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Positions

- Professor:** University of North Carolina Greensboro, Aug. 2016-present.
Associate Professor: Aug. 2009-2016.
Assistant Professor: Aug. 2003-2009.
- Research Associate:** National Bureau of Economic Research (Environmental and Energy Economics), April 2010-present. (Faculty Research Fellow April 2008-2010.)
- Visiting Research Associate:** University of California Energy Institute, Aug. 2001 –Dec. 2003 and Aug. –Dec. 2007.
- Economist:** Bureau of Economics, Federal Trade Commission, Aug. 1999- Aug. 2002.

Education

- Ph.D.**, Economics, University of Michigan, August 1999.
- M.S.**, Agricultural Economics, Iowa State University, August 1994.
- B.A.**, Mathematics, With distinction, University of Iowa, May 1989.

Refereed Publications

- “Why marginal CO₂ emissions are not decreasing for US electricity: Estimates and implications for climate policy” (with Matthew J. Kotchen, Erin T. Mansur, and Andrew J. Yates) *Proceedings of the National Academy of Sciences* Feb 2022, 119 (8) e2116632119; DOI: 10.1073/pnas.2116632119
- “Expected Health Effects of Reduced Air Pollution from COVID-19 Social Distancing,” (with Steve Cicala, Erin Mansur, Nicholas Muller, and Andrew Yates) *Atmosphere* (2021), 12(8): 951. <https://doi.org/10.3390/atmos12080951> Initially released as NBER Working Paper No. 27135.
- “The Environmental Benefits from Transportation Electrification: Urban Buses,” (with Erin Mansur, Nicholas Muller, and Andrew Yates) *Energy Policy* (2021) 148:111921. Initially released as NBER Working Paper No. 27285.
- “The Electric Vehicle Transition and the Economics of Banning Gasoline Vehicles,” (with Erin Mansur and Andrew Yates) *American Economic Journal: Economic Policy* (2021), 13(3): 316–344. <https://doi.org/10.1257/pol.20200120>. Initially released as NBER Working Paper No. 26804.
- “Decompositions and Policy Consequences of an Extraordinary Decline in Air Pollution from Electricity Generation,” (with Erin Mansur, Nicholas Muller, and Andrew Yates) *American Economic Journal: Economic Policy* (2020) 12(4): 244-74. Initially released as NBER WP 25339.
- “Distributional Effects of Air Pollution from Electric Vehicle Adoption” (with Erin Mansur, Nicholas Muller, and Andrew Yates) *Journal of the Association of Environmental and Resource Economists*, (2019) 6(S1): S65-S94. Initially released as NBER WP 22862.

- “Strategic Policy Choice in State-Level Regulation: The EPA's Clean Power Plan” (with James Bushnell, Jonathan Hughes, and Christopher Knittel) *American Economic Journal: Economic Policy*. (2017) 9(2): 57-90. Initially released as NBER WP 21259.
- “Are There Environmental Benefits from Driving Electric Vehicles? The Importance of Local Factors” (with Erin Mansur, Nicholas Muller, and Andrew Yates) *American Economic Review*. (2016) 106(12): 3700–3729. Initially released as NBER WP 21291.
- “Damages and Expected Deaths Due to Excess NO_x Emissions from 2009 to 2015 Volkswagen Diesel Vehicles” (with Erin Mansur, Nicholas Muller, and Andrew Yates) *Environmental Science & Technology*. (2016) 50(3): 1111-1117.
- “Some Inconvenient Truths About Climate Change Policy: The Distributional Impacts of Transportation Policies” (with Jonathan E. Hughes, Christopher Knittel, and Nathan C. Parker) *Review of Economics and Statistics*. (2015) 97(5): 1052-1069. Initially released as NBER WP 17386 and EI@Haas WP 220.
- “Optimal Trading Ratios for Pollution Permit Markets” (with Andrew Yates) *Journal of Public Economics* (2015) 125: 16-27. Initially released as NBER WP 19780.
- “Unintended Consequences of Transportation Carbon Policies: Land-Use, Emissions, and Innovation” (with Jonathan E. Hughes, Christopher Knittel, and Nathan C. Parker) *Energy Journal* (2015) 36(3): 35-74. Initially released as NBER WP 19636.
- “Market Design in Cap and Trade Programs: Permit Validity and Compliance Timing” (with Michael R. Moore) *Journal of Environmental Economics and Management* (2013) 66(3): 671-687. Initially released as NBER WP 18098.
- “Taxes and Trading versus Intensity Standards: Second-Best Environmental Policies with Incomplete Regulation (Leakage) or Market Power” *Journal of Environmental Economics and Management* (2012) 63(3): 375–387. Initially released as NBER WP 15262 and CSEM WP 190.
- “What Do Emissions Markets Deliver and to Whom? Evidence from Southern California’s NO_x Trading Program” (with Meredith Fowlie and Erin Mansur) *American Economic Review* (2012) 102(2): 965-93. Initially released as NBER WP 15082 and CSEM WP 186.
- “When to Pollute, When to Abate? Intertemporal Permit Use in the Los Angeles NO_x Market” (with Michael R. Moore) *Land Economics* (2012) 88(2): 275-299. Initially released as NBER WP 14254 and CSEM WP 178.
- “Greenhouse Gas Reductions under Low Carbon Fuel Standards?” (with Jonathan E. Hughes and Christopher Knittel) *American Economic Journal: Economic Policy* (2009) 1(1): 106-146. Initially released as NBER WP 13266 and CSEM WP 167.
- “Is Real-Time Pricing Green? The Environmental Impacts of Electricity Demand Variance,” (with Erin Mansur) *Review of Economics and Statistics* (2008) 90(3): 550-561. Initially released as NBER WP 13508 and CSEM WP 136.
- “Modeling Peak Oil,” *Energy Journal* (2008) 29(2): 61-80. Initially released as UNCG WP 11-13.
- “The Short-Run Effects of Time-Varying Prices in Competitive Electricity Markets,” (with Erin Mansur) *Energy Journal* (2006) 27(4): 127-155. Initially released as CSEM WP 143.
- “Privatization of Water-Resource Development,” *Environmental and Resource Economics* (2006) 34: 291-315.

- “On the Efficiency of Competitive Electricity Markets With Time-Invariant Retail Prices,” (with Severin Borenstein) *The RAND Journal of Economics*, 36(3) Autumn 2005 pp. 469-493. Initially released as NBER WP 9922 and CSEM WP 116.
- “Set-up Costs and the Existence of Competitive Equilibria when Extraction Capacity Is Limited,” *Journal of Environmental Economics and Management* 46(3) November 2003, p. 539-56.
- “Cadillac Desert Revisited: Property Rights, Public Policy, and Water Resource Depletion,” (with Michael R. Moore) *Journal of Environmental Economics and Management* 46(1) July 2003, p. 131-155.
- “Extraction Capacity and the Optimal Order of Extraction,” *Journal of Environmental Economics and Management* 45(3) May 2003, p. 569-588.

Papers under Submission

- “Why Are Marginal CO₂ Emissions Increasing for U.S. Electricity? Estimates and Implications for Climate Policy,” (with Matthew Kotchen, Erin Mansur, and Andrew Yates). November 2020.

Invited Publications and Other Manuscripts

- “Sustainable and Socially Responsible Investing at the University of North Carolina Greensboro: The First Chapter” <https://sustainability.uncg.edu/wp-content/uploads/2017/06/Case-Study-SRI-at-UNCG.pdf>. 2018.
- “Economics of Peak Oil.” In: Shogren, J.F., (ed.) *Encyclopedia of Energy, Natural Resource, and Environmental Economics*, Vol. 1, pp. 146-150 Amsterdam: Elsevier, 2013.
- “Comment on ‘Setting the Initial Time-Profile of Climate Policy’” in *The Design and Implementation of U.S. Climate Policy*, Don Fullerton and Catherine Wolfram, editors, University of Chicago Press, 2012.
- “Spillovers from Climate Policy” in *The Design and Implementation of U.S. Climate Policy*, Don Fullerton and Catherine Wolfram, editors, University of Chicago Press, 2012. Initially released as NBER WP 16158.
- “Brokering Power,” (with John Neufeld) *IEEE Power & Energy* (Sept./Oct. 2009) 7(5): 36-43.

Honors, Grants, and Sponsored Research

- UNC Research Competitiveness Grant: “Economic and Environmental Impacts of the Production and Transportation of Crop Residues as Bioenergy Feedstocks” (with Mark Burkey, PI, Lyubov Kurkalova, and Abolghasem Shahbazi) Spring 2008: \$132,739.
- Beta Gamma Sigma, 2007.
- EPA-NCER STAR grant: “The Market for RECLAIM Trading Credits: A Theoretical and Empirical Investigation of Intertemporal Trading and Cost Effectiveness” (with Michael R. Moore co-PI) Oct. 1, 2004- Sept. 30, 2006: \$119,498
- Federal Trade Commission Outstanding Team Award, 2000.
- RFF Joseph L. Fisher Dissertation Fellowship, 1998-1999.
- Michael J. Moore Dissertation Prize, 1998.
- Rackham Dissertation Fellowship, 1997.
- University of Michigan Regents Fellowship, 1994-1996.
- Gamma Sigma Delta, Honor Society for Agriculture, 1993.

U.S.D.A. National Needs Fellowship, 1993-1994.
Phi Beta Kappa, 1988.

Seminars and Presentations

- “Electric Mobility: Implications for Energy and the Environment” MIT Center for Energy and Environmental Policy Research (CEEPR) April 14, 2021.
- “Why are Marginal CO₂ Emissions Increasing for U.S. Electricity? Estimates and Implications for Climate Policy” University of California Energy Institute, POWER conference, March 16, 2021.
- “The Electric Vehicle Transition and the Economics of Banning Gasoline Vehicles,” University of North Carolina Chapel Hill, April 10, 2019; NBER Conference on Economics of Autonomous and Electric Vehicles at Stanford University, June 7, 2019; Indiana University, November 1, 2019; University of Pittsburgh, November 19, 2019.
- “Electric vehicle policy in the face of environmental uncertainties” Troxler Symposium, East Carolina University, November 8, 2019.
- “Measuring the Environmental Benefits from Transportation Electrification: Urban Electric Buses” University of North Carolina Greensboro, February 25, 2019; NBER's Economics of Energy Use in Transportation Conference, Washington, DC, May 2, 2019; EI@Haas Camp, June 24, 2019.
- “Decompositions and Policy Consequences of an Extraordinary Decline in Air Pollution from Electricity Generation,” University of California Energy Institute, POWER conference, March 22, 2019; Transportation, Economics, Energy and the Environment (TE³), University of Michigan, October 18, 2019.
- “Is Electricity Getting Cleaner? Implications for Electric Vehicles,” EI@Haas Camp, June 27, 2018.
- “Environmental Benefits from Transportation Electrification” Conference on Economics of Energy Use in Transportation. NBER April 20, 2018.
- “Distributional Effects of Air Pollution from Electric Vehicle Adoption,” Energy Policy Tradeoffs between Economic Efficiency and Distributional Equity, NBER in Durham, NC, September 16, 2016; Advances in Environmental Economics Conference, Arizona State University, October 29, 2016; University of British Columbia, September 22, 2017.
- “Are There Environmental Benefits from Driving Electric Vehicles? The Importance of Local Factors,” EI@Haas, June 25, 2014; POWER at EI@Haas, March 20, 2015; Nanyang Technical University (Singapore), March 15, 2016.
- “Strategic Policy Choice in State-Level Regulation: The EPA's Clean Power Plan,” Guelph University, October 24, 2014; Virginia Tech, October 31, 2014; UNCG, November 21, 2014; UC Berkeley (EI@Haas) December 2, 2014; UC Davis, December 3, 2014; University of Connecticut, February 2, 2016.
- “Optimal Trading Ratios for Pollution Permit Markets” University of Michigan, September 20, 2013; UNCG, October 11, 2013; Elon University, October 18, 2013; Colorado State University, April 10, 2014; University of Colorado, April 11, 2014.
- “Which Second-Best Transportation Policy is Second Best?” EI@Haas, June 28, 2012.
- “Should Firms Trade Emissions 1-to-1? The Case of Uniformly Mixed Pollutants” EI@Haas, June 25, 2012.

- “Some Inconvenient Truths About Climate Change Policy” University of Texas, April 6, 2011; NBER EEE, April 9, 2011; UNCG Brown Bag, July 6, 2011; Georgia Institute of Technology, September 9, 2011; Duke University, January 27, 2012; Texas A&M University, April 2, 2014.
- “Smart Grid Dynamics: What do we know about dynamic pricing?” University of Texas, April 7, 2011.
- “Carbon Policy for Transportation: Low Carbon Fuel Standards, Land Use, and Incomplete Regulation” US EPA National Center for Environmental Economics, November 10, 2010.
- “Permit Validity and Compliance Timing in Cap and Trade Programs” UNCG Brown Bag, June 9, 2010; Camp EI@Haas, June 21, 2010; Southern Economic Association, November 19, 2011; POWER at EI@Haas, March 22, 2012; Appalachian State Conference, April 20, 2012; AERE Summer conference, June 4, 2012.
- “Green Acres? Transportation Carbon Policies and Land Use” Bioenergy Camp, Iowa State University, May 21, 2010.
- “Taxes and Trading versus Intensity Standards: Second-Best Environmental Policies with Incomplete Regulation (Leakage) or Market Power” University of California Energy Institute, June 24, 2009; Appalachian State University, October 30, 2009.
- “What Do Emissions Markets Deliver and to Whom? Evidence from Southern California's NO_x Trading Program,” University of California Energy Institute, POWER conference, March 20, 2009.
- “Economic and Environmental Impacts of the Production and Transportation of Crop Residues as Bioenergy Feedstocks in North Carolina,” Southern Economic Association, November 21, 2008.
- “Carbon Standards: What is the right choice for the US & Canada? The Academic Perspective,” Woodrow Wilson Center Cross-Border Forum on Energy Issues, Chicago, IL, October 2, 2008.
- “The Carbon Cost of Cofiring Corn Stover in Coal-Fired Power Plants,” UC Energy Institute, June 27, 2008.
- “Evaluating Emissions Trading Using a Nearest (Polluting) Neighbor Estimator,” UNCG, May 7, 2008; UC Energy Institute, June 24, 2008; Camp Resources, August 7, 2008.
- “Greenhouse Gas Reductions under Low Carbon Fuel Standards?” NBER Environmental and Energy Economics Program Meeting, February 8, 2008; University of Central Florida, February 22, 2008; International Industrial Organization Conference, May 17, 2008.
- “When to Pollute, When to Abate? Evidence on Intertemporal Permit Use in the Los Angeles NO_x Market,” UC Energy Institute, September 21, 2007; UC Santa Barbara, October 19, 2007; Yale University, November 19, 2008.
- “CO₂ Spillover Effects from the Environmental Regulation of Power Plants,” International Industrial Organization Conference, April 14, 2007; UC Berkeley ARE, November 30, 2007.
- “Nearest Polluting Neighbors Estimates: An Empirical Assessment of the RECLAIM Market,” (with Erin Mansur and Meredith Fowlie) UC Energy Institute, June 30, 2006.
- “Pollutant Spillovers and the Effectiveness of Environmental Regulations on Power Plants” University of North Carolina-Greensboro, June 1, 2006; UC Energy Institute, June 28, 2006; Southern Economic Association November 18, 2006.
- “Modeling Peak Oil,” University of North Carolina-Greensboro, March 17, 2006; University of West Virginia, March 31, 2006; Appalachian State University, April 21, 2006; Southern Economic Association November 19, 2006.

- “The Distributional and Environmental Effects of Time-Varying Prices in Competitive Electricity Markets,” (with Erin Mansur) University of Richmond, February 25, 2005, NC State/RTI, October 18, 2005.
- “The Benefits of Flat Bills,” UC Energy Institute, June 27, 2005.
- “The Political Economy and Environmental Effects of Real-Time Pricing Adoption in Competitive Electricity Markets,” (with Erin Mansur) University of North Carolina-Greensboro, April 2, 2004, and UC Energy Institute, June 28, 2004.
- “Raising Rivals’ Costs in the RECLAIM Permit Market” (with Erin Mansur and Meredith Fowlie) UC Energy Institute, August 29, 2003.
- “Is Real-time Pricing Green?” UCEI Power Conference, Berkeley, CA. (with Erin Mansur), March 14, 2003; International Industrial Organization Conference, Northwestern University, Chicago, IL April 24, 2004.
- “Investment Efficiency in Competitive Electricity Markets With and Without Time-Varying Retail Prices” Econometrics Society Summer Meetings, Northwestern University, Evanston, IL, June 28, 2003; Center for Research in Regulated Industries Western Conference, San Diego, CA, June 26, 2003; International Industrial Organization Conference, Northeastern University, Boston, MA, April 4, 2003; Department of Economics, UC Berkeley, CA, November 26, 2002.
- “The Impact of Time-Varying Prices on Investment in Electricity Markets,” UC Energy Institute, Oct. 4, 2002.
- “Privatization of Water-Resource Development,” UC-Davis ARE, March 7, 2002; UC-Berkeley ARE, March 8, 2002; U. of Michigan, April 12, 2002; AERE/EAERE World Congress June 23, 2002; University of North Carolina-Greensboro, January 24, 2003; St. Joseph’s University, January 28, 2003; Rensselaer Polytechnic Institute, January 29, 2003; Amherst College, January 30, 2003; Clark University, January 31, 2003; California State University-Sacramento, February 6, 2003.
- “Is Collusion Possible in Natural Resource Extraction,” Berkeley-Stanford Conference in Industrial Organization, October 27, 2001.
- “Extraction Capacity and the Optimal Order of Extraction,” UC Energy Institute, Sept. 21, 2001.
- “Competition and the EIA Information Disclosure Reforms,” Harvard Electricity Policy Group Plenary Session, June 11, 2001.
- “Antitrust Problems and Solutions in the Gas/Electric Convergence,” UC Energy Institute, April 6, 2001.
- “*Cadillac Desert* Revisited: Property Rights, Public Policy, and Water Resource Depletion in the American West,” Heartland Environmental Economics Workshop, Sept. 20, 1999; UC-Berkeley Environmental and Resource Economics Seminar, Oct. 17, 2001.
- “Subgame Perfection in Natural Resource Extraction: An Example” U. of Michigan Natural Resources Seminar, April 7, 2000; FTC Bureau of Economics, April 27, 2000.
- “Saving Existence of a Competitive Equilibrium When Set-up Costs Cannot Be Ignored,” U. of Michigan Natural Resources Seminar, Sept. 25, 1998; U. of California-Riverside, Jan. 25, 1999; U. of Calgary, Jan. 29, 1999; Wake Forest University, Feb. 3, 1999; Resources for the Future, Feb. 5, 1999.
- “The Optimal Order of Natural Resource Extraction with Capacity Constraints: Partial vs. General Equilibrium,” U. of Michigan Natural Resources Seminar, March 20, 1998.

“Optimal Transition to a Capacity Constrained Backstop with Fixed Costs,” U. of Michigan Natural Resources Seminar, Sept. 19, 1997.

Teaching and Professional Experience

UNCG Sustainability Faculty Fellow, UNCG, 2017-18. Coordinated “Conversations on Sustainable and Socially Responsible Investing.”

PhD Committee Chair: Justin Larson (Spring 2018) Qing Shi (Spring 2017)

University of North Carolina, Greensboro, 2003-present. Courses: Economics of a Global Sustainable Society (undergrad); Environmental Economics (undergrad, writing intensive); Microeconomics I (MA); Microeconomics II (MA); Mathematical Economics (PhD); Intertemporal Economics (PhD); Environmental Economics (MA, PhD); Advanced Microeconomics II (PhD); Public Policies toward Innovation and Sustainability (MA, PhD).

Graduate Student Instructor, University of Michigan, 1995-97. Courses: Introductory Micro, Intermediate Micro, Ph.D. Statistics, Ph.D. Micro, American Economic History (English Composition Board course).

Research Assistant, Office of Tax Policy Research, U. of Michigan, 1995.

Summer Intern, Resources for the Future, RFF, Washington, D.C., 1994.

Research Assistant, Center for Agricultural and Rural Development, CARD, Iowa State University, 1992-93.

Mathematics Teacher, U.S. Peace Corps Botswana, Secondary Ed., 1990-91.

Other Professional Activities

Co-Editor: *Journal of the Association of Environmental and Resource Economists* (2013 to present)

Co-Editor: *Southern Economic Journal* (2019 to present)

Editorial Board: *Journal of Environmental Economics and Management* (2012 to 2021)

Co-Chair of UNCG Sustainability Council 2014-2016. Member 2013-2018.

External Dissertation Examiner: Energy & Environment Ph.D., North Carolina Agricultural and Technical State University (2009 to present)

Memberships: American Economic Association and Association of Environmental and Resource Economists.

Referee: *American Economic Review*, *Journal of Political Economy*, *Proceedings of the National Academy of Sciences*, *Review of Economic Studies*, *Review of Economics and Statistics*, *Rand Journal of Economics*, *American Economic Journal: Economic Policy*, *Journal of Public Economics*, *Journal of the Association of Environmental and Resource Economists*, *Journal of Environmental Economics and Management*, *American Journal of Agricultural Economics*, *Canadian Journal of Economics*, *Contemporary Economic Policy*, *Energy Economics*, *Energy Journal*, *Energy Policy*, *Environmental and Resource Economics*, *Environment and Development Economics*, *Environmental Health Perspectives*, *Geoforum*, *International Journal of Industrial Organization*, *Journal of Development and Agricultural Economics*, *Journal of Environmental Management*, *Natural Resource Modeling*, *Oxford Economic Papers*, *Resource and Energy Economics*, and *Water Resources Research*.

Reviewer: National Science Foundation; MacArthur Fellows Program; University of California
Energy Institute; National Center for Environmental Research at U.S. Environmental Protection
Agency.