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EDUCATION

1977 Ph.D., Economics, Georgetown University
1975 M.A., Economics, Georgetown University
1972 B.S., Foreign Service, Georgetown University

HONORS AND AWARDS

Corporate: EDS-MCS Leadership Award, 1996
McGraw-Hill Corporate Achievement Award, 1993
DRI Consulting Group awards, 1990, 1991, and 1992
Standard & Poor's Business Success Award, 1988
Standard & Poor's Business Innovation Awards, 1986, 1987
McGraw-Hill Senior Management School, 1988
Undergraduate: Phi Beta Kappa, Phi Alpha Theta, University Fellow
Graduate: Departmental Fellow, University Merit Scholarship,
Distinction in Ph.D. Comprehensive (all areas)

PROFESSIONAL BACKGROUND

Current	Consulting Economist
1998-2000	Professor (adjunct), University of NH; Clark University; Consulting Economist
1996-2000	Senior Advisor, PHB-Hagler Bailly Consulting
1994-1996	Principal & Economics Practice Leader, EDS Management Consulting Services
1990-1994	Managing Director, Consulting, DRI/McGraw-Hill
1988-1994	Sr. Vice President, McGraw-Hill
1987	Vice President, McGraw-Hill
1985	Director, Industry Information Products, Services and Consulting, DRI/McGraw-Hill
1982-1984	Manager, Washington Operations, Battelle Northwest
1981-1984	Senior Research Economist, Battelle Northwest
1977-1981	Senior Research Associate, The Urban Institute
1980-Present	Referee, <i>Review of Economics and Statistics</i> , <i>Southern Economic Journal</i> , <i>Empirica</i> , <i>Telecommunications Policy</i>
1978-1979	Adjunct Assistant Professor, Georgetown
1976-1977	Research Economist, Science Applications
1973-1975	Economist and Consultant, U.S. Environmental Protection Agency

CURRENT/PAST PROFESSIONAL SOCIETIES

American Economic Association
Royal Economic Society
Canadian Economic Association
Western Economic Association
Southern Economic Association
Int'l Ass. for Energy Economics
Eastern Economic Association

PROFESSIONAL EXPERIENCE

Currently, and in previous positions with EDS Management Consulting Services, S&P-DRI, Battelle Northwest, The Urban Institute, and SAIC, Dr. Cronin has applied his expertise in project management and quantitative analysis to a wide range of issues for both private and public sector clients. Often, these engagements require the design, collection, and construction of multidimensional information sets and their creative quantitative application to complex issues. Dr. Cronin has expertise in applied microeconomics, econometrics, and industrial organization. He has extensive experience in such areas as energy, network economics and technology and has led dozens of major engagements for multinational corporations, industry associations, and government agencies in policy/regulatory analysis, market planning, and, tactical/ strategic business applications.

Dr. Cronin has appeared as an expert witness in private as well as regulatory proceedings. He has testified for regulators as well as electric utilities, gas, pipeline, and local, long distance, and wireless telecommunications companies. He has testified on topics such as: market power, concentration, and structure (e.g., industrial gas pricing and alternative fuels); pricing/transfers and competitive safeguards (ancillary services); rate making approaches; productivity, price indexes, and alternative regulation/PBR; commodity pricing in long-term contracts; infrastructure investment returns, requirements, and pricing; and, access terms, conditions, and implications. His work has been filed with or presented to regulatory bodies (e.g., NTIA, FCC, CRTC, Ontario Energy Board, Alberta Utility Commission) and numerous state commissions (e.g., ICC, CPUC). In Alberta, he has participated in both the ENMAC 2008 PBR as well as the AUC's on-going generic restructuring of the gas and electric distribution LDCs. Dr. Cronin has also led engagements for regulators including DOT, NYPSC, PAPUC, OEB, and the Singapore Telecommunications Authority.

From 1998 to 2001, Dr. Cronin was a senior advisor to the OEB on restructuring/commercializing more than 250 LDCs, including an extensive assessment of LDCs' productivity. He has examined actual performance under PBR versus COS; initial inefficiency levels among restructured LDCs; the magnitude of technical versus allocative inefficiency; the role of third-party financing in overcapitalized LDCs; and, alternative market designs for competition policies. Rather than the tournament-type regulation proposed by Shleifer (1985) or the design used in most North American restructurings, some regulators in Europe and Australia have opted for hybrid-yardstick efficiency comparisons based on peer-group frontiers formed on partial costs combined with regulator-determined X factors/price indexes, as in North America. Compared with these alternatives, Shleifer's design has a number of advantages. Dr. Cronin presented research findings on these issues to the 35th Annual MSU Institute for Public Utilities regulatory Conference in Charleston and Camp NARUC at Michigan State University.

His public or quasi public sector clients have included the Municipal Electric Association (MEA) of Ontario, EPRI, API, DOE, ERA, NRC, DOT, NASA, DOD, COE, JCS, and, the US intelligence community. He has also conducted research for Bellcore, MPAA, and EPA. This work has included: technical change, restructuring, and regulatory alternatives; technical change and intellectual property rights; energy (e.g., the feasibility of refined (industrial) and crude storage reserves, disruption modeling, electricity forecasting and end-user technology, refining assessments, OCS leasing and drilling, defense requirements, conservation/commercialization, R&D, and alternative fuels); defense (i.e., surge industrial requirements), network economics (e.g., productivity, pricing, investment, access, externalities in the areas of transportation, pipelines, gas, telecom, electric), R&D/ technology spin-offs , taxation; and, environmental (e.g., transportation control plans, auto/fuel tax, global warming, acid deposition and contingent valuation). This work has been presented to congressional committees and state legislatures.

His private sector engagements include: high tech (e.g., computer, information technology, and software); energy (e.g., coal, electric, natural gas, petroleum, pipeline, nuclear, conservation); transportation and telecommunications; financial (e.g., insurance, asset management, and banking); manufacturing (e.g., automotive, instrument and aircraft); chemical; furniture and construction industries; accounting/consulting; temporary services; and entertainment (i.e., intellectual property). Engagements have included: cost-benefit analysis; acquisition asset valuation; commodity pricing in long term contracts; econometric decision support systems, forecasting and planning models; regulatory strategy,

testimony, and support; market potential; competitive assessments; strategic marketing; and customer satisfaction assessments. Dr. Cronin has worked at corporate, business unit and functional levels.

Dr. Cronin has taught at Georgetown and Clark Universities and held an adjunct appointment as Professor of Economics at the Whittemore School of Business and Economics, Univ. of NH. At UNH, he taught graduate and undergraduate Industrial Organization and the Regulation of Business. He has taught Urban-regional Economics. He presents at academic (e.g., Southern Economic), regulatory (e.g., Camp NARUC), and industry (e.g., MEA) conferences. His research for New Jersey Bell was instrumental in shaping the 1992 Utility Reform Act and in the company obtaining alternative regulation (see, *Fortune*, March 1993).

JOURNAL ARTICLES, SUBMISSIONS, PRESENTATIONS, and WORKS in PROCESS

- Cronin, F. J. and Motluk, S., “Ten Years After Restructuring: Degraded Distribution Reliability and Regulatory Failure in Ontario.” *Utility Policy*, (2011).
- Cronin, F. J. and Motluk, S., “Going Beyond Scale Economies in Distribution: the Effects of Firm Boundary and Financing Choices on Utility Costs.” *Annals of Public and Cooperative Economics*, 2011, 82:3: pp. 277–299
- Cronin, F. J. and Motluk, S., “Ontario’s Failed Experiment (Part 2): Service quality declines after 10 years of incentive regulation.” *Public Utilities Fortnightly*, August, 2009.
- Cronin, F. J. and Motluk, S., “Ontario’s Failed Experiment (Part 1): Service quality declines after 10 years of incentive regulation. ” *Public Utilities Fortnightly*, July, 2009.
- Cronin, F. J. and Motluk, S., “Dealing with Asymmetric Risk: Improving Performance through Graduated ROE incentives.” *Public Utilities Fortnightly*, May, 2009.
- Cronin, F. J. and Motluk, S., “Factor Substitution in Electricity Distribution.”
- Cronin, F. J. and Motluk, S., “Flawed Competition Policies: Designing ‘Markets’ with Biased Cost and Efficiency Benchmarks,” *Review of Industrial Organization*, 2007.
- Cronin, F. J. and Motluk, S., “Agency Costs of Third-Party Financing and the Effects of Regulatory Changes on Utility Costs and Factor Choices,” *Annals of Public and Cooperative Economics*, 78, No.4, 2007.
- Cronin, F.J., and Motluk, S., “How Effective are M&As in Distribution? Evaluating the Government’s Policy of Using Mergers and Amalgamations to Drive Efficiencies into Ontario’s LDCs,” *Electricity Journal*, April, 2007.
- Cronin, F.J. and Motluk, S., “Reviewing Electric Distribution Restructuring in Ontario: Policy without Substance or Commitment.” *Utility Policy*, March, 2006.
- Cronin, F. J. and Motluk, S., “The Road Not Taken: PBR with Endogenous Market Designs,” *Public Utilities Fortnightly*, March 2004. Initially presented at Michigan State University, Institute for Public Utilities, Regulatory Conference, Charleston, December 2003.
- Cronin, F.J., et al., “Prices, Profits, and Productivity: Analytical Miscues and their Consequences for Telecommunications Deregulation.”
- Cronin, F. J. and Motluk, S., “The (Mis)Specification of Efficiency Benchmarks among Electric Utility Peer Groups.” The North American Productivity Workshop, Union College, June 2002.

- Cronin, F. J., et al, "The Effect of Alternative Fuels and Gas Suppliers on Bilaterally Negotiated Industrial Gas Rates."
- Cronin, F.J., "Restructuring, Vertical Integration, and the Measurement of Output, Growth and Productivity." Submitted for publication.
- Cronin, F. J., Motluk, S. A., "Inter-Utility Differences in Efficiency." Prepared for the Canadian Economics Association Meeting, Montreal, May 2001.
- Cronin, F. J. and Motluk, S. A., "Comparing the Productivity Improvements of Leaders with Laggards Using Malmquist Index Estimates."
- Cronin, F. J., et al., "Productivity and Input Price Performance among Electric Distribution Utilities in Ontario." Originally prepared as Staff Report, Ontario Energy Board, July 1999.
- Cronin, F. J. and Gold, M., "Analytical Problems in Decomposing the System-Wide Effects of Sectoral Technical Change." *Economic Systems Research*, December 1998.
- Cronin, F.J. and Brown, D. M., "Technical Change and Sectoral Productivity in the U.S. Economy." Prepared for the Southern Eco. Association, Baltimore, November 1998
- Cronin, F.J. and Brown, D. M., "Vertical Integration, Restructuring, and Productivity: Shedding New Light on an Old Paradox." Prepared for the Southern Eco. Association, Baltimore, November 1998.
- Brown, D. M., and Cronin, F.J., "The Productivity of Computers: an Input- Output Approach." Prepared for the Southern Economic Association, Atlanta, November 1997.
- Cronin, F.J., et al., "Telecommunications, Factor Substitution and Sectoral Growth." *Contemporary Economic Policy*, July 1997. Prepared for the Western Economic Ass., San Diego, July 1995.
- Cronin, F.J., et al., "Local Exchange Competition, Rate Restructuring and Universal Service." *Telecommunications Policy*, April 1997.
- Cronin, F.J., et al., "The Social Rate of Return from Telecommunications Infrastructure Investment."
- Cronin, F.J., et al., "Factor Prices, Factor Substitution and the Relative Demand for Telecommunications across U.S. Industries." *Information Economics and Policy*, 1993, No. 5.
- Cronin, F.J., et al., "Telecommunications and Savings in Health Care Services." *Southern Economic Journal*, October 1994.
- Cronin, F.J., et al., April 1995. "The Calculation and Application of Composite Telecommunications Service Price Indexes." *Information Economics and Policy*.
- Cronin, F.J., et al., June 1994. "Inequities in the Costs and Benefits of Telecommunications across Stakeholder Groups." *Telecommunications Policy*.
- Cronin, F.J. and Wusterbarth, A. R., April 1986. "Economic Harm Ignored: Betamax Revisited." *Contemporary Policy Issues*.
- Cronin, F.J., October 1984. "Analytical Assumptions and Casual Ordering in Inter-industry Modeling." *Southern Economic Journal*.
- Cronin, F. J., et al., 1994, No. 1. "Telecommunications and Cost Savings in Educational Services." *Information Economics and Policy*.
- Cronin, F.J. et al., November 1993. "Telecommunications Infrastructure Investment and Productivity." *Telecommunications Policy*.
- Cronin, F.J. and E. Parker, November 1993. "A Review of Telecommunications and Geography," by A. Kellerman. *Telecommunications Policy*.

- Cronin, F.J., et al., October 1995. "Telecommunications and Rural Economic Development." *Telecommunications Policy*.
- Cronin, F.J. et al., August 1993. "Telecommunications Infrastructure Investment and Economic Development." *Telecommunications Policy*.
- Cronin, F.J., et al., October 1992. "Telecommunications Technology, Sectoral Prices, and International Competitiveness." *Telecommunications Policy*.
- Cronin, F.J., et al., September 1992. "Linking Telecommunications and Economic Competitiveness." *Global Telephony*.
- Cronin, F.J., et al., December 1991. "Telecommunications Infrastructure and Economic Growth: An Analysis of Causality." *Telecommunications Policy*.
- Cronin, F.J., et al., March 1992. "Confusion Clouds U.S. Telecommunications Equipment Trade." *Telephony*.
- Cronin, F.J., et al., in process. "Temporal and Spatial Variation in LEC Productivity Performance."
- Cronin, F. J., et al., work in process. "Telecommunications and the Derived Demand for Transportation by U.S. Sectors, 1963-1991."
- Cronin, F.J. and Wusterbarth, A. R., October 1983. "A Review of Cities and Firms," by B. Harrington, editor. *Southern Economic Journal*.
- Cronin, F.J., October 1983. "Market Structure and the Price of Housing Services." *Urban Studies*.
- Cronin, F.J., October 1983. "Federal Tax Regulations and the Housing Demand of Owner Occupants." *Land Economics*.
- Cronin, F.J., Winter 1983. "The Efficiency of Demand-Oriented Housing Programs: Generalizing from Experimental Findings." *Journal of Human Resources*.
- Cronin, F.J., July 1982. "The Household's Decision to Accept or Reject a Conditional Transfer Offer." *Southern Economic Journal*.
- Cronin, F.J., April 1982. "The Efficiency of Housing Search." *Southern Economic Journal*.
- Cronin, F.J., February 1982. "Estimation of Dynamic Linear Expenditure Functions for Housing." *Review of Economics and Statistics*.
- Cronin, F. J. and Motluk, S., "Examining the Relationships among Reliability Performance, Maintenance, and Investment among Electric Distribution Companies," October, 2009.
- Cronin, F. J. and Motluk, S., "The Biases in Using Proxy Capital Measures, Partial Costs and Incorrect Capital Prices in Utility Benchmarking."

BOOK ARTICLES:

- Cronin, F.J., June 1982. "Racial Differences in the Search for Housing." In W.A.V. Clark (ed.), *Housing Search*, Croom and Helm, London.
- Cronin, F.J., 1981. "Participation in the Experimental Housing Allowance Program." In R. Struyk and M. Bendick (eds.), *What Do Housing Allowances Buy? Answers from the Nation's Largest Social Experiment*, The Urban Institute Press, Washington, DC

- Cronin, F.J., 1981. "Consumption Responses to Constrained Programs." In R. Struyk and M. Bendick (eds.), *What Do Housing Allowances Buy? Answers from the Nation's Largest Social Experiment*, The Urban Institute Press, Washington, D.C.
- Cronin, F.J., 1981. "Consumption Responsiveness to Unconstrained Housing Allowances." In R. Struyk and M. Bendick (eds.), *What Do Housing Allowances Buy? Answers from the Nation's Largest Social Experiment*, The Urban Institute Press, Washington, D.C.
- Cronin, F.J., 1981. "Mobility." In R. Struyk and M. Bendick (eds.), *What Do Housing Allowances Buy? Answers from the Nation's Largest Social Experiment*, The Urban Institute Press, Washington, D.C.

POLICY-RELATED/REGULATORY ENGAGEMENTS: SELECTED CASES

- **Market Designs for Restructured Monopolies.** Dr. Cronin is now examining alternative market designs for competition policies. Rather than the tournament-type regulation proposed by Shleifer (1985) or the design used in most North American restructurings, some regulators in Europe and Australia have opted for hybrid-yardstick efficiency comparisons based on peer-group frontiers formed on partial costs combined with regulator-determined X factors/price indexes, as in North America. Compared with these alternatives, Shleifer's design has a number of advantages. This research was presented at Michigan State University, Institute for Public Utilities, Regulatory Conference, Charleston, December 2003 and submitted for publication.
- **Performance Benchmarks for Electric Utilities.** Dr. Cronin is continuing to work with former Staff from the Ontario Energy Board to quantify and evaluate the efficiency of electric utilities using non-parametric techniques. This work is also evaluating the peer-group performance benchmarks employed by regulators in Europe, Australia, California and the U.K. Unlike other analyses that have tended to examine only technical efficiency for LDCs operating under traditional cost of service (COS), this analysis is calculating a total measure of efficiency including allocative. The effect of factor input mix selection on efficiency, is a critical issue sparsely addressed in the literature. The analysis employs data on firms operating first under both COS and subsequently under higher incented frameworks and gauges the actual adjustment processes of utilities' cost structure over both short and long periods-- important in establishing correct benchmarks. The analysis examines the specification of the efficiency frontier, the assignment of utilities to peer groups, and calculated relative utility efficiency. It has examined the results under a variety of sensitivity tests including: the assumption of constant returns to scale (CRS) versus variable returns (VRS); the composition of frontier utilities over both short and long periods; the impact sample selection has on frontier efficiency estimates and peer group comparisons; and the effect of alternative time frames on utility performance. Dr. Cronin is also examining the effect of third-party financing of utility infrastructure on factor choice and efficiency. He is also calculating alternative measures of productivity such as the Malmquist index. This research was initially presented at the 2001 Canadian Economic Association Conference and further findings at the 2002 North American Productivity Workshop.
- **Profits, Market Structure and Deregulation.** The advent of incentive regulation in the 1980s (e.g., U.S. railroads/ICC, AT&T/FCC, British Telecom/OFTTEL, UK electric distribution/OFFER) brought a changing focus on the part of the regulators -- from rates, investment, and profits, to prices and productivity. It was hoped that the increasingly costly proceedings involving such topics as cost of capital, cost allocations, and returns would be replaced by consensus views of price and productivity adjustments. However, the emergence of the local monopolies as winners in the communications battles with long distance carriers in the 1990s was tied directly to pricing and profit distortions in the design of their restructuring. From divestiture, the FCC pursued asymmetrical policies: promoting competition in the inter-exchange market while replacing rate of return with "incentive" regulation in local markets. Analytical errors by the FCC and its failure to grasp the ultimate extent of inter-segment competition biased the competitive outcome toward local providers and supported counter

intuitive outcomes: rate-regulated local monopolies selling high-tariff, essential services to unregulated long distance carriers. The FCC relied on estimates of telecommunications productivity growth incorrectly derived from the price-dual method and on fifty-year trends during a secular rise in the rate of productivity growth. These errors biased the productivity target to levels below those being attained by the industry and created the opportunity for incumbent monopolies to earn supranormal profits. A robust competitive fringe enforced market discipline and limited AT&T's pricing power; for incumbent local exchange carriers, the lack of competition led to substantial, broad-based and persistent supranormal profits. By 1999, local monopolies were "earning" returns on equity of just under 30 percent versus 2 for long distance carriers.

- **Energy-Related Costs and Contract Litigation.** Dr. Cronin has been involved in several energy-related litigation cases. These include engagements on long-term supply contracts, unfair trade practices, and breach of contract. The first involved the methodology for setting coal prices employed in long-term, take or buy coal contracts between electricity generators and major mines. This case involved a major, long-term review of the coal industry and the changing technology (i.e., long-wall mining) for coal production. Dr. Cronin examined the implications of technical change on coal productivity and prices. The analysis also specified the appropriate manner for setting the price of purchased coal for utility contracts. In the case of unfair trade practices and breach of contract the work spanned almost 4 years and involved extensive analyses of a major South Eastern utility's cost of service accounting, cost allocation, rate design; and design, implementation, effectiveness, and valuation of DSM/conservation programs spanning the 1980s and 1990s. The four-year effort involved substantial analysis of the utility's strategies, tactics and results with respect to its environment, customers, competitors and accounting, costs and rates
- **Productivity and the Theory of the Firm.** Dr. Cronin has been investigating the relationship among the nature of the firm, restructuring and productivity. During the- post war period through the mid 1970s and 1980s, largely stable, vertically integrated operations shaped the notion that firm ownership was generally synonymous with production. Ford offered the ultimate in vertical integration at its Rouge River plant featuring wood production as well as steel and auto plants on the same site. AT&T produced local and long-distance services supported by internal equipment production and R&D. IBM, the world's largest computer manufacture, also internally supplied its own software, semiconductors and R&D. Many large corporations were functionally integrated as well internally supplying a broad array of support activities. From the 1970s until the early 1990s large, vertically integrated firms developed substantial in-house IT operations in some cases involving thousands of employees. However, deregulation and improved information technology have changed the nature of the firm. Since the early 1990s, a greater focus on core competencies as well as externally driven shifts in efficient boundaries has prompted firms to move these operations to suppliers. Economists have not recognized the measurement effects of such changes.
- **Rates, Returns and Recapitalisation.** Dr. Cronin testified for the MEU Association of Ontario in the OEB's proceeding reviewing the Minister's Directive to the Board to revise its PBR decision. The Minister contented that not-for-profit MEUs would achieve market rates of return by cost efficiencies alone within their current all equity financing, rather than by distribution rate increases and recapitalisation toward a more optimal debt/equity formulation. Dr. Cronin presented research that demonstrated that the typical MEU had net fixed assets almost 10 times greater than operating costs. This structure implies that an MEU would have to reduce costs by about 85 percent pretax (about 160 percent post-tax) to move from its near zero return to a market return. Leaving open the issue of overcapitalization on the part of some MEUs (a matter for second term PBR and notable as a potential issue whose solution would be markedly advanced by applying the appropriate opportunity cost of capital, not by continuing to suppress it), Dr. Cronin estimated that many MEUs would be effectively barred from ever attaining a market ROE- even with the elimination of all O&M costs.

- Antitrust, Market Power and Industrial Rates.** As part of a comprehensive filing support engagement, Dr. Cronin prepared for a major regional pipeline/LDC an analysis of market power relative to rate - making methodology governing sales to direct industrial customers. This assessment considered DOJ anti-trust and market power criteria for the utility within the relevant industrial fuels market, as well as measures of business and financial risk, maximum rate attainment and contract retention. Dr. Cronin reviewed the company's records and determined that its Negotiated Rates Data Base (i.e., monthly bilateral contract information for individual customers with data on gas rates and costs and alternative fuels and prices) would support an econometric examination of pricing determinants. Dr. Cronin's analysis indicated that the utility had been losing sales to industrial customers from alternative fuels and gas suppliers. In addition, sales that were made were done with declining margins. The statistical analysis concluded that the company did not possess monopoly-pricing power. An evaluation of the historical rate setting methodology relative to the "just and reasonable" standard was also presented, including a simulation of how rates would have preformed under alternative rate regulation such as PBR. The analyses included an assessment of critical background issues such as the market environment for industrial sales and precedents in applying alternative regulatory frameworks. This research was filed with the state PUC and presented by Dr. Cronin in testimony. The findings from this research were supported by SC PUC Staff.
- Design and Implementation of Electricity Restructuring.** Dr. Cronin was co-director of the Ontario Energy Board's restructuring of the electric distribution sector and acted as its chief economic advisor. He assisted the OEB to develop the effective regulatory options for the more than 275 distribution utilities formerly overseen by Ontario Hydro that were undergoing privatization, recapitalisation, and regulatory restructuring. Phase 1 of the engagement involved stakeholder consultation (e.g., two educational seminars and five regional workshops) and the development of recommendations for OEB policy guidelines. Dr. Cronin also drafted two OEB papers on policy options. The first discussed potential alternative PBR frameworks; the second discussed the possible application of price caps and yardstick competition to the MEUs. Phase 2 involved the formation, management, and assessment of the industry/government/stakeholder Task Forces handling electric distribution restructuring (i.e., PBR design, rates and rate design, implementation, DSM, and yardstick). Multiple survey instruments (e.g., reliability, service, financial, economic, yardstick) were developed to assist in the analyses. Substantial efforts were devoted to the Task Forces, in particular, the analyses of alternative yardstick designs and the ultimate decision to recommend yardstick PBR as a second generation consideration. Dr. Cronin co-edited the Task Forces' final reports. In phase 3, Dr. Cronin and his colleagues constructed pooled sets of LDC/government data to examine and determine the appropriate approaches for setting performance benchmarks. In particular, Dr. Cronin constructed the first consistent inter-utility data set covering economic/operational/financial factors and analyzed the productivity and input prices of 48 LDCs spanning a ten- year period. This work was published as a staff report by the OEB and its results on long- term performance provided the factual historical foundation for the PBR mechanism adopted by the Board in the restructured market. Dr. Cronin and his colleagues authored the Board's Draft Rate Handbook and conducted five workshops for industry participants. He testified and assisted Board Staff at the technical and general proceedings. Dr. Cronin also acted as co-examiner for the Board on other stakeholder filings.
- LDC Regulatory and Pricing Strategy.** Dr. Cronin was engaged by a major midwestern local gas distribution company (LDC) to examine the company's options for alternative regulation, including a PBR framework. This study assessed the appropriate analytical framework for PBR and the quantification of the relevant price indexes and productivity factors. Dr. Cronin worked with the company and PUC to examine alternative price formulas as well as supply/acquisition based incentive schemes. The analysis also examined prior industry experience with PBR and the implications of low inflation or deflationary environments. Ultimately, the company and PUC agreed on a supply/acquisition incentive plan.

- **Gas LDC Performance Based Regulation.** Following his work for the Ontario Energy Board on electric distribution restructuring, Dr. Cronin was engaged by the OEB to act as an expert advisor to the Staff in the first proceeding dealing with the comprehensive reform of gas LDC regulation. Dr. Cronin provided advice on a wide range on issues dealing with the regulatory restructuring of gas LDCs.
- **Singapore Regulatory Review and Assessment.** For the Telecommunications Authority of Singapore (TAS), Dr. Cronin undertook an extensive review and assessment of regulatory policy initiatives and their implications for telecommunications. The results of this assessment and recommendations were presented in a two-day seminar attended by over forty representatives of TAS, other government of Singapore agencies, the incumbent provider and prospective new entrants.
- **Access Pricing and Canadian Telecommunications Price Cap Policy.** Dr. Cronin assisted CallNet, a Canadian telecommunications company, in a national incentive regulation (PBR) proceeding before the Canadian Radio-Television Commission (CRTC). He developed and implemented regulatory strategy and provided comprehensive support in all aspects of the case, including filing evidence, delivering testimony, and working closely with the legal team in preparing cross-examination. The filed evidence provided a critique of the price cap proposals offered by competitors, a quantification of the biases embedded within these proposals, an alternative recommendation for the specification and implementation of a price cap formula, and an analysis of the methodologies to estimate total factor productivity and telecommunications industry input prices. Results of this research were presented at the Southern Economic Conference.
- **Economic System Productivity and Telecommunications.** Dr. Cronin led a team of researchers in an analysis of the benefits of telecommunications network improvements on aggregate and industry-specific efficiency. The study presented: 1) an analysis of the causal relationship between telecommunications network development and economic growth; 2) an analysis of the substitution of telecommunications for other inputs based on econometrically estimated production functions for each U.S. industry; and, 3) an analysis of the resources saved by each industry as a result of enhanced telecommunications usage. The study was filed with the NTIA (National Telecommunications and Information Administration Industry Association) as part of its hearings on network infrastructure modernization. Results of the research have been published in *Contemporary Economic Policy*, *Telecommunications Policy*, *Information Economics & Policy*, and *Economic Systems Research*. Additional research examining the social returns from telecommunications investments over the 1963 to 1991 period is under revision for resubmission to the *Review of Economics and Statistics*.
- **Regulatory Review and Incentive Regulation Assessment.** For Bell Atlantic, Dr. Cronin provided a comprehensive assessment of the economic and regulatory impacts of the company's incentive regulation program and network investment for a review by the New Jersey Board of Public Utilities. This analysis included an assessment of the company's incentive regulation plan relative to those implemented in other states. The plans were analyzed across several criteria including the parameters and specification of the price cap formula and in terms of network investment mandates. Dr. Cronin presented this research before the BPU.
- **PCS Interconnection Cost Alternatives.** For a major wireless provider Dr. Cronin directed an assessment of personal communications services (PCS) interconnection compensation alternatives on service providers and customers. A number of interconnection compensation alternatives were first defined. He then constructed a basket of LEC network elements required for PCS (trunks, signaling, etc.), determined costs to PCS providers under each interconnection alternative, estimated potential PCS prices under each compensation plan, and PCS penetration and usage for both business customers and consumers. Dr. Cronin estimated impacts on PCS usage based on the relationship between interconnection prices and wholesale prices, as well as the effects from advanced features such as messaging, extended battery lives, and innovative service packaging. Included in this assessment is an explicit analysis of how businesses may incorporate PCS technology into their

production processes. He then estimated direct and indirect customer impacts associated with each interconnection compensation plan and the costs and benefits to specific customer groups.

- **Local Competition, Costs and Prices in Telecommunications.** For a major Midwestern local telecommunications company, Dr. Cronin analyzed the impact of local competition in telecommunications by developing a quantitative analysis of competition and rate rebalancing on specific stakeholder groups (the business sector, low and high income groups, rural/urban consumers and the elderly). The analysis determined that increased competition would result in benefits for most ratepayer groups. In all cases, benefits will be transmitted to other stakeholders in the form of lower commodity prices, due to the widespread impact of telecommunications pricing on the economy. However, the results indicated that if competition is to maximize benefits for all ratepayers, traditional LEC rate designs must be modified to reduce economic distortions generated by the pervasive subsidies. Results of this research were published in *Telecommunications Policy*.
- **Federal Telecommunication Access Pricing and Price Cap Policy.** For a major integrated telecommunications company, Dr. Cronin directed an analysis of the current LEC Price Cap Plan as part of the FCC's review of interstate access pricing. The study reviews the theory of price cap regulation and its successful implementation by the ICC based on a direct approach (i.e., industry input prices and industry TFP) versus the modified differential approach adopted by the FCC. The biases inherent in the LEC price cap plan have substantially overstated price changes for LEC interstate access charges. The analysis quantifies these biases and recommends procedures for correcting them. Dr. Cronin also provided a thorough examination of publicly available sectoral information and assessed its effective use in price cap regulation. Research results were presented at the Southern Economic Conference.
- **Interconnection, Costs, and Prices in Local Telecommunications.** Dr. Cronin directed a study filed with the Canadian Radio–Television and Telecommunications Commission (CRTC) to assess the impact of various proposed interconnection and pricing arrangements for telecommunications network access. The incumbents' proposed pricing arrangements would seek to recover the embedded costs of past business decisions, in three parts: causally related incremental costs (Phase II), a 25% markup, and a charge for local contribution gauged to produce whatever revenues are required to cover embedded costs. The report directly measures the implications of these proposed charges for various stakeholders, including: businesses, residential customers by income type, and the Competitive Local Exchange Carriers ("CLECs"), relative to long-run incremental costs (LRIC)-based pricing for access. The analysis also addresses several substantive issues concerning the underlying role of telecommunications in economic development as well as the importance of an appropriate interconnection policy in fostering competition.
- **PCS License Application.** Dr. Cronin directed a study in support Microcell's PCS license application to Industry Canada. The analysis examined such issues as (1) the social rate of return from telecommunications research and development; (2) the stakeholder benefits from competition; and (3) the role of interconnection arrangements in infrastructure development. This report was filed as part of the client's successful Phase II Detailed Submission to Industry Canada's Policy and Call for (PCS) License Applications.
- **Competition Issues in Telecommunication.** Prepared for Pacific Bell an analysis of the myriad, interrelated issues (e.g. competition, rate rebalancing, universal service and infrastructure) facing the telecommunications industry. The filing analyzed the reasons for dealing with these topics in an integrated fashion. This report was filed with the California Public Utility Commission.
- **Electric Utility Entry into Telecommunications.** Dr. Cronin directed this engagement with Southern Company, a major LDC in the southeast. The objective was to provide policy-makers with estimates of the quantifiable macro- and microeconomic benefits to society of allowing market-based electric utility deployment of Energy Information Services (EIS) and telecommunications technologies. Study findings focused on such factors as deferred capital investment, reduced energy costs for consumers and businesses, increased employment levels, price competitiveness of the telecommunications industry, and household income. Dr. Cronin was invited to present these

findings at a White House, National Economic Council/DOE/EPRI Conference on the national information infrastructure (NII). This report was filed with the Florida Public Utility Commission.

- **Telecommunications Infrastructure Planning.** Working with D&T, Dr. Cronin co-directed a comprehensive study of the impacts of telecommunications infrastructure investment on the state of Pennsylvania. This study linked potential infrastructure systems with desirable economic development, taking into consideration different geographical, economic, and demographic characteristics of the Commonwealth. This extensive analysis addressed the costs and the benefits of the investment to the economy, including an analysis of quantitative and qualitative improvements in health care, education, government, and business. Dr. Cronin's work supported the Pennsylvania Public Utility Commission and state legislature in developing an appropriate regulatory framework to promote infrastructure investment programs. Direct and indirect employment, tax-revenues, and income are all calculated as a requirement for the analysis of potential infrastructure investment. An important step in the analysis of Pennsylvania's telecommunications systems is the development of a set of state-specific telecommunications price indexes. The study addresses the issues of state and sub-state causality and the direction of economic benefits, and a complete funding analysis addressing the fiscal responsibility for the costs associated with the range of possible telecommunications infrastructure investments. Included in this analysis is a discussion of the benefits of telecommunications network modernization on educational and medical services as well as specific stakeholder groups; e.g., the elderly, the disabled, and the low-income population. Results of this research were presented to the Pennsylvania legislature and published in *Telecommunications Policy, Information Economics and Policy*, and the *Southern Economic Journal*.
- **Transportation Productivity and Policy Assessment.** Assisted policy-makers at the U.S. Department of Transportation (DOT) in developing state of the art system approaches to productivity assessment. This system approach would provide valuable insights in selecting the appropriate level and mix for transportation investments. Dr. Cronin conducted a team of researchers in this path breaking productivity analysis in which each transportation sector (i.e., rail, trucking and warehousing, airline, barge and shipping) was analyzed in terms of: (1) its own productivity performance over the 1963-91 period; (2) the sources of productivity change; (3) the rate of successful technology absorption; (4) the contribution to comprehensive total economy productivity growth; and, (5) the sectors contributing to indirect productivity growth in the transportation sectors. Dr. Cronin also directed the three-year effort to procure DRI's first consulting contract from DOT and was officer-in-charge for DRI's multi-year, multi-million prime contract with DOT.
- **Telecommunications Incentive Regulation and Infrastructure.** Conducted quantitative studies analyzing the implications to the New York, Virginia, California, Maryland, New Jersey, Illinois, Ohio, Arkansas, and Massachusetts economies of telecommunications' network modernization. The analyses included application of the comprehensive telecommunications input substitution model, which relates individual industries' usage of capital, labor, materials, and telecommunications to the prices of each input, the advancement in each input 's technology, and the industry 's production level. The studies analyzed the historical and/or prospective impacts of telecommunications' network development, under various scenarios, on each state's employment, tax revenues, prices, and per-capita income, increasing state competitiveness. The research for New Jersey Bell was instrumental in shaping the 1992 Utility Reform Act and in the company obtaining alternative regulation under the Act (see, *Fortune*, March 1993). The reports prepared for major LECs in Maryland, Illinois, Ohio and Arkansas were filed with the Public Utility Commissions. The findings for California and Massachusetts were presented to top aides of the Governors. In New York, the report was undertaken for the Governor's Telecommunications Exchange Commission by the NYPSC and DED.
- **Nuclear Fuel Cycle Options.** At the request of the U.S. Department of Energy and the U.S. intelligence community, Dr. Cronin directed an examination of the economic justifications for selecting reprocessing rather than a conventional once-through nuclear fuel cycle in the Republic of Korea. Employing macroeconomic and energy demand models for Korea as well as a nuclear fuel cycle model, the project examined the conditions that could make reprocessing economic.

- **Defense Attainability.** Because of his expertise in inter-industry modeling, Dr. Cronin was asked to participate in a study for the Joint Chiefs of Staff (JCS). The U.S. Department of defense wished to which enhance its analytical capabilities to conduct attainability assessments. Inter-industry (IO) models offer an excellent platform to examine critical defense issues such as surge production.
- **Supply and Demand for Electricity.** Dr. Cronin directed and was lead author of an invited paper presented at a symposium sponsored by the Electric Power Research Institute (EPRI). Aggregate, sectoral, and industrial electricity demands were forecast to the 1990s; potential impacts from changing demands and technologies were analyzed. These results were compared with estimates of likely generation capacity. The paper concluded that a national shortfall in electric generating capacity may occur in the 1990s. Dr. Cronin was also senior economist on a second paper presented at an EPRI conference. This analysis focused specifically on regional outlooks for electricity supply and demand.
- **Residual Fuel Oil Market Regulations.** Dr. Cronin conducted a study for the Economic Regulatory Administration (ERA), part of the U.S. Department of Energy, on the residual fuel oil market. Employing refinery cracking and energy demand models, Dr. Cronin examined the impacts of various government regulations on the demand and supply of residual fuel oil.
- **Contingent Market Valuation of Environmental Goods.** Dr. Cronin conducted a study for the U.S. Environmental Protection Agency (EPA) to estimate households' willingness to pay for improved water quality using a contingent market sample of 2,000 households. Issues addressed included the choice of estimation techniques (e.g., covariance, random coefficients) and the significance and magnitude of strategic bias, information bias, and interview bias. Results will aid the EPA in selecting the appropriate methodology to gauge the value of "non-market" goods and in determining the optimal level of environmental improvements.
- **Nuclear Waste and Accident Assessments.** Dr. Cronin contributed to a number of studies for the NRC while at PNL. Among these were two studies on waste. The first examined the options for low-level radioactive waste storage. The second examined the disposal alternatives and implications for the low-level, contaminated water at Three Mile Island. A third study that Dr. Cronin contributed to involved the infrastructure and economic system damages from plant reactor accidents.

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