissions, and the International Transmission of Mitigation Costs, U.S. Dept. of Energy Office of Science (BER), 2006-2008, \$323,000.
- F3. General Equilibrium Analyses of California's Global Warming Solutions Act of 2006, California Energy Commission, 2007-2008, \$334,129.
- F4. Crops, Climate, Canals and the Cryosphere in Asia - Changing Water Resources around the Earth's Third Pole (PI: Steve Frolking, UNH), National Science Foundation (Water Sustainability & Climate, Category 3), 2010-2013, \$224,014.
- F5. Research in Integrated Assessment: Inter-Model Comparison, Development, Testing, and Diagnostics (PI: John Weyant, Stanford), U.S. Dept. of Energy Office of Science (BER), 2010-2013, \$137,891 (total award: \$6M).
- F6. The Impacts of Climate Change on the U.S. Economy: An Interregional Computable General Equilibrium Approach (PI: Robert Beach, Research Triangle Institute), U.S. Environmental Protection Agency Climate Change Division, Dec. 2011-Jun. 2012, \$93,694.
- F7. What are Sustainable Climate Risk Management Strategies? (PI: Klaus Keller, Pennsylvania State University), National Science Foundation (Sustainability Research Networks), 2012-2017, \$199,991 (total award: \$12M).
- F8. Research in Integrated Assessment: Inter-Model Comparison, Development, Testing, and Diagnostics—Renewal (PI: John Weyant, Stanford), U.S. Dept. of Energy Office of Science (BER), 2013-2016, \$156,028 (total award: \$4M).
- F9. A Multi-Model, Multi-Scale Research Program in Stressors, Responses, and Coupled Systems Dynamics at the Energy-Water-Land Nexus (PI: John Weyant, Stanford), U.S. Dept. of Energy Office of Science (BER), 2016-2020, \$227,000 (total award: \$3.6M).
- F10. Understanding Multistressor and Multiscale Drivers of Feedbacks, Cascading Failures, and Risk Management Pathways within Complex MSD Systems (PI: Karen Fisher-Vanden, Pennsylvania State University), U.S. Dept. of Energy Office of Science (BER), 2021-2026, \$537,000.
- F11. Climate change and calorie crops - global impacts, adaptation and implications for US agricultural communities: Collaborative research with Columbia University and Boston University, USDA National Institute of Food and Agriculture, 2021-2025, \$650,000.
- F12. Large-scale CoPe: Coastal Hazards, Equity, Economic prosperity, and Resilience – CHEER (PI: Rachel Davidson, University of Delaware), National Science Foundation, 2022-2027, \$1.3M (total award: \$10.7M).

#### **Editorial Boards**

- Energy Economics*, Associate editor, 2006-2012.
- Environmental and Resource Economics*, Co-Editor, 2013-2021.

#### **Refereeing**



Journal of Environmental Economics and Management, Land Economics, The Energy Journal, Energy Economics, Resource and Energy Economics, Journal of Applied Economics, Energy Policy, Climatic Change, Ecological Economics, The B.E. Journals in Economic Analysis and Policy, Journal of the Japanese and International Economies, Journal of Policy Analysis and Management, National Science Foundation (Economics, Geography & Regional Science, Social and Behavioral Sciences, Decision, Risk & Management Sciences), NWO/Netherlands Organization for Scientific Research, Pew Center on Global Climate Change, Proceedings of the National Academy of Sciences, European Economic Review, The Economic Journal, European Research Council.

#### Professional Memberships

American Economic Association (AEA), International Association for Energy Economics (IAEE), Association of Environmental and Resource Economists (AERE)

#### Teaching

1. Fundamentals of International Economics (CAS IR292), International Relations Dept.
2. Environmental Policy Analysis and Modeling (CAS EE545), Dept. of Earth & Environment
3. Resource Economics (CAS EE460/660), Dept. of Earth & Environment
4. U.S. Environmental Policy (CAS EE528), Dept. of Earth & Environment
5. Data, Models and Analysis in Earth & Environment (CAS EE270), Dept. of Earth & Environment
6. Climate Change Policy Analysis and Modeling (CAS GE512), Dept. of Earth & Environment

#### Theses Supervised

- |             |   |
|-------------|---|
| 2004        | L. Seifert, MA International Relations & Environmental Policy, Boston University  |
| 2005        | B. Strode, Work for Distinction, BA Environmental Analysis & Policy, Boston University<br>A. Karakowka Richmond, Ph.D. Geography, Boston University (3 <sup>rd</sup> reader) – now Professor of Geography, U.S. Military Academy West Point   |
| 2006        | A. Gencer, Ph.D. Geography, Boston University (3 <sup>rd</sup> reader)<br>A. Lempp, Ph.D. Economics, University of Paris I (2 <sup>nd</sup> reader)   |
| 2008        | D. Salem, MA International Relations & Environmental Policy<br>J. Baldwin, Ph.D. Geography, Boston University (1 <sup>st</sup> reader) – now Senior Lecturer in Earth & Environment, Boston University  |
| 2010        | E. Lanzi, Ph.D. Economics, University of Venice C' Foscari (external committee member) – now Senior Economist, OECD Environment Directorate   |
| 2011        | K. Schu Daenzer, Ph.D. Geography, Boston University (supervisor)  |
| 2014        | J. Winkler, Ph.D. Geography, Boston University (supervisor)   |
| 2015        | J. Woollacott, Ph.D. Geography, Boston University (supervisor)  |
| 2016        | C. Gately, Ph.D. Geography, Boston University (supervisor)  |
| 2017        | M. Mistry, Ph.D. Science and Management of Climate Change, University of Venice Ca'Foscari (external committee member) – now Assistant Professor, London School of Hygiene and Tropical Medicine  |
| 2022        | A. Pollack, Ph.D. Earth & Environment, Boston University (1 <sup>st</sup> reader)   |
| 2023        | F. Colelli, Ph.D. Science and Management of Climate Change, University of Venice Ca'Foscari (external committee member)<br>Y. Romitti, Ph.D. Earth & Environment, Boston University (1 <sup>st</sup> reader)<br>J. Horing, Ph.D. Stanford University Management Science & Engineering (external committee member) |
| In progress | I. Kieffer (supervisor), N. Schneider (supervisor), N. Pape (supervisor), J. He (supervisor), F. Pavanello (Economics, University of Bologna, external committee member)  |

#### Postdoctoral Supervision

- |         |   |
|---------|---|
| 2012-14 | E. De Cian (Marie Curie Fellow, Fondazione Eni Enrio Mattei – now Professor of Economics, University of Venice Ca' Foscari) |
| 2015-16 | G. Akin-Olcum (Boston University – now Senior Economist, Environmental Defense Fund)  |

#### **Departmental and University Service**

- Curriculum development for courses GE309, GE420/620, GE425/625 and GE460/660, Dept. of Geography & Environment, 2003-2005
- Director of Undergraduate Studies, Dept. of Geography & Environment, 2006-2009
- Member, search committee for environment and development position, Dept. of Geography & Environment, 2007-2008
- Social Science Curriculum Committee, BU College of Arts & Sciences, 2010-2013(chair, 2011-2012)
- Director of Graduate Studies, BU Dept. of Geography & Environment, Sep. 2011-2012
- Member: Departmental Curriculum Committee, BU Dept. of Earth & Environment, 2013-14
- Search chair: Human Dimensions of Global Change, BU Dept. of Earth & Environment, 2013-14
- Search chair: Human Dimensions of Global Change, BU Dept. of Earth & Environment, 2015-16
- Associate Chair for Curriculum, BU Dept. of Earth & Environment, 2016-17

#### **Honors and Awards**

- Rhodes Scholarship, 1994-1996 (Mansfield College)

#### **Consulting**

The Brattle Group, Battelle Memorial Institute, RTI International, US Geological Survey, Industrial Economics Inc., Organization of Economic Cooperation and Development, The World Bank.