

CURRICULUM VITA

CHARLES D. KOLSTAD

OFFICE: Department of Economics (North Hall 2127)
University of California, Santa Barbara, CA 93106-9210 USA
Tel. (805) 893-2108; Fax (805) 893-8830;
Email: kolstad@econ.ucsb.edu; Homepage: <http://econ.ucsb.edu/~kolstad>

EDUCATION:

Ph.D. Stanford University (1982)
Eng.-Econ. Sys. (Economics and Operations Research)
Fields: Econometrics, Economic Development
M.A. University of Rochester (1973) Mathematics
B.S. Bates College (1969) Mathematics (High Honors)

PERMANENT FACULTY POSITIONS:

January 1993 to present University of California, Santa Barbara, *Professor*,
Department of Economics (50%); Donald Bren School of Environmental
Science and Management (34%); Environmental Studies Program (16%).
August 1983- August 1994 University of Illinois, Urbana-Champaign, *Professor*,
Institute for Environmental Studies and Department of Economics;
affiliate, Regional Science Program, Institute for Govt & Public Affairs
(1983-88: *Assistant Professor*; 1988-92 *Associate Professor*)

OTHER PROFESSIONAL POSITIONS:

Spring 99 & 00 Stanford University, *Visiting Professor of Economics*
Summer 1998 New Economic School, Moscow, Russia, *Visiting Professor of Economics*
April 1998 Catholic University of Leuven, Belgium, *Visiting Professor of Economics*
Fall 1995 Stanford University, Institute for International Studies, *Visiting Scholar*
January 1993 Catholic University of Leuven, Belgium, *Visiting Professor of Economics*
Winter, 1992 Univ. of California, Santa Barbara, *Visiting Assoc. Professor of Economics*
August 1986- August 1987 Massachusetts Institute of Technology
Visiting Assistant Professor of Applied Economics

June 1985- Norwegian School of Economics and Business Administration,
August 1985 Bergen, Center for Applied Research, *Visiting Scholar*

August 1974- University of California, Los Alamos National Laboratory
August 1983 (Economics Group), Los Alamos, New Mexico, *Staff Member*.

CURRENT AND RECENT RESEARCH AREAS:

Environmental and resource/energy economics; industrial organization and regulation; public economics; environmental regulation and valuation; economics of information; computation of equilibrium; climate change; coal and electricity markets.

PROFESSIONAL SOCIETY SERVICE:

President-elect, Association of Environmental and Resource Economists (2000-2002)
Board of Directors, Association. of Environmental and Resource Economists (1995-97)

CONSULTING AND OTHER SELECTED POSITIONS:

United Nations Environment Programme, January 2000 (co-taught in Kenya, to African water managers, short course on management of lake eutrophication).
The World Bank, 1991--present (various projects).
Oak Ridge National Laboratory (Tenn.), 1990 (review of EIA data collection).
Oak Ridge National Laboratory (Tenn.), 1992-1993 (review Natll Energy Modelling System)
CMT International (Cambridge, MA), May 1987--October 1987 (Kuwait energy policy).
Energy Laboratory, Massachusetts Institute of Technology, 1984-1986 (review of NAPAP Advanced Utility Simulation Model for EPRI, DOE and EPA).
Resource Economics Corporation (Urbana, IL), 1984-94 (economic software development).
Los Alamos National Laboratory (New Mexico), 1983-1988 (European gas, technical change).
New Mexico Energy Research and Development Institute, 1982-1984 (NM Coal Market Study).
Raytheon Corporation, 1973-1974.
Peace Corps, Ghana (West Africa), 1969-1971.

CONGRESSIONAL TESTIMONY:

"The Use of Economic Incentives for Air Pollution Control in the Southwest," presented before the Committee on Environment and Public Works, U.S. Senate, Albuquerque, New Mexico (July 6, 1983).
"The Four Corners Regional Study," presented before the Subcommittee on Health and Environment, U.S. House of Representatives, Washington, D.C. (May 19, 1981).

EXPERT TESTIMONY:

Economic Analysis Corporation, 1994-96 (expert testimony on valuing environmental resources -- American Trader Oil Spill).

Charles River Associates (Boston, MA), 1989-1990 (antitrust and economics of coal markets).

Worsham, Forsythe, Sampels and Wooldridge (Dallas, TX), 1988-90 (expert testimony on antitrust, coal markets and electric power)

AWARDS/RECOGNITION:

University Scholar, University of Illinois, 1988-91

List of Faculty Rated as Excellent by Students, University of Illinois, Fall 1989

Arnold O. Beckman Award, 1983-84

Fellowship, Center for Operations Research and Econometrics, Catholic University of Louvain, Belgium, 1983-84, 1992-93 (declined)

ADVISORY BOARDS:

Member, Advisory Council on Clean Air Act Compliance Analysis, US Environmental Protection Agency, 1999 -- .

Member, Review Committee, Decision and Information Sciences Division, Argonne National Laboratory, Chicago, IL, 1998 --.

Member, Environmental Economics Advisory Committee, Science Advisory Board, US Environmental Protection Agency), 1992 -98.

Member, Risk Reduction Committee, Science Advisory Board, US Environmental Protection Agency, 1996-7.

Member, Board on Energy and Environmental Systems, National Academy of Sciences/National Research Council, 1994-95

Member, Committee on Fuel Economy of Automobiles and Light Trucks, National Academy of Sciences/National Research Council, 1991-92

Member, Energy Engineering Board, National Academy of Sciences/National Research Council, 1990-94

Participant, U.S. National Academy of Sciences -- Academy of Sciences of the USSR Program for Young Professional Economists, 1990-91

Participant, Electric Power Research Institute, Economics Advisory Committee, 1992

Member, University of Chicago Review Committee for Energy and Environmental Systems Division, Argonne National Laboratory, 1988-91

JOURNAL EDITORIAL POSITIONS:

Editor, *Resource and Energy Economics* (1998--; Co-editor, 1994-97)

Board of Editors, *Land Economics* (1998--)

Editorial Council, *Journal of Environmental Economics and Management* (1989-91; 1998--)

Associate Editor, *Journal of Economic Dynamics and Control* (1995-1997)

Associate Editor, *Journal of Environmental Economics and Management* (1992-93)

Board of Editors: *Energy Journal* (1984 -94), *Resource and Energy Economics* (1993 -94)

CONFERENCES ORGANIZED (jointly):

National Bureau of Economic Research *Workshop on Trade and Environment*, Snowmass, Colorado (Aug. 12, 1998)

First, Second, Third, Fourth and Fifth *California Environmental Economics Workshop*, Santa Barbara, CA (May, 1993; Oct. 1994; May, 1996; Oct 1998; May 2000).
Environmental Policy with Economic and Political Integration: The European Community and the United States, University of Illinois, (1993)

PROFESSIONAL ORGANIZATIONS (MEMBERSHIP):

American Economic Association
Association of Environmental and Resource Economists
Econometric Society
European Association of Environmental and Resource Economics
International Association for Energy Economics

RESEARCH GRANTS AND CONTRACTS:

US Environmental Protection Agency, "California Workshop on Environmental Resource Economics," \$51,459, 10/98 – 9/01 (PI).
US Department of Agriculture, "Testing Models of Learning and Adaptation for Agriculture in Responding to Climate and Other Shocks," \$25,000, 10/96--12/97 (PI).
US Department of Energy, "Climate Variability, Stochasticity and Learning in Integrated Assessment Models," \$380,182, 9/96 -- 9/99 (PI).
Minerals Management Service, "Valuation of Coastal Resources--Understanding Substitution in Time and Space," \$57,399, 7/1/95--8/1/96 (co-PI).
US Department of Energy, "Learning and Enhanced Climate Representation in Integrated Assessment Models," \$230,000, 9/94--12/96 (PI).
National Institute for Global Environmental Change, Midwest Regional Center, "Incorporating Learning into an Integrated Assessment Model of Climate Change," \$168,109, 7/94--6/97 (PI).
Committee on Research, University of California, Santa Barbara, "The 'Hypotheticalness' of Contingent Valuation," \$4,000, 1994-5 (PI).
University of Illinois Research Board, "An Experimental Test of the Hypothetical Aspect of Contingent Valuation," \$1,950, 1994 (PI).
National Science Foundation, "The Timing of Control of Stock Externalities in the Presence of Learning with an Application to Global Warming," \$121,000, 1991-95 (PI).
US Agency for International Development, "Environmental Policy and Training," approx. \$35,000 per year 1992-94 (part of larger multi-university project).
US Information Agency, "Environmental Policy and the 1992 Integration of Europe," \$99,744, 1991-94 (Co-PI).
University of Illinois Research Board, "The Timing of Control of Stock Externalities with Learning: An Application to Global Warming," \$4,500, 1990-91 (PI).
Illinois World Trade Center Association, "Eastern and Western European Boiler Inventory," \$19,320, 1990 (PI).
Illinois Department of Energy and Natural Resources, "Review of the State-of-the-Art of Measuring Environmental Benefits," \$39,000, September 1987--February 1988 (PI).
Illinois Center for Research on Sulfur in Coal, "The Utility Market for Desulfurized Coal," \$124,000, September 1986--August 1988 (PI).
Illinois Department of Energy and Natural Resources, "Promoting Illinois Coal through Clean Coal Technologies," \$46,000, July 1987--July 1988 (Co-PI).

Massachusetts Institute of Technology, Center for Energy Policy Research, "Studies in Electric Utility Regulation," \$10,000, January 1987--June 1988 (PI).
University of Illinois Research Board, "Studies in Electric Utility Behavior: Bias and Efficiency in Response to Emission Regulations," \$1600, Summer 1986 (PI).
University of Illinois Research Board, "Measuring Market Conduct in a Spatial Market: The Case of US Coal," \$7500, September 1984--July 1985 (PI).
U.S. Department of Energy, "Evaluating Oil and Gas Backout from Electric Utilities," \$100,000, October 1981--September 1982 (PI).
Los Alamos National Laboratory, "Studies in Bi-Level Programming," \$120,000, October 1980--September 1982 (PI).
Los Alamos National Laboratory, "Modeling the International Steam Coal Market," \$100,000, October 1981--September 1982 (PI).
National Commission on Air Quality, "Four Corners Study of Alternatives to the Clean Air Act," \$650,000, October 1980--May 1981 (Co-PI).

POSTDOCTORAL SUPERVISION:

David L. Kelly, Ph.D., Carnegie-Mellon University (1994), 5/95 -- 7/98
Currently: Assistant Professor of Economics, University of Miami.

DISSERTATION COMMITTEES:

Doctoral (Research Supervisor)

Glenn Mitchell (UCSB, Economics, PhD, pending)

Gregory Hunter (UCSB, Economics, PhD, pending)

Jeff Wagner (UIUC, Economics, Ph.D., 1998, "Economic Aspects of Radioactive Waste Management")

Yuqing Xing (UIUC, Economics, Ph.D., 1995, "Trade and Environment") [Currently a faculty member at International University of Japan]

Maria Cunha-e-sa (UIUC, Economics, Ph.D., 1994; Thesis title: "Essays in Environmental Economics: An Application to the Case of the Accumulation of Pollution") [Currently a faculty member at New University of Lisbon, Portugal]

Jong-Kun Lee (UIUC, Economics; Ph.D., 1991; Thesis title: "Modeling and Measuring Technical Change and Productivity Growth") [Currently with the Bank of Korea]

Rodger Woock (UIUC, Economics; Ph.D., 1989; Thesis title: "Market Power and Transportation Price Formation: Theory and an Application to the Captive Shipper Problem") [Currently with USWest]

Doctoral (Committee Member Only)

Edmund Balsdon (UCSB, Economics; Ph.D., pending)

Shawn Knabb (UCSB, Economics, Ph.D., pending)

Rolando M. Guzman (UIUC, Economics; Ph.D., 1997)

Roxanna Barrantes (UIUC, Economics; Ph.D., 1992)

Noelwal Netusil (UIUC, Economics; Ph.D., 1992)

Aisling J. Reynolds (UIUC, Geography; Ph.D., 1989)

Khalid Abdul Rahim (UIUC, Agricultural Economics, Ph.D., 1989)

Dan Biller (UIUC, Economics; Ph.D., 1990)

Sundak Suh (UIUC, Urban and Regional Planning; Ph.D., 1989)

Omar Ben-Ayed (UIUC, Business Administration; Ph.D., 1988)
Dah-Nein Tzang (UIUC, Economics; Ph.D., 1985)
Lon Carlson (UIUC, Economics; Ph.D., 1984)

Masters

Larry Hull (MIT, Management; M.Sc., 1987)
Cosimo Asciente (UIUC, Agricultural Economics; MA, 1992)

TEACHING

UCSB:

Econ 115/EnvSt 175: *Environmental Economics* (upper level undergrad)
EnvSt 174: *Environmental Policy and Economics* (lower level undergrad)
Econ 260B: *Environmental Economics* (PhD level)
ESM 243: *Environmental Policy Analysis* (Masters level)
ESM 204: *Economics for Environmental Management* (Masters level)
Econ 594ER: *Workshop in Env. & Res Econ* (PhD level, with R. Deacon)

UIUC:

Economics 300: *Intermediate Microeconomics* (undergrad)
EnvSt 236: *Tomorrow's Environment* (lower level undergrad)
Economics 495: *Public and Environmental Economics Workshop* (PhD level)
Economics 464: *Environmental Economics* (PhD level)
EnvSt 341: *Environmental Simulation* (upper level undergrad)
Economics 389: *Industrial Organization* (upper level undergrad)
Economics 288: *Government Regulation of Economic Activity* (undergrad)
LAS 295: *Environmental Quality* (Honors, lower level undergrad)
Economics 463: *Resource Economics* (PhD level)

MIT:

15.019: *Energy Economics and Policy* (Masters level)

STANFORD:

Economics 101 *Economic Policy Analysis* (upper level undergrad)
Economics 155 *Environmental Economics and Policy* (upper level undergrad)

PUBLICATIONS of C. D. Kolstad:

Books

Spatial Environmental and Resource Economics, Edward Elgar (forthcoming, 2000)

Environmental Economics, Oxford University Press (2000), 400 pp.

Measuring the Demand for Environmental Quality, North-Holland, Amsterdam (1991), 370 pp., edited with John Braden.

Currently Active Working Papers

"Learning About Climate Sensitivity from the Instrumental Record," unpublished manuscript, with D. Kelly, M. Schlesinger and N. Andronova.

"A Model of Auction Equilibrium with Costly Information Acquisition," under review at *Economic Theory*, with R.M. Guzman.

"Do Lax Environmental Regulations Attract Foreign Investment?," UCSB Economics Dept. working paper #6-95R; revision requested, *Env. and Res Econ.*, with Y. Xing.

"The Demand for Synthetic Fuels: Contingent Valuation of Quality - Differentiated Factors of Production," under review at *Energy J.*, with J. Braden, R. Woock and J. Machado.

"Efficiency and the Non-enforcement of Penalties," with J. Leitzel (also Hoover Institution working paper E-92-2).

"Bidding Behavior under Costly Information Acquisition: An Experimental Study," working paper, with R.M. Guzman.

Refereed Journal Articles

"Solving Infinite Horizon Growth Models with an Environmental Sector," *Computational Economics* (forthcoming), with D. Kelly.

"Malthus and Climate Change: Betting On a Stable Population," *J. Env. Econ. and Mgmt.* (forthcoming), with D. Kelly.

"Valuing Beach Recreation Lost in Environmental Accidents," *J. Water Resources Planning & Mgmt* (forthcoming), with R. Deacon.

"Energy and Depletable Resources: Economics and Policy, 1973-98," *J. Env. Econ. and Mgmt.* (forthcoming).

"Information and the Divergence Between Willingness-to-accept and Willingness-to-pay," *J. Env. Econ. and Mgmt.*, **38**:66-80 (1999), with R.M. Guzman.

"Bayesian Learning, Growth and Pollution," *J. Econ. Dyn. And Control*, **23**:491-518 (1999), with D. Kelly.

"Research Trends and Opportunities in Environmental and Resource Economics," *Environmental and Resource Economics*, **11**:383-97 (1998), with R. Deacon, D. Brookshire, A. Fisher, A. Kneese, D. Scrogin, V. Smith, M. Ward and J. Wilen.

"Cost Functions and Nonlinear Prices: Estimating a Technology with Quality-Differentiated Inputs," *Review of Economics and Statistics*, **80**:444-53 (1998), with M. Turnovsky.

"Learning and Stock Effects in Environmental Regulation: The Case of Greenhouse Gas Emissions," *J. Env. Econ. and Mgmt.*, **31**:1-18 (1996).

- "Fundamental Irreversibilities in Stock Externalities," *J. Public Economics*, **60**:221-33 (1996).
- "Foreign Direct Investment, Exchange Rate Variability and Demand Uncertainty," *Int'l Economic Review*, **36**:855-73 (1995), with L. Goldberg.
- "Is Technical Change Embodied in the Capital Stock or New Investment?," *Journal of Productivity Analysis*, **5**:385-406 (1994), with J-K Lee.
- "Hotelling Rents in Hotelling Space: Product Differentiation in Exhaustible Resource Markets," *J. Env. Econ & Mgmt.*, **26**:163-180 (1994).
- "George Bush vs. Al Gore: Irreversibilities in Greenhouse Gas Accumulation and Emission Control Investment," *Energy Policy*, **22**:771-78 (1994).
- "The Specification of Dynamics in Cost Function and Factor Demand Estimation," *Review of Economics and Statistics*, **75**:721-26 (1993), with J-K Lee.
- "Measuring the Energy Efficiency and Productivity Impacts of Embodied Technical Change," *Energy Journal*, **14**:33-55 (1993) with E. Berndt and J.-K. Lee.
- "A Model of Homogeneous Input Demand Under Price Uncertainty," *American Economic Review*, **81**:514-538 (1991) with F. Wolak.
- "Computing Cournot-Nash Equilibria," *Operations Research*, **39**:739-748 (1991) with Lars Mathiesen.
- "Ex Post Liability for Harm vs. Ex Ante Safety Regulation: Substitutes or Complements?," *American Economic Review*, **80**:888-901 (1990) with T. Ulen and G. Johnson.
- "Acid Deposition Regulation and the U.S. Coal Industry," *Energy Policy*, **18**:845-852 (1990).
- "Clean Air and Energy: Reform of the PSD Provisions of the Clean Air Act," *J. Air Poll. Control Assn.*, **40**:177-184 (1990).
- "Derivative Evaluation and Computational Experience with Large Bi-Level Mathematical Programs," *J. Opt. Theory & Applic.*, **65**:485-499 (1990) with L. Lasdon.
- "Aggregate Source/Receptor Relations for the Economic Analysis of Ambient Regulations," *J. Air Poll. Control Assn.*, **39**:824-830 (1989) with M. Williams.
- "Shapley Values as Ex Ante Measures of Relative Market Power: An Application to the Western US Coal Market," *Resources and Energy*, **10**:293-314 (1988) with F. Wolak.
- "Necessary and Sufficient Conditions for Uniqueness of a Cournot Equilibrium," *Rev. Econ. Stud.*, **54**:681-690 (1987) with Lars Mathiesen.
- "Uniformity vs. Differentiation in Regulating Externalities," *J. Env. Econ. & Mgmt.*, **14**:386-399 (1987).
- "Imperfectly Competitive Equilibria in International Commodity Markets," *Amer. J. Agric. Econ.*, **68**(1):27-36 (1986), with A. Burris.
- "Conjectural Variation and the Indeterminacy of Duopolistic Equilibria," *Canadian J. Economics*, **19**:656-677 (1986) with F. Wolak.
- "Empirical Properties of Economic Incentives and Command-and-Control Regulations for Air Pollution Control," *Land Economics* **62**:250-268 (1986).
- "A Short-Run Capital-Labor-Energy Model of Fuel Demand in the Manufacturing Sector of Seven Major OECD Countries," *OPEC Review*, **10**(2):179-214 (Summer 1986), with A. Bopp, R. Pendley and F. Wolak.
- "Strategy and Market Structure in Western Coal Taxation," *Rev. Econ. Stat.*, **67**(2):239-249 (1985), with F. Wolak.
- "The Effect of Market Conduct on International Steam Coal Trade," *Eur. Econ. Rev.*, **24**:39-59 (1984), with D. Abbey.

- "Competition in Interregional Taxation: The Case of Western Coal," *J. Political Economy*, 91(3):443-460 (1983), with F. Wolak.
- "The Structure of International Steam Coal Markets," *Natural Resources J.*, 23:859-891 (Oct. 1983), with D. S. Abbey.
- "Alternative Air Quality Policy Options in the Four Corners Region," *Southwestern Rev. of Mgmt. and Econ.*, 1(2):29-58 (Summer 1981), with J. F. Roach, A. V. Kneese, and M. D. Williams.
- "Air Quality Implications of a Nuclear Moratorium: An Alternative Analysis," *The Energy Journal*, 2(3):33-48 (July 1981), with Anthony Bopp, Verne Loose and Robert Pendley.
- "American Indians and National Energy Policy," *J. of Energy and Development*, 5(2):221-251 (Spring 1980), with Robert E. Pendley.
- "Thermal Evolution Models for the Valles Caldera with Reference to a Hot-Dry-Rock Geothermal Experiment," *J. of Volcanology and Geothermal Res.*, 3, pp. 197-218 (1978), with T. R. McGetchin.
- "Temperature Coefficient of Resistivity of Silicon and Germanium Near Room Temperature," *Solid-State Electronics*, 11, 639 (1968), with W. M. Bullis, F. H. Brewer and L. J. Swartzendruber.

Chapters in Books

- "Integrated Assessment Models for Climate Change Control," Ch 4, pp 171-97 in H. Folmer and T. Tietenberg (Eds.), *International Yearbook of Environmental and Resource Economics 1999/2000: A Survey of Current Issues* (Edward Elgar, Cheltenham, UK, 1999), with D. Kelly.
- "Integrated Assessment Modelling of Climate Change," in W.D. Nordhaus (Ed), *Economics and Policy Issues in Climate Change* (Resources for the Future, Washington, DC, 1998).
- "Uncertainty, Learning, Stock Externalities and Capital Irreversibilities," Chapter 2 in E. van Ierland and K. Górká (Eds.), *Economics of Atmospheric Pollution*, pp 17-30 (Springer-Verlag, Berlin, 1996).
- "The Implications of Learning About Uncertainty for United States/European Greenhouse Gas Policy," chapter 14 in J. B. Braden, H. Folmer and T. S. Ulen (Eds.), *Environmental Policy with Political and Economic Integration* (Edward Elgar, Cheltenham, UK, 1996).
- "Normas Anticontaminación: Enfoques Pasados e Innovaciones," [Regulating Pollution: Past Approaches and Innovations] in Juan Ignacio Varas (Ed.), *Economía del Medio Ambiente en América Latina [The Economics of Ambient Environment in Latin America]*, pp 209-24 (Ediciones Universidad Católica de Chile, Santiago, 1995).
- "The Timing of CO₂ Control in the Face of Uncertainty and Learning," in E.C. van Ierland (ed), *International Environmental Economics* , pp 75-96 (Elsevier, Amsterdam, 1994).
- "Buying Energy and Non-Fuel Minerals: Final, Derived and Speculative Demand," Chapter 20 in *Handbook of Natural Resources and Energy Economics*, Vol. III, A.V. Kneese and J.S. Sweeney (eds.), Handbooks in Economics series, K.J. Arrow and M.D. Intrilligator (eds.) (North-Holland, Amsterdam, 1993), with M. Slade and R. Weiner.
- "Natural Resource Use and the Environment," Chapter 26 in *Handbook of Natural Resources and Energy Economics*, Vol. III, A. V. Kneese and J. S. Sweeney (eds.), Handbooks in

- Economics series, K. J. Arrow and M. D. Intrilligator (eds.) (North-Holland, Amsterdam, 1993), with J. Krautkraemer.
- "The Law and Economics of Hazardous Materials Transportation: Regulating Harm by Administrative Agency and by Tort Liability," Chapter 15 in Transportation of Hazardous Materials: Issues in Law, Social Science and Engineering, Leon Moses and Dan Lindstrom (Eds) (Kluwer Academic Publishers, Boston, 1993), with T. Ulen.
- "Environmental Demand Theory," in Braden and Kolstad (eds.), *Measuring the Demand for Environmental Quality*, North-Holland, Amsterdam (1991), with J. Braden.
- "Computing Equilibria in Imperfectly Competitive Commodity Markets," in O. Guvenen, W.C. Labys and J-B. Lesourd (eds.), *International Commodity Market Models. Advances in Methodology and Applications*, Chapman-Hill, London (1990), with L. Mathiesen.
- "Pollution Possibility Frontiers," pp 273-287 in B. Lev, J. A. Bloom, A. S. Gleit, F. H. Murphy, and C. Shoemaker (eds.), *Strategic Planning in Energy and Natural Resources* (North-Holland, Amsterdam 1987).
- "Computing Dynamic Spatial Oligopolistic Equilibrium in an Exhaustible Resource Market: the Case of Coal," *Quantitative Methods for Market-Oriented Economic Analysis over Space and Time*, W.C. Labys, T. Takayama and N.D. Uri (eds.), Avebury (Gower), Aldershot, UK (1989).
- "Clean Air and Energy: From Conflict to Reconciliation," pp. 163-191 in *Paradoxes of Western Energy Development*, Cyrus M. McKell et al. (eds.) (Westview Press, Boulder, Colorado, 1984), with W. D. Schultze and M. D. Williams.
- "A Dynamic Linear Programming Model for Allocating Energy Supply Activities Within the Rocky Mountain Region of the United States," in *Applied Numerical Modeling*, by C. A. Brebbia (ed.), (Pentech Press, London, 1978), with G. Morris, R. Palmer, R. Pendley and G. Hinman.

Proceedings

- "The Climate Change Footprint: Will We See It Before It Is Upon Us?", pp 135-57, in *Climate Change: Integrating Science, Economics and Policy*, N. Nakicenovic, W.D. Nordhaus, R. Richels and F.L. Toth (Eds), IIASA, Laxenburg, Austria (December 1996).
- "From Stalin to Yeltsin: Perestroika in US Environmental Policy" prepared for conference: *Environmental Policy: Current Trends, Future Directions* (January 1992).
- "Comment on 'Energy Demand and Supply in the Developing World 1990-2020,' by Churchill" Proc., 1993 World Bank Annual Conference on Development Economics," pp. 459-461 (1994).
- "Mitigating Climate Change Impacts: The Conflicting Effects of Irreversibilities in CO₂ Accumulation and Emission Control Investment," pp 205-18 in Integrative Assessment of Mitigation, Impacts and Adaptation to Climate Change, N. Nakicenovic, W.D. Nordhaus, R. Richels, and R.L. Toth (Eds), IIASA, Laxenburg, Austria (May, 1994).
- "Looking vs. Leaping: The Timing of CO₂ Control in the Face of Uncertainty and Learning," pp. 63-82 in Y. Kaya, N. Nakicenovic, W. D. Nordhaus and F. L. Toth (eds), Costs, Impacts and Benefits of CO₂ Mitigation, IIASA, Austria (June 1993).
- "Price Formation in International Coal Trade," Proc., Coaltrans 91, Berlin, pp. 71-77 (1991).

- "A Framework for Exploring Cost Effective CO₂ Control Paths: Discussant Comments," in Proceedings of the Workshop on Economic/Energy/Environmental Modeling for Climate Policy Analysis, David O. Wood and Yoichi Kaya (eds.), MIT Center for Energy Policy Research, Cambridge, Massachusetts, 1991, pp. 409-414.
- "Measuring the Sulfur Premium in Coal," pp. 547-53 in YP Chugh, and R.D. Caudle, eds, *Processing and Utilization of High Sulfur Coals II* (Elsevier, New York, 1987), with J. Braden.
- "Estimating Hedonic Price Functions for Coal," *Proc.*, 1986 North American Meeting of Int'l Assn. of Energy Economists, Cambridge, Massachusetts, November 1986, pp. 73-75 (1987) with M. Turnovsky.
- "Using Shapley Values to Measure Market Power in the Western US Coal Market" *Proc.*, 1986 North American Meeting of Int'l Assn. of Energy Economists, Cambridge, Massachusetts, November 1986, pp. 248-53 (1987) with Frank Wolak.
- "Short-Run and Long-Run Industrial Demand for Energy: Recent Evidence from Seven Major OECD Countries," *Proc.*, Eighth Annual International Conference of International Association of Energy Economists, Tokyo (June 5-7, 1986).
- "The Effect of Producer and Consumer Behavior on Prices and Trade in the International Steam Coal Market," Coal Consumers Conference, Tel Aviv (June 1986).
- "A Capital-Labor-Energy Model of Fuel Demand in the Manufacturing Sector of Seven Major OECD Countries," *Proc.*, Seventh Annual International Conference of International Association of Energy Economists, Bonn, 4: 13-32 (June 3-5, 1985).
- "Efficiency and Equity in Acid Rain Regulation," *Proc.*, Annual North American Meeting of International Association of Energy Economists, San Francisco, California, pp. 479-495 (November 1984).
- "Competitive Interstate Taxation of Western Coal," *Proc.*, Annual North American Meeting of International Association of Energy Economists, Washington, D.C. (June 1983), with F. Wolak.
- "Patterns of Energy Production in the Southwest," *Proc.*, ASME Symp. on the Impact of Energy Development in the Southwest, Albuquerque, New Mexico, March 17, 1977, pp. 33-37 (1977).

Reports

- Measuring the Demand for Environmental Improvement*, Illinois Department of Energy and Natural Resources Report ILENR/RE-EA-89/16, Springfield, IL (July 1989), edited with John Braden.
- A Constructive Proof of a Theorem on the Uniqueness of Cournot Equilibria*, University of Illinois BEBR working paper No. 1444 (1988).
- A Review of the State-Level Advanced Utility Simulation Model*, Electric Power Research Institute Report EA-5499, Palo Alto, California (December 1987), with M. L. Baughman, E. R. Berndt, J. A. Fay, D. S. Golomb, J. Gruhl, M. Manove, F. C. Scheppe and D. O. Wood.
- Progress in Measuring Energy Demand*, Institute for Environmental Studies Staff Paper No. 45, University of Illinois, Urbana, Illinois (Oct. 1987).

- A Marketing Survey and Assessment of the Potential for Desulfurized Coal, Univ. Illinois Institute for Environmental Studies report (1987), with J. Braden, J. Machado and R. Woock.
- Marketable Permits vs. Emission Fees: Uncertain Costs, Damage and Product Demand*, Univ. Illinois BEBR Working Paper No. 1223 (1986).
- A Review and Economic Analysis of Reasonably Available Control Technology (RACT) Regulations for Emissions of Volatile Organic Material in Illinois and Seven Other States*, Institute for Environmental Studies Report, University of Illinois, Urbana, Illinois (July 1987), with G. V. Johnson, T. S. Ulen, J. L. Carlson, B. McDonald and R. Moreschi.
- An Economic Analysis of the Costs to Business from the Implementation of Reasonably Available Control Technology (RACT) Regulations for Emissions of Volatile Organic Material in Illinois*, Institute for Environmental Studies Report, University of Illinois, Urbana, Illinois (July 1987), with G. V. Johnson, J. P. Guo, R. Moreschi, M. Turnovsky and T. S. Ulen.
- A Review of the Literature on Bi-level Mathematical Programming*, Los Alamos National Laboratory Report LA-10284-MS, Los Alamos, NM (1985).
- Evaluation of the St. Lucia Geothermal Resource: Macroeconomic Models*, Los Alamos National Laboratory Report LA-10212-MS, Los Alamos, NM (August 1984), with A. Burris, L. Trocki and M. Yeaman.
- New Mexico Coal Market Study, Summary Report*, New Mexico Energy Research and Development Institute Report NMERDI 2-72-4601, Santa Fe, New Mexico (November 1983), with G. Hinman, R. Mitchell, B. Stockton and D. Symes.
- Modeling International Steam Coal Trade*, Los Alamos National Laboratory Report LA-9661-MS, Los Alamos, New Mexico (January 1983), with D. S. Abbey and R. Bivins.
- Economic and Regulatory Efficiency in Air Pollution Control*, Los Alamos National Laboratory Report LA-9458-T (Thesis), Los Alamos, NM (1982).
- Soviet Energy and Western Security*, Los Alamos National Laboratory Report LA-9456-MS, Los Alamos, New Mexico (1982), with R. E. Pendley, W. G. Davey and S. A. Maaranen.
- Electric Utility Oil and Gas Use in the Eighties*, Los Alamos National Laboratory Report, LA-9319-MS, Los Alamos, New Mexico (1982), with D. S. Abbey, A. J. Martinez, D. S. Williams, F. A. Wolak and M. K. Yeaman.
- Documentation of the Los Alamos Coal and Utility Modeling System, Version 3.0*, Los Alamos National Laboratory Report LA-8863-MS, Los Alamos, New Mexico (1981), with F. Wolak, R. Bivins and M. Stein.
- Alternative Air Quality Policy Analysis for the Four Corners Study Region*, Los Alamos National Laboratory Report LA-UR-81-1380, Los Alamos, New Mexico (1981), with F. Roach, J. Bartlit, A. Kneese, D. Nochumson, R. Tobin, G. Weatherford and M. Williams.
- Effects of Accelerating the Construction of Nuclear Power Plants on Oil and Gas Use*, Los Alamos National Laboratory Report, LA-9171-MS, Los Alamos, New Mexico (1982).
- ROCKY I--An Energy-Environment Model of Coal and Electricity Supply in the Rocky Mountain West*, Los Alamos National Laboratory Report LA-7988, Los Alamos, New Mexico (February 1980), with Robert Bivins, Verne Loose and Robert Pendley.
- Appropriate Technology and Navajo Economic Development*, Los Alamos National Laboratory Report LA-6489, Los Alamos, New Mexico (October 1976), with D. P. Grimmer, P. Reno and J. Tutt.

WESCO Coal Gasification Plans: Navajo Considerations, Los Alamos National Laboratory Report LA-6247-MS, Los Alamos, New Mexico (February 1976), with William S. Bennett and Donald M. Kerr.

A Minimum Cost Linear Programming Model for Regional Assessment of Energy Extraction, Transportation and Use, Los Alamos National Laboratory Report LA-6689-MS, Los Alamos, New Mexico (March 1978), with G. Hinman, G. Morris, R. Palmer and R. Pendley.

The 1975 Energy Production System in the States of the Rocky Mountain Region, Los Alamos National Laboratory Report LA-6624, Los Alamos, New Mexico (December 1976).

Air Quality Regulation in Spatial Equilibrium Models, Los Alamos National Laboratory Report LA-9019-MS, Los Alamos, New Mexico (1981).

Rocky Mountain Energy 1974: Flows, Employment, Prices, Los Alamos National Laboratory Report LA-6122-MS, Los Alamos, New Mexico (October 1975), with Richard J. Barrett and William A. Beyer.

Book Reviews

Recent Modelling Approaches in Applied Energy Economics by Bjerkholt, Olsen and Vislie, Chapman Hall, 1990. Reviewed in the *Energy Journal*, 12:165-167 (1991).

World Coal: Economics, Policies and Prospects by Richard L. Gordon, Cambridge University Press, 1987. Reviewed in *Energy Policy*, 16:328 (1988).

Other Articles

"Environmental Protection and Economic Reform in Russia," *EPAT/MUCIA Policy Brief*, July 1993, with A. Golub.

"Home Energy Projects--How Many Dollars Do They Really Save?" *Alternate Sources of Energy*, No. 30, pp. 12-16 (February 1978).

"The Economics of the Attached Solar Greenhouse for Home Heating--A Preliminary Assessment," *Proc.*, Second National Passive Solar Conference, pp. 822-826 (1978).

"Heat Calculations for Greenhouses," *Alternate Sources of Energy*, No. 36, pp. 30-33 (February/March 1979), with D. P. Grimmer.

"An Inexpensive Method for Constructing Darrieus Wind Turbine Blades," *Alternate Sources of Energy*, No. 29, pp. 14-20 (December 1977), with D. P. Grimmer.

"Why an Owner Built Greenhouse is Competitive with Gas for Home Heating in Northern New Mexico," *Bulletin*, New Mexico Solar Energy Association, 2(1), pp. 5-8 (1977).