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Education:

University of Colorado, PhD, 1976
Indiana University, MA, 1967
Indiana University, AB, 1965

Professional Experience:

Professor, Interdisciplinary Telecommunications Program, College of Engineering and Applied Science, University of Colorado at Boulder, CO, 2004 - present.

Senior Fellow, Columbia Institute for Tele-Information (CITI), Columbia University, New York, NY, 2003 - present.

Visiting Associate Professor in the Media, Communications, and Entertainment Program at Columbia Business School and Director of Research, Columbia Institute for Tele-Information (CITI) – The Sloan Foundation Center on the Telecommunications Industry, Columbia University, New York, NY, 2001-2002.

Distinguished Visiting Faculty, Faculty of Law, University of Toronto, Toronto, Canada, 2001.

Visiting Scholar, Curtin Business School, Curtin University of Technology, Perth Australia, fall 1998.

Associate Professor, Interdisciplinary Telecommunications Program, College of Engineering and Applied Science, University of Colorado at Boulder, CO, 1991- 2004.

Director and Associate Professor, International Center for Telecommunications Management, College of Business Administration, University of Nebraska at Omaha, Omaha, NE, 1989-1991.

Manager Policy Planning, GTE Service Corporation, Stamford, Connecticut, 1987-1989.

Economist, International Telecommunication Union, Geneva, Switzerland, 1985-1986.

Director Policy Research, GTE Service Corporation, Stamford, Connecticut, 1978-1985.

Economist, Department of Commerce, Office of Telecommunication, Policy Support, Boulder, Colorado, 1972 –1978.

Professional Societies:

American Economics Association
International Telecommunications Society (Board Member and former Chairman)
Omicron Delta Epsilon (Economics Honor Society)
Transportation and Public Utilities Group, American Economics Association
Western Economic Association

Publications:

Books/Monographs

Should We Regulate High Speed Internet Access?, (co-editor, Robert Crandall), AEI-Brookings Joint Center for Regulatory Studies, pp. i-viii, 1-331, December 2002.

White Paper on Interconnection (for Japan/United States telecommunications trade dispute) (with Gary Biglaiser, Brian Savin, Tsuruhiko Nambu; and Greg Rosston), Gakushuin University, Tokyo, Japan, 17 July 2000, pp. 1-8.

The New Investment Theory of Real Options and Its Implications for Telecommunications Economics, Regulatory Economics Series, Kluwer Academic Publishers (co-edited with Eli Noam), Boston, MA, pp. i-xi, 1-280, 1999.

Fijacion del Precio de Interconexion/ Acceso: Un Resumen y Critica, Fundación Airtel Móvil, Madrid, 1998.

Temas Importantes para la Competencia en las Telecomunicaciones: Servicio Universal e Interconexión, in *Economía de las Telecomunicaciones*, Fundación Airtel Móvil, Madrid, 1997.

Perspectives on the Telephone Industry: The Challenge for the Future (co-edited with Richard D. Emmerson), Harper Row, New York, NY, pp. i-xviii, 1-324, 1989.

Telecommunications Pricing Primer for Developing Countries, (with Lawrence P. Cole and Neal C. Stolleman), International Telecommunication Union (ITU), Geneva, 1987.

Investing in Telecommunications (editor), Ingidayehu Girmaw and Frank Norman, International Telecommunication Union, Geneva, July 1986.

Information, Telecommunications and Development, (co-editor) International Telecommunication Union, Geneva, February 1986.

The Pricing Structure of Local Telephone Service: An Overview, US Department of Commerce, Office of Telecommunications, OT Special Report, 77-121, 1977.

The Pricing of Local Telephone Service, US Department of Commerce, Office of Telecommunications, OT Special Report, 77-14, pp. i-iv, 1-21, 1977.

The Demand for Local Telephone Service, US Department of Commerce, Office of Telecommunications, OT Report, 76-24, 1977.

Competition in Telecommunications--The Telephone Industry Bill. White Paper, Office of Telecommunications, Executive Office of the President, Washington, DC (with L. Darby and G. Skall), 1976.

The Shadow Price of Electromagnetic Spectrum, U.S. Department of Commerce, Office of Telecommunications, OT Report 74-42, 1974.

Books/Monographs (in process)

Financial Collapse of the Telecommunications Sector: Recommendations for Recovery, (with Eli Noam and Jonathan Liebenau).

Refereed Journal Publications

"Dominant Carrier Market Power in United States International Telephone Markets" (with Gary Madden and Scott Savage), *Applied Economics*, volume 35, April 2003, pp. 665-73.

"Modelling Regulatory Distortions with Real Options," (with Paul Rappoport), *The Engineering Economist*, volume 47, number 4, December 2002, pp. 390-417.

"A New View of Telecommunications Economics," *Telecommunications Policy: The International Journal on Knowledge Infrastructure Development, Management and Regulation*, volume 26, January 2002, pp. 87- 92.

"Real Options, Real Opportunities" *Optimize CMP Media*, New York, NY, volume 1, number 2, January 2002, pp. 57-66.

"Trade Imbalance in International Message Telephone Service," (with Gary Madden and Scott J. Savage), *Applied Economics*, 2000, volume 32, number 10, August 2000, pp. 1311-1321.

"Universal Service: The Poverty of Policy," (with Paul N. Rappoport, and Dennis Weller), *University of Colorado Law Review*, volume 71, number 4, fall 2000, pp. 849-878.

"International Settlements: An Analysis of Rates," *Communications & Strategies*, Special Edition, IDATE, 2nd. Quarter, 1998, Montpellier, France.

"Strategic Alliances and Interconnections: Highlights of a Symposium," *Intermediate*, II, London, February 1995.

"The Determinants of Traffic and Duration in International Telephone Communications," (with Sam Hakim), *Midwestern Business and Economics Review*, fall 1992.

"Procedimientos de Ajuste Alternativo para un Servicio Internacional de Telecomunicaciones: Una Simulacion" (with Paul Rappoport), *Telecomunicaciones*, 1990.

La tarification des telecommunications, (with Lawrence P. Cole and Neal C. Stolleman) *le Bulletin de l'IDATE*, No. 24, août 1986.

"Charging for Local Telephone Calls: How Household Characteristics Affect the Distribution of Calls in the GTE Illinois Experiment," (with R. E. Park, B. M. Mitchell and B. M. Wetzel), *Journal of Econometrics* 22, 1983.

"A Prospective View of Measured Telephone Service," *Public Utilities Fortnightly*, August 1981.

"Getting Together on Local Measured Service," *Telephone Engineer and Management*, May 1980.

Book Chapters

"Network Resilience and its Regulatory Inhibitors," (with Jonathan Liebenau), in *Global Economy and Digital Society*, Erik Bohlin, Sanford L. Levin, N. Sung, and C-H Yoon (eds.) Elsevier, Amsterdam (forthcoming).

"Business Model of Wireless in the USA," *Mobile Communication in Next Generation Wireless Networks*, Düsseldorf, Germany, Valerie Feldmann (ed.), Edward Elgar Publishers, Cheltenham, UK (forthcoming)

"WTP (Willingness-to-Pay) Analysis of Mobile Internet Demand," (co-authored with Paul Rappoport and Lester D. Taylor), *Frontiers of Broadband, Electronic and Mobile Commerce*, Cooper, Russel and Gary Madden (eds.), Physica-Verlag, Heidelberg, Germany (2004), pp. 165 – 180.

"The Internet and the Demand for News: Macro- and Microevidence," (with Paul Rappoport) *Crisis Communications: Lesson from September 11*, A. Michael Noll (ed.), Rowman & Littlefield Publishers, Inc., New York (2004), pp. 151-166.

"Sprint: GTE's Lost Opportunity," (with Lawrence Cole) *The International Handbook of Telecommunications Economics, Volume III: World Telecommunications Markets*, Madden, Gary (ed.), Edward Elgar Publishers, Cheltenham, UK (2003), pp. 137-150.

"Forecasting the Demand for Internet Services," (with Rappoport, P. N., Kridel, D. J., Taylor, L. D., and Duffy-Deno, K.), *The International Handbook of Telecommunications Economics, Volume II: Emerging Telecommunications Networks*, Madden, Gary (ed.), Edward Elgar Publishers, Cheltenham, UK (2003), pp. 55-72.

"Universal Service: A Policy Survey, Review and Critique," (with Rappoport, P. N.), *The International Handbook of Telecommunications Economics, Volume I: Traditional Telecommunications Networks* Madden, Gary (ed.), Edward Elgar Publishers, Cheltenham, UK (2003) pp. 315-336.

"Introduction" (co-authored with Robert Crandall), *Should We Regulate High Speed Internet Access?*, James Alleman and Robert Crandall (eds.), AEI-Brookings Joint Center for Regulatory Studies, (December 2002), pp. 1-8.

"Introduction and Overview," in Alleman and Noam (eds.), *The New Investment Theory of Real Options and Its Implications for Telecommunications Economics*, Regulatory Economics Series, Kluwer Academic Publishers, Boston, MA 1999; pp. xiii-xv.

"The Poverty of Cost Models, The Wealth of Real Options", in Alleman and Noam (eds.), *The New Investment Theory of Real Options and Its Implications for Telecommunications Economics*, Regulatory Economics Series, Kluwer Academic Publishers, Boston, MA 1999; pp. 159-179.

"International Settlements: A Time for a Change" (with Barbara Sorce), in *Telecommunications Transformation: Technology, Strategy and Policy*, Erik Bohlin and Sanford L. Levin (eds.) pp. 189-201, ISO Press, Amsterdam, 1998.

"Telecommunications Demand," (with Alain de Fontenay), in Donald M. Lambertson, (ed.), *New Frontiers in Telecommunications Research*, North Holland, Amsterdam, 1997.

"Alternative Settlement Procedures in International Telecommunications Service," (with Paul Rappoport and Ken Stanley), *Communications Policy in Europe*, Springer-Verlag, Kronberg, FRG, 1990, pp. 129-160.

"Introduction" and "After word," in Alleman and Emmerson (eds.), *Perspectives on the Telephone Industry: The Challenge for the Future*, Harper Row, New York, NY, pp. xvii-xviii and 305-306, 1989.

"Estimating and Linking Economic and Financial Costs in Telecommunications," (with Veena Gupta) in *Regulating Utilities in an Era of Deregulation*, M. A. Crew (ed.), MacMillan, pp. 171-196, 1987.

"Telecommunications in a Fickle Regulatory Environment," (with Leland W. Schmidt) P. C. Mann and H. M. Trebing (eds.), *Changing Patterns in Regulation, Markets, and Technology: The Effect on Public Utility Pricing*, Michigan State University, East Lansing, Michigan 1984.

"Local Loops as a Barrier to Entry," (with E. C. Beauvais) *Challenges for Public Utility Regulation in the 1980s*, *The Institute of Public Utilities*, Michigan State University, East Lansing, Michigan, 1981, pp.

"Local Measured Service: The Telephone Industry's Perspective," (authored for L. W. Schmidt), in *Perspectives on Local Measured Service*, J. A. Baude, et al. (eds.), Telecommunication Industry Workshop Committee, Kansas City, MO, 1979.

Invited Articles

"The Demand for Voice over IP: An Econometric Analysis Using Survey Data on Willingness-to-Pay," (co-authored with Paul Rappoport, Lester D. Taylor, and Donald Kridel), *Telektronikk*, No. 4, (forthcoming).

"The Future of Regulation," *Directions for the Next New Age of Telecom Regulation*, *New Millennium Research Journal*, New Millennium Research Council, Washington, DC. 6 January 2004, pp. 1-7.

"How should telecom companies be valued?," *America's Network Magazine*, 1 October 2003, pp. 8-11.

"An important valuation remedy: Executive stock options," *America's Network Magazine*, 1 October 2003, p. 9

"Real Options, Real Opportunities" *Optimize CMP Media*, New York, NY, volume 1, number 2, January 2002, pp. 57-66.

Articles in Refereed Conference Proceedings

"Household Demand for Wireless Telephony: An Empirical Analysis" (with Paul Rappoport and Lester Taylor), Telecommunications Policy Research Conference 2003, Washington, DC, 21-22 September 2003.

"Information Technology and Communications Financial Meltdown – Lessons for America," International Conference on the Telecommunication Sector in Russia, Centre for Economic and Financial Research, Moscow, Russia, 27 June 2003.

"A Decision Making Criterion Incorporating Real Options," (with Hirofumi Suto and Paul Rappoport), Proceedings of Bell University Laboratory Workshop, University of Waterloo, Waterloo, Ontario, Canada, 28 May 2003.

"Simple Decision Making Criterion as Real Options," (with Hirofumi Suto and Paul Rappoport), Proceedings of International Conference on Computational Intelligence for Financial Engineering (CIFER2003), Hong Kong, 21-23 March 2003.

"Modeling Regulatory Distortions with Real Options: An Empirical Analysis," (with Paul Rappoport) Conference Proceeding of TPRC, The 30th Research Conference on Communication, Information and Internet Policy, Alexandria, Virginia, 28-30 September 2002.

"Regulatory Impediments to Network Resilience," Conference Proceeding of International Telecommunications Society 14th Biennial Conference, Seoul, South Korea, 20 August 2002.

"Modelling Regulatory Distortions: Empirical Results," (with Paul Rappoport) Conference Proceeding of International Telecommunications Society 14th Biennial Conference, Seoul, South Korea, 19 August 2002.

"Modelling Regulatory Distortions with Real Options: DSL versus Cable Modems," International Communications Forecasting Conference: Telecom Forecasting, Markets, and Demand Analysis in an Uncertain Economy, San Francisco, CA, 26-28 June 2002.

"Empirical Estimates of Regulatory Distortions in a Dynamic, Uncertain World," Conference Proceeding of Advanced Workshop in Regulation & Competition, Twenty-first Annual Eastern Conference, Newport, Rhode Island, 22- 24 May 2002.

"International Settlements: A Time for a Change" (with Barbara Sorce), *Proceedings of the Global Networking '97 Conference*, Calgary, Canada, 15 - 18 June 1997 ISO Press, Amsterdam, June 1997. Reprinted in *Telecommunications Transformation: Technology, Strategy and Policy*, Erik Bohlin and Sanford L. Levin (eds.), ISO Press, Amsterdam, , pp. 189-201, 1998.

"The Myth of the Local Loop Bottleneck," *The Proceedings of the 1982 Rate Symposium on Problems of Regulated Industries*, Kansas City, Missouri, February 1982.

Book Reviews

Interconnecting the Network of Networks by Eli Noam, *Journal of Economics*, volume 76, issue 3, December 2002.

Who Pays for Universal Service: When Subsidies Become Transparent by Robert Crandall and Len Waverman, *Information Economics and Policy*, Vol. 12, No. 4, December 2000.

Real Options: Management Flexibility and Strategy in Resource Allocation, by Lenos Trigeorgis, *Information Economics and Policy*, Vol. 11, No. 2, July 1999.

Toward Competition in Local Telephony, by William J. Baumol and J. Gregory Sidak, *Information Economics and Policy*, Vol. 7, No. 2, June 1995

Reports

"Economics of Standards: A Survey and Framework," (with Soontaraporn Techapalokul and Yongmin Chen), International Center for Standards Research (ICSR), University of Colorado, Boulder, CO, June 2001.

"Business Access Line Estimations," (with Michael Quayle) for ICG Communications, Englewood, CO, 17 December 1996.

"Telefónica de España National Demand Analysis: A New Look," (with Paul N. Rappoport and Lester Taylor) for Telefónica de España, October 1994.

"Telecommunications Trade Database: The Asian Pacific Economic Community (APEC)," United States Department of State, Washington, D. C., August 1994.

"Telefónica de España Provincial Demand Analysis," (with Paul N. Rappoport and Lester Taylor) for Telefónica de España, September 1993.

"Telefónica de España National Demand Analysis," (with Paul N. Rappoport and Lester Taylor) for Telefónica de España, August 1993.

"Evaluation of Telephony Costs," Study for University of Colorado Administration, Boulder, CO, 1992.

"Southern Africa Telecommunications/Economics Scoping Study, Task II," U.S. Agency for International Development Contract (with P. N. Rappoport, L. Taylor, M. Mueller, P. Greene, C. Hunt, M. Gerarity), October 1992.

"Jordanian Telecommunications System: The Feasibility of Privatization" Center for Privatization, Washington, D. C. July 1987.

"Recommendations by International Telecommunication Union (ITU) on the Development of Telecommunications Infrastructure for Cameroon," prepared for the International Telecommunication Union on the Cameroon Telecommunications System, Geneva, June 1986.

"Strategic Planning: Project Recommendations and Analyses," Report prepared for the International Telecommunication Union on the Hellenic Telecommunications Organization, Athens, Greece, January 1987.

"Critical Issues in Telecommunication Policy," (with Lawrence P. Cole and Neal C. Stolleman), published as "Report of Pricing Sub-Committee," Paul MacAvoy Chairman, Report of the Task Force on Economics, Technical Advisory Committee, GTE Service Corporation, 1 June 1982.

"Economic Implications and Interrelationships Arising From Policies and Practices Relating to Customer Interconnection, Jurisdictional Separations and Rate Structures," before the Federal Communications Commission: Comments on FCC Docket 20003, Office of Telecommunications Policy, Executive Office of the President, Washington, DC (with others), 1975. Reprinted in *Hearings before Subcommittee on Communications*, House of Representatives, 84th Congress on HR 7047, November 10-11-13-17 and 18, 1975.

Newspaper Articles

"Las Telecomunicaciones en la encrucijada," *Empresas* (Madrid), 13 de agosto de 1996.

"International Settlements: Impact in the Caribbean," *Business Puerto Rico*, San Juan, Puerto Rico, March 1994.

"International Settlements Explained," *African Telecommunications Review*, March 1994.

"Understanding International Settlements," *The Free Press*, (Turks and Caicos Islands), 26 February 1994.

Patents:

Interactive telephone system for optimizing service economy patent, Call-back technology III, patent pending.

Interactive telephone system for optimizing service economy, Call-back technology II, patent number 6,035,027, granted 7 March 2000.

Interactive telephone system for optimizing service economy, Call-back technology I, patent number 5,883,964, granted 16 March 1999.

Presentations:***Scheduled***

“Modelling Regulatory Distortions with Real Options” (with Paul Rappoport), Fifteenth Biennial International Telecommunications Society Conference, Berlin, Germany, 4 - 7 September 2004.

“An Investment Decision-making Criterion Incorporating Real Options,” (with Hirofumi Suto and Paul Rappoport), Fifteenth Biennial International Telecommunications Society Conference, Berlin, Germany, 4 - 7 September 2004.

“Demand for Voice over Internet Protocol: An Econometric Approach,” Fifteenth Biennial International Telecommunications Society Conference, Berlin, Germany, 4 - 7 September 2004.

“Modelling Regulatory Distortions with Real Options: Implications for Telecommunications Policy” (with Paul Rappoport), The 32nd. Research Conference on Communication, Information and Internet Policy, Arlington, VA, 1- 3 October 2004.

Invited/keynote

“Demand for Voice over Internet Protocol: Financial Implications,” Telecom Financial & Asset Management Conference, International Quality & Productivity Center, Denver, 27-28 July 2004.

“Financial Collapse of the Telecommunications Industry: The Role of Infectious Greed,” Global Communications Strategy Forum, University of Texas at Dallas, Richardson, Texas, 5 -7 May 2004

“The Demand for New Telecommunications Services,” (with Paul Rappoport, Lester Taylor, and Donald Kridel), Global Communications Strategy Forum, University of Texas at Dallas, Richardson, Texas, 5 -7 May 2004

“Financial Remedies for Telecommunications Recovery,” Remedies for Telecom Recovery Workshop, ITU Telecom World 2003, Geneva, Switzerland, 12 -18 October 2003.

“Telecommunications Recovery: Financial Remedies,” Remedies for Telecom Recovery Conference, Columbia Institute of Tele-Information, Columbia University, New York, NY, 3 October 2003.

“Telecommunications Financial Recovery,” Telecommunications Policy Research Conference 2003, Washington, DC, 11-22 September 2003.

"The Telecommunications Financial Meltdown: Lessons from America," International Conference on the Telecommunication Sector in Russia, Centre for Economic and Financial Research, Moscow, Russia, 27 June 2003.

"A Decision Making Criterion Incorporating Real Options," (with Hirofumi Suto and Paul Rappoport), Bell University Laboratory Workshop, University of Waterloo, Waterloo, Ontario, Canada, 28 May 2003.

"Household Demand for Wireless Telephony: An Empirical Analysis," (with Paul Rappoport), International Symposium on Advanced Radio Technologies, Boulder, CO, 7 March 2003.

"Obstacles to Remedies of the TMT Financial Crisis," Competitive Dynamics & the Financial Recovery of the Communications Sector, London Business School, London, UK, 4 March 2003.

"Regulatory Distortions in Communications," WEFA/DRI International Conference, IT & Telecom Issues on Regulation, New York, NY, 30 October 2002.

"Telecommunications Stock Market Volatility: Irrational Exuberance?," Communications Research Forum 2002, Canberra, Australia, 2 - 3 October 2002.

"Media Policy," Formulating a Research Agenda for Communication Policy, Federal Communications Commission, Washington, D.C. 27 September 2002.

"Business Model of Wireless in the USA," Second Transatlantic Dialogue: Düsseldorf - New York; Mobile Communication in Next Generation Wireless Networks, Düsseldorf, Germany, 28 February 2002.

"Broadband Demand: The View from the USA," Telecom-Internet-Media: Time for Broadband? International Conference of IDATE, 22-23 November 2001, Montpellier, France.

"Application of Real Options in the Telecommunications Industry," The Fifth National Conference on Real Options: Leveraging Uncertainty in a Volatile Economy, International Quality & Productivity Center, New Orleans, 15 October 2001.

"Valuation with Uncertainty: A New Approach," Faculty of Law, University of Toronto, Centre for Innovation Law and Policy's Roundtable, Toronto, Canada, 12 October 2001.

"Real Options and Investments in Telecommunications," the Gardner Lecture Series, University of Denver & Alan Gerry Cable Telecommunications Center of the National Cable Television Center and Museum, Denver, CO, 7 March 2001.

"The Digital Divide and Economic Development," ITS 2000, Buenos Aires, Argentina (Plenary panel), 7 July 2000.

"Voice over the Internet (VoIP): An Application of Real Options" (with Hakju Kim), ITS 2000, Buenos Aires, Argentina, 6 July 2000.

"Real options and Long-run Incremental Costs," Broadband/Interconnection Symposium, Tokyo, Japan, 1 June 2000,

"Implication of New Valuation Techniques on Estimation," International Communications Forecasting Conference, Denver, CO, 16 - 18 June 1999.

"Real Options Application to Cost Modelling: A Review of the NERA Model," Department of Communications and Information Technology, Telecommunications Research Unit, Canberra, Australia, 22 January 1999.

"Implication of Real Options Methodology for Cost Models," Real Options Workshop, Columbia University, New York, 2 October 1998.

"International Telecommunications: Implications for Off-Shore Banking," On-Line Offshore 98: Electronic Commerce, Intellectual Property, Tax Efficiency and the Offshore World, Grand Cayman 27-30 April 1998.

"Universal Service Worldwide," On-Line Offshore 98: Electronic Commerce, Intellectual Property, Tax Efficiency and the Offshore World, Grand Cayman 27-30 April 1998.

"Applying Customer Profiles for Competitive Advantage," Market Forecasting & Competitive Intelligence for the New Telecommunications Industry Seminar, Organized by Institute for International Research, Dallas, Texas, 28 - 30 October 1996.

"The Telecommunications Act of 1996 (USA): A Paradigm of Deregulation?" International Telecommunications Society Biennial Conference, Seville, Spain, 20 June 1996.

"Competition, Universal Service, and Interconnection: A Critique of the United States Telecommunications Act of 1996," public lecture sponsored by Telefónica de España, Madrid, Spain, 30 May 1996.

"Telecommunications Impact on Small and Medium Size Businesses," INEX, Seoul, Korea, 23 May 1996.

"Access Pricing: A Survey and Critique," Electric and Telecommunications Research Institute (ETRI), Taejon, Korea, 21 May 1996.

"Internet Pricing," Public Policy & Corporate Strategy for the Information Economy, Teleport '96, Tokyo, Japan. 13 –15 May 1996.

"Role of Telecommunications in Development: Overview of Recent Empirical Analysis," "Empirical Evidence of the Role of Telecommunications in Development: Part 1: Southern African Results," and "Empirical Evidence of the Role of Telecommunications in Development: Part 2 South East Asia World Bank Results," (with Joe Park), Workshop on Economic Quantification of the Impact of Telecommunication in Development, International Centre for the Study of Theoretical Physics, Trieste, Italy, Conference, 26 February - 1 March, 1996.

"Universal Service: A Critique," Rethinking State and Local Telecommunications Policy Conference sponsored by the Communications Initiative, University of Colorado, Boulder, CO, 11 – 12 December 1995.

"The Kiwi Share Obligation: A Critique," Interconnection and InterOperative Workshop, Wellington, New Zealand, 18 – 20 October 1995.

"Predicción de la demanda en Telecomunicaciones" (Forecasting the Demand for Telecommunications), La posibilidad de predicción en la ciencia económica, Universidad Nacional de Educación a Distancia, Ávila, Spain, 10 – 14 June 1995.

"Telecommunications Demand & Forecasting in a Dynamic Environment," *International Forecasting Conference*, Toronto, Canada, 14 – 16 June 1995.

"Interconnection and Incentive Regulation: An Overview" International Telecommunications Society Workshop on Interconnection, Wellington, New Zealand, 10 – 12 April 1995.

"Telecommunications Role in Economic Development: A Focus on the South," University of Mississippi, Jackson, Mississippi, November 1994.

"Universal Service: Déjà Vu: A Critique of 'Can Universal Access Survive in a Competitive Environment?' by Frank A. Wolak," discussant Networks and Competition Seminar, Institut D'Economie Industrielle, Toulouse, France, 20 – 22 October 1994.

"International Telecommunications Overview," Public Utilities Regulatory Training Institute, University of Wyoming and US West, Denver, CO, 25 May 1994.

"Privatization: Policy Guidelines," Ukrainian Delegation under sponsorship of United States Department of State, Washington D. C., 2 June 1993.

"International Telecommunications: An Overview," WEFA (formerly Wharton Econometric and Forecasting Associates, now Global Insight), Philadelphia, PA, 8 November 1993.

"Privatization and Regulation: Implications for Latin America," Organization of American States Conference on Telecommunications Technologies and Management, Miami, FL, 5 December 1990.

"Impact of Changes in the Present Global Tariffing Patterns," Center for Strategic & International Studies Conference on International Telecommunications Tariffs, Washington, DC, 12 October 1990.

"Restructuring of Telecommunications Administrations," The Emerging Link Conference sponsored by U.S. Department of Commerce. Atlanta, Georgia, April 1990.

"Economic and Regulatory Theory and Practice with Application to Telecommunications," Hungarian delegation sponsored by World Bank; Omaha, NE, November 1989

Refereed Conference Presentations

"An Investment Decision-Making Criterion Incorporating Real Options," (with Hirofumi Suto and Paul Rappoport), Real Options: Theory meets Practice, 8th Annual International Conference, Montréal Canada, June 17-19, 2004

"Estimating the Demand for VoIP services," (with Paul Rappoport and Lester Taylor), Competition in Networking: Wireless and Wireline Conference, London Business School, London, 13 – 14 May 2004.

"Estimation of Price Elasticities of Mobile Internet Demand Using Data on Willingness-to-Pay Data," (co-authored with Paul Rappoport and Lester D. Taylor), Telecommunications Policy Research Conference 2003: The 31st Research Conference on Communication, Information and Internet Policy Washington, D.C. 21 September 2003.

"Financial Collapse of the Telecommunications Sector: Obstacles to Recovery," Western Economics Association, Denver, CO, 12 July 2003.

"Financial Recovery of the Technology, Media, and Telecommunications Sector," (with Scott Savage) Network Industries under Siege: Reforming Regulatory Structure, 16th Annual Western Regulatory Conference (of Rutgers University), San Diego, California, June 25-27, 2003.

"The Analysis of Mobile Internet Demand Using Data on Willingness-to-Pay," (with Paul Rappoport and Lester D. Taylor), ITS Asia-Australasian Regional Conference, Perth, Australia, 22 -25 June 2003.

"Simple Decision Making Criterion as Real Options," (with Hirofumi Suto and Paul Rappoport), Proceedings of International Conference on Computational Intelligence for Financial Engineering (CIFEr2003), Hong Kong, 21-23 March 2003.

"Modeling Regulatory Distortions with Real Options; An Empirical Analysis," (with Paul Rappoport) TPRC, The 30th Research Conference on Communication, Information and Internet Policy, Alexandria, Virginia, 28-30 September 2002.

"Regulatory Impediments to Network Resilience," International Telecommunications Society 14th Biennial Conference, Seoul, South Korea. 20 August 2002.

"Modelling Regulatory Distortions: Empirical Results (with Paul Rappoport)," International Telecommunications Society 14th Biennial Conference, Seoul, South Korea. 19 August 2002.

"Modelling Regulatory Distortions with Real Options: DSL versus Cable Modems," International Communications Forecasting Conference: Telecom Forecasting, Markets, and Demand Analysis in an Uncertain Economy, San Francisco, 26-28 June 2002.

"Empirical Estimates of Regulatory Distortions in a Dynamic, Uncertain World," Advanced Workshop in Regulation & Competition, 21st Annual Eastern Conference, Newport, Rhode Island, 22 - 24 May 2002

"Economics of Standards: A Survey and Framework," Second IEEE Conference on Standardization and Innovation in Information Technology, Boulder, CO, 3 - 5 October 2001.

"Regulatory Distortions under Uncertainty," Information Infrastructure and Sustainable Development: Challenges to Government Policy and Corporate Strategies, International Telecommunications Society, Asia-Pacific Regional Conference, Hong Kong, 6 July 2001.

"Regulation under Uncertainty: A Real Options Approach," Telecommunications and E-Commerce: Trade and Development in a Knowledge-Based Economy, International Telecommunications Society, Asia-Indian Ocean Regional Conference, Perth, Australia, 2 July 2001.

"Universal Service: The Poverty of Policy," University of Colorado Telecommunications Law for the Twenty-first Century Symposium, Boulder, CO, 6 -7 February 2000.

"Estimating Market Power in United States International Telephone Markets," (with Gary Madden and Scott J. Savage) Telecommunications Policy Research Conference, Alexandria VA, 24 - 27 September 1999.

"Market Power in United States International Telephone Markets," (with Gary Madden and Scott J. Savage) International Communications Forecasting Conference, Denver, CO, 16 - 18 June 1999.

"International Settlements: Alternative Settlement Mechanisms," ITS 1998, Beyond Convergence, Stockholm, 22 - 24 June 1998.

"Trade Imbalances in International Message Telephone Services," (with Gary Madden and Scott Savage) ITS 1998, Beyond Convergence, Stockholm, 22 - 24 June 1998.

"Real Options and Cost Models," Consortium for Research on Telecommunications Policy and Strategy: Fourth Annual CRTPS Conference, Ann Arbor, Michigan, 5 - 6 June 1998.

"International Settlements: An Analysis of Rates," Eleventh Annual European Communications Policy Research Conference, Venice, Italy, 16 - 17 March 1998.

"International Settlements: A Time for a Change," (with Barbara Sorce), The Global Networking '97 Conference, Calgary, Canada, 15 - 18 June 1997.

"International Settlements: An Analysis of Alternatives," Workshop on International Settlements, London Business School, London, England, 17 - 18 November 1997.

"Role of Telecommunications in Development: Empirical Evidence," (with Joe Park), Information Infrastructure Conference, University of Michigan, Ann Arbor, Michigan, 10 -11 March 1995.

"Role of Telecommunications in Development: The Case of Southern Africa," International Telecommunications Society's Tenth Biennial Conference, Sydney, Australia, 4 - 6 July 1994.

"International Settlement: The View from America," International Telecommunications Society's Ninth Biennial Conference, Sofia Antipolis, France, 16 June 1992.

"The Demand for International Telecommunications Service," The International Symposium on Forecasting, New York, NY, 9 - 12 June 1991.

"Workshop: International Settlements," Pacific Telecommunications Conference, Honolulu, HI, 15 January 1991.

"The Demand for International Telecommunications Services," (with Paul Rappoport), Bell Communication Research/Bell Canada Conference on Telecommunications Demand Analysis with Dynamic Regulation, Hilton Head, South Carolina, 22 - 25 April 1990.

"Simulation of Alternative Settlement Procedures for International Telecommunications Service: A Simulation," (with P. Rappoport) International Telecommunications Society Eighth International Conference, Venice, Italy, 18-21 March 1990.

"Alternative Settlement Procedures in International Telecommunications Service," Fundesco Conference, Madrid, Spain, January 1990.

"International Telecommunications Policy Options," Third World Studies Conference University of Nebraska, Omaha, Nebraska, October 1989.

"Alternatives For International Settlements," (with Paul N. Rappoport and Kenneth B. Stanley), International Telecommunications Society Regional Conference, Ottawa, Canada, June 1989.

"Alternative Settlement Procedures in International Telecommunications Service," (with Paul Rappoport and Kenneth B. Stanley), International Telecommunications Futures Symposium, Omaha, NE, June 1989.

"Simulation of Alternative Settlement Procedures for International Telecommunications Service," (with Paul N. Rappoport and Kenneth B. Stanley), International Telecommunications Society Regional Conference, Louvain, Belgium, April 1989.

"Efficiency of Rural Telephone Companies: An Estimate of a Frontier Production Function for Telephone Service," The Second NARUC Biennial Regulatory Information Conference, Ohio State University, Columbus, Ohio, September 1980.

"The Effect of Local Measured Service on the Distribution of Residential Telephone Use in the GTE Illinois Experiment" (with R. Park and B. Mitchell), Seventh Annual Telecommunications Policy Research Conference, Skytop, Pennsylvania, April 1979.

"The Economics of Local Measured Service," France Telecommunications & AT&T's Forecasting Conference, Paris, France, May 1979.

"Self-selecting Local Telephone Prices," (with J. Jensik), First NARUC Biennial Regulatory Information Conference, October 1978.

"Introduction to Recent Empirical Work in Telephone Common Carriage," Fifth Annual Telecommunications Policy Research Conference, Airlie, Virginia, 1977.

"The Demand for Telephone Service," British Telecommunications & AT&T's Forecasting Conference, Windermere, England, 1976.

"Cost of Telephone Common Carriage," Fifth Annual Telecommunications Policy Research Conference, Airlie, Virginia, 1976.

Conference/Workshop Presentations

"Financial Meltdown of the Telecommunications Sector: Remedies for Recovery," Telecommunications Policy Research Conference 2003: The 31st Research Conference on Communication, Information and Internet Policy Washington, D.C., 20 September 2003.

"Financial Collapse of the Telecommunications Sector: Obstacles to Recovery," Workshop III: Remedies for Telecommunications Financial Crisis, Columbia University, New York, NY, 27 March 2003.

"Reducing Financial Uncertainty: Framework," Workshop II: Remedies for Telecommunications Financial Crisis, Columbia University, New York, NY, 28, February 2003.

"Reducing Financial Uncertainty: Overview of Issues," Workshop I: Remedies for Telecommunications Financial Crisis, Columbia University, New York, NY, 25 January 2003.

"Irrational Exuberance: Causes of the Industry's New Volatility," The New Telecommunications Industry and Financial Markets: From Utility to Volatility, Columbia University, New York, NY, 30 April 2002.

"Questions Regarding *Broadband: Bring Home the Bits*," (with Robert Blau) National Academy of Science's Broadband Report Round Table, Columbia University, New York, NY, 18 March 2002.

"Regulatory Distortions: An Overview," Media Seminar, School of Journalism, Columbia University, New York, NY, 27 November 2001.

"The Next Frontier: Opening Wireless Communications," (with Eli Noam) Telecommunications Policy Research Conference, Alexandria, VA, 29 October 2001.

"Regulatory Distortions: Implications for Broadband," Broadband Economy Conference, Columbia Institute for Tele-Information, Columbia University, New York, NY, 26 October 2001.

"Communications Issues in Disaster Recovery: Overview," Workshop on Disaster Recovery: Communications and Information Systems in the Financial Industry: Lesson from the City of London and the World Trade Center Attacks, Columbia Institute for Tele-Information Workshop, Columbia Business School, Columbia University, New York, NY, 17 October 2001.

"The Digital Divide: An Inhibitor of Growth?" Columbia Institute for Tele-Information, Columbia Business School, Columbia University, New York, NY, 11 June 2001.

"Telecommunication Curriculum Roundtable: Academic Seminar" and "Engineering/Technology in the Telecommunications Curriculum," National Cable Television Association Convention, Chicago, IL, 6 June 2001.

"Broadband Demand: Introduction to a Methodology," Broadband Demand Workshop, Columbia Institute for Tele-Information, Graduate Business School, Columbia University, New York, NY, 3 May 2001.

"Internet Service Providers: A Sectoral Example" Workshop on Policies for Indonesian Economic Institutional Building, School of International and Public Affairs, Columbia University, New York, NY, 23 April 2001.

"Critique of *Finance: Just in Time Finance* by Hugo Dixon," CITI, Columbia Business School, Columbia University, New York, NY, 26 March 2001.

Seminars/Others

"Dot Coms' Financial Meltdown," Fifty-third Annual Conference on World Affairs: The Power of an Idea, Boulder, CO, 9 March 2003.

Briefing on USA's telecommunications policy, Ed Richards, Senior Policy Adviser, Policy Directorate, Prime Minister's Office, 10 Downing Street, London, UK, 4 March 2003.

"Obstacles to Remedies of the TMT Financial Crisis," Strategy in Turbulent Times, London Business School, London, UK, 4 March 2003

Briefing on USA's Regulatory Policy, Lord David Currie, Chairman, OFCOM, House of Lords, London, UK, 4 March 2003.

Telecommunications Strategies in Today's Markets Seminar, BT Roundtable, London, UK, 3 March 2003.

"Broadband Policy in the United States," The National Office for the Information Economy, Canberra, Australia, 4 October 2002.

"Telecommunications Policy in the United States: Implications for Japan," for Highway Industry Development Organization (HIDO) (an affiliated research institute of the Ministry of Construction and Transport) and NTT America, New York, NY, 26 September 2002.

"Real Options and Finance Part I" and "Real Options and Finance Part II," undergraduate and graduate finance courses, University of Denver, 6 March 2001, Denver, CO.

Tutorial: "Real Options and Implications for Regulation." 28th Annual Telecommunications Policy Research Conference, 23 September 2000, Alexandria, VA.

"Real Options and Applications to Network Economics" Seminar, 21 September 2000, CITI, Columbia University, New York, NY.

"Pricing of Broadband/Internet Services: Cable Modem Role," (with Tim Brown) Cable Labs, 24 August 2000, Louisville, CO.

"Real Options," Level (3) Communications, 23 August 2000, Broomfield, CO.

"Broadband Demand Estimation," (with Lester Taylor), Level (3) Communications, Broomfield, CO, 31 July 2000.

"Real Options and Interconnection Prices," Experts Seminar, Gakushuin University, 31 May 2000, Tokyo, Japan.

"Real Options and Its Implications for Cost Modeling," Nippon Telephone and Telegraph (NTT), 29 May 2000, Tokyo, Japan.

"Real Options Application to Cost Modelling," École Nationale Supérieure des Télécommunications (Graduate School of Telecom Engineering), Paris France, 5 May 1999.

"Real Options Application to Telecommunications," seminar, La Trobe University, Melbourne, Australia, 14 January 1999.

"Telecommunications in the Millennium," School of Business, Curtin University, Perth, Australia, 18 November 1998.

"Challenges for the Universities, Telecommunications Management: Skills for the Information Age," Research Symposium, Murdoch University, School of Business, Perth, Australia, 16 November 1998.

"International Settlements: An Overview" Seminar, Business School, Curtin University of Technology,

22 October 1998.

"Telecommunications Privatization and Regulation: An Overview," Korean Telecom Executive Management Seminar, Seoul, Korea, 9 December 1994.

Teaching/Training:

Faculty of Law, University of Toronto, graduate intensive course, Telecommunications Economics: Information and Networks, Toronto, Canada, 24 –28 September and 9 – 12 October 2001.

DaCom, Telecommunications Program I & II, University of Denver, Denver CO, 5 December 2000.

DaCom, Telecommunications Industry Overview & Analysis I, II, & III, Regis University, Broomfield, CO, 8-9 June 2000.

"Real Options: Applications to Network Economics" Seminar, Scuola Superiore G. Reiss Romoli S.p.A., Coppito (Rome) Italy, 23 –25 June 1999.

"Telecommunications Economics Pricing," Training Courses for Telefonos de Mexico, Mexico City, Mexico, 3-4 April 1998.

Teaching/training programs for SK Telecom (formerly Korean Mobile Telephone). Korean Mobile Telephone BMD Development Program: Telecommunications Economics and Finance Courses, University of Colorado, Boulder, CO, 1995 – 1997.

DaCom, Telecommunications Economics, Sponsored by the Economics Institute, Boulder, CO 1997.

"Telecommunications Economics Principles," Training Courses for Polish Telecommunications Authority, Krakow and Poznan, Poland for U.S. Agency for International Development, 10 - 14 and 24 - 28 June 1996.

"Universal Service and Interconnection," Telecommunications Short Course sponsored by Fundación Airtel Móvil & Alfonso X el Sabio Universidad, Madrid, Spain, 28 May 1996.

"Principles of Network Economics," Training Course for Singapore Telecommunications Training Institute, Singapore, 22 - 26 April 1996.

"Basic Engineering Economics for Telecommunications Professionals," video lectures for a Distance Learning course for Eastern Europe Program (Distributed by Tele/Telematic), Washington, D.C., 1995.

"Principles of Telecommunications Economics: An Overview," Overseas Telecommunications Executives for the United States Telecommunications Training Institute, Washington, D. C., 10 August 1994.

"Principles of Telecommunications Economics," Training Course for Singapore Telecommunications Training Institute, Singapore, 12 - 16 December 1994.

Telecommunications Economics Principles, United States Telecommunications Training Institute, Boulder, CO, 6 August 1992.

"The Economic Guidelines for Restructuring the Telecommunications Sector," presented in Budapest, Sofia and Warsaw on behalf of the U.S. State Department, Bureau of International Communication and Information Policy with support of the U.S. Agency for International Development, 21-24 July and 24-25 September 1991.

Testimony:

"Alternative Operator Service: Role of Competition," for One Call & OptiCom Communications, Indiana Public Service Commission. Indianapolis. IN, December 14 - 15, 1995.

"Exchange Telephone Service Costs," Illinois Commerce Commission, Springfield, IL. March 1983.

"Usage Sensitive Service: Effect of Usage Sensitive Pricing on Local Telephone Traffic -- An Overview," Wisconsin Public Service Commission. February 1982.

"Impact of Competition on the Telecommunications Industry," U.S. House of Representatives, Subcommittee on Telecommunications, 1977.

Conferences/seminars hosted and organized:

"Turmoil in the Telecommunications Industry: Implications for Developing Nations" (with Rajni Gupta), Columbia University, New York, NY, 8 May 2003.

Workshop III: Remedies for Telecommunications Financial Crisis, Columbia University, New York, NY, 27 March 2003.

"Strategy in Turbulent Times: Remedies for Telecommunications Financial Crisis" (with Len Waverman), London Business School, London, England, 4 March 2003.

Workshop II: Remedies for Telecommunications Financial Crisis, Columbia University, New York, NY, 28 February 2003.

Workshop I: Remedies for Telecommunications Financial Crisis, Columbia University, New York, NY, 25 January 2003.

Economics of Scale and Scope in Telephone Access, CITI, Columbia University, New York, NY, 17 December 2002.

Standards in a Telecommunications Curriculum? (with Tim Schoechle), CITI, Columbia University, New York, NY, 9 September 2002.

Real Options, Decision Analysis and DSL, Hirofumi Suto, CITI, Columbia University, New York, NY, 3 September 2002.

Network Externalities and the Internet, Gary Madden and Russel Cooper, CITI, Columbia University, New York, NY, 7 May 2002.

"The New Telecommunications Industry and Financial Markets: From Utility to Volatility," CITI, Columbia University, New York, NY, 30 April 2002.

"National Academy's Broadband Report Round Table," CITI, Columbia University, New York, NY, 18 March 2002.

"Whither Telecommunications Sector Investment?" CITI, Columbia University, New York, NY (Co-organized with Alain de Fontenay & Brian Savin), 4 March 2002.

"Workshop Resilience in Communication Networks in Times of Disaster," CITI, Columbia University, New York, NY (Co-organized with Jonathan Liebenau), 20 February 2002.

"Telecommunications Law in the Internet Age" CITI Panel, Columbia Business School, Columbia University, New York, NY, 8 November 2001.

"Broadband Policy" CITI Conference, Columbia Business School, Columbia University, New York, NY, 26 October 2001.

"The Mobile Internet," CITI Workshop, Columbia Business School, Columbia University, New York, NY, 25 October 2001.

"Disaster Recovery: Communications and Information Systems in the Financial Industry: Lesson for the City of London and the World Trade Center Attacks." CITI Workshop, Columbia Business School, Columbia University, New York, NY, 17 October 2001.

"The Digital Divide: An Inhibitor of Economic Growth?" CITI Conference, Columbia Business School, Columbia University, New York, NY, 11 June 2001.

"Demand for Broadband Telecommunications Services," CITI Workshop, Columbia Business School, Columbia University, New York, NY, 3 May 2001.

"Iridium: Infrastructure for the Developing World," CITI Seminar, Columbia Business School, Columbia University, New York, NY, 25 April 2001.

"Media/Telecommunications Finance: Understanding the Key to Business and Investment," CITI Workshop, Columbia Business School, Columbia University, New York, NY, 26 March 2001.

"Mobile Media Marketing: Translating Consumer Behavior into Business Strategy," CITI Seminar, Columbia Business School, Columbia University, New York, NY, 20 March 2001.

"Stakeholders' Workshop on Converging Interconnection Pricing," (invitation only Workshop) Washington, DC, 13 December 2000

"Real Options Workshop," hosted by Columbia University, Columbia Business School and co-sponsored by Interdisciplinary Telecommunications Program, University of Colorado, New York, NY, 2 October 1998.

Symposium: Game Theoretic Approach to Telecommunications," co-sponsored by the International Telecommunications Society, University of Colorado, 8 January 1995. (This led to a two and-a-half million dollar (\$2,500,000) contract with SK Telecom, formerly Korean Mobile Telecom, to train its executives at the University of Colorado facilities in Boulder.)

"Economic and Regulatory Theory and Practice with Application to Telecommunications," high level Hungarian delegation sponsored by World Bank; Omaha, NE, November 1989

"First International Telecommunications Futures Symposium," sponsored by International Center for Telecommunications Management, University of Nebraska at Omaha, June 1989.

"Local Exchange Pricing: The Challenge of the Future," Conference sponsored by the United States Telephone Association, Exchange Carrier Alternative Pricing Concepts Committee, New Orleans, 16-18 November 1987.

Developed the TELECOM '87 FORUM, Part IV (Telecommunications Economic Financial Seminar) for International Telecommunication Union held in Geneva, October 1987.

Telecommunication Industry Workshop, Kansas City, MO, Workshop sponsored by the GTE Telephone Operations and AT&T, Kansas City, KA, October 1979.

Journal Reviewer:

Engineering Economics

European Journal of Law and Economics

Information Economics and Policy

Journal of Economic Dynamics and Control

The International Journal on Media Management

Telecommunications Policy

Other:

Wall Street Journal interview on financial recovery of the telecommunications industry by Dennis K. Berman, 7 October 2003.

Wall Street Journal interview on telecommunications industry by Jesse Drucker, 28 July 2003.

Telephony Magazine, interview on the financial recovery of the telecommunications by Ed Gubbins, 23 June 2003.

Forbs Magazine, interview on Baby Bells and the CALLS proposal by Steve William, 24 February 2003.

Wall Street Journal interview on telecommunications industry by Jesse Drucker, 19 December 2002.

Albany Times Union, interview on VoIP and Vanage (a VoIP company) by Ken Aaron 16 December 2002.

Wall Street Journal interview on wireless consolidation by Jesse Drucker, 26 November 2002.

Dow Jones News Wire (*Wall Street Journal*) interview on telecommunications industry by Mark Hopkins 15 November 2002.

Outstanding Teacher Award, Korean Interdisciplinary Telecommunications Alumni Association, 22 August 2002.

Guest Commentator (on telecommunications and the stock market), NPR, Marketplace, Morning Edition, 29 July 2002.

Guest Commentator on AOL Time Warner probe by the SEC, BBC Television News Hour, 24 July 2002.

Radio interview, Curtin 927 6NR, Curtin University, Perth, Australia, 7 November 1998.