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Summary of Professional Experience

Dr. Ross is a Senior Research Economist at the Nicholas Institute for Environmental Policy Solutions, specializing in environmental/energy economics and macroeconomic-simulation modeling. Prior to joining the Nicholas Institute at the end of 2011, he was with RTI International where he developed the *Applied Dynamic Analysis of the Global Economy* (ADAGE) model, which is used by the U.S. Environmental Protection Agency (EPA) to respond to Congressional requests for legislative analyses. The ADAGE model can investigate many types of economic, energy, environmental, and trade policies at the international, national, and U.S. regional levels. It is particularly useful for examining how climate-change mitigation policies limiting carbon dioxide (CO₂) emissions from energy consumption and non-CO₂ greenhouse gas (GHG) emissions will affect all sectors of the economy, altering industrial and residential energy consumption and efficiency. Research conducted for the U.S. EPA Climate Change Division, the Stanford Energy Modeling Forum, and the Pew Center on Global Climate Change has involved using the ADAGE model to estimate U.S. macroeconomic impacts of legislative proposals to reduce GHG emissions. Other modeling by Dr. Ross has included developing a detailed technology model of electricity markets to examine how criteria pollutant and GHG policies affect capacity planning decisions and generation costs. Prior to joining RTI, Dr. Ross spent several years at Charles River Associates where he developed regional models to look at effects of climate-change mitigation policies and macroeconomic impacts of electric-utility legislation. In addition to his legislative analysis, Dr. Ross has advised industry groups such as the Electric Power Research Institute and Edison Electric Institute on economic and electricity modeling, and is published in *The Energy Journal*, *Energy Economics*, and *Climatic Change*, among others.

Education

Ph.D., Economics, University of Colorado, Boulder, Colorado, 1997
M.A., Economics, University of Colorado, Boulder, Colorado, 1993
B.A., Economics, Michigan State University, East Lansing, Michigan, 1988

Professional Experience

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| 2011 to date | Duke University, Nicholas Institute for Environmental Policy Solutions, Durham, NC. <i>Senior Research Economist.</i> |
| 2003 to 2011 | RTI International, Global Climate Change and Environmental Science, Research Triangle Park, NC. <i>Senior Economist.</i> |
| 1999 to 2003 | Charles River Associates Inc., Washington, DC. <i>Senior Associate.</i> |
| 1998 to 1999 | U.S. Environmental Protection Agency, Washington, DC. <i>Economist.</i> |
| 1997 to 1998 | Hagler/Bailly (Stratus Consulting), Boulder, CO. <i>Consultant.</i> |

Areas of Expertise

Economic Modeling of Effects of Climate Change Policies. Developed the [*Applied Dynamic Analysis of the Global Economy*](#) (ADAGE) model for several clients, including the U.S. EPA Climate Change Division and the Pew Center on Global Climate Change. ADAGE is capable of examining many types of economic, energy, environmental, and trade policies, which can be investigated at the international, national, and U.S. regional levels. Of particular note is the ability of the ADAGE model to investigate climate-change mitigation policy issues affecting six types of greenhouse gases at a range of geographic scales. In this context, the model has been used by EPA and other groups such as the United States Climate Action Partnership to analyze many recent legislative proposals related to climate policies.

Electricity Generation and Emissions Modeling. Developed the [*Electricity Markets Analysis*](#) (EMA) model, a dynamic linear-programming model of U.S. wholesale electricity markets. It is designed to examine how mid- to long-term policies affecting these markets will affect electricity-supply decisions, electricity-generation costs, and electricity prices. Model determines least-cost methods for meeting electricity demand on a seasonal and time-of-day basis, while considering factors such as growth in demand, peak demands, and limits on emissions. It can estimate impacts associated with policies related to the generation mix, limits on criteria pollutants, and cap-and-trade systems to reduce GHG emissions.

Economic Modeling of Effects of Criteria Pollutant Policies. Developed the [*EMPAX-CGE*](#) model for U.S. EPA Office of Air Quality Planning and Standards. EMPAX-CGE is a regional CGE model designed to estimate regional macroeconomic impacts of environmental regulations on the United States' economy. Many major regulations directly affect a large number of industries and/or substantially affect markets for key factors of production. In either case, substantial indirect impacts may result from changes in production, input use, income, and consumption patterns for directly affected markets. EMPAX-CGE offers the ability to trace economic impacts as they are transmitted throughout the economy and allows it to provide insights to policy makers evaluating the magnitude and distribution of costs associated with environmental policies.

Papers

Ross, M. T., Fawcett, A., & Clapp, C. (2009). U.S. climate mitigation pathways post-2012: transition scenarios in ADAGE. *Energy Economics*, 31, S212–S222.

Pattanayak, S., M.T. Ross, B. Depro, S. Bauch, C. Timmins, K. Wendland, and K. Alger. (2009). *Climate Change and Conservation in Brazil: CGE Evaluation of Health and Wealth Impacts*, B.E. Journal of Economic Analysis & Policy, vol. 9 no. 2, Article 6

Ross, M. T., Murray, B., Beach, R. H., & Depro, B. M. (2008). State-level economic impacts of a national climate change policy. White paper. Arlington, VA: Pew Center on Global Climate Change.

Murray, B., Sohngen, B. L., & Ross, M. T. (2007). Economic consequences of consideration of permanence, leakage and additionality for soil carbon sequestration projects. *Climatic Change*, 80(1), 127–143.

Andriamananjara, S., Balistreri, E., & Ross, M. T. (2006). State-level equity and the demise of the Agreement on Textiles and Clothing. *North American Journal of Economics and Finance*, 17, 17–33.

Kaempfer, W., & Ross, M. (2004). The gravity of sanctions against South Africa. *The Policy Economy of Trade, Aid and Foreign Investment Policies*.

Ross, M., McKibbin, W., Shackleton, R., & Wilcoxon, P. (1999). Emissions trading, capital flows and the Kyoto protocol. *Special Issue of The Energy Journal*, 287–333.

Ross, M., Kaempfer, W., & Rutherford, T. (1997). Tariffication of a distorted economy: A CGE analysis. *Review of Development Economics*, 1(2), 143–167.

Policy Analyses

- Ross, M. T. (2010). (*ADAGE modeling of*) United States Environmental Protection Agency's analysis of the *American Power Act in the 111th Congress*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T. (2009). (*ADAGE modeling of*) *United States Climate Action Partnership (U.S. CAP) economic modeling - blueprint for legislative action*. Prepared for the Pew Center on Global Climate Change.
- Ross, M. T. (2009). (*ADAGE modeling of*) United States Environmental Protection Agency's analysis of *H.R. 2454 in the 111th Congress, the American Clean Energy and Security Act of 2009*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T. (2009). (*ADAGE modeling of*) United States Environmental Protection Agency's preliminary analysis of the *Waxman-Markey discussion draft in the 111th Congress, the American Clean Energy and Security Act of 2009*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T. (2008). (*ADAGE modeling of*) United States Environmental Protection Agency's analysis of the *Lieberman-Warner Climate Security Act of 2008 in the 110th Congress*. Prepared for the U.S. Environmental Protection Agency.

Presentations and Proceedings

- Ross, M.T. (2011, December). *ADAGE Modeling of Technology Strategies for GHG Reduction and Energy Security*. Presented at the Stanford Energy Modeling Forum (EMF) meeting. Adelphi, MD.
- Fawcett, A., & Ross, M. T. (2009, June). *EMF 22: Overview of U.S. climate policy scenarios*. Presented at Stanford Energy Modeling Forum (EMF) Briefing on Climate Policy Scenarios: U.S. Domestic and International Policy Architectures, Washington DC.
- Ross, M. T. (2009, June). *Economic analysis of climate change mitigation policies*. Presented at RTI Fellows Seminar Series: Effective global climate change policy - technical and regulatory challenges, Washington DC.
- Ross, M. T., DeAngelo, B. J., Beach, R. H., Gallaher, M. P., Pattanayak, S. K., Poulos, C., & Waldhoff, S. (2009, March). Representing the impacts of climate change in a US economic model. In *IOP Conference Series: Earth and Environmental Sciences*, 6(2009):522007. Copenhagen, Denmark.
- Ross, M. T. (2008, October). *RTI ADAGE CGE Model: Structure and policy analyses*. Presented at The National Academies: Assessing Economic Impacts of Greenhouse Gas Mitigation, Washington, DC.
- Ross, M. T., Pattanayak, S. K., Depro, B. M., Timmins, C., Bauch, S., Alger, K., & Wendland, K. J.. (2008, October). *Mediating health impacts of climate change: Evidence from regressions and CGE modeling of forest conservation in Brazil*. Presented at American Public Health Association Meeting, San Diego, CA.
- Ross, M. T. (2008, September). *EMF-22 U.S. cap-and-trade scenarios (cost-effective reductions)*. Presented at Stanford EMF-22 Transition Policy Subgroup at the International Institute for Applied Systems Analysis, Laxenburg, Austria.
- Murray, B., & Ross, M. T. (2008, July). *Economic modeling of federal cap-and-trade legislation: Variations on the Lieberman-Warner Bill*. Presented at RFF Workshop on Federal Policy to Reduce U.S. Greenhouse Gas Emissions, Washington, DC.

- Ross, M. T. (2007, July). *Assessing cap-and-trade proposals at the global, national, and sub-national scales*. Presented at Nicholas Institute Symposium on the Economic Modeling of Federal Climate Legislation, Washington, DC.
- Ross, M. T., Depro, B. M., & Pattanayak, S. K. (2006, September). *Payments, promises, and protection: A general equilibrium assessment of market incentives for forest conservation in Costa Rica*. Presented at EcoMarkets Workshop, San Jose, Costa Rica.
- Pattanayak, S. K., Ross, M. T., & Depro, B. M. (2006, September). *Climate change, biodiversity conservation, and infectious diseases: Integrating surveys with CGE models*. Presented at Biodiversity and Human Health: A Multidisciplinary Approach to Examining the Links, Washington, DC.
- Pattanayak, S. K., Ross, M. T., & Depro, B. M. (2006, September). *Climate change, biodiversity conservation, and infectious diseases: Integrating surveys with CGE models*. Presented at Nicholas Institute for Environmental Policy Solutions Seminar, Durham, NC.
- Pattanayak, S. K., Ross, M. T., & Depro, B. M. (2006, September). *Climate change, biodiversity conservation, and infectious diseases: An example from Brazil*. Presented at Nicholas Institute, Duke University, Durham, NC.
- Pattanayak, S. K., Ross, M. T., & Depro, B. M. (2006, September). *Valuing biodiversity benefits to human health*. Presented at US EPA/Yale University Workshop on Biodiversity and Human Health: A Multidisciplinary Approach to Examining the links, Washington, DC.
- Ross, M. T., Depro, B. M., & Pattanayak, S. K. (2005, August). *A general equilibrium assessment of forest protection in Costa Rica*. Presented at Camp Resources XIII, Wilmington, NC.
- Gallaher, M., Petrusa, J. E., & Ross, M. T. (2006, July). Modeling investment decisions and marginal abatement costs for methane. In *Fourth International Symposium on Non-CO₂ Greenhouse Gases*, Utrecht, Netherlands.
- Gallaher, M., Petrusa, J. E., & Ross, M. T. (2005, July). Productivity factors and international marginal abatement costs for methane. In *Fourth International Symposium on Non-CO₂ Greenhouse Gases*, Utrecht, Netherlands.
- Gallaher, M., Petrusa, J. E., & Ross, M. T. (2005, July). International marginal abatement costs of non-CO₂ greenhouse gases. Submitted In *Fourth International Symposium on Non-CO₂ Greenhouse Gases*, Utrecht, Netherlands.
- Ross, M. T. (2004, October). *Regional models and linking sector models with CGE models*. Presented at Third Forestry and Agriculture Greenhouse Gas Modeling Forum, Shepherdstown, WV.
- Ross, M. T., Beach, R. H., & Murray, B. C. (2004, October). General equilibrium assessment of regional climate change policy. In *Proceedings of the 2004 National IMPLAN User's Conference*. Shepherdstown, WV.
- Beach, R. H., & Ross, M. (2004, October). *General equilibrium assessment of regional climate change policy*. Presented at 2004 National IMPLAN User's Conference, Shepherdstown, WV.
- Ross, M. T., & Smith, A. E. (2002, September). *Analyses of GHG permit allocation and compensation issues*. Presented at International Energy Agency's Expert Meeting on Allocation of GHG Objectives, Paris, France.

- Ross, M. T., & Smith, A. E. (2002, May). *Modeling upstream and downstream implementations of climate policy*. Presented at Electric Power Research Institute's Climate Group meeting, Washington, DC.
- Ross, M. T. (2002, February). *Computable general equilibrium modeling of energy/environmental policies*. Presented at World Bank.
- Ross, M. T., Balistreri, E. J., & Smith, A. E. (2000, December). *State-level analysis of climate policy*. Presented at Center for Clean Air Policy's Greenhouse Gas Emissions Trading Braintrust Meeting, Washington, DC.
- Ross, M. T., Montgomery, W. D., & Ory, R. (2000, September). *An assessment of the potential impacts of proposed environmental regulations on U.S. refinery supply of diesel fuel*. Presented at Office of Management and Budget, Washington, DC.

Technical Reports

- Ross, M. T. (2009). *(ADAGE modeling of) U.S. CAP economic modeling - blueprint for legislative action*. Prepared for the Pew Center on Global Climate Change. <http://www.pewclimate.org/uscap/economic-modeling>.
- Ross, M. T. (2009). *United States Environmental Protection Agency's analysis of H.R. 2454 in the 111th Congress, the American Clean Energy and Security Act of 2009*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T. (2009). *United States Environmental Protection Agency's preliminary analysis of the Waxman-Markey discussion draft in the 111th Congress, the American Clean Energy and Security Act of 2009*. Prepared for the U.S. Environmental Protection Agency.
- O'Connor, A. C., Ross, M. T., & Tallett, M. (2009, April). *Global trade and fuels assessment: Additional ECA modeling scenarios*. Prepared for U.S. Environmental Protection Agency.
- Ross, M. T. (2008). *United States Environmental Protection Agency's analysis of Senate Bill S.1766 in the 110th Congress, the Low Carbon Economy Act of 2007*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T. (2008). *United States Environmental Protection Agency's analysis of Senate Bill S.2191 in the 110th Congress, the Lieberman-Warner Climate Security Act of 2008*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T., Murray, B. C., Beach, R. H., & Depro, B. M. (2008). *State-level economic impacts of a national climate change policy*. Prepared for the Pew Center on Global Climate Change.
- Murray, B., & Ross, M. T. (2007). *The Lieberman-Warner America's Climate Security Act: A preliminary assessment of potential economic impacts*. Policy Brief #NI PB 07-04. Prepared for the Nicholas Institute for Environmental Policy Solutions.
- Ross, M. T. (2007). *United States Environmental Protection Agency's analysis of Senate Bill S.280 in the 110th Congress, The Climate Stewardship and Innovation Act of 2007*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T., & Depro, B. M. (2007, December). *Ozone regulatory impact analysis: Economic impact analysis (Appendix B)*. Prepared for the U.S. Environmental Protection Agency.

- Ross, M. T., & Depro, B. M. (2007, December). *Ozone regulatory impact analysis: Economic impact analysis (chapter 6)*. Prepared for the U.S. Environmental Protection Agency.
- Ross, M. T., & Depro, B. M. (2007, June). *The economic benefits of expanding the border-crossing for commercial vehicles at the mariposa crossing in Nogales, Arizona*. Prepared for the U.S. Department of Homeland Security Private Sector Office.
- Murray, B. C., Nicholson, R. L., Ross, M. T., Holloway, T. C., & Patil, S. R. (2006, March). *Biomass energy consumption in the forest products industry: Final report*. Prepared for U.S. Department of Energy, Energy Information Administration.
- Ross, M. T., Murray, B. C., Beach, R. H., & Depro, B. M. (2005, July). *State-level economic impacts of global climate change policies: Analysis of the climate stewardship act of 2003*. Prepared for the Pew Center on Global Climate Change.
- Ross, M. T., Beach, R. H., Depro, B. M., & Murray, B. C. (2005, April). *Regulatory impact analysis for the final clean air interstate rule*. Prepared for the U.S. Environmental Protection Agency, Office of Air Quality Planning and Standards.
- Heller, K. B., Ross, M. T., Beach, R. H., Van Houtven, G., Yang, J.-C., Clayton, L. J., Throneburg, W., Bonakdarpour, M., Brinner, J., Gault, N., Hopkins, P., Iqbal, M., & Newport, P. (2004, September). *Estimating employment impacts of water infrastructure funding*. Prepared for the U.S. Environmental Protection Agency, Office of Water.
- Ross, M. T., Gallaher, M. P., Murray, B. C., Throneburg, W. W., & Levinson, A. (2004, July). *PACE survey: Background, applications, and data quality issues*. Research Triangle Park, NC: RTI International. Available at <[http://yosemite.epa.gov/ee/epa/eed.nsf/ffb05b5f4a2cf40985256d2d00740681/cf0ffb9e37c9a7eb85256edd004d3282/\\$FILE/2004-09.pdf](http://yosemite.epa.gov/ee/epa/eed.nsf/ffb05b5f4a2cf40985256d2d00740681/cf0ffb9e37c9a7eb85256edd004d3282/$FILE/2004-09.pdf)>.
- Ross, M. T., & Smith, A. E. (2002, February). *Allowance allocation: Who wins and loses under a carbon dioxide control program?* Prepared for Center for Clean Air Policy.
- Ross, M. T., Bernstein, P., Montgomery, W. D., & Smith, M. (2001, November). *Impacts on Canada under different implementations of the Kyoto protocol*. Prepared for Natural Resources Canada.
- Ross, M. T., Smith, A. E., & Wile, J. (2001, August). *Analysis of comprehensive emissions reduction scenarios for the U.S. electricity generating sector*. Prepared for Edison Electric Institute.
- Ross, M. T., & Smith, A. E. (2000, November). *Benefit-cost ratios of the CAAA by title: Based on EPA's prospective study*. Prepared for General Motors.
- Ross, M. T., Moncrieff, I., Montgomery, W. D., & Ory, R. (2000, August). *An assessment of the potential impacts of proposed environmental regulations on U.S. refinery supply of diesel fuel*. Prepared for American Petroleum Institute.
- Ross, M. T., Balistreri, E. J., Eads, G., & Montgomery, W. D. (2000, August). *Diesel technology and the American economy*. Prepared for Diesel Association.
- Ross, M. T., Bohi, D., & Montgomery, W. D. (2000, May). *Ethanol demand under MTBE phase-down with no oxygen or renewable fuels mandate*. Prepared for American Petroleum Institute.