

APPENDIX A: CURRICULUM VITAE OF DANIEL RUBINFELD

CONFIDENTIAL

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Curriculum Vitae

DANIEL L. RUBINFELD

PRESENT POSITIONS:

Robert L. Bridges Professor of Law, Professor of Economics,
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ACADEMIC STUDIES: Princeton, Mathematics, B.A., June 1967
M.I.T., Economics, M.S., September 1968
M.I.T., Economics, Ph.D., June 1972

TEACHING EXPERIENCE:

Suffolk University, Boston, Massachusetts
Full-time Economics Instructor, 1968-70
Wellesley College, Wellesley, Massachusetts
Full-time Economics Instructor, 1970-71
University of Michigan, Ann Arbor, Michigan
Assistant Professor of Economics, 1972-77
Associate Professor of Economics and Law, 1977-82
Professor of Economics and Law, 1982-83
Research Associate, Institute of Public Policy Studies, 1972-82
University of California, Berkeley, 1983 - present
Robert L. Bridges Professor of Law and Professor of Economics, 1983-Present
Stanford University
Visiting Professor of Law, Spring 1989 (Economics and Public Policy)
University of Geneva
Visiting Professor, May 1991 (Antitrust Law and Economics)
Swiss National Bank, Studienzentrums Gerzensee (one week for each visit)
Visiting Professor of Law and Economics, Spring 1995-97 (Economics of Private Law), 2002
(Political Economy of Federalism), 2004, 2007 (Competition Law and Economics), 2009
(Competition Law and Economics)
New York University
Visiting Professor of Law, Spring 1999, Fall 2000, 2003, 2005-2006, 2008-2010
(Quantitative Methods in Law, Antitrust Law and Economics)

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University of Virginia
Visiting Professor of Law, January 2004 (Antitrust Law and Economics)
University of Hamburg
Visiting Professor of Law, May 1999, 2002 (Quantitative Methods), June, 2008 (Antitrust Law and Economics)
University of Bergen
Visiting Professor of Law, August 2006, August 2007, August 2008, August 2010
Catholic University of Portugal, Lisbon
Visiting Professor of Law, April 2009, April 2010
Kiev School of Economics
Visiting Professor, April 2010

GOVERNMENT POSITIONS

Economist, Staff of President's Council of Economic Advisers, Summer 1969
Deputy Assistant Attorney General, Antitrust Division, U.S. Department of Justice, June 1997-Dec 1998

GOVERNMENT CONSULTING

Member, Ann Arbor Rent Control Study Commission, 1973
Consultant, Urban Institute, 1973
Consultant, U.S. Treasury, Program in State and Local Finance, 1984-85
Consultant, National Academy of Sciences, Panel on Taxpayer Compliance, 1985-86
Consultant, U.S. Consumer Product Safety Commission, Safety of All-Terrain Vehicles, 1987-88
Consultant and Lecturer, Federal Judicial Center, 1993-97, Use of Regression Analysis by the Courts
Consultant, World Bank (South Africa Mission), 1995-1997
Consultant, Antitrust Division, 1999, *U.S. v. Microsoft*
Consultant, Competition Directorate, European Union, 2003-2004, Merger Simulation
Lecturer, Federal Trade Commission, June-July, 2003, Antitrust Economics
Consultant, Federal Trade Commission, Antitrust Division, Dept. of Justice, 2000-2009, various investigations

OTHER POSITIONS HELD:

Research Assistant, William G. Bowen, 1966-67
Research Assistant, Paul A. Samuelson, 1971
Consultant, M.I.T.- Harvard, Joint Center for Urban Studies, Spring and Summer, 1972
Consultant, Urban Institute, 1973
Consultant, National Academy of Sciences, Committee on the Costs of Automobile Emission Control, Summer 1974
Consultant, National Academy of Sciences, Panel on Statistical Assessments as Evidence in the Courts, 1984
Consultant, National Academy of Sciences, Panel on Taxpayer Compliance, 1985-86
Chair, Program in Law and Economics, UC Berkeley, 1986-97, Co-Chair, 2000-

Member, National Academy of Sciences, Working Panel on Field Experimentation in Criminal Justice, 1986-87
Chair, Program in Jurisprudence and Social Policy, U.C. Berkeley, 1987-1990, 1998-1999
Member, Board of Directors, American Law and Economics Association, 1994-1996, 2001-2003
Secretary-Treasurer, American Law and Economics Association, 2003-2004
Vice President, American Law and Economics Association, 2004-2005
President, American Law and Economics Association, 2005-2006
Vice Chair, ABA Section on Antitrust, Committee on Economics, 1997-1999
Member, National Academy of Sciences, NSF Blue Ribbon Commission on Digital Preservation,

ACTIVITIES AND HONORS:

Princeton University, 1967, Magna Cum Laude, Phi Beta Kappa
Woodrow Wilson Fellow, 1967
National Science Foundation Fellowship, 1968-69
National Science Foundation Dissertation Fellowship, 1971-72
Winner, National Tax Association, Outstanding Doctoral Dissertation Award, 1972
Research Fellow, National Bureau of Economic Research, Cambridge, Massachusetts, 1975-76
Editorial Board, Public Finance Quarterly, 1980-2003
Editorial Board, Law and Society Review, 1982-1985, 1989-1999
Advisory Panel, NSF, Program in Law and Social Science, 1982-84
Editorial Board, Evaluation Review, 1985-1987
Faculty Advisory Board, U.C. Berkeley, Center for Real Estate and Urban Economics, 1983-97, 2000-
Co-Editor, International Review of Law and Economics, 1987-2003
Lecturer, California Continuing Judicial Studies Program, 1988-1989
Oversight Panel, NSF Program in Law & Social Science, 1988
Board of Directors, LECG, 1995-1997
Board of Directors, Atlas Assets, Inc., 1989-1997, 1999-2008
Member, Correspondent Comm., Interuniversity Consortium for Political & Social Research, 1991-
Editorial Board, Law and Social Inquiry, 1992-1999, 2002-2004
Fellow, Center for Advanced Study in the Behavioral Sciences, 1992-93
Ida Beam Distinguished Lecturer in Law and Economics, University of Iowa, Spring 1995
John Simon Guggenheim Fellowship, 1995
Faculty Advisory Board, UC Berkeley, Burch Ctr. for Tax Policy & Public Finance, 1994-97, 1999-
Elected to American Academy of Arts and Sciences, 2001
Advisory Council, Master Program on Law & Economics, Universidad de Buenos Aires, 2003-
Research Associate, Law School, Australian National University, 2003-
Editorial Board, Journal of Australian Economic Education, 2003-
Editorial Board, The Reviews of Law and Economics, 2004-
Fellow, National Bureau of Economic Research, 2004-
Member, International Academic Council, U. of St. Gallen, Masters in Law & Economics, 2005-
Honorary Doctorate, U. of Basel, November 2008.
Co-Editor, Journal of Legal Analysis, 2008-

PUBLICATIONS:

Books

1. STATISTICAL ANALYSIS OF ECONOMIC AND FINANCIAL DATA, Dynamics Associates, Cambridge, 1971, Revised Edition, 1974.
2. ECONOMETRIC MODELS AND ECONOMIC FORECASTS (with Robert S. Pindyck), McGraw-Hill, January 1976. Second Edition, 1981, Spanish, Japanese, and Chinese versions available; Third Edition, 1990; Fourth Edition, 1998.
3. ESSAYS ON THE LAW AND ECONOMICS OF LOCAL GOVERNMENTS (Editor), COUPE Papers on Public Economics, Urban Institute, December 1979.
4. AMERICAN DOMESTIC PRIORITIES: AN ECONOMIC APPRAISAL (Co-editor with John M. Quigley), University of California Press, 1985.
5. MICROECONOMICS (with Robert S. Pindyck), MacMillan, 1989, Second Edition, 1992, Italian, Spanish, and Russian editions, Third Edition, 1995, Portuguese edition; Fourth edition, 1998, Japanese, Chinese editions; Fifth Edition, 2000, Uzbek, Indonesian, German, Korean editions, Sixth Edition, 2005, Seventh Edition, 2009, Croatian, French, and Taiwan editions.
6. DID MICROSOFT HARM CONSUMERS: TWO OPPOSING VIEWS (with David S. Evans, Franklin M. Fisher, and Richard L. Schmalensee), AEI-Brookings Joint Center for Regulatory Studies, 2000.
7. ECONOMETRICS: LEGAL, PRACTICAL, AND TECHNICAL ISSUES (Co-editor with John Harkrider), ABA Antitrust Section, 2005.

Journal Articles

1. "Credit Ratings and the Market for General Obligation Municipal Bonds," National Tax Journal, March 1973, pp. 17-27.
2. "The Determination of Equalized Valuation: A Massachusetts Case Study," Public Finance Quarterly, April 1975, pp. 153-161.
3. "Voting in a Local School Election: A Micro Analysis," Review of Economics and Statistics, February 1977, pp. 30-42.
4. "Suburban Employment and Zoning: A General Equilibrium Analysis," Journal of Regional Science, March 1978, pp. 33-44.
5. "Hedonic Housing Prices and the Demand for Clean Air" (with David Harrison, Jr.), Journal of Environmental Economics and Management, March 1978, pp. 81-102, in Joseph Herriges and Cathy Kling, eds., REVEALED PREFERENCE APPROACHES TO ENVIRONMENTAL VALUATION: Volume II, Ashgate Publishing Limited, 2008.

6. "The Long-Run Effects of a Residential Property Tax and Local Public Services" (with A. Mitchell Polinsky), Journal of Urban Economics, April 1978, pp. 241-262, reprinted in John M Quigley, ed., THE ECONOMICS OF HOUSING, Edward Elgar, 1997.
7. "On the Measurement of Benefits in an Urban Context: Some General Equilibrium Issues" (with Paul N. Courant), Journal of Urban Economics, June 1978, pp. 346-356.
8. "The Air Pollution and Property Value Debate: Some Empirical Evidence" (with David Harrison, Jr.), Review of Economics and Statistics, November 1978, pp. 635-638.
9. "The Distribution of Benefits from Improvements in Urban Air Quality" (with David Harrison, Jr.), Journal of Environmental Economics and Management, December 1978, pp. 313-332.
10. "Tax Limitation and the Demand for Public Services in Michigan" (with Paul N. Courant and Edward M. Gramlich), National Tax Journal, Supplement, June 1979, pp. 147-157.
11. "Public Employee Market Power and the Level of Government Spending" (with Paul N. Courant and Edward M. Gramlich), American Economic Review, December 1979, pp. 806-817. Reprinted in W. Patrick Beaton (ed.) MUNICIPAL EXPENDITURES REVENUES AND SERVICES (New Brunswick: Rutgers University, 1983), pp. 180-202.
12. "Why Voters Support Tax Limitation Amendments: The Michigan Case" (with Paul N. Courant and Edward M. Gramlich), National Tax Journal, March 1980, pp. 1-20. Also in TAX AND EXPENDITURE LIMITATIONS (H. Ladd and N. Tideman, editors), COUPE Papers on Public Economics, Urban Institute, 1981, pp. 37-72.
13. "On the Economics of Voter Turnout in Local School Elections," Public Choice, Fall 1980, pp. 315-331.
14. "Why Voters Turn Out for Tax Limitation Votes" (with Edward M. Gramlich and Deborah Swift), National Tax Journal, March 1981, pp. 115-124.
15. "On the Welfare Effects of Tax Limitation" (with Paul N. Courant), Journal of Public Economics, December 1981, pp. 289-316.
16. "Multiple Regression with a Qualitative Dependent Variable," Journal of Economics and Business, January 1982, pp. 67-78.
17. "Micro Estimates of Public Spending Demand Functions and Tests of the Tiebout and Median Voter Hypotheses" (with Edward M. Gramlich), Journal of Political Economy, June 1982, pp. 536-560.
18. "The Dynamics of the Legal Process" (with Lawrence Blume), Journal of Legal Studies, June 1982, pp. 405-421.
19. "Voting on Public Spending: Differences between Public Employees, Transfer Recipients, and Private Workers" (with Edward M. Gramlich), Journal of Policy Analysis and Management, Summer 1982, pp. 516-533. Reprinted in PROBLEMI DI AMMINISTRAZIONE PUBBLICA, No. 2/1983, pp. 55-88.
20. "Micro-Based Estimates of Demand Functions for Local School Expenditures" (with Theodore C. Bergstrom and Perry Shapiro), Econometrica, November 1982, pp. 1183-1205.

21. "The Distributional Impact of Statewide Property Tax Relief: The Michigan Case" (with Michael Wolkoff), Public Finance Quarterly, April 1983, pp. 131-153.
22. "The Taking of Land: When Should Compensation Be Paid?" (with Lawrence Blume and Perry Shapiro), Quarterly Journal of Economics, February 1984, pp. 71-92.
23. "On Determining the Optimal Magnitude and Length of Liability In Torts," Journal of Legal Studies, August 1984, pp. 551-563.
24. "Budget Reform and the Theory of Federalism" (with John Quigley), American Economic Review, May 1986, pp. 132-137.
25. "The Efficiency of Comparative Negligence," Journal of Legal Studies, June 1987, pp. 375-394.
26. "Tax Reform: Implications for the State-Local Public Sector" (with Paul Courant), Journal of Economic Perspectives, Summer, 1987, pp. 87-100. Reprinted in Samuel Baker and Catherine Elliot (eds.) READINGS IN PUBLIC SECTOR ECONOMICS (Lexington, Massachusetts: D.C. Heath and Company, 1990) pp. 585-507.
27. "Efficient Awards and Standards of Proof in Judicial Proceedings (with David Sappington), Rand Journal, Summer 1987, pp. 308-315.
28. "Tiebout Bias and the Demand for Local Public Schooling" (with Perry Shapiro and Judith Roberts), Review of Economics and Statistics, August 1987, pp. 426-437.
29. "The Welfare Implications of Costly Litigation for the Level of Liability" (with A. Mitchell Polinsky), Journal of Legal Studies, January 1988, pp. 151-164, in Alan O. Sykes (ed.) ECONOMICS OF TORT LAW, Elgar, 2007, and in Chris William Sanchirico (ed.), ECONOMICS OF EVIDENCE, PROCEDURE, AND LITIGATION, Elgar, 2007, Chapter 19.
30. "A Test for Efficiency in the Supply of Public Education" (with Theodore Bergstrom, Perry Shapiro and Judith Roberts), Journal of Public Economics, April 1988, pp. 289-307.
31. "Robbing Peter to Pay Peter: The Economics of Local Public Residency Requirements" (with Paul N. Courant), Journal of Urban Economics, May 1988, pp. 291-306.
32. "The Deterrent Effect of Settlements and Trials" (with A.Mitchell Polinsky), International Review of Law and Economics, June 1988, pp. 109-117.
33. "Micro-Estimation of the Demand for Schooling: Evidence from Michigan and Massachusetts" (with Perry Shapiro), Regional Science and Urban Economics, January 1989, pp. 381-398.
34. "Unobservables in Consumer Choice: Residential Energy and the Demand for Comfort" (with John Quigley), Review of Economics and Statistics, August 1989, pp. 416-425.
35. "Economic Analysis of Legal Disputes and their Resolution" (with Robert Cooter), Journal of Economic Literature, September, 1989, pp. 1067-1097. Reprinted in Richard Posner and Francesco Parisi, eds., ECONOMIC FOUNDATIONS OF PRIVATE LAW, Edward Elgar Publishing, 2002, reprinted in Eric B. Rasmusen (ed.), GAME THEORY AND THE LAW, Edward Elgar Publishing, 2008.

36. "A Note on Optimal Public Enforcement with Settlements and Litigation Costs" (with A.M. Polinsky), Research in Law and Economics, 1989, pp. 1-8.
37. "Trial Courts: An Economic Perspective" (with Robert D. Cooter), Law and Society Review, 1990, pp. 2501-2514.
38. "A Model of Optimal Fines for Repeat Offenders" (with A. Mitchell Polinsky), Journal of Public Economics, September, 1991, pp. 291-306. Reprinted in Peder Andersen, Vibeke Jensen and Jorgen Birk Mortensen, eds., GOVERNANCE BY LEGAL AND ECONOMIC MEASURES, Copenhagen, G-E-C Gad Publishers, 1993, pp. 33-52.
39. "Statistical and Demographic Issues Underlying Voting Rights Cases," Evaluation Review, December, 1991, pp. 659-672.
40. "Private Guarantees for Municipal Bonds: Evidence from the Aftermarket" (with John M. Quigley), National Tax Journal, December 1991, pp. 29-39.
41. "Fiscal Federalism in Europe: Lessons from the American Experience" (with Robert P. Inman), European Economic Review, 1992, pp. 654-660.
42. "Evaluating the Injury Risk Associated with All-Terrain Vehicles: An Application of Bayes' Rule" (with Gregory B. Rodgers), Journal of Risk and Uncertainty, May 1992, pp. 145-158.
43. "Contingent Fees for Attorneys: An Economic Analysis," (with Suzanne Scotchmer), Rand Journal, Autumn, 1993, pp. 343-356.
44. "An Economic Model of Legal Discovery" (with Robert Cooter), Journal of Legal Studies, January, 1994, pp. 435-463, reprinted in Chris William Sanchirico (ed.), ECONOMICS OF EVIDENCE, PROCEDURE, AND LITIGATION, Elgar, 2007, Chapter 14.
45. "The EMU and Fiscal Policy in the New European Community: An Issue for Economic Federalism" (with Robert Inman), International Review of Law and Economics, June, 1994, pp. 147-161.
46. "Designing Tax Policy in Federalist Economies: An Overview," (with Robert P. Inman), Journal of Public Economics, 60, 1996, pp. 307-334.
47. "Antitrust Settlements and Trial Outcomes," (with Jeffrey M. Perloff and Paul Ruud), Review of Economics and Statistics, 1996, pp. 401-409.
48. "Optimal Awards and Penalties when the Probability of Prevailing Varies Among Plaintiffs," (with A. Mitchell Polinsky), Rand Journal, 27, 1996, pp. 269-280.
49. "Federalism and Reductions in the Federal Budget," (with John M. Quigley), National Tax Journal, 49, 1996, pp. 289-302.
50. "Rethinking Federalism," (with Robert P. Inman), Journal of Economic Perspectives, 11 (Fall 1997), pp. 43-64.
51. "Does the English Rule Discourage Low-Probability-of-Prevailing Plaintiffs?" (with A. Mitchell Polinsky), Journal of Legal Studies, June 1998, pp. 519-534.

52. “Antitrust Enforcement in Dynamic Network Industries,” The Antitrust Bulletin, Fall-Winter 1998, pp. 859-882. (Translated as “Wettbewerb, Innovation und die Durchsetzung des Kartellrechts in dynamischen, vernetzten Industrien,” in GRUR International Gewerblicher Rechtsschutz und Urheberrecht Internationaler Teil, Heft 6, 1999).
53. “Empirical Methods in Antitrust: Review and Evidence,” (with Jonathan B. Baker), American Law and Economics Review, Fall, 1999, pp. 386-435.
54. “The Primestar Acquisition of the News Corp./MCI Direct Broadcast Satellite Assets,” Review of Industrial Organization, Vol. 16, No. 2, March, 2000, pp. 191-209.
55. “Market Definition with Differentiated Products: The Post-Nabisco Cereal Merger,” Antitrust Law Journal, Vol. 68, No. 1, 2000, pp. 163-185. (Reprinted in GLOBAL COMPETITION POLICY: ECONOMICS ISSUES AND IMPACTS, David S. Evans and A. Jorge Padilla, eds., LECG, 2004; also available in Peking University, International and Comparative Law Review, Vol.5:8, July 2007, pp. 94-111.)
56. “Structuring Intergovernmental Grants to Local Governments: Lessons From South Africa,” Constitutional Political Economy, Vol. 12, 2001, pp. 173-187.
57. “Can We Decentralize Our Unemployment Policies? Evidence from the United States” (with Robert Inman), Kyklos, March 2001, Vol. 54, pp. 287-308.
58. “U.S. v. Microsoft - An Economic Analysis” (with Franklin M. Fisher), The Antitrust Bulletin, Spring 2001, pp. 1-69.
59. “Vertical Foreclosure in Broadband Access” (with Hal J. Singer) Journal of Industrial Economics, September, 2001, Vol. 49, pp. 299-318.
60. “Merger Simulation: A Simplified Approach with New Applications” (with Roy Epstein), Antitrust Law Journal, Volume 69, No. 3, December 2001, pp. 883-919, reprinted in Stefan Vogt, Max Albert, and Dieter Schmidtchen (eds.), THE MORE ECONOMIC APPROACH TO EUROPEAN COMPETITION LAW, (Conferences on the New Political Economy), Tubingen, 2007.
61. “A Note on Settlements under the Contingent Fee Method of Compensating Lawyers” (with A. Mitchell Polinsky), International Review of Law and Economics, Volume 22, No. 2, September 2002, pp. 217-225.
62. “Aligning the Interests of Lawyers and Clients” (with A. Mitchell Polinsky), American Law and Economics Review, Volume 5, No. 1, Spring 2003, pp. 165-188.
63. “Merger Simulation with Brand-Level Margin Data: Extending PCAIDS with Nests” (with Roy Epstein), Advances in Economic Analysis & Policy: Vol. 4: No. 1, Article 2, Berkeley Electronic Press, March 2004.
64. “Exclusion or Efficient Pricing? The “Big Deal” Bundling of Academic Journals” (with Aaron S. Edlin), Antitrust Law Journal, Volume 72, No. 1, August 2004, pp. 128-159.
65. “Federalism and the Democratic Transition: Lessons from South Africa” (with Robert P. Inman), American Economic Review, Vol. 95, No. 2, May 2005, pp. 39-43.

66. "The Bundling of Academic Journals" (with Aaron S. Edlin), American Economic Review, Vol. 95, No. 2, May 2005, pp. 441-446.
67. "Academic Journal Pricing and the Demand of Libraries" (with Aviv Nevo and Mark McCabe), American Economic Review, Vol. 95, No. 2, May 2005, pp. 447-452.
68. "A Damage-Revelation Rationale for Coupon Remedies (with A. Mitchell Polinsky), Journal of Law, Economics & Organization, Vol. 23, No. 3, October 2007, pp. 653-661.
69. "The Deadweight Loss of Coupon Remedies for Price Overcharges" (with A. Mitchell Polinsky), Journal of Industrial Economics, Vol. LVI, No. 2, June 2008, pp. 402-417.
70. "Econometric Issues in Antitrust Analysis," Journal of Institutional and Theoretical Economics, Vol. 166(1), 2010, pp. 62-77.
71. "Understanding UPP" (with Roy J. Epstein), B.E. Journal of Theoretical Economics: Policies and Perspectives, Vol. 10, Issue 1, 2010, Article 21.
72. "Online Advertising: Defining Relevant Markets (with James Ratliff), Journal of Competition Law and Economics, 2010.

Law Review Articles

1. "The Judicial Pursuit of Local Fiscal Equity" (with Robert Inman), Harvard Law Review, June 1979, pp. 1662-1750.
2. "Quantitative Analysis in Antitrust Litigation" (with Peter Steiner), Law and Contemporary Problems, Autumn 1983, pp. 69-141.
3. "Compensation for Takings: An Economic Analysis" (with Lawrence Blume), California Law Review, July, 1984, pp. 569-628. Also in Austin Jaffe (ed.) RESEARCH IN LAW AND ECONOMICS, Volume 10, 1987, pp. 53-103 as well as Kenneth G. Dau-Schmidt and Thomas S. Ulen (eds.), LAW AND ECONOMICS ANTHOLOGY, 1988, PP. 226-234.
4. "Econometrics in the Courtroom," Columbia Law Review, Volume 85, June 1985, pp. 1048-1097.
5. "The Assignment of Temporary Justices in the California Supreme Court" (with Stephen Barnett), Pacific Law Journal, July 1986, pp. 1045-1197.
6. "Regulatory Takings: The Case of Mobile Home Rent Control," Chicago Kent Law Review, Vol. 67, No. 3, Fall 1992, pp. 923-929.
7. "Sanctioning Frivolous Suits: An Economic Analysis" (with A. Mitchell Polinsky), Georgetown Law Journal, Vol. 82, No. 2, December 1993, pp. 397-435. (translated as "Liti Temerarie E Sanzioni Giudiziarie: Un'Analisi Economica", 14 Rivista Critica del Diritto Privato (1996)).
8. "Reforming the New Discovery Rules" (with Robert Cooter), Georgetown Law Journal, Vol. 84, No. 1, November 1995, pp. 61-89.

9. "Making Sense of the Antitrust State Action Doctrine: Balancing Political Participation and Economics Efficiency in Regulatory Federalism" (with Robert Inman), Texas Law Review, Vol. 75, May 1997, pp. 1203-1299.
10. "On Federalism and Economic Development," Virginia Law Review, Vol. 83, No. 7, October 1997, pp. 1581-1592.
11. "Open Access to Broadband Networks: A Case Study of the AOL-Time Warner Merger" (with Hal J. Singer), Berkeley Technology Law Journal, Vol. 16, No. 2, Spring 2001, pp. 631-675.
12. "3M's Bundled Rebates: An Economic Perspective," Chicago Law Review, Vol. 72, 2005, pp. 243-264.

Articles in Books

1. "Credit Ratings, Bond Defaults, and Municipal Borrowing Costs: A New England Study," 1972 PROCEEDINGS OF THE SIXTY-FIFTH ANNUAL CONFERENCE ON TAXATION, National Tax Association, 1972, pp. 331-350.
2. "Property Taxation, Full Valuation, and the Reform of Educational Finance in Massachusetts," in PROPERTY TAXATION AND THE FINANCE OF EDUCATION, Committee on Taxation, Resources and Economic Development (University of Wisconsin Press), 1974, pp.189-201.
3. "Property Values and the Benefits of Environmental Improvements: Theory and Measurement" (with A. Mitchell Polinsky), in Wingo and Evans, eds., PUBLIC POLICY AND THE QUALITY OF LIFE IN CITIES (Johns Hopkins Press for Resources for the Future), 1977, pp. 154-180.
4. "Market Approaches to the Measurement of the Benefits of Air Pollution Abatement," in Ann Friedlaender, ed., APPROACHES TO CONTROLLING AIR POLLUTION (M.I.T. Press), 1978, pp. 240-279.
5. "Judicial Approaches to Local Public-Sector Equity: An Economic Analysis," in Peter Mieszkowski and Mahlon Straszheim, eds., CURRENT ISSUES IN URBAN ECONOMICS (Johns Hopkins Press), 1979, pp. 542-576.
6. "The Stimulative Effects of Intergovernmental Grants: Or Why Money Sticks Where it Hits" (with Paul N. Courant and Edward M. Gramlich), in Peter Mieszkowski and William Oakland, eds., FISCAL FEDERALISM AND GRANTS-IN-AID, COUPE Papers on Public Economics, Urban Institute, 1979, pp. 5-21.
7. "On Super-rationality and the School Voting Process," in Clifford Russell, ed., COLLECTIVE DECISION-MAKING (Johns Hopkins Press), 1979, pp. 75-82.
8. "Property Tax Reduction in Michigan" (with Robert Vishny) in H. Brazer and D. Laren, eds., MICHIGAN'S FISCAL AND ECONOMIC STRUCTURE (University of Michigan Press), 1982, pp. 530-560.
9. "Tax Assignment and Revenue Sharing in the United States," in R. Mathews and C. McLure, eds., TAX ASSIGNMENT IN FEDERAL COUNTRIES, (Australian National Univ. Press), 1983, pp. 205-33.

10. "Residential Choice and the Demand for Public Education: Estimation Using Survey Data" (with Perry Shapiro and Judith Roberts), in H. Timmermans and R. Golledge, eds., BEHAVIOR MODELLING APPROACHES IN GEOGRAPHY AND PLANNING, (Croom Helm), 1986, pp. 179-197.
11. "Local Public Economics: A Methodological Review," in A. Auerbach and M. Feldstein, eds., HANDBOOK OF PUBLIC ECONOMICS, Volume II, 1987, pp. 87-161.
12. "Settlements in Private Antitrust Litigation" (with Jeffrey Perloff) in L. White (ed.), PRIVATE ANTITRUST LITIGATION, M.I.T. Press, 1988, pp. 149-184.
13. "A Federalist Fiscal Constitution for an Imperfect World: Lessons from the United States," in H. N. Scheiber (ed.) FEDERALISM, STUDIES IN HISTORY, LAW, AND POLICY, Institute of Governmental Studies, U.C. Berkeley, 1988, pp. 76-92.
14. "Public Choices in Public Higher Education," (with John Quigley) in Charles Clotfelter and Michael Rothschild, eds. THE ECONOMICS OF HIGHER EDUCATION, National Bureau of Economic Research, 1993, pp. 243-283.
15. "European Labor Markets: The Eastern Dimension" (with Jasminka Sohinger) in W. Dickens, B. Eichengreen, and L. Ulman (eds.) LABOR RESPONSES TO EUROPEAN INTEGRATION, Brookings Institution, 1993, pp. 271-286.
16. "Reference Guide on Multiple Regression," in Federal Judicial Center, REFERENCE MANUAL ON SCIENTIFIC EVIDENCE, 1994, pp. 415-470, Second Edition, 2000, pp.179-227 (available at [http://www.fjc.gov/public/pdf.nsf/lookup/11.mult_reg.pdf/\\$File/11.mult_reg.pdf](http://www.fjc.gov/public/pdf.nsf/lookup/11.mult_reg.pdf/$File/11.mult_reg.pdf)).
17. "California Fiscal Federalism: A School Finance Perspective," in B. Cain and R. Noll (eds.), CONSTITUTIONAL REFORM IN CALIFORNIA, Institute of Governmental Studies, UC Berkeley, 1995, pp. 431-453.
18. "The Political Economy of Federalism," (with Robert Inman), in D. Mueller (ed.), PERSPECTIVES ON PUBLIC CHOICE, Cambridge University Press, New York, 1997, pp. 73-105.
19. "Federalism as a Device for Reducing the Budget of the Central Government,"(with John M. Quigley), in FISCAL POLICY: LESSONS FROM ECONOMIC RESEARCH, Alan Auerbach (ed.), M.I.T. Press, 1997.
20. "Guide to Multiple Regression," in Faigman, Kaye, Saks, and Sanders (ed.), MODERN SCIENTIFIC EVIDENCE: THE LAW AND SCIENCE OF EXPERT TESTIMONY, West Publishing Co., St. Paul, Minn., 1997, Vol. 1, pp. 147-183, second edition, 2000.
21. "Discovery", in THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW, Peter Newman (ed.), MacMillian Reference Ltd. 1998, pp. 609-615.
22. "Contingent Fees" (with Suzanne Scotchmer), in THE NEW PALGRAVE DICTIONARY OF ECONOMICS AND THE LAW, Peter Newman (ed.), MacMillian Reference, Ltd., 1998, pp. 415-420.

23. "Federalism," (with Robert Inman), in THE ENCYCLOPEDIA OF LAW AND ECONOMICS, Boudewijn Bouchaert and Gerrit DeGeest, editors, 2000, Volume V, pp. 661-691, available on-line at <http://encyclo.findlaw.com>.
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25. "United States v. Microsoft: An Economic Analysis" (with Franklin M. Fisher), pp. 1-44, and "Misconceptions, Misdirections, and Mistakes," pp. 87-96, in Evans, Fisher, Rubinfeld, and Schmalensee, DID MICROSOFT HARM CONSUMERS? TWO OPPOSING VIEWS, AEI-Brookings Joint Center for Regulatory Studies, 2000. An updated and revised version appears in Antitrust Bulletin, Spring, 2001.
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**APPENDIX B: TESTIMONY OF DANIEL RUBINFELD AT DEPOSITION
OR TRIAL**

CONFIDENTIAL

Deposition and Trial Testimony

DANIEL L. RUBINFELD

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Rambus, Inc. v. Micron, Inc. et al., 2009, Deposition (Superior Court of the State of California, County of San Francisco)

State of Alabama v. Sandoz, Inc., 2009, Deposition, Trial Testimony (Circuit Court of Montgomery County, Alabama)

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Marcus v. American Express, Inc., 2008, Deposition (Federal District Court, Southern District of New York)

Omnicare v. United Health, 2008, Deposition (Federal District Court, Northern District of Illinois)

In re K-Dur Antitrust Litigation, 2007, 2008, Depositions (Federal District Court, District of New Jersey)

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Clinton Reilly v. Media News, Group, Inc., et al., 2007, Deposition (Federal District Court, Northern District of California)

Federal Trade Commission v. Warner Chilcott Holdings Co. III, Ltd., State of Colorado et al. v. Warner Chilcott, Barr Industries, 2007, Deposition (Federal District Court, District of Columbia)

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Bradburn Parent/Teacher Store, Inc. v. 3M (Minnesota Mining and Manufacturing Company), 2003, Deposition, Testimony at Class Certification Hearing (Federal District Court, Eastern District of Pennsylvania), 2006 Deposition

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UAC-CFJO001-002	UAC-JBRO001	UAC-RCON001
UAC-CPRO001-006	UAC-JGAR001-007	UAC-RKUN001-005
UAC-CSTE001	UAC-JGLI001	UAC-SHOL001
UAC-CWHA001-003	UAC-JLOV001-002	UAC-SKUN001-005
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UAC-DJOH001-022	UAC-LGEN001-005	UAC-SSTE001
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APPENDIX D: TECHNICAL APPENDIX

115. In this appendix, I describe the technical details of the estimation of consumer benefits arising from the merger.¹³⁶ As described in Section V, I provide estimates of consumer benefits using two distinct approaches. The first relies on converting the increases in demand predicted by the parties' internal planning models into estimates of the monetary value of consumer benefits. The second relies on directly estimating a demand model and then applying the estimated demand parameters to the post-merger schedules to determine the increase in consumer welfare.

D.1. ESTIMATING CONSUMER BENEFITS USING THE PREDICTIONS FROM QSI MODELS

116. United provided a variety of post-merger schedules along with predictions of traffic generated by their QSI models. These schedules indicate that the combined carrier will serve more passengers than would the two carriers on a stand-alone basis. The projected net increase in United and Continental passengers provides direct evidence that this transaction will benefit consumers.¹³⁷ In its review of the Delta-Northwest merger, the DOJ recognized that the benefit to consumers of improved service quality is reflected in increases in the forecasted post-merger traffic of the merging carriers and can be quantified by valuing the fare reduction necessary to drive an equivalent increase in traffic.¹³⁸

117. I apply of the DOJ staff's methodology in Delta-Northwest to these data in order to provide one estimate of consumer benefits arising from this transaction. To understand the approach, note that improvements in itinerary characteristics can be thought of as shifting the demand curve facing the merged carrier outward, which induces substitution from competing carriers.¹³⁹ Prior to the merger, assume that the demand for United and Continental flights is given by D , and at the market price of p and given quality level s , q consumers choose United or Continental:

¹³⁶ I include the code used to generate my estimates in the backup to my report.

¹³⁷ Ken Heyer, Carl Shapiro, and Jeffrey Wilder (2009), "The Year in Review: Economics at the Antitrust Division, 2008-2009," *Review of Industrial Organization*, 35:4, pp. 349-367.

¹³⁸ Ken Heyer, Carl Shapiro, and Jeffrey Wilder (2009), "The Year in Review: Economics at the Antitrust Division, 2008-2009," *Review of Industrial Organization*, 35:4, pp. 349-367.

¹³⁹ Note that the PFM holds market size constant so that, by assumption, there is no switching from the outside good (the option of not traveling via air) as a result of improved quality.

$$q = D(s,p).$$

As a result of the merger, the quality of service offered by the combined carrier increases (a change in s). This leads to an increase in the number of passengers carried (a change in q). Alternatively, holding quality (s) constant, the combined carrier could have attracted an equivalent number of passengers by lowering its fare (p). The fare decrease required to induce increased demand equal to that associated with the post-merger quality increase provides an estimate of the value of those quality changes.¹⁴⁰

118. To compute the implied price change (Δp), I need estimates of: i) the change in quantity (Δq), which can be obtained from the PFM; and ii) the slope of the demand curve (which is related to the demand elasticity ε). The implied consumer benefits from the increase in quality is then given by:¹⁴¹

$$\Delta p * q = (1/\varepsilon) * \Delta q * p.$$

119. To accommodate the effect of capacity constraints on benefits, I measure changes in predicted traffic rather than changes in predicted demand. To do so, I rely on a version of the PFM that includes a spill and recapture algorithm that accounts for capacity. The basis for using traffic estimates can be demonstrated as follows. Suppose that the demand curve shifted out such that consumers would like to consume q' , but only q'' seats are available. Then the equivalent price decrease would be ($\Delta p = p - p''$) rather than ($\Delta p = p - p'$), as would be suggested by using predicted changes in demand. This adjustment limits the calculated benefits to the number of passengers who can be accommodated without an increase in price, accounting for capacity constraints.

120. Estimates of the own-price elasticity ε are taken from the empirical literature on airlines.¹⁴² I note that the results reported in Berry and Jia (2009) suggest that different customer

¹⁴⁰ Symmetrically, on routes where traffic is predicted to decrease, the fare increase required to generate an equivalent decrease in demand can be calculated.

¹⁴¹ I obtain estimates of p from the data underlying United's PFM. United computes the average fare on the OD using data from DB1B. I modify the average fare to account for the fare distribution as described below.

This estimate provides a linear approximation of the true consumer benefits from the merger.

¹⁴² The recent literature contains estimates of the own-price elasticity that range from 1.5 to 4. In the calculations presented here, I rely on the estimate in Berry and Jia (2009). I use this estimate because it is

types might have different preferences for certain characteristics of air travel. In particular, business travelers are likely to be less sensitive to price and have greater preferences for convenient schedules and larger networks relative to leisure travelers. This suggests that business travelers will disproportionately benefit from the proposed transaction. To capture this, I use separate estimated elasticities for leisure (Type One) and business (Type Two) passengers as reported in Berry and Jia (2009). In their base model, Berry and Jia (2009) report that the average price elasticity for leisure travelers is -6.55, while the average price elasticity for business travelers is -0.63.¹⁴³ They also estimate that leisure travelers account for 51 percent of passengers.

121. To compute benefits for each passenger type, I combine the change in passengers predicted by PFM with the average fare and elasticity estimate for each passenger type on each route.¹⁴⁴ To compute fares for each passenger type, I use the DB1B to compute the average fares for the bottom 51 percent (to capture the average leisure fare) and the top 49 percent (to capture the average business fare). I then adjust both fares so that the average route-level fare matches the average route-level fare reported by United in the May 2010 schedules. Exhibit 16 reports benefits estimated from the Conduit schedule, which combines the networks of United and Continental, optimizes the fleet across the combined network, and adds profitable frequencies to conduit (intra-hub) routes.¹⁴⁵

D.2. ESTIMATING CONSUMER BENEFITS USING ESTIMATES OF CONSUMER DEMAND

122. The DOJ's QSI-based methodology is conservative for several reasons. First, the approach attributes benefits only to those passengers who choose United or Continental

based on the most recent data and also provides us with estimated elasticities for different passenger types. See Berry and Jia (2009).

Note that the elasticity reported by Berry and Jia is a product-level elasticity. For the purposes of the analysis, I am primarily interested in the carrier-level elasticity. Since carrier-level elasticities are likely to be even lower, my estimates are conservative.

¹⁴³ Berry and Jia (2009), Table 7B.

¹⁴⁴ I assume that the change in passengers across types is proportional to the share of each type. To the extent that increases in passengers derive disproportionately from business travelers due to their preferences for the types of characteristics that will be improved by the merger, this calculation is conservative.

¹⁴⁵ As discussed in Section V, I estimate benefits using schedules provided by United. However, based on the similarity of the predicted revenue synergies, I expect that the Continental model would result in similar estimates.

itineraries pre-merger. It does not account for the fact that some passengers may wish to switch to the improved products offered by the combined carrier post-merger.¹⁴⁶ Second, the PFM fails to capture improved scheduling convenience, described above.¹⁴⁷ Finally, the DOJ's approach fails to account for the fact the price elasticity of demand may be lower on routes with fewer carriers.¹⁴⁸ To address these simplifications associated with the basic QSI approach, I have estimated a model of consumer demand for air travel that builds on the extensive academic literature on the subject.¹⁴⁹

123. To evaluate the benefits that are likely to arise from the merger of United and Continental based on the direct estimation of demand, I proceed in several steps. First, I estimate a structural demand model that estimates the value that consumers place on various price and quality elements of air travel. Second, I use pre- and post-merger schedules developed by the carriers as part of their transition planning to evaluate how quality is likely to change as a result of the proposed transaction. Third, using the information on quality improvements in conjunction with our demand estimates, I compute the consumer surplus arising from the merger. As discussed in Section V, a shortcoming of this approach is that my model cannot explicitly account for capacity constraints (that is, it assumes that the combined carrier can seat every passenger who would like to use its services post-merger). To account for this, I use information from United's PFM – which does account for capacity constraints – to adjust the benefits estimates.

124. The economics literature on airlines as well as the airlines' own internal planning models have typically modeled demand using discrete choice (logit-based) models that define products as a set of characteristics. However, standard logit models impose restrictions on substitution patterns across products.¹⁵⁰ Most of the literature assumes that markets are defined as either city-pairs or airport-pairs and does not allow for flexible substitution patterns across airports

¹⁴⁶ Although the dollar benefit per passenger is determined by the amount of switching, the methodology only applies to passengers that were flying United or Continental pre-merger. No benefits accrue to passengers that switch from other carriers.

¹⁴⁷ This point applies to United's PFM model, Continental's APM model, and to QSI models more generally.

¹⁴⁸ In a standard logit model, elasticities are inversely proportional to market shares such that products with higher shares will tend to have lower elasticities, conditioning on price.

¹⁴⁹ *See, e.g.*, Peters (2006); Berry and Jia (2009).

¹⁵⁰ Most papers estimate either a nested logit model with the outside good in one nest and all inside goods in another nest or a simple logit model with no outside good.

within a geographic area. This assumption artificially restricts substitution patterns across airports in the same city. One exception is Peters (2006), which estimates a generalized extreme value (GEV) model that allows for imperfect substitution patterns across airports.¹⁵¹

125. To understand the basic logit model, suppose that on route r , a consumer i may choose from F flights corresponding to J itineraries. Each itinerary j offers F_j flights. Consumers have preferences over the F flights. The utility function of consumer i from choosing flight f (belonging to itinerary j) is given by:

$$U_{ijf} = \delta_j + \varepsilon_{ijf}$$

where $\delta_j = \alpha p_j + X_j \beta + \zeta_j$, p_j is the price of itinerary j , X_j is a vector of characteristics for itinerary j , ζ_j captures unobserved characteristics of itinerary j , and the term ε_{ijf} captures the idiosyncratic preferences of consumer i for flight f on itinerary j .

126. Logit models come in a variety of different “flavors,” corresponding to different assumptions about the distribution of ε . The GEV model proposed by Peters (2006) allows substitution patterns to depend on two product characteristics: i) whether the product was non-stop or connecting; and ii) the origin and destination airports.¹⁵² However, the modeling of flexible substitution patterns across multiple product characteristics substantially increases the computation burden.¹⁵³ To focus on the key questions of interest, I only allow substitution patterns to depend upon the origin airport. With this assumption, the GEV model is equivalent to a multi-level nested logit model, where the outside good forms one nest and products originating at adjacent airports form separate nests.

127. Thus, in my model, share is given by:¹⁵⁴

¹⁵¹ Peters (2006) can point to only one other working paper that allows for imperfect substitution across airports. (Craig Peters (2006), ‘Evaluating the Performance of Merger Simulation: Evidence from the U.S. Airline Industry,’ *Journal of Law and Economics*, 49: 627-49.)

¹⁵² In addition, the outside good forms a separate nest.

¹⁵³ In particular, with multiple overlapping nests, the market shares cannot be inverted analytically so the computation requires a contraction mapping algorithm. See Berry (1994).

¹⁵⁴ Formally, using Peters’ notation, we assume that $\rho_D = \rho_0$. As a result, $a = 1$ and the market share equation in the appendix collapses to the equation listed here.

$$s_j = \frac{\exp(\delta_j/\rho_A)}{\sum_n \exp(\delta_n/\rho_A)} \times \frac{[\sum_n \exp(\delta_n/\rho_A)]^{\frac{\rho_A}{\rho_0}}}{\sum_A [\sum_n \exp(\delta_n/\rho_A)]^{\frac{\rho_A}{\rho_0}}} \times \frac{[\sum_A [\sum_n \exp(\delta_n/\rho_A)]^{\frac{\rho_A}{\rho_0}}]^{\rho_0}}{1 + [\sum_A [\sum_n \exp(\delta_n/\rho_A)]^{\frac{\rho_A}{\rho_0}}]^{\rho_0}}$$

$$\equiv s_{j|A_j} \times s_{A_j|A} \times s_{A'}$$

where δ_j is the mean utility for product j , ρ_A is the parameter that governs correlation of the error terms of products within the airport nests, and ρ_0 is the parameter that governs correlation of the error terms within the inside goods nest. The parameter ρ_A is bounded between zero and ρ_0 . As ρ_A approaches zero, there is no cross-airport substitution. As ρ_A approaches ρ_0 , the model collapses to a simple nested logit and products at adjacent airports are equally good substitutes for each other.

128. Given this functional form, shares can be inverted analytically following Berry (1994). In particular, by normalizing δ_0 to be equal to zero,¹⁵⁵ the equation above can be manipulated to show:¹⁵⁶

$$\ln\left(\frac{s_j}{s_0}\right) = \delta_j + (1 - \rho_A) \ln(s_{j|A_j}) + (1 - \rho_0) \ln(s_{A_j|A}).$$

129. Intuitively, the model identifies the parameter ρ_A from changes in the group-level share as the number of products changes. In the extreme case in which ρ_A equals zero, the group-level share does not change as the number of products within the group changes.

130. My sample is based on two primary data sources. First, I use data from the Department of Transportation's Origin and Destination Survey (DB1B), which is a ten percent random sample of tickets from reporting carriers in the United States. The DB1B provides data on fares and quantities for each itinerary. Second, I use itinerary data provided by United. The itinerary data include itineraries that are based on segment-level data from the Official Airline Guide (OAG) and created by United's itinerary generation model, which applies a number of filters to

¹⁵⁵ This is a standard assumption in the discrete choice literature.

¹⁵⁶ I use linear instrumental variable methods to minimize the difference between observed and predicted shares. I compute observed shares as the ratio of the number of passengers choosing a given product in a quarter to the geometric mean of the endpoint MSA-level populations.

create plausible OD-level itineraries.¹⁵⁷ The itinerary data provide me with information on itinerary characteristics, including equipment type, number of stops, operating and marketing carriers, and codeshare status. I use data from the first quarter for 2008 through the fourth quarter of 2009.

131. I define route r as a directional origin and destination city pair, *e.g.*, SF2-CH2-SF2 is a different route than CH2-SF2-CH2.¹⁵⁸ I define product j by an itinerary (ordered sequence of airports, *e.g.*, SFO-STL-ORD-STL-SFO), ticketing carrier, and time period.¹⁵⁹ To create my estimation sample, I apply a number of screens to the data.¹⁶⁰ First, I keep round-trip tickets with at most four segments. Second, I eliminate itineraries with non-credible or bulk fares or round-trip fares below \$50. Third, I eliminate itineraries that include a non-US marketing or operating carrier segment.¹⁶¹ Fourth, I eliminate itineraries with multiple marketing carriers. Fifth, I eliminate products with fewer than 100 passengers per quarter (roughly one passenger per day).¹⁶² To remain consistent with the itinerary data provided by United, we separate round-trip itineraries into directional segments and divide the round-trip fare by two.¹⁶³

¹⁵⁷ United provided data from a representative week in each quarter.

¹⁵⁸ I define the following city pairs: CH2 (Chicago O'Hare (ORD) and Chicago Midway (MDW)), CL2 (Cleveland Hopkins International (CLE) and Akron Canton (CAK)), DA2 (Dallas/Ft. Worth (DFW) and Dallas Love Field (DAL)), HO2 (George Bush Intercontinental (IAH) and Hobby (HOU)), LA3 (Los Angeles International (LAX), Burbank (BUR), and Long Beach (LGB)), MI2 (Miami International (MIA) and Ft. Lauderdale (FLL)), NY3 (LaGuardia (LGA), Newark (EWR), and John F. Kennedy (JFK)), SF2 (San Francisco (SFO) and Oakland (OAK)), DC3 (Reagan National (DCA), Washington Dulles (IAD), and Baltimore-Washington (BWI)), and TA2 (Tampa International (TPA) and St. Petersburg/Clearwater International (PIE)).

¹⁵⁹ Note that because I define a product by the ticketing carrier, I treat code-shared flights as separate products. For example, suppose UA and CO codeshare on a particular route that is operated by CO. This would show up in the data as two sets of observations, one for a flight operated by CO and ticketed by UA and a second for a flight operated by CO and ticketed by CO. In general, the physical characteristics of the two flights will be identical, but ticketing characteristics (*e.g.*, price and a fixed effect for ticketing carrier) will be different.

¹⁶⁰ These screens are standard in the literature. See, *e.g.*, Severin Borenstein (1989), "Hubs and High Fares: Dominance and Market Power in the U.S. Airline Industry," *The RAND Journal of Economics*, 20(3), 344-365; Peters (2006).

¹⁶¹ I also eliminate routes that do not have both endpoints in the continental United States.

¹⁶² Peters (2006) applies a similar screen. The reason for doing so is because the logit model assumes that choice probabilities (shares) are integrated over multiple individuals, each with her own i.i.d. logit error term. Without sufficient product-level observations, it is not possible to differentiate between the product-level unobservable quality and the individual idiosyncratic error term. For example, suppose I observe a product with just one passenger in the quarter. Further, suppose that the reported fare for this product is twice the average fare on the route, while other observable characteristics are equal to the average values on the route. With just a single individual observation, the model cannot determine whether the individual

132. As described in Section V, I define utility as a linear function of fare, non-stop status, codeshare status, equipment type, scheduling convenience, network quality, hub status of the origin airport, marketing carrier fixed effects, year-quarter fixed effects, and route fixed effects.¹⁶⁴ Following Akerberg and Rysman (2005), I also control for the flight frequency (in logs) of each itinerary.¹⁶⁵ I treat fares, frequency, convenience, and the nested logit terms as endogenous and instrument for them.

133. I create the following instrumental variables. My first set of instruments assumes that the network structure of the carries is exogenous. In particular, a number of connecting itineraries may make use of any given segment. Segments that are used by many itineraries are more likely to fly more frequently and to lead to more convenient schedules. I construct instruments that consist of the geometric mean of the number of itineraries making use of each segment at the carrier-itinerary level (the level of aggregation at which we measure frequency) and the carrier-route level (the level of aggregation at which we measure convenience). Similarly, itineraries on more populous routes are likely to lead to greater demand at the segment level. I construct analogous instruments at the carrier-itinerary and carrier-route level based on the geometric mean of the endpoint populations of the itineraries making use of each segment. I construct a second set of instruments based on the principles introduced in Berry (1994), Berry, et al.

chose to fly on the flight – despite its high price – because the product itself has a high level of unobserved quality or because the individual has an idiosyncratic preference for the product and is therefore willing to pay a high fare. With multiple observations, the logit model integrates over the idiosyncratic error term in order to identify the unobserved quality.

¹⁶³ I estimate the current model using the outbound segment of the round-trip itinerary.

¹⁶⁴ The route fixed effects generate a route-specific constant term. This route-specific constant term captures the aggregate level of flying (relative to the outside good) on a route-by-route basis. I assume that the quality of the outside good stays constant over the sample period.

¹⁶⁵ Daniel A. Akerberg and Marc Rysman (2005), “Unobserved Product Differentiation in Discrete-Choice Models: Estimating Price Elasticities and Welfare Effects,” *The RAND Journal of Economics*, 36(4):771-788.

The model allows a consumer’s preferences for flights within the same itinerary to be correlated. This specification allows each consumer to realize a draw from the logit error distribution for each flight in addition to each itinerary. The intuition is that each consumer has idiosyncratic preferences over each flight, perhaps because actual and preferred departure times vary. Note that this means that consumers only receive a different number of draws from the error distribution for flights as a result of the merger if the merger results in addition (or subtraction) of flights. If the merger were to simply “smush” the networks of UA and CO, then consumers would receive an identical number of draws from the error distribution for flights.

(1995), and Bresnahan, et al (1997).¹⁶⁶ These instruments measure the number and quality of competing carriers on a route.¹⁶⁷ I construct a third set of instruments that account for itineraries that fly to or through hubs. Flying to or through a hub could affect the marginal costs of a flight because of economies of scale as well as congestion costs.¹⁶⁸ Finally, I include fuel costs as an instrument. To allow for differential effects of higher fuel prices on different carriers due to different equipment and other differences, I interact fuel costs with carrier indicator variables as well as with distance.

134. Given estimated demand parameters, it is straightforward to calculate the consumer surplus derived from any given schedule.¹⁶⁹ To do so, I follow Small and Rosen (1981) and calculate consumer surplus for a representative consumer as follows:¹⁷⁰

$$CS_i = - \frac{\ln \left[1 + \left[\sum_{j=0}^J \exp(\delta_j / \rho_A) \right]^{\frac{\rho_A}{\rho_0}} \right]}{\alpha}$$

135. To compute the consumer surplus generated by the merger, I compute the difference between the pre- and post-merger consumer surplus and aggregate across routes, weighting by market size. As discussed in Section V, three factors generate the estimated increase in

¹⁶⁶ Berry (1994); Steven Berry, James Levinsohn, and Ariel Pakes (1995), "Automobile Prices in Market Equilibrium," *Econometrica*, 60(4), 889–917; Timothy F. Bresnahan, Scott Stern, and Manuel Trajtenberg (1997), "Market Segmentation and the Sources of Rents from Innovation: Personal Computers in the Late 1980s," *The RAND Journal of Economics*, 28(0), S17-S44.

¹⁶⁷ In particular, we count the number of products offered by competing carriers on a route, the percent of products offered by competing carriers on a route that are non-stop, passenger-weighted mean circuitry for products offered by competing carriers on a route, the mean of the number of itineraries making use of segments for competing carriers on a route, the mean of the endpoint populations for those itineraries for competing carriers on the route, the mean of non-stop network quality for products offered by competing carriers on a route, and the mean of connecting network quality for products offered by competing carriers on a route.

¹⁶⁸ See Berry and Jia (2009). By focusing on itineraries that fly to or through hubs, we eliminate the demand effects associated with flying from a hub.

¹⁶⁹ In particular, given the characteristics of a set of flights on a route, I can apply the estimated parameters to determine the mean utility of each product. For those products that exist in the estimation sample, I apply the weighted average unobserved quality level (ζ). For those products that do not exist in the estimation sample, I assume that $\zeta=0$.

¹⁷⁰ Note that, in contrast to Berry and Jia (2009), I estimate demand parameters for a single type of passenger. Thus, to the extent that benefits are non-linear in the type of consumer and accrue disproportionately to business-type travelers (as suggested by Berry and Jia (2009)), the estimated benefits based on a direct estimate of demand are likely to be conservative.

consumer surplus in this model: improvements in scheduling convenience, improvements in network size, and the generation of new online itineraries.¹⁷¹

136. A complication of my approach is that it cannot easily account for capacity constraints. To account for capacity restrictions, I have relied on United's estimates of both unconstrained and constrained demand. The constrained estimates apply United's "spill and recapture" algorithm. With respect to the schedule including frequency optimization on hub-to-hub flights, the constrained demand benefits estimates (computed using the DOJ approach) are approximately 49.6 percent of the unconstrained demand estimates. To account for this, I scale down my estimated benefits by 49.6 percent.

¹⁷¹ For the purposes of this calculation, I assume that unobserved carrier-level quality (captured by the carrier fixed effects) and unobserved product-level quality (captured by the residual ζ) remain fixed at pre-merger levels. For example, an itinerary marketed by Continental in the stand-alone schedule would continue to receive the Continental fixed effect as well as its product specific residual.