PROFESSIONAL ACTIVITIES:

Associate Editor, Bell Journal of Economics, 1974-1983
Associate Editor, Rand Journal of Economics, 1984-1988
Associate Editor, Econometrica, 1978-1987
Reviewer, Mathematical Reviews, 1978-1980
American Editor, Review of Economic Studies, 1979-82
Associate Editor, Journal of Public Economics, 1982-
Associate Editor, Journal of Applied Econometrics, 1985-1993
Member of MIT Center for Energy and Environmental Policy Research, 1973-
Research Associate, National Bureau of Economic Research, 1979-
Member, American Statistical Association Committee on Energy Statistics, 1981-1984
Special Witness (Master) for the Honorable John R. Bartels, U.S. District Court for the Eastern District of New York in Carter vs. Newsday, Inc., 1981-82
Member of Governor's Advisory Council (Massachusetts) for Revenue and Taxation, 1984-1992
Member, Committee on National Statistics, 1985-1990
Member, National Academy of Social Insurance, 1990-
Member, Committee to Revise U.S. Trade Statistics 1990-1992
Director, MIT Telecommunications Economics Research Program, 1988-
Board of Directors, Theseus Institute, France Telecom University, 1988-
Member, Conference on Income and Wealth, National Bureau of Economic Research, 1992-

PUBLICATIONS:

I. Econometrics

"Minimum Mean Square Estimators and Robust Regression," Oxford Bulletin of Statistics, April 1974.

"Minimum Distance and Maximum Likelihood Estimation of Structural Models in Econometrics," delivered at the European Econometric Congress, Grenoble: August 1974.

"Full-Information Instrumental Variable Estimation of Simultaneous Equation Models," Annals of Economic and Social Measurement, October 1974.

"Estimation and Inference in Nonlinear Structural Models," Annals of Economic and Social Measurement, with E. Berndt, R.E. Hall, and B.H. Hall, October 1974

"An Instrumental Variable Approach to Full-Information Estimators in Linear and Certain Nonlinear Econometric Models," Econometrica, May 1975.

"Simultaneous Equations with Errors in Variables," delivered at Winter Econometric Meetings, San Francisco: December 1974; published in Journal of Econometrics 5, 1977, pp. 389-401.

"Social Experimentation, Truncated Distributions, and Efficient Estimation," delivered at the World Econometric Congress, Toronto: August 1975; Econometrica, with D. Wise, June 1977.

"A Conditional Probit Model for Qualitative Choice," delivered at World Econometric Congress, Toronto: August 1975; MIT Working Paper 173, April 1976; Econometrica, with D. Wise, March 1978.

PUBLICATIONS cont.:

"Specification Tests in Econometrics," MIT Working Paper 185, June 1976; Econometrica, 1978.

"Non-Random Missing Data," with A.M. Spence, MIT Working Paper 200, May 1977.

"Attrition Bias in Experimental and Panel Data: The Gary Income Maintenance Experiment," with D. Wise, J.F. Kennedy School Working Paper, May 1977; Econometrica, January 1979.

"Missing Data and Self Selection in Large Panels," with Z. Griliches and B.H. Hall, Harvard Economics Department Working Paper, August 1977; delivered at INSEE conference on Panel Data, Paris: August 1977; Annales de l'INSEE, April 1978.

"Stratification on Endogenous Variables and Estimation," with D. Wise, J.F. Kennedy School Working Paper, January 1978; delivered at CME Conference, April 1978; in The Analysis of Discrete Economic Data, ed. C. Manski and D. McFadden, MIT Press, 1981.

"Les models probit de choix qualitatifs," ("Alternative Conditional Probit Specifications for qualitative Choice.") (English Version), September 1977; EPRI report on discrete choice models, presented at INSEE Seminar, Paris: May 1978; Cahiers du Seminar d'Econometrie, 1980.

"The Econometrics of Labor Supply on Convex Budget Sets," Economic Letters, 1979.

"Panel Data and Unobservable Individual Effects," with W. Taylor, MIT Working Paper 225; Econometrica 49, November 1981.

"Comparing Specification Tests and Classical Tests," with W. Taylor, August 1980, Economic Letters, 1981.

"The Effect of Time on Economic Experiments," invited paper at Fifth World Econometrics Conference, August 1980; in Advances in Econometrics, ed. W. Hildebrand, Cambridge University Press, 1982.

"Sample Design Considerations for the Vermont TOD Use Survey," with John Trimble, Journal of Public Use Data, 9, 1981.

"Identification in Simultaneous Equations Systems with Covariance Restrictions: An Instrumental Variable Interpretation," with W. Taylor, December 1980; Econometrica, 1983.

"Stochastic Problems in the Simulation of Labor Supply," presented at NBER conference, January 1981; in Tax Simulation Models, ed. M. Feldstein, University of Chicago Press, 1983.

"The Design and Analysis of Social and Economic Experiments," invited paper for 43rd International Statistical Institute Meeting, 1981; Review of the ISI.

"Specification and Estimation of Simultaneous Equation Models," in Handbook of Econometrics, ed. Z. Griliches and M. Intriligator, vol. 1, 1983.

"Full-Information Estimators," in Kotz-Johnson, Encyclopedia of Statistical Science,vol. 3, 1983

"Instrumental Variable Estimation," in Kotz-Johnson, Encyclopedia of Statistical Science, vol. 4, 1984

PUBLICATIONS cont.:

"Specification Tests for the Multinomial Logit Model," with D. McFadden, October 1981; Econometrica, 1984.

"Econometric Models for Count Data with an Application to the Patents R&D Relationship," with Z. Griliches and B. Hall, NBER Working Paper, August 1981; Econometrica, 1984.

"The Econometrics of Nonlinear Budget Sets," Fisher-Shultz lecture for the Econometric Society, Dublin: 1982; Econometrica, 1985.

"The J-Test as a Hausman Specification Test," with H. Pesaran, November 1982; Economic Letters, 1983.

"Seasonal Adjustment with Measurement Error Present," with M. Watson, May 1983; Journal of the American Statistical Association, 1985.

"Efficient Estimation and Identification of Simultaneous Equation Models with Covariance Restrictions," with W. Newey and W. Taylor, October 1983; Econometrica, 1987.

"Technical Problems in Social Experimentation: Cost Versus Ease of Analysis," with D. Wise, in Social Experimentation, ed. J. Hausman and D. Wise, 1985.

"Errors in Variables in Panel Data," with Z. Griliches, Journal of Econometrics, 1986.

"Specifying and Testing Econometric Models for Rank-Ordered Data," with P. Ruud; Journal of Econometrics, 1987.

"Semiparametric Identification and Estimation of Polynomial Errors in Variables Models," with W. Newey, J. Powell and H. Ichimura, 1986, Journal of Econometrics, 1991.

"Flexible Parametric Estimation of Duration and Competing Risk Models," with A. Han, November 1986, revised January 1989, Journal of Applied Econometrics, 1990.

"Consistent Estimation of Nonlinear Errors in Variables Models with Few Measurements," with W. Newey and J. Powell, 1987.

"Optimal Revision and Seasonal Adjustment of Updated Data: Application to Housing Starts," with M. Watson, Journal of the American Statistical Association Proceedings, 1991.

"Seasonal Adjustment of Trade Data," with R. Judson and M. Watson, ed. R. Baldwin, Behind the Numbers: U.S. Trade in the World Economy, 1992.

"Nonparametric Estimation of Exact Consumers Surplus and Deadweight Loss," with W. Newey, 1992, Econometrica, 1995.

"Misclassification of a Dependent Variable in Qualitative Response Models," with F. Scott-Morton, mimeo December 1993.

"Nonlinear Errors in Variables: Estimation of Some Engel Curves," Jacob Marschak Lecture of the Econometric Society, Canberra 1988, Journal of Econometrics, 65, 1995.

PUBLICATIONS cont.:

II. Public Finance

"The Evaluation of Results from Truncated Samples," with D. Wise, Annals of Economic and Social Measurement, April 1976.

"Discontinuous Budget Constraints and Estimation: The Demand for Housing," with D. Wise, J.F. Kennedy School Working Paper, July 1977; Review of Economic Studies, 1980.

"The Effect of Taxation on Labor Supply: Evaluating the Gary Negative Income Tax Experiment," with G. Burtless, October 1977; Journal of Political Economy, December 1978.

"AFDC Participation -- Permanent or Transitory?," delivered at NBER-NSF Conference, August 1978; in Papers from the European Econometrics Meetings, ed. E. Charatsis, North Holland: 1981.

"The Effect of Wages, Taxes, and Fixed Costs on Women's Labor Force Participation," March 1979; presented at SSRC-NBER Conference on Taxation, Cambridge, England: June 1979; Journal of Public Economics, October 1980.

"The Effect of Taxes on Labor Supply," presented at Brookings Conference, October 1979; published in How Taxes Affect Economic Behavior, ed. H. Aaron and J. Pechman, Brookings: 1981.

"Income and Payroll Tax Policy and Labor Supply," presented at St. Louis Fed. conference, October 1980; in The Supply Side Effects of Economic Policy, ed. G. Burtless, St. Louis: 1981.

"Individual Retirement Decisions Under an Employer-Provided Pension Plan and Social Security," with G. Burtless, Journal of Public Economics, 1982.

"Individual Retirement and Savings Decisions," with P. Diamond, October 1981; presented at SSRC-NBER Conference on Public Economics, Oxford: June 1982; Journal of Public Economics, 1984.

"Retirement and Unemployment Behavior of Older Men," with P. Diamond, presented at Brookings Conference on the Aged, November 1982; in H. Aaron and G. Burtless, Retirement and Economic Behavior, Brookings: 1984.

"Tax Policy and Unemployment Insurance Effects on Labor Supply," May 1983; in Removing Obstacles to Economic Growth, ed. M. Wachter, 1984.

"Family Labor Supply with Taxes," with P. Ruud, American Economic Review, 1984.

"Social Security, Health Status and Retirement," with D. Wise, in Pensions, Labor, and Individual Choice, ed. D. Wise, 1985.

"The Effect of Taxes on Labor Supply," January 1983; in Handbook on Public Economics, ed. A. Auerbach and M. Feldstein, 1985.

"Choice Under Uncertainty: The Decision to Apply for Disability Insurance," with J. Halpern, Journal of Public Economics, 1986.

PUBLICATIONS cont.:

"Household Behavior and the Tax Reform Act of 1986," with J. Poterba, October 1986; Journal of Economic Perspectives, 1987, also published in French in Annales D'Economie et de Statistique, 1988.

"Involuntary Early Retirement and Consumption," with L. Paquette, ed. G. Burtless, Economics of Health and Aging, 1987.

"Income Taxation and Social Insurance in China," in Sino-U.S. Scholars on Hot Issues in China's Economy, 1990.

"On Contingent Valuation Measurement of Nonuse Values," with P. Diamond, in Contingent Valuation: A Critical Appraisal, ed. J. Hausman, 1993.

"Does Contingent Valuation Measure Preferences? Experimental Evidence," with P. Diamond, G. Leonard, M. Denning, in Contingent Valuation: A Critical Appraisal, ed. J. Hausman, 1993.

"Contingent Valuation: Is Some Number Better than No Number?" with P. Diamond, December 1993, Journal of Economic Perspectives, 8, 1994.

"A Utility-Consistent Combined Discrete Choice and Count Data Model: Assessing Recreational Use Losses Due to Natural Resource Damage," with G. Leonard and D. McFadden, October 1992, Journal of Public Economics, 56, 1995.

"The Cost of Cellular Telephone Regulation," mimeo, 1995.

"Contingent Valuation Measurement of Nonuse Values," with P. Diamond, ed. R.B. Stewart, Natural Resource Damages: A Legal, Economic, and Policy Analysis, 1995.

III. Applied Micro Models

"Project Independence Report: A Review of U.S. Energy Needs up to 1985," Bell Journal of Economics, Autumn 1975.

"Individual Discount Rates and the Purchase and Utilization of Energy Using Durables," MIT Energy Laboratory Working Paper, January 1978; Bell Journal of Economics, Spring 1979.

"Voluntary Participation in the Arizona Time of Day Electricity Experiment," with D. Aigner, May 1978; delivered at EPRI Conference on Time of Day Pricing, June 1978; in EPRI Report, Modeling and Analysis of Electricity Demand by Time of Day, 1979; Bell Journal of Economics, 1980.

"A Two-level Electricity Demand Model: Evaluation of the Connecticut Time-of-Day Pricing Test," delivered at EPRI Conference on Time of Day Pricing; with D. McFadden, in EPRI Report, Modeling and Analysis of Electricity Demand by Time of Day, 1979; Journal of Econometrics, 1979.

"Assessing the Potential Demand for Electric Cars," with S. Beggs and S. Cardell, presented at EPRI Conference, November 1979; Journal of Econometrics, 1981.

"Assessment and Validation of Energy Models," presented at EIA-NBS conference on Energy Models, May 1980; in Validation and Assessment of Energy Models, ed. S. Gass, Washington: Department of Commerce, 1981.

PUBLICATIONS cont.:

"Exact Consumer Surplus and Deadweight Loss," working paper 1979, American Economic Review, 71, 1981.

"Appliance Purchase and Usage Adaptation to a Permanent Time of Day Electricity Rate Schedule," with J. Trimble, August 1983; Journal of Econometrics, 1984.

"Evaluating the Costs and Benefits of Appliance Efficiency Standards," with P. Joskow, MIT Energy Lab Working Paper, MIT-EL82005WP; American Economic Review, 72, 1982.

"Information Costs, Competition and Collective Ratemaking in the Motor Carrier Industry," presented at Conference On Consensual Decision Making, American University, August 1982; American University Law Review, 1983.

"An Overview of IFFS," presented at EIA-NBS Conference on Energy Models, August 1982; in Intermediate Future Forecasting System, ed. S. Gass et al., Washington: 1983.

"Choice of Conservation Actions in the AHS," November 1982; in Energy Simulation Models, ed. R. Crow, 1983.

"Patents and R&D: Searching for a Lag Structure," with B. Hall and Z. Griliches, in Actes du Colloque Econometrie de la Recherce, Paris: 1983.

"The Demand for Optional Local Measured Telephone Service," in Adjusting to Regulatory, Pricing and Marketing Realities, East Lansing: 1983.

"Patents and R&D: Is There a Lag?," with B. Hall and Z. Griliches, 1985; International Economic Review, 1986.

"Price Discrimination and Patent Policy," with J. MacKie-Mason, Rand Journal of Economics, 1988.

"Residential End-Use Load Shape Estimation from Whole-House Metered Data," IEEE Transactions on Power Systems, 1988 (with I. Schick, P. Vsoro, and M. Ruane).

"Competition in Telecommunications for Large Users in New York," with H. Ware and T. Tardiff, Telecommunications in a Competitive Environment, 1989.

"Innovation and International Trade Policy," Oxford Review of Economic Policy, 1988 (with J. MacKie-Mason).

"The Evolution of the Central Office Switch Industry," with W. E. Kohlberg, 1987; in ed. S. Bradley and J. Hausman, Future Competition in Telecommunications, 1989.

"Future Competition in Telecommunications," 1987; ed. S. Bradley and J. Hausman, Future Competition in Telecommunications, 1989.

"Joint Ventures, Strategic Alliances and Collaboration in Telecommunications," presented at International Conference on Joint Ventures in Telecommunications, October 1989, Regulation, 1991.

PUBLICATIONS cont.:

"An Ordered Probit Model of Intra-day Securities Trading," with A. Lo and C. MacKinlay, Journal of Financial Economics, 1992.

"A Proposed Method for Analyzing Competition Among Differentiated Products," with G. Leonard and J.D. Zona, Antitrust Law Journal, 60, 1992.

"Global Competition and Telecommunications," in Bradley, et al., ed., Globalization, Technology and Competition, 1993.

"The Bell Operating Companies and AT&T Venture Abroad and British Telecom and Others Come to the US," presented at Harvard Business Conference on International Telecommunications, 1991, in Bradley, et al., ed., Globalization, Technology and Competition, 1993.

"The Effects of the Breakup of AT&T on Telephone Penetration in the US," with T. Tardiff and A. Belinfante, American Economic Review, 1993.

"Competitive Analysis with Differentiated Products," with G. Leonard and D. Zona, Annales, D'Economie et de Statistique, 34, 1994.

"Proliferation of Networks in Telecommunications," ed. D. Alexander and W. Sichel, Networks, Infrastructure, and the New Task for Regulation, presented at Conference 1994, University of Michigan Press, 1996.

"The Effect of Superstars in the NBA: Economic Value and Policy," with G. Leonard, mimeo May 1994.

"Valuation of New Goods Under Perfect and Imperfect Competition," MIT Working Paper, June, 1994, forthcoming ed. T. Bresnahan and R. Gordon, University of Chicago Press.

"Cellular Telephone: Competition and Regulation," November 1994; ed. W. Read and W. Sapronov, Telecommunications Law, Regulation & Policy, Ablex Publishing, 1995.

"Competition in Long Distance and Equipment Markets: Effects of the MFJ," 1994, Journal of Managerial and Decision Economics, 1995.

"The Cost of Cellular Telephone Regulation," MIT Working Paper, January 1995.

"State Regulation of Cellular Prices," Wireless Communications Forum, Volume III, April 1995.

"Efficient Local Exchange Competition," with T. Tardiff, Antitrust Bulletin, 1995.

"Valuation of New Services in Telecommunications," with T. Tardiff, presented at OECD Conference in Toronto, June 1995, forthcoming in Conference Proceedings.

"Regulation of New Services in Telecommunications," with T. Tardiff, mimeo, July 1995.

"Market Definition Under Price Discrimination," with G. Leonard and C. Vellturo, Antitrust Law Journal, Vol. 64, 1996.

"Telecommunications: Building the Infrastructure for Value Creation," presented at the Harvard Business School Conference, November 16, 1995, forthcoming in ed. S. Bradley and R. Nolan, 1995.

JOINT REPORTS, TESTIMONY, AND BOOKS:

"Project Independence: An Economic Analysis," Technology Review, May 1974.

"The FEA's Project Independence Report: Testimony before Joint Economic Committee," U.S. Congress, March 18, 1975.

"The FEA's Project Independence Report: An Analytical Assessment and Evaluation," NSF Report, June 1975.

"Energy Demand in the ERDA Plan," with D. Wood, Energy Laboratory Report, August 1975.

"A Note on Computational Simplifications and Extensions of the Conditional Probit Model," EPRI report on choice models, September 1977.

"Labor Supply Response of Males to a Negative Income Tax," Testimony for U.S. Senate Finance Subcommittee on Public Assistance, November 22, 1978.

"Appliance Choice with Time of Day Pricing," Energy Laboratory Report, January 1980.

"Discrete Choice Models with Uncertain Attributes," Oak Ridge National Laboratories Report, January 1980.

"Individual Savings Behavior," with P. Diamond, Report to the National Commission on Social Security, May 1980.

"Wealth Accumulation and Retirement," with P. Diamond, Report to the Department of Labor, May 1982.
"A Review of IFFS," Report to the Energy Information Agency, February 1982.

"A Model of Heating System and Appliance Choice," with J. Berkovec and J. Rust, Report to the Department of Energy, December 1983.

"Labor Force Behavior of Older Men After Involuntary Job Loss," with L. Paquette, Report to Department of Health and Human Services, December 1985.

"Pollution and Work Days Lost," with D. Wise and B. Ostrow, NBER Working Paper, January 1984; Revised 1985.

"Demand for Interstate Long Distance Telephone Service," with A. Jafee and T. Tardiff, November 1985.

"Competition in the Information Market 1990", August 1990.

"The Welfare Cost to the US Economy of Regulatory Restriction in Telecommunications," January 1995.

"Benefits and Costs of Vertical Integration of Basic and Enhanced Telecommunications Services," April 1995.

"Statement on the Natural Resource Damage Provisions of CERCLA," Testimony before the U.S. Senate Committee on Environment and Public Works, May 11, 1995; Testimony before the U.S. House of Representatives, Transportation & Infrastructure Committee, Water Resources & Environment Subcommittee, July 11, 1995.

"Competition in Cellular Markets," Testimony before the U.S. House of Representatives, Committee on Commerce, October 12, 1995.

JOINT REPORTS, TESTIMONY, AND BOOKS cont.:

"Merger Policy in Declining Demand Industries," Testimony before the U.S. Federal Trade Commission, November 14, 1995.

The Choice and Utilization of Energy Using Durables, ed. J. Hausman, Palo Alto: EPRI, 1981.

Social Experimentation, ed. J. Hausman and D. Wise, Chicago: 1985.

Future Competition in Telecommunications, ed. S. Bradley and J. Hausman, Harvard: 1989.

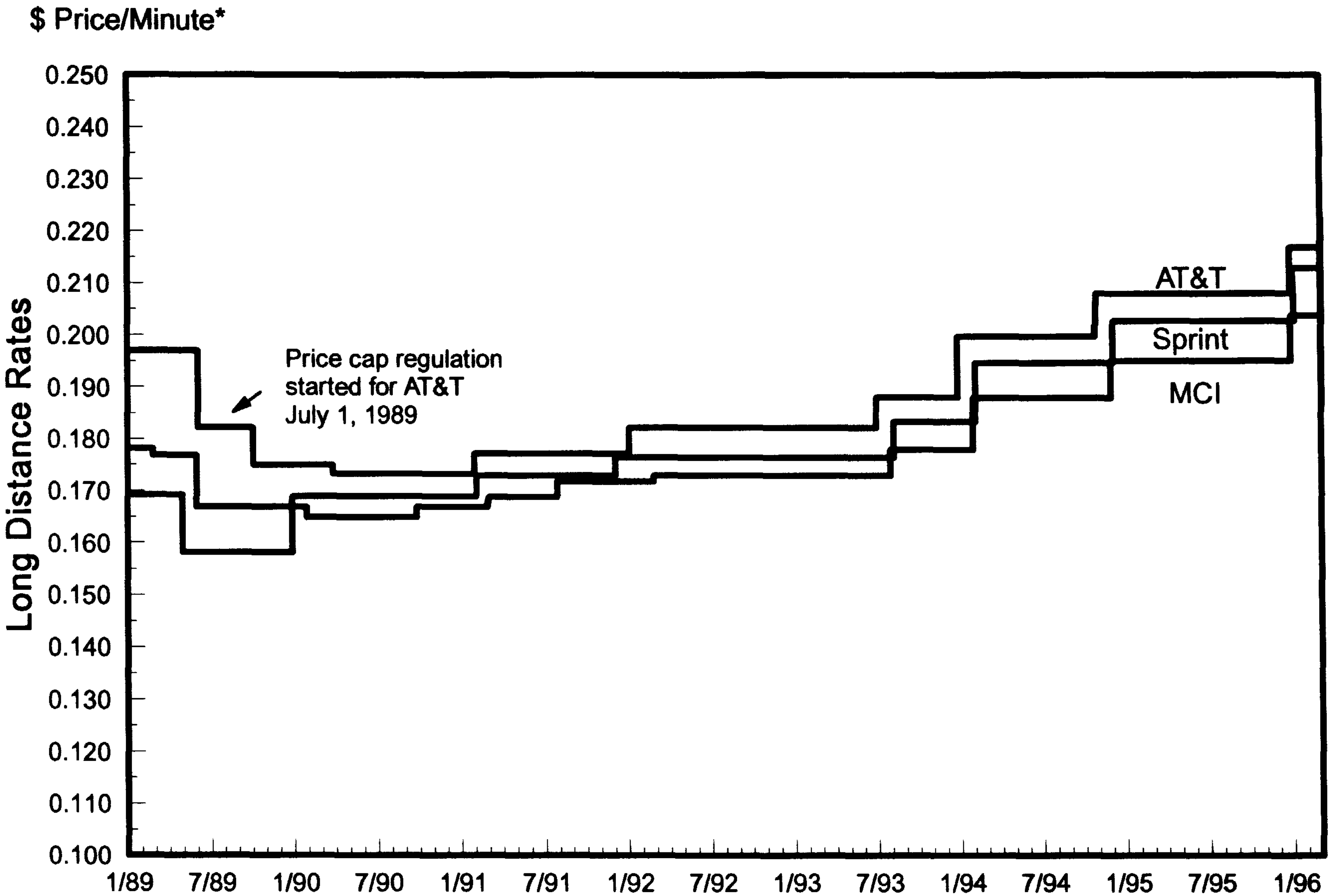
Contingent Valuation: A Critical Appraisal, ed. J. Hausman, North Holland, 1993.

Globalization, Technology and Competition, ed. S. Bradley, J. Hausman, R. Nolan, Harvard 1993.

Economic Impact of Deregulating U.S. Communications Industries, The WEFA Group, Burlington, MA, February 1995.

Exhibit 2

Trends in Long Distance Rates



* Long distance rates based on the average price per minute for basic service.

Exhibit 3

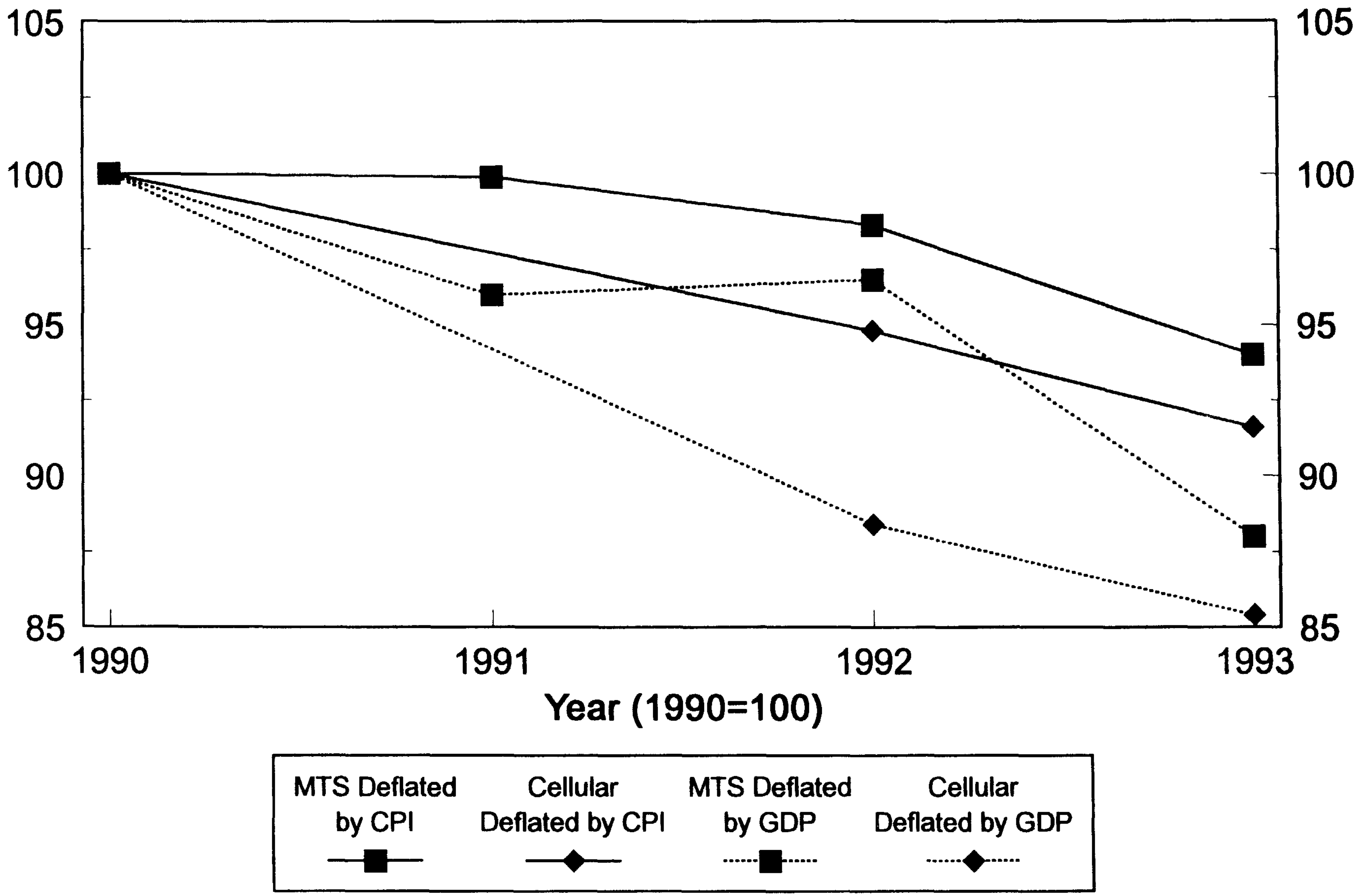
Access Charges

Rates in Effect		Total Charges Per Conversation Minute	Index
From	To		
01/01/90	06/30/90	7.8	1.00
07/01/90	12/31/90	7.5	0.96
01/01/91	06/30/91	7.2	0.92
07/01/91	06/30/92	7.0	0.90
07/01/92	06/30/93	6.8	0.87
07/01/93	06/30/94	6.7	0.86
07/01/94	07/31/95	6.3	0.81
08/01/95		5.7	0.73

Source: FCC Monitoring Report, CC Docket No. 87-339, May 1995.

Exhibit 4

AT&T ARPM v. Cellular Prices



Note: Cellular data are year-end prices. Cellular data not collected in 1991.

Exhibit B
MacAvoy Affidavit

BEFORE THE
FEDERAL COMMUNICATIONS COMMISSION

In the Matter of	)	
	)	
Policy and Rules Concerning the Interstate, Interexchange Marketplace	)	CC Docket No. 96-61
	)	
Implementation of Section 254(g) of the Communications Act of 1934, as amended	)	

AFFIDAVIT OF PAUL W. MACAVOY
on behalf of
BELLSOUTH CORPORATION

My name is Paul W. MacAvoy and I hold the Williams Brothers Professorship in Management Studies at the Yale School of Management. BellSouth has requested that I provide for this proceeding a survey of the analytical studies in economics on competition in interLATA long-distance service markets, based in part on my forthcoming book THE FAILURE OF ANTITRUST AND REGULATION TO ESTABLISH COMPETITION IN LONG-DISTANCE TELEPHONE SERVICE MARKETS (MIT/AEI Press), which is included as an attachment to this affidavit. In addition, I examine available evidence compiled by other economists on the competitiveness of long-distance markets. Studies by myself and others use the same methodology – that of examining market price behavior over time – to come to different conclusions. But these conclusions are not contradictory, in the sense of being opposite findings from the same data; rather, they are conclusions resulting from the use of different source materials and different data. Those studies directly measuring and testing price behavior conclude that markets have become dominated by tacitly collusive pricing in the 1990s and, thus, are not competitive.

I. TESTING AND ANALYZING BEHAVIOR FOR "COMPETITIVENESS"

Since the emergence of the field of Industrial Economics in the 1940s, the research process has in the mainstream been built on (1) finding market structure, (2) examining firm conduct or strategy, and (3) analyzing performance. In forming conclusions, however, only performance analysis has had significant weight. Markets could have two or five equal-sized firms in (1), and these firms could presume that their strategies are to take away shares or not to take away shares in (2). But if prices do not exceed long-run marginal costs, the first-order test for competitive performance, various presumptions about "competitiveness" from the assessments in (1) and (2) are not given any weight.

Performance studies of long-distance service markets have centered on how toll charges have changed over the ten years since the divestiture of AT&T established a small number of very large carriers in interLATA services. Economic consultants for the long-distance carriers have stressed that estimated averages of these toll charges have declined. Other economic consultants and some non-consultant academics have taken the position that toll charges have not fallen sufficiently to come into line with long-run marginal costs, or that they have not changed in response to changes in conditions that would be associated with procompetitive changes in structure (1) or in conduct (2).

To make analysis more complex, the structural conditions and key aspects of conduct in these markets correctly can be associated with presumptions that either markets *should be competitive* or markets have the *necessary conditions for tacit collusion* in long-distance telecommunications.[1] These conditions, as well-established in economics,[2] are (1) that few firms

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[1] *See also,* MacAvoy, P. (1995), *Tacit Collusion Under Regulation in the Pricing of Interstate Long-Distance Telephone Services*, 4 JOURNAL OF ECONOMICS AND MANAGEMENT STRATEGY 147 (hereinafter MacAvoy (1995)). *See also Affidavit of Paul W. MacAvoy*, July 6, 1994, *United States of America v. Western Electric Company, Inc. and American Telephone and Telegraph Company*, Civil Action No. 82-0192 (hereinafter MacAvoy (1994)); *Affidavit of Paul W. MacAvoy on Behalf of Pacific Telesis*, January 1995, *United States of America v. Western Electric Company, Inc. and American Telephone and Telegraph Company*, Civil Action No. 82-

of substantial size operate in the market; (2) their market shares are stable; (3) their prices are readily observable to each other; (4) the products they sell are close to identical and have similar cost levels; and (5) new entrants face barriers to entry. These conditions all exist in markets for long-distance telecommunications services, with items one, two, and five given by technology and firm strategies, and items three and four determined by regulatory practices at both the state and federal level.

With respect to the first condition, the three large facilities-based carriers AT&T, MCI, and Sprint account for more than 80 percent of toll revenues.[3] During the period 1984 to 1989, AT&T's market shares in the provision of message toll service ("MTS"), inbound wide-area telecommunications service (inbound WATS), outbound WATS, and virtual network services declined as the shares of MCI and Sprint increased. During the period 1990 to the present, the decline in AT&T's market shares slowed and the shares of the three carriers stabilized. The three firms offer essentially identical packages of services under publicly available terms, and their marginal costs are virtually identical (access charges they pay to local exchange carriers, by Federal Communications Commission policy, are the same, and the remainder of costs incurred in day-to-day operations is also quite similar given their common use of standard fiber-optic transmission and switching systems). Barriers to entry are substantial given the large sunk costs of the fiber-optic systems now in place and dominated by significant excess capacity.

0192; *see also Reply Affidavit of Paul W. MacAvoy on Behalf of Pacific Telesis*, May 1995, *United States of America v. Western Electric Company, Inc. and American Telephone and Telegraph Company*, Civil Action No. 82-0192.

[2] Orr, Daniel and MacAvoy, Paul W. (1965), *Price Strategies to Promote Cartel Stability*, 32 ECONOMICA 186; *see also* Salop, S. (1986), *Practices that (Credibly) Facilitate Oligopoly Coordination*, in Joseph Stiglitz and Frank Mathewson, eds., NEW DEVELOPMENTS IN THE ANALYSIS OF MARKET STRUCTURE, Washington, DC: Federal Trade Commission.

[3] FEDERAL COMMUNICATIONS COMMISSION, STATISTICS OF COMMUNICATIONS COMMON CARRIERS, 1994/1995 Edition, Table 1.4.

Given that these structural conditions are conducive for establishing either tacit price coordination or interfirm competition, then the analysis has had to center on competitiveness of price behavior in the important long-distance markets. The extent of each carrier's market power has been measured directly in a number of studies by determining the amount by which its prices exceed its costs, i.e., by the price-cost margin. The definitive test of competitive behavior in economics is that when there is competition, and more competition over time, price-cost margins are lower and they decline over time. Carrier concentration has declined in long-distance telecommunications markets. Carriers' price-cost margins also should have declined unless they successfully prevented the diminution of market power through tacit price collusion.

II. STUDIES THAT ANALYZE THE COMPETITIVENESS OF MARKET BEHAVIOR

Studies of prices measure levels and changes against marginal costs, and as determined by sales concentration, elasticities of demand, and an interaction factor among firms.[4] When these determinants posit competition, so that concentration is low, elasticity is large, and the interaction factor is negative, then the price-cost margin tends towards zero. The first objective has been to measure this margin (usually as a percentage of price) and to observe its behavior over time relative to the levels and to changes in the levels of these determinants.

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[4] A firm's price-cost margin (also known as its Lerner Index) equals (Price - Marginal Cost) / Price. If the firm's price-cost margin is multiplied by [(market elasticity of demand) / (firm's market share) - 1], its conjectural variation is obtained, which equals its expectation of how other firms will change their output in aggregate in response to a change in its output. Thus, a positive conjectural variation means that the firm expects if, for example, it decreases its output, other firms will as well, constituting a collusive pattern of firm behavior. Conversely, a negative conjectural variation implies competitive firm behavior. *See, e.g.*, Martin, S. (1993), ADVANCED INDUSTRIAL ECONOMICS, Oxford: Blackwell, Chapter 2.

A. MacAvoy Studies

There is to date only one set of studies that attempts to develop a full set of these margins for the three large carriers in the 1989 to 1994 period. These studies are documented in the attached book manuscript. The following paragraphs summarize the findings.

To measure long-distance carriers' price-cost margins, a detailed database of carriers' tariffs as submitted to the Federal Communications Commission was assembled. Index prices per minute for calls of various types that fit the profiles of typical calling patterns of households and businesses were estimated from the tariffs for MTS, inbound WATS, outbound WATS, and virtual network services by carrier and date.[5] Next carriers' marginal costs were estimated from filed testimony of an AT&T cost expert who provided detailed figures for marginal network costs for the provision of various long-distance services.[6] The other component of carriers' marginal costs is the access charges they pay to local exchange companies for originating and terminating calls; these charges were obtained from Federal Communications Commission tariffs of the operating companies.

Thus, given these data on both market concentration and carriers' price-cost margins, analyses of carriers' price behavior were undertaken. The evidence was that *despite large declines in seller concentration in long-distance markets, the price-cost margins of AT&T, MCI, and Sprint increased over the last ten years.* The largest increases were in the early and mid 1990s, when market shares of the three carriers had stabilized. This result held for MTS, inbound

[5] These prices are presented in Chapter Five of the attached book.

[6] *Direct Testimony of John Sumpter on Behalf of AT&T Communications of California, Inc.*, June 18, 1990, *Application of AT&T Communications of California, Inc. (U 5002 C) for Authority to Provide Intrastate AT&T 800 READYLINE Service.*

WATS, outbound WATS, and virtual network services provided in the U.S.[7] This relationship was marked in long-distance markets both nationwide and even more so in the state of California (where a special study was undertaken). Moreover, when a similar analysis was performed for international calls, the same result obtained: falling seller concentration for MTS and WATS calls between the U.S. and eight foreign countries was accompanied by rising price-cost margins.

One response to this research has been that it ignored "competitive" effects of discount calling plans.[8] But long-distance carriers' price-cost margins earned on the provision of discount plans were examined in detail. The pattern of price-cost margins for discount plans was similar to that for standard MTS plans. Thus, for example, AT&T's price-cost margins on its *Reach-Out America* Discount Calling Plan were approximately ninety-seven percent of those earned on its standard MTS plan. MCI and Sprint also earned price-cost margins on their discount calling plans that were more than ninety percent of the profit-margins on standard plans.[9]

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[7] AT&T has announced this finding publicly. AT&T's 1994 ANNUAL REPORT states at page 24:

> Total costs of telecommunications services declined [in 1993 and 1994] despite higher volumes, in part because of reduced prices for connecting customers through local networks. In addition, we improved our efficiency in network operations, engineering and operator services, with lower costs and higher revenues, the gross margin percentage rose to 41.8 % in 1994 from 39.0% in 1993 and 37.2% in 1992.

[8] *Affidavit of R. Glenn Hubbard and William H. Lehr, Attachment 1, An Analysis of Competition in U.S. Long-Distance Telephone Service*, December 5, 1994, *United States of America v. Western Electric Company, Inc. and American Telephone and Telegraph Company*, Civil Action No. 82-0192; *Affidavit of B. Douglas Bernheim and Robert D. Willig, An Analysis of the MFJ Line of Business Restrictions*, December 1, 1994; and *Declaration of Robert E. Hall*, December 2, 1994, *United States of America v. Western Electric Company, Inc. and American Telephone and Telegraph Company*, Civil Action No. 82-0192.

[9] *Reply Affidavit of Paul W. MacAvoy on Behalf of Pacific Telesis*, May 1995, *United States of America v. Western Electric Company, Inc. and American Telephone and Telegraph Company*, Civil Action No. 82-0192, at 33-35.

Thus, discounts did not have the effect of causing a breakdown in the tacitly collusive pricing patterns observed in the provision of standard MTS, but instead were part of that strategy of holding shares and price levels steady. Therefore, *advertised discounting does not establish the "competitiveness" of long-distance telecommunications markets.*

There are obvious reasons for this outcome. The discount plans have been set up as offering percentage discounts off standard MTS tariff rates. They offer lower prices on night and weekend service, for the most part, when costs are lower and demand is more price sensitive. Thus, they are discriminatory in the monopoly sense. As standard tariff rates have increased in recent years and percentage discounts have been constant, discount plan prices have increased. More basic, the discounts have not been based on bargaining between buyer and seller, but instead have been embedded in tariffs approved by the FCC. Discounts are no more competitive than the process from which they emerge. By providing competing carriers with notice of proposed price cuts, the tariffing process ensures that a carrier loses any first-mover advantage from making a price cut. The FCC has acknowledged the tariffing process is "an excellent mechanism for inducing noncompetitive pricing."[10]

Even so, discount plans for residential customers have been advertised intensively by the carriers and discussed enthusiastically in the popular press. BUSINESS WEEK states that discounts "make the basic rate irrelevant - like a car's sticker price," and quotes MCI president Gerald M. Taylor: "Nobody, absolutely nobody, pays sticker price."[11] This depiction of reality is not correct on its face. More than 39 million of AT&T's customers have monthly bills too low to take advantage of any discount plan, so the claim that "nobody" pays sticker price is grossly

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[10] *See* July Affidavit at 33-36.

[11] *See* C. Arust, *All Those Long Distance Discounts are Sweet, But . . .*, BUSINESS WEEK 66 (September 19, 1994).

inaccurate.[12] For customers with monthly bills large enough to allow them to realize lower prices under discount plans than those offered under standard MTS, prices for discount MTS calling plans generally exceeded 90 percent of prices for standard MTS plans. For example, under AT&T's *Reach Out America* plan, customers paid approximately 95 percent of the standard MTS rate.[13] Similarly, MCI's customers using its *Friends & Family I* plan paid approximately 94 percent of its standard MTS rate; while Sprint's customers received discount rates under its *Sprint Plus* and *Sprint Day* plans that were from 95 percent to 77 percent of its standard MTS prices over the period 1989 to 1994.[14] In sum, the prices of these "discount" plans show no more evidence of price competition than do those of the standard rates that they discount.

A factor that has facilitated the exercise of tacit collusion in these long-distance markets was the FCC's tariff-filing process. In particular, the requirement that carriers file publicly available tariffs prior to the initiation of price changes and new service offerings enable other carriers to observe such changes prior to their taking effect. When carriers are knowledgeable of their rivals' price changes, their incentive to cut prices is substantially reduced or eliminated because rivals may respond to such price changes before they have the intended effect of capturing market share. But there was no finding to the effect that removal of the tariff submission process by itself was sufficient to generate competitive pricing.

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[12] According to an October 1994 letter to the FCC, AT&T states that over 60 percent of its customers have monthly bills for long-distance service of $10 or less. *See* Letter of Alex Mandl, executive vice president and CEO of AT&T's Communications Services Group to The Honorable Reed E. Hundt, Chairman, Federal Communications Commission, October 4, 1994. Since customers with such low usage levels cannot obtain rates below those in AT&T's standard MTS plan, and since AT&T has approximately 65 million customers, the presence of discount calling plans does no good for the more than 39 million AT&T customers who cannot benefit from these plans.

[13] *Reply Affidavit of Paul W. MacAvoy on Behalf of Pacific Telesis*, May 1995, *United States of America v. Western Electric Company, Inc. and American Telephone and Telegraph Company*, Civil Action No. 82-0192, at 33-35.

[14] *Id.*

More recent research, in MacAvoy, Doane, and Williams (1995), documents a "competitive experiment" that occurred in California the past year.[15] On January 1, 1995, the California Public Utilities Commission (CPUC) reduced by one-half the access charges paid by long-distance phone companies. This single action lowered the cost of transmitting a long-distance call within California by approximately forty percent. The CPUC's belief was that the reduction in costs would be passed on to consumers through lower prices, since this is how a competitive market operates. However, the California study indicates the response was anything but competitive. In lock-step, AT&T, MCI, and Sprint reduced their prices by three, three, and zero percent respectively, thus adding an additional twenty percent to their already high (fifty percent) profit margins.

B. HAUSMAN STUDIES

The finding that non-competitive pricing dominates long-distance markets has been arrived at by other economic analysts specializing in telecommunications. In testimony for the Bell Operating Companies filed before the federal district court in Washington D.C., Professor Jerry Hausman of the Massachusetts Institute of Technology concluded interLATA toll markets for residential and small business users were not competitive.[16] Professor Hausman observed that AT&T's prices were constrained by Federal Communications Commission price cap regulation, but when

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[15] MacAvoy, Paul W., Doane, Michael J., and Williams, Michael A. (1995) *Policy and Competitiveness Issues in California Long Distance Telephone Service Markets*, YALE SCHOOL OF MANAGEMENT, WORKING PAPER SERIES C, NO. 39.

[16] *Affidavit of Jerry A. Hausman, Appendix Volume II, Motion of Bell Atlantic Corporation, BellSouth Corporation, NYNEX Corporation, and Southwestern Bell Corporation to Vacate the Decree, United States of America v. Western Electric Co., Inc. and American Telephone and Telegraph Co. Civil Action No. 82-0192 (HHG).*

AT&T had the opportunity to raise prices, it did so. In particular, Professor Hausman found that AT&T's prices for residential and small business service were near their allowed maximums in the four-year period following the adoption of "price-cap" regulation in 1989.[17] Prices at the price-cap index would be consistent with competition only if (1) productivity gains during the price-cap period matched exactly the percentage target embodied in the price-cap formula and (2) the initial period "cost of service" regulated price by chance were set at the competitive level. However, the available evidence indicates that AT&T's productivity substantially exceeded that target, implying that if prices were competitive they should have fallen during this time period.[18]

Professor Hausman offered additional evidence on the lack of competition in long distance. He documented that subsequent to the Federal Communication Commission's evaluation of the price cap mechanism, AT&T increased its index and raised rates to generate increased revenues of more than $200 million, primarily in response to the adoption of accrual accounting for employee post-retirement benefits. In response, MCI and Sprint almost immediately matched AT&T's rate increase. As Professor Hausman correctly noted, accounting changes in post-retirement costs are changes in regulatory costs, not economic costs. That is, they are a change in financial reporting requirements for costs which have long been recognized. In a competitive market, changes in accounting costs should *not* affect the competitive price: the price of computers and cars, for example, did not go up when IBM and Ford made accounting changes similar to AT&T's.

[17] *Id* at 13.

[18] Professor Hausman observed that during the period 1989 - 1993, AT&T improved its network by undertaking investment in fiber optic transport facilities. He estimated that this technological advance should have yielded annual cost reductions on the order of thirteen percent. Hausman Affidavit at 14.

C. TAYLOR AND ZONA STUDIES

Drs. William Taylor and Douglas Zona of National Economic Research Associates, Inc. have examined competitiveness of long-distance telephone markets.[19] They studied AT&T's prices and costs and concluded:

> On an aggregate basis, AT&T's price reductions have failed to match reduction in access charges. In fact, AT&T's pricing relating to costs suggest the company may continue to enjoy significant market power. The adverse effects appear to have been experienced disproportionately by low-volume residential and small business customers, for whom prices deviated from the maximum levels allowed under price-cap regulation.[20]

Taylor and Zona also investigated AT&T's improvements in service quality, advertising expenditures, and financial performance. Based on these measures of firm performance they found: (1) while AT&T had improved its quality of service, the gains were similar to those in localities without other facilities-based providers, suggesting competition was not the direct impetus for quality enhancements; (2) AT&T's substantial increases in advertising expenditures were consistent with barriers to entry, low levels of price competition, and high operating margins; and (3) AT&T's reported financial results were entirely consistent with the presence of non-competitive price-cost margins.

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[19] Taylor, William E. and Zona, J. Douglas, *An Analysis of the State of Competition in Long-Distance Telephone Markets, Appendix - Volume II, Reply of BellSouth Corporation, NYNEX Corporation, and SBC Communications Inc. to the Initial Comments on Their Motion to Vacate the Decree, United States of America v. Western Electric Co., Inc. and American Telephone and Telegraph Co. Civil Action No. 82-0192 (HHG).*

[20] *Id.* at 4.

III. ANALYSES NOT BASED ON PRICE BEHAVIOR

A. SPILLER STUDIES

Professor Pablo Spiller of the University of California at Berkeley conducted an investigation of the financial market behavior associated with potential Bell Operating Company (BOC) entry into the long-distance markets.[21] He found lifting the Modification of Final Judgment's (MFJ's) restriction on RBOC entry into interLATA markets easily could increase consumer welfare by $6 billion per year.[22] In contrast to the analysis of price-cost margins in MacAvoy (1995), Professor Spiller based his findings on the responses of the stock market to major telecommunications restructuring events since divestiture. Professor Spiller noted that the response of a company's stock price to an unexpected event reflects the perception of the market concerning a change in the present value of the company's net cash flow. For example, if a merger creates efficiencies, so that the combined cash flow of the merged entities increases, then the stock market capitalization of the combined enterprise should increase. Mergers, however, may also effect the stock prices of other companies depending on the competitiveness of markets. Professor Spiller states "if the competitors' stock prices are negatively affected by the events under analysis [e.g., an announced merger that increases corporate efficiency], then it can be inferred that the events increased the extent of competition in those markets. In other words, for the response of competitors' stock values to be negative, there had to be large rents to be extracted in those markets." [23]

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[21] *Affidavit of Pablo T. Spiller, Appendix Volume II, Motion of Bell Atlantic Corporation, BellSouth Corporation, NYNEX Corporation, and Southwestern Bell Corporation to Vacate the Decree, United States of America v. Western Electric Co., Inc. and American Telephone and Telegraph Co. Civil Action No. 82-0192 (HHG).*

[22] Professor Spiller characterized this estimate as a conservative lower bound.

[23] Spiller Affidavit, at 4-5.