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### Degrees

PhD 1987, Stanford University (Operations Research, Supervisor: Alan S. Manne)

BS 1977, Yale University. (Engineering and Applied Science)

### Experience

The Swiss Federal Institute of Technology (ETH), Zürich. Chair in Energy Economics, 2008–present.

Freelance Professional Economist, 2005–2008.

University of Colorado.

Professor of Economics, 2003–2005.

Associate Professor, 1997–2002.

Assistant Professor, 1992–1996.

University of Western Ontario. Assistant Professor of Economics, 1987–1992.

Yale University. Postdoctoral research associate and lecturer, 1986–1987.

Norwegian School of Economics. Researcher. 1982–1983.

Peace Corps, Nepal. Rural suspension bridge engineer. 1977–1979.

### Academic Honours and Awards

GTAP Hall of Fame Award, User Community of the *Global Trade Analysis Project*, 2007.

Daeyang Prize (with Glenn W. Harrison and David G. Tarr), *Journal of Economic Integration*, 1997.

Cowles Foundation Post-Doctoral Research Fellowship, Yale University, 1986.

Yale College McCloskey award in mechanical engineering, 1977.

### Foreign Languages

Nepali, Norwegian, German

**Articles in Refereed Journals**

- Trade and Welfare: Does industrial organization matter?, with Edward J. Balistreri and Russell H. Hillberry, *Economics Letters*. 109 (2), 85–87, 2010.
- Computation of equilibria in OLG models with many heterogeneous households, with Sebastian Rausch, *Computational Economics*. 36, 171–189, 2010.
- The efficiency of fiscal measures in preventing out-migration from North Finland, with Hannu Törmä, *Regional Studies*. 44(4), 465–475, 2010.
- Regional impacts of liberalization of barriers against foreign direct investment in services: the case of Russia's accession to the WTO, with David Tarr, *Review of International Economics*, 18(1): 30–46, 2010.
- The Costs of Compliance: A CGE Assessment of Canada's Policy Options under the Kyoto Protocol, with Christoph Böhringer, *The World Economy*, 33(2), 177–211, 2009.
- EU climate policy up to 2020: An economic impact assessment, with Christoph Böhringer, Andreas Löschel and Ulf Moslener, *Energy Economics*, 31(2):S295–S305, 2009.
- The EU 20/20/2020 targets: An overview of the EMF22 assessment, with Christoph Böhringer and Richard S.J. Tol *Energy Economics*, 31(2):S268–S273, 2009.
- Feasible climate targets: The roles of economic growth, coalition development and expectations, with Geoffrey J. Blanford and Richard G. Richels, *Energy Economics*, 31(2):S82–S93, 2009.
- The case for international emission trade in the absence of cooperative climate policy, with Jared Carbone and Carsten Helm, *Journal of Environmental Economics and Management*, 58(3): 266–280, 2009.
- International climate policy: a “second best” solution for a “second best” world?, with Richard Richels and Geoffrey Blanford, *Climate Change Letters*, 97 (1–2): 289–296, 2009.
- Integrated Assessment of Energy Policies: Decomposing Top-Down and Bottom-Up, with Christoph Böhringer, *Journal of Economic Dynamics and Control* 33:1648–1661, 2009.
- Dairy Tariff-Quota Liberalization: Contrasting Bilateral and Most Favored Nation Reform Options, with Thomas Hertel and Jason Grant, *American Journal of Agricultural Economics* 91(3):673–684, 2009.
- Modeling Services Liberalization: The Case of Kenya, with Edward Balistreri and David Tarr, *Economic Modelling* 26: 668–679, 2009.

- Poverty effects of Russia's WTO accession: modeling "real" households with endogenous productivity effects, with David Tarr, *Journal of International Economics* 75(1):131–150, 2008.
- Projecting long term medical spending growth, with Christine Borger and Gregory Y. Won. *Journal of Health Economics* 27(1):69–88, 2008.
- Combining top-down and bottom-up, with Christoph Böhringer, *Energy Economics* 30 (2): 574-596, 2008.
- Managing the Transition to Climate Stabilization, with Richard Richels, Geoffrey Blanford, and Leon Clarke, *Climate Policy* 7(5):409–428, 2007.
- Alternative Strategies for Promoting Renewable Energy in EU Electricity Markets, with Christoph Böhringer and Tim Hoffman, *Applied Economics Quarterly Supplement* 58:9–26, 2007.
- The impact of liberalizing barriers to foreign direct investment in services: the case of Russian accession to the World Trade Organization, with Jesper Jensen and David Tarr, *Review of Development Economics* 11 (3), 2007.
- Decomposing integrated assessment of climate change, with Christoph Böhringer and Andreas Löschel, *The Journal of Economic Dynamics and Control* 31:683–702, 2007.
- The importance of telecommunications reform in Russia's accession to the WTO, with Jesper Jensen and David Tarr. *Eastern European Economics* 44(1):25–58, 2006.
- The economic effects of border measures in subglobal climate agreements, with Mustafa H. Babiker, *The Energy Journal* 26(4):101–128, 2005.
- Trade and direct investment in producer services and the domestic market for expertise, with James R. Markusen and David Tarr. *The Canadian Journal of Economics* 38(3):758–777, 2005.
- Regional, multilateral and unilateral trade policies of Mercosur for growth and poverty reduction in Brazil, with Glenn W. Harrison, David Tarr and Angelo Gurgel. *The World Bank Economic Review* 18(4):289–317, 2004.
- Modeling overlapping generations in a complementarity format, with Tobias N. Rasmussen. *Journal of Economic Dynamics and Control* 28(7):1383–1409, 2004.
- Who should pay how much? Compensation for spillovers from carbon abatement policies to developing countries – a global CGE assessment, with Christoph Böhringer. *Computational Economics* 23(1):71–103, 2004.
- Climate policies and induced technological change: Which to choose, the carrot or the stick?, with Snorre Kverndokk and Knut Einar Rosendahl. *Environmental and Resource Economics* 27(1):21–41, 2004.

- Políticas de comércio regionais, multilaterais e unilaterais do Mercosul para o crescimento econômico e a redução da pobreza no Brasil, with Glenn W. Harrison, David Tarr and Angelo Gurgel. *Pesquisa e Planejamento Econômico* 33(1):1–60, 2003.
- Regional trading arrangements for Chile: Do the results differ with a dynamic model?, with David Tarr. *Economie Internationale and Trade and Integration* 18:93–94, 2004.
- Rules of thumb for evaluating preferential trading arrangements: evidence from CGE assessments, with Glenn W. Harrison and David Tarr. *Cuadernos de Economía* 121:101–137, December, 2003.
- Trade liberalization, poverty and efficient equity, with Glenn W. Harrison and David Tarr. *Journal of Development Economics* 71(1):97–128, 2003.
- Distributional Effects of Fiscal Consolidation, with Svend E. Hougaard Jensen. *Scandinavian Journal of Economics* 104(3): 473–496, 2002.
- Trade policy options for Chile: the importance of market access, with Glenn W. Harrison and David Tarr. *The World Bank Economic Review* 16(1):49–79, 2002.
- Carbon abatement and international spillovers, with Christoph Böhringer. *Environmental and Resource Economics* 22(3):391–417, 2002.
- Trade liberalization, product variety and growth in a small open economy: a quantitative assessment, with David Tarr. *Journal of International Economics* 56(2):247–272, 2002.
- Approximating infinite-horizon models in a complementarity format: a primer in dynamic general equilibrium analysis, with Morten I. Lau and Andreas Pahlke. *Journal of Economic Dynamics and Control* 26(4):577–609, 2002.
- Applied general equilibrium modeling with MPSGE as a GAMS subsystem: an overview of the modeling framework and syntax. *Computational Economics* 14:1–46, 1999.
- Computing Wardropian equilibria in a complementarity framework, with Michael C. Ferris and Alexander Meeraus. *Optimization Methods and Software* 10: 669–685, 1999.
- Effects of restrictions on international permit trading: the MS-MRT model, with Paul M. Bernstein, W. David Montgomery and Gui-Fang Yang. *The Energy Journal – Kyoto Special Issue*: 221–256, 1999.
- Global CO<sub>2</sub> emissions and unilateral action: policy implications of induced trade effects, with Christoph Böhringer and Alfred Voß. *The International Journal of Global Energy Issues* 11(1-4): 18–22, 1999.

- Trade impacts of climate policy: the MS-MRT model, with Paul M. Bernstein and W. David Montgomery. *Energy and Resource Economics* 21: 375–413, 1998.
- A comparison of the performance of flexible functional forms for use in applied general equilibrium analysis, with Carlo Perroni. *Computational Economics* 11:245-263, 1998.
- Quantifying the Uruguay round, with Glenn W. Harrison and David Tarr. *Economic Journal* 107, 1405–1430, 1997.
- Opciones de política comercial para Chile: una evaluación cuantitativa, with Glenn W. Harrison and David Tarr. *Cuadernos de Economía* 101–137, 1997.
- Economic implications for Turkey of a customs union with the European Union, with Glenn W. Harrison and David Tarr. *European Economic Review* 41(3-5):861–870, 1997.
- Morocco's free trade agreement with the EU: a quantitative assessment, with David Tarr and Elizabet Rutström. *Economic Modelling* 14(2):237–269, 1997.
- Carbon taxes with exemptions in an open economy: a general equilibrium analysis of the German tax initiative, with Christoph Böhringer. *Journal of Environmental Economics and Management* 32(2):189–203, 1996.
- Trade policy subtleties with multinational firms, with Florencio Lopez de Silanes and James R. Markusen. *European Economic Review* 40(8):1605–1627, 1996.
- Efficient equity: removing salary discrimination by meeting statistical legal constraints at least cost, with Maribeth Coller and Thomas F. Rutherford. *Economics Letters* 52(1):81–88, 1996.
- Increased competition and completion of the market in the European Union: static and steady-state effects, with Glenn W. Harrison and David Tarr. *Journal of Economic Integration* 11(3):332–365, 1996.
- Economic implications of changes in labor standards: a computational analysis for Mexico, with Keith Maskus and Steven Selby. *North American Journal of Economics and Finance* 6(1):171–188, 1996.
- Extensions of GAMS for complementarity problems arising in applied economics. *Journal of Economic Dynamics and Control* 19(8):1299–1324, 1995.
- Quantifying the outcome of the Uruguay round, with Glenn W. Harrison and David Tarr. *Finance and Development* 32(4):38–41, 1995.
- Liberalizing agriculture in the European Union, with Glenn W. Harrison and Ian Wooton. *Journal of Policy Modeling* 17(3):223–255, 1995.
- Regular flexibility of nested CES functions, with Carlo Perroni. *European Economic Review* 39(2):335–343, 1995.

- Trade liberalization in a multinational-dominated industry, with Linda Hunter and James R. Markusen. *Journal of International Economics* 38:95–118, 1995.
- Complementarity and increasing returns in intermediate inputs, with Florencio Lopez de Silanes and James R. Markusen. *Journal of Development Economics* 45:133–151, 1994.
- L'accord de libre-échange entre le Maroc et la CE: une évaluation quantitative, with David Tarr and Elizabet Rutström. *Revue d'Économie du Développement* 1994.
- An alternative welfare decomposition for customs unions, with Glenn W. Harrison and Ian Wooton. *Canadian Journal of Economics* 26(4):961–970, 1993.
- Trade reform in the partially liberalized economy of Turkey, with Glenn W. Harrison and David Tarr. *The World Bank Economic Review* 7(2):191–217, 1993.
- Discrete plant-location decisions in an applied general equilibrium model of trade liberalization, with James R. Markusen. *Weltwirtschaftliches Archiv* 130(1):133–151 1994.
- International trade in oil, gas and carbon emission rights: an intertemporal general equilibrium model, with Alan Manne. *The Energy Journal* 14(5):1–20, 1993.
- International trade in carbon emission arights and basic materials: general equilibrium calculations for 2020, with Carlo Perroni. *Scandinavian Journal of Economics* 95(3):257–278, 1993.
- Unilateral CO<sub>2</sub> reductions and carbon leakage: the effect of international trade in oil and basic materails, with Stefan Felder. *Journal of Environmental Economics and Management* 25(2):162–176, 1993.
- An implementation of the generalized basis reduction algorithm for integer programming, with Bill Cook, Herbert Scarf, and David Shallcross. *ORSA Journal on Computation* 5(3):206–212, 1993.
- Crashing a maximum weight complementary basis, with Kurt Anstreicher and Jon Lee. *Mathematical Programming* 54(3):281–290, 1992.
- A long-term model of oil markets, economic growth and balance of payments constraints, with Alan Manne. *Empirical Economics* 16:51–69, 1991.
- An empirical database for a general equilibrium model of the European communities, with Glenn W. Harrison and Ian Wooton. *Empirical Economics* 16:95–120, 1991.
- Capitalization, conditionality and dilution: land prices and the U.S. wheat program, with John Whalley and Randy Wigle. *Journal of Policy Modelling* 12(3):605–622, 1990.
- Vemod: a model of world trade, with Jan Haaland, Victor Norman, and Tor Wergeland. *Scandinavian Journal of Economics* 89(3):705–721, 1987.

### Articles in Edited Volumes and Proceedings

- Revised emissions growth projections for China: why post-Kyoto climate policy must look east, with Geoffrey J. Blanford and Richard G. Richels, in *Post-Kyoto International Climate Policy: Implementing Architectures for Agreement*, Robert Stowe and Robert Stavins (eds.), Cambridge University Press, 822–856, 2010.
- Extending general equilibrium to the tariff line: U.S. dairy in the Doha development agenda, with Jason H. Grant and Thomas W. Hertel, in *Contributions of Agricultural Economics to Critical Policy Issues*, International Association of Agricultural Economists, 271–280, 2007.
- The Impact on Russia of WTO Accession and The Doha Agenda: the importance of liberalization of barriers against foreign direct investment in services for growth and poverty reduction, with David Tarr and Oleksandr Shepotylo, in L. Alan Winters (ed.), *The WTO and Poverty and Inequality*, Edgar Elgar Publishing, Cheltenham, UK, 2007.
- Taxation and Economic Efficiency in Armenia, with Miles Light, in *The Caucasian Tiger – Sustaining Economic Growth in Armenia*, The World Bank, Washington, D.C., 243–282, 2007.
- Russia's Accession to the WTO: Macroeconomic, Sector, Labor Market and Household Effects, with David Tarr, in David Tarr (ed.), *Trade Policy and Accession to the WTO for Development of Russia and Countries of the CIS, A Handbook*, Ves Mir, Moscow, (World Bank Institute), 2006.
- Efficiency gains from “what”-flexibility in climate policy - an integrated CGE assessment, with Christoph Böhringer and Andreas Löschel, in *Multi-Greenhouse Gas Mitigation and Climate Policy, The Energy Journal Special Issue #3*, 402–424, 2006.
- The impact on Russia of WTO accession and the Doha agenda: the importance of liberalization of barriers against foreign direct investment in services for growth and poverty reduction, with David Tarr and Oleksandr Shepotylo. In Thomas Hertel and L. Alan Winters (eds.), *Poverty and the WTO: Impacts of the Doha Development Agenda*, Palgrave MacMillan, 2005.
- Equity and efficiency costs of raising tax revenue in Colombia, with Miles K. Light. In *Fiscal Reform in Colombia, Problems and Prospects*, Richard M. Bird, James M. Poterba and Joel Slemrod editors, MIT Press, 2005.
- Sharing the burden of carbon abatement in the European Union, with Christoph Böhringer and Glenn W. Harrison. In *Empirical Modeling of the Economy and the Environment*, C. Böhringer and A. Löschel, editors, ZEW Economic Studies, Physica, Heidelberg, 153–182, 2003.
- Endogenous policy in a computational general equilibrium framework, with Stanley L. Winer. In *Political Economy in Federal States*, Stanley L. Winer, editor, Edward Elgar, 285–324, 2002.

- Policy reform without tears, with Glenn W. Harrison, Jesper Jensen and Morten I. Lau. In *Policy Evaluation with Computable General Equilibrium Models*, A. Fossati and J. Hutton, editors, Routledge, London, 20–28, 2002.
- The efficiency costs of voluntary agreements in environmental policy, with Christoph Böhringer. In *Policy Evaluation with Computable General Equilibrium Models*, A. Fossati and J. Hutton, editors, Routledge, London, 140–155, 2002.
- World economic impacts of the Kyoto protocol, with Christoph Böhringer. In *Internalization of the Economy and Environmental Policy Options*, P.J.J. Welfens, editor, Springer, Berlin, 161–180, 2001.
- Foreign direct investment in producer services, with James R. Markusen and David Tarr. In *Economic Impact of EU Membership on Entrants: New Methods and Issues*, Richard E. Baldwin and Aymo Brunetti, editors, Kluwer Academic Publishers, 27–40, 2001.
- The dynamic gains from trade liberalization with product variety: summary of results, with David Tarr. In *Economic Theory, Dynamics and Markets - Essays in Honor of Ryuzo Sato*, Takashi Negishi, Rama V. Ramachandran and Kazuo Mino, editors, Kluwer Academic Publishers, 221–231, 2001.
- Carbon abatement, technical change and intergenerational burden sharing. In *Using Dynamic General Equilibrium Models for Policy Analysis*, G.W. Harrison, S.E.H. Jensen, L. H. Pedersen and T. F. Rutherford, editors, North Holland, 79–118, 2000.
- Energy market projections and differentiated carbon abatement in the European Union, with Christoph Böhringer and Jesper Jensen. In *Efficiency and Equity of Climate Change Policy*, C. Carraro, editor, Kluwer, 199–220, 2000.
- Burden sharing, joint implementation, and carbon coalitions, with Glenn W. Harrison. In *International Environmental Agreements on Climate Change*, C. Carraro, editor, Kluwer, Amsterdam, 77–108, 1999.
- Carbon abatement, revenue recycling and intergenerational burden sharing, with Christoph Böhringer, Andreas Pahlke. In *The Theory of Markets, Proceedings of the KNAW Colloquium*, P.J.J. Herings, G. van der Laan and A.J.J. Talman, editors, North-Holland, Amsterdam, 305–326, 1999.
- Blueprints, spillovers and the dynamic gains from trade liberalization in a small open economy, with David Tarr. In *Dynamic Issues in Applied Commercial Policy Analysis*, Richard Baldwin, editor, Cambridge University Press, 269–316, 1999.
- Tax policy in a computable model of economic and political equilibrium, with Stanley Winer. In *Democratic Choice and Taxation*, Walter Hettich and Stanley L. Winer, Cambridge University Press, 153–192, 1999.

- Sequential joint maximization. In *Energy and Environmental Policy Modeling*, John Weyant, editor, International Series in Operations Research and Management Science, 18, Kluwer, 1999.
- Alternative CO<sub>2</sub> abatement strategies for the European Union, with Christoph Böhringer and Michael Ferris. In *Climate Change, Transport and Environmental Policy*, Stef Proost and John Braden, editors, Edward Elgar, 16–47, 1998.
- Future trade between Egypt and the European Union: potential trade gains and policy issues, with Glenn W. Harrison and David Tarr. In *The Partnership Agreement between Egypt and the EU: Potential Impact and Policy Implications*, S. Fawzy, editor, 1997.
- Economic implications for Turkey of a customs union with the European Union, with Glenn W. Harrison and David Tarr. *European Economic Review (Proceedings)* 41:861–870, 1997.
- Accessing realistic complementarity problems within MATLAB, with Michael C. Ferris. In *Nonlinear Optimization and Applications*, 141–153, 1996.
- Carbon dioxide emission restrictions in the global economy: leakage, competitiveness and the implications for policy design. In *An Economic Perspective on Climate Change Policies*, 203–222, American Council for Capital Formation, Center for Policy Research, 1996.
- Quantifying the Uruguay round, with Glenn W. Harrison and David Tarr. In *The Uruguay Round and the Developing Countries*, Will Martin and L. Alan Winters, editors, Cambridge University Press, 216–252, 1996.
- El libre comercio en América del Norte y la producción de automoviles, with Linda Hunter and James R. Markusen. *Cuadernos Economicos de Ice* 59(1):57–68, 1995.
- The auto industry and the North American free-trade agreement, with Florencio Lopez de Silanes and James R. Markusen. In *Modelling Trade Policy: AGE Assessments of North American Free Trade*, Cambridge University Press, 1994.
- North American free trade and the production of finished automobiles, with Linda Hunter and James R. Markusen. In *Modeling North American Economic Integration*, Timothy Kehoe and Patrick Kehoe, editors, Kluwer, 117–130, 1995.
- International trade, capital flows and sectoral analysis: formulation and solution of intertemporal equilibrium models, with Alan Manne. In *New Directions in Computational Economics*, W.W. Cooper and A.B. Whinston, editors, 191–205. 1994.
- International trade in oil, gas and carbon emission rights: an intertemporal general equilibrium model, with Alan Manne. In *Costs, Impacts and Benefits of CO<sub>2</sub> Mitigation*, Y. Kaya, N. Nakienovic, W.D. Nordhaus, and F.L. Toth, editors, International Institute for Applied Systems Analysis, 315–340, 1993.

Welfare effects of fossil carbon restrictions. In *The Costs of Cutting Carbon Emissions: Results from Global Models*, Organization for Economic Co-operation and Development, Paris, 95–106, 1993.

Vertical redistribution and the franchise, with Stanley Winer. In *Preferences and Democracy (Villa Colombella Papers)*, Albert Breton, Gianluigi Galeotti, Pierre Salmon, and Ronald Wintrobe, editors, Kluwer Academic Press, 351–376, 1993.

US-Mexico free trade and the North American auto industry: effects on the spatial organization of production of finished autos, with Linda Hunter and James R. Markusen. *The World Economy*, 1991.

The economic impact of the European community, with Glenn W. Harrison and Ian Wooton. *American Economic Review (Papers & Proceedings)*, 288–294, 1989.

### **Book Reviews**

Review of *Economic Models of Climate Change – A Critique* by Stephen J. DeCanio. *The Journal of Economic Literature* 43(2), 2005.

Review of *Applied General Equilibrium and Economic Development* by Jean Mercenier and T.N. Srinivasan. *The Journal of Economic Literature* 33(4):2020–2021, 1995.

### **Edited Books**

*Using Dynamic General Equilibrium Models for Policy Analysis*, with Glenn W. Harrison, Svend E. Hougaard Jensen, and Lars Haagen Pedersen, North Holland, 2000.

### **Forthcoming Articles in Refereed Journals**

Structural estimation and solution of international trade models with heterogeneous firms, with Edward J. Balistreri and Russell H. Hillberry, *Journal of International Economics*.

Modeling Services Liberalization: The Case of Kenya, with Edward Balistreri and David Tarr, *Economic Modelling*.

Modeling Services Liberalization: The Case of Tanzania, with Jesper Jensen and David G. Tarr, *Journal of Economic Integration*.

### **In Progress**

A model of traffic congestion, housing prices and compensating wage differentials.

Mixed complementarity formulations of stochastic equilibrium models with recourse, with Alex Meeraus.