PAUL R. WATKINS (1899 - 1973)
DANA LATHAM (1898 - 1974)

CHICAGO OFFICE
SEARS TOWER, SUITE 5800
CHICAGO, ILLINOIS 60606
PHONE (312) 876-7700, FAX 993-9767

HONG KONG OFFICE
SUITE 2205A, 22ND FLOOR
NO. 9 QUEEN'S ROAD CENTRAL
HONG KONG
PHONE + 852-2522-7886, FAX 2522-7006

LONDON OFFICE
99 BISHOPSGATE, ELEVENTH FLOOR
LONDON EC2M 3XF ENGLAND
PHONE + 44-207-710-1000, FAX 374-4460

LOS ANGELES OFFICE
633 WEST FIFTH STREET, SUITE 4000
LOS ANGELES, CALIFORNIA 90071-2007
PHONE (213) 485-1234, FAX 891-8763

MOSCOW OFFICE
ULITSA GASHEKA, 7, 9TH FLOOR
MOSCOW 123056, RUSSIA
PHONE + 7-095 785-1234, FAX 785-1235

NEW JERSEY OFFICE
ONE NEWARK CENTER, 16TH FLOOR
NEWARK, NEW JERSEY 07101-3174
PHONE (973) 639-1234, FAX 639-7298

LATHAM & WATKINS
ATTORNEYS AT LAW
1001 PENNSYLVANIA AVE., N.W.
SUITE 1300
WASHINGTON, D.C. 20004-2505
TELEPHONE (202) 637-2200
FAX (202) 637-2201

DOCKET FILE COPY ORIGINAL

RECEIVED
DEC 3 1999
FEDERAL COMMUNICATIONS COMMISSION
OFFICE OF THE SECRETARY

NEW YORK OFFICE
885 THIRD AVENUE, SUITE 1000
NEW YORK, NEW YORK 10022-4802
PHONE (212) 906-1200, FAX 751-4864

ORANGE COUNTY OFFICE
650 TOWN CENTER DRIVE, SUITE 2000
COSTA MESA, CALIFORNIA 92626-1925
PHONE (714) 540-1235, FAX 755-8290

SAN DIEGO OFFICE
701 "B" STREET, SUITE 2100
SAN DIEGO, CALIFORNIA 92101-8197
PHONE (619) 236-1234, FAX 696-7419

SAN FRANCISCO OFFICE
505 MONTGOMERY STREET, SUITE 1900
SAN FRANCISCO, CALIFORNIA 94111-2562
PHONE (415) 391-0600, FAX 395-8095

SILICON VALLEY OFFICE
135 COMMONWEALTH DRIVE
MENLO PARK, CALIFORNIA 94025
PHONE (650) 328-4600, FAX 463-2600

SINGAPORE OFFICE
20 CECIL STREET, SUITE 25-02
THE EXCHANGE, SINGAPORE 049705
PHONE + 65-536-1161, FAX 536-1171

TOKYO OFFICE
INFINI AKASAKA, 8-7-15, AKASAKA, MINATO
TOKYO 107-0052, JAPAN
PHONE +813-3423-3970, FAX 3423-39

December 3, 1999

VIA HAND DELIVERY

Magalie Roman Salas
Secretary
Federal Communications Commission
445 12th Street, S.W.
Washington, D.C. 20554

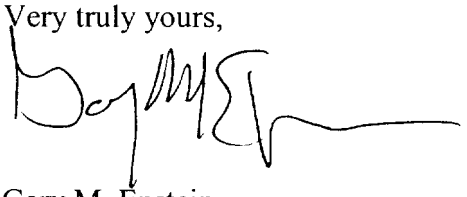
Re: Proposal Submitted by the Coalition for Affordable Local and Long Distance Service ("CALLS") in Access Charge Reform, CC Docket No. 96-262;
Price Cap Performance Review for Local Exchange Carriers, CC Docket No. 94-1;
Low-Volume Long Distance Users, CC Docket No. 99-249;
Federal-State Joint Board on Universal Service, CC Docket No. 96-45

Dear Ms. Salas:

Attached on behalf of BellSouth Corporation is a Study by Dr. Robert W. Crandall and Dr. Jeffrey H . Rohls entitled The Economic Case for the CALLS Proposal. The Crandall/Rohlfs Study provides economic and analytic support for the CALLS proposal.

The Study is submitted by BellSouth Corporation on the date for reply comments in the above-captioned proceeding. BellSouth requests that it be included in the formal record of this proceeding.

Very truly yours,



Gary M. Epstein
Richard R. Cameron
of LATHAM & WATKINS

Counsel for BellSouth Corporation

cc: Service List Attached

William E. Kennard, Chairman
Federal Communications Commission
Room 8-B201
445 12th Street, S.W.
Washington, DC 20554

Commissioner Susan Ness
Federal Communications Commission
Room 8-B115H
445 12th Street, S.W.
Washington, DC 20554

Commissioner Harold W. Furchtgott-Roth
Federal Communications Commission
Room 8-A302C
445 12th Street, S.W.
Washington, DC 20554

Commissioner Michael K. Powell
Federal Communications Commission
Room 8-A204C
445 12th Street, S.W.
Washington, DC 20554

Commissioner Gloria Tristani
Federal Communications Commission
Room 8-C302C
445 12th Street, S.W.
Washington, DC 20554

Kathryn C. Brown
Chief of Staff
Federal Communications Commission
Room 8-B201E
445 12th Street, S.W.
Washington, DC 20554

Patrick DeGraba
Federal Communications Commission
Room 7-C314
445 12th Street, S.W.
Washington, DC 20554

Lawrence E. Strickling, Chief
Common Carrier Bureau
Federal Communications Commission
Room 5-C450
445 12th Street, S.W.
Washington, DC 20554

Dorothy T. Attwood, Legal Advisor
Federal Communications Commission
Room 8-B201
445 12th Street, S.W.
Washington, DC 20554

Jordan Goldstein, Legal Advisor
Federal Communications Commission
Room 8-B115D
445 12th Street, S.W.
Washington, DC 20554

Rebecca Beynon, Legal Advisor
Federal Communications Commission
Room 8-A302
445 12th Street, S.W.
Washington, DC 20554

Kyle D. Dixon, Legal Advisor
Federal Communications Commission
Room 8-A204E
445 12th Street, S.W.
Washington, DC 20554

Sarah Whitesell, Legal Advisor
Federal Communications Commission
Room 8-C302
445 12th Street, S.W.
Washington, DC 20554

Howard Shelanski
Chief Economist
Federal Communications Commission
Room 7-C452
445 12th Street, S.W.
Washington, DC 20554

Robert Pepper
Federal Communications Commission
Room 7-C450
445 12th Street, S.W.
Washington, DC 20554

Yog Varma, Deputy Chief
Common Carrier Bureau
Federal Communications Commission
Room 5-C352
445 12th Street, S.W.
Washington, DC 20554

Donald K. Stockdale, Jr.
Common Carrier Bureau
Federal Communications Commission
Room 5-C354
445 12th Street, S.W.
Washington, DC 20554

Jane E. Jackson, Chief
Competitive Pricing Division
Common Carrier Bureau
Federal Communications Commission
Room 5-A225
445 12th Street, S.W.
Washington, DC 20554

Rich Lerner, Deputy Chief
Competitive Pricing Division
Common Carrier Bureau
Federal Communications Commission
Room 5-A221
445 12th Street, S.W.
Washington, DC 20554

Jay Atkinson
Competitive Pricing Division
Common Carrier Bureau
Federal Communications Commission
Room 5-A220
445 12th Street, S.W.
Washington, DC 20554

Aaron R. Goldschmidt, Attorney
Competitive Pricing Division
Common Carrier Bureau
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Janice Jamison, Attorney
Competitive Pricing Division
Common Carrier Bureau
Federal Communications Commission
Room 5-A133
445 12th Street, S.W.
Washington, DC 20554

Neil Fried, Attorney
Competitive Pricing Division
Common Carrier Bureau
Federal Communications Commission
Room 5-B431
445 12th Street, S.W.
Washington, DC 20554

THE ECONOMIC CASE FOR THE CALLS PROPOSAL

Robert W. Crandall

Jeffrey H. Rohlfs

December 3, 1999

TABLE OF CONTENTS

I. EXECUTIVE SUMMARY 1

II. THE CALLS PROPOSAL 3

III. MOVING TOWARDS ECONOMICALLY EFFICIENT PRICING 4

A. THE THEORY OF ECONOMICALLY-EFFICIENT PRICING 5
B. INEFFICIENCY OF THE CURRENT RATE STRUCTURE 6
C. THE CALLS PROPOSAL INCREASES THE EFFICIENCY OF THE RATE STRUCTURE 7

IV. THE CALLS PROPOSAL PROVIDES IMPROVED INCENTIVES FOR DEPLOYING PACKET-SWITCHED HIGH-SPEED SERVICES 8

A. REDUCED DEPENDENCE ON SWITCHED ACCESS CHARGES 8
B. EFFECT OF THE CALLS PROPOSAL ON THE DEPLOYMENT OF PACKET SWITCHING 11

V. THE CALLS PROPOSAL INCREASES INCENTIVES TO INVEST IN RURAL AREAS 12

VI. THE IMMEDIATE EFFECTS OF THE CALLS PLAN ON CONSUMER WELFARE FOR RESIDENTIAL SUBSCRIBERS 14

VII. CONCLUSIONS 17

Curriculum Vitae

Robert W. Crandall

Jeffrey H. Rohlfs

THE ECONOMIC CASE FOR THE CALLS PROPOSAL

I. EXECUTIVE SUMMARY

The CALLS proposal is an innovative approach for substantially reducing per-minute interstate access prices and combining the existing system of subscriber line charges ("SLCs") and pre-subscribed interexchange carrier charges ("PICCs") into a single charge for residential and single-line business subscribers. It also reduces the combined SLC and PICC for multi-line business subscribers. All of these changes move regulated rates closer to economically-efficient, market-based prices.

The restructuring of rates towards costs is particularly important in the new competitive era for local telecommunications. By increasing residential SLCs, reducing the combined level of SLCs plus PICCs for multi-line business lines, and sharply reducing per-minute access charges, the proposal reduces the artificial incentives for the competitive local exchange carriers ("CLECs") to focus their attention principally on business customers in urban areas and on other subscribers who are intense users of long-distance services. But just as importantly, the proposal increases the incentives for all carriers — entrant and incumbents — to serve residential and rural areas, increasing the likelihood that consumers in these areas will see enhanced choice, service offerings and value from competition. It also reduces the dependence of the incumbent local exchange carriers ("ILECs") on per-minute access charges and business customers, and makes mass market service relatively more attractive.

The substitution of SLCs for PICCs in the CALLS proposal does not, in itself, increase subscriber rates, because the PICCs are currently passed through to subscribers by the interexchange carriers ("IXCs"). Substitution of the SLC for PICC charges reduces transaction costs, which would otherwise be recovered by long-distance companies, most likely in their flat-rated PICC or subscription charges. In the

absence of alternative sources of loops for competing carriers, the PICCs are not "competed away" by the long-distance carriers because they are unavoidable costs of serving pre-subscribed customers. On the other hand, while the increased SLCs will also initially be reflected in the ILECs' monthly bills to their customers, these rates will be subject to downward competitive pressure from the CLECs, whose cost structures are unaffected by this proposal. Moreover, placing these charges in the SLC, which is paid by the end users, rather than the PICC, which is paid by the IXC and then passed on to the end user, increases the transparency of these charges.

The restructuring of rates in the CALLS proposal realigns prices so that they also more closely reflect the cost structure of new packet-switched technologies, which, in turn, creates a rate structure that can more easily make the transition from circuit to packet switching and which increases the incentives for ILECs and entrants to invest in high-speed, broadband services. The rapid growth of data services, including Internet services, creates the need for carriers to substitute packet-switched technology for the current circuit-switched architecture. This substitution involves moving away from a technology in which circuit time can be measured to a technology that transmits bursts of digital bits over "always-on" local circuits. In an "always-on" environment, there are no minutes of circuit time over which to collect implicit support. The "always-on" packet technology therefore requires that the cost of the subscriber's dedicated access line be recovered from subscription (i.e per-line) charges (or, if desired by policymakers, per line subsidy support), not from per-minute charges. The CALLS proposal moves regulated rates in this direction, thereby sending the carriers the appropriate market signals.

Through the substitution of SLCs for PICCs and some deaveraging of these SLC increases, the proposal increases the incentives for ILECs and CLECs to invest in rural areas. Because PICCs are geographically averaged and business PICCs recover part of the cost of serving residential customers, recovery of common-line costs through SLCs rather than through PICCs increases entry and investment incentives in rural and residential markets. The CALLS proposal aligns SLCs more

closely with costs, thereby making investment in existing and new, innovative services in rural areas more attractive to ILECs and entrants alike.

Residential and business consumers alike will benefit substantially from the more efficient pricing policy promoted by the CALLS proposal. Lower-income households will be insulated from the modest increases in the primary SLC because Lifeline subscribers are exempt from these increases, and benefit from the elimination of PICC charges and lower toll bills. The net benefit to residential consumers will be between $1 and $2 billion per year because the benefits of lower consumer long-distance bills that result from the reduced per-minute access charges are far greater than the costs of the modest increase in SLCs.

II. THE CALLS PROPOSAL

The CALLS proposal represents a major step towards economic rationalization of the pricing of interstate telephone services. This proposal will improve economic welfare, reduce uneconomic arbitrage, and spur network investment in new, broad-band service facilities. It reflects an attempt to reduce per-minute access charges first through consumer price-neutral restructuring and later through small increases in average residential and single-line business per-line charges. Business per-line charges (SLCs and PICCs) decline, and urban and rural rates are permitted to vary to a limited extent to reflect underlying costs. It also simplifies the residential and single line business rate structure by combining SLCs and presubscribed PICCs into a single SLC for those customers, and by eliminating pricing differentials between "primary" and "non-primary" residential lines.

Specifically, the CALLS proposal reduces interstate access usage charges to $0.0055 per minute for the Bell Companies and GTE and to $0.0065 per minute for other ILECs — both to be reached through a combination of restructuring of the loop and switching charges and reductions of switching and transport components of switched access charges. Thereafter, until 2005, switched access charges are to be applied at $0.0055 or $0.0065 per minute. The proposed reductions are approximately 50 percent of current switched access charges.

At the same time, the current SLCs and PICCs are replaced by a single SLC, which rises gradually from a maximum of $5.50 — equivalent to what an ordinary, on-line residential consumer would likely pay in July 2000 in combined residential SLC and IXC-billed PICC charges — over three and one-half years to a maximum of $7 for primary residential lines and single-line business lines. CALLS projects that, on average, the primary residential SLC will rise only $0.78 over that period, from $5.37 to $6.15. These increases in residential primary line SLCs do not apply to Lifeline subscribers. At the same time, the non-primary SLC is reduced slightly and also capped at $7 per line. The multi-line business PICC is also reduced and eventually eliminated in most areas over the five-year period. The multi-line business SLC is frozen during the period in which the CCL and PICC are being reduced and eliminated. The CALLS proposal also allows a modicum of geographic deaveraging of SLCs, subject to a number of constraints.

Finally, the CALLS proposal includes a $650 million increase in high-cost universal service support to replace $650 million of support implicit in interstate access charges. This support (as well as the additional Lifeline support) is portable, providing an entry incentive for CLECs, and is recovered through universal-service fund contributions by all providers of interstate telecommunications.

III. MOVING TOWARDS ECONOMICALLY EFFICIENT PRICING

Economic efficiency is an important consideration in setting interstate telecommunications rates. The economic losses from inefficient pricing, in terms of lost productivity and competitiveness, grow dramatically as competition intensifies. Regulatory policies that mandate inefficient pricing also dilute incentives to invest in new telecommunications technologies, such as digital subscriber-line ("DSL"), and in infrastructure in unprofitable areas. They also provide artificial incentives for entrants to exploit arbitrage opportunities by targeting customers who are paying regulated prices that are far above cost — particularly business subscribers in urban areas — while diminishing incentives to offer service in areas where regulated rates are below cost, particularly in rural areas and in most residential areas. They can therefore have

a devastating long-run impact on the growth of the telecommunications sector and on economic growth opportunities that depend upon a robust and innovative telecommunications infrastructure. This is particularly true with respect to e-commerce and other Internet-based services, all of which can continue to grow and develop if bandwidth in the "last mile" increases throughout the country.

The CALLS proposal should be evaluated in light of the requirements for efficient pricing and its effect on network investment. To do so, we address the following issues:

- How should regulated rates be structured to reflect the economics of current and new technologies?
- How do current rates violate these requirements, and what are the harmful effects of the failure of regulated rates to reflect these requirements?
- How would the CALLS proposal create economic benefits in both the short and long run?

A. The Theory of Economically-Efficient Pricing

The requirements for economically efficient prices are well known. In most industries, prices should equal marginal costs. Since our focus here is on long-run policies, the relevant marginal cost is *long-run* marginal cost ("LRMC"). However, in telecommunications and other industries where economies of scale and/or scope are important, marginal-cost pricing of all services provided by the network provider does not cover the total costs of building, operating and maintaining the network and is therefore not feasible in the long run. As a result, all services must be marked up over marginal cost so that the firm covers its total costs, including its cost of capital but the markups should be relatively small on the services whose demand is most price elastic. The gains from efficient pricing accrue because:

- Productivity of the telecommunications sector increases as suppliers produce and sell more of the elastic services whose prices have declined. The suppliers thereby enjoy greater scale economies;

- Firms that consume more of the lower-priced elastic services lower their costs and become more competitive; and
- There is an improvement in the economic welfare of consumers who use more of the lower-priced elastic services and the welfare of those with whom they communicate.

As competition intensifies, demand facing the supplier becomes more elastic in competitive markets. Regulated rates that reflect large markups above marginal cost in those markets lead to greater loss of economic efficiency — perhaps much greater — than without competition — and even to lower carrier profits as the carrier loses market share to competitors.

B. Inefficiency of the Current Rate Structure

The current structure of ILEC rates does not meet the requirements for economic efficiency. Access services and other price-elastic services are priced above competitive levels while local residential rates are held below economically efficient levels, particularly in rural areas. At the same time, local business rates are often set far above LRMC to recover the losses from serving residential customers. Interstate per-minute access charges are still above their competitive levels despite 15 years of Commission policy to reduce them through a combination of SLCs and price caps.

The current regulatory rate structure leads in several different ways to enormous losses of economic welfare. First, it discourages efficient investments by ILECs and CLECs in rural areas and creates artificial incentives for CLECs to target business customers while delaying or foregoing entry into residential areas. Second, it reduces the incentives for ILECs to invest in important new technologies, such as packet switching and DSLs, because of the ILEC's need to protect revenue flows from usage-sensitive access charges. Finally, it sends the wrong signals to subscribers on the cost of network access and use, reducing network usage (calling) and, therefore, the total value of telecommunications services.

C. The CALLS Proposal Increases the Efficiency of the Rate Structure

By reducing per-minute access charges, combining the existing system of PICCs and SLCs into a single SLC, reducing multi-line business SLCs, and permitting a limited amount of geographic deaveraging of the SLCs, the CALLS proposal moves the regulated rate structure in a direction consistent with the requirements for economically-efficient pricing. The reduction of per-minute access charges clearly moves them toward their economically-efficient levels. The proposal raises primary residential per-line rates modestly while reducing multi-line business rates, a change that is generally consistent with relative LRMCs. By substituting SLCs for PICCs and allowing some geographical deaveraging of the SLCs, the proposal also allows rates more accurately to reflect the differences in the cost of serving areas of different population densities.

Some have expressed concern that a substitution of SLCs for the combined SLCs and PICCs in the current rate structure will unfairly penalize consumers because the PICCs can be "competed away" by the rivalry among interexchange carriers while the SLCs will not be subject to such competition.[1] This concern reflects a fundamental misunderstanding of the economic effects of competition and of the CALLS proposal itself.

First, the substitution of SLCs for PICCs recovers the cost of the ILECs' local lines directly from its subscribers, not indirectly through the long-distance carriers. These charges are then a transparent part of the subscribers' direct costs of the ILECs' local services and these rates are subject to competition from the new CLECs, who do not have to charge the SLC but who compete against the full range of ILEC end user charges. This competition will serve to place downward pressure on all local charges, including the SLC. By simplifying the rate structures and making the charges

[1] See, for example, the Comments of the Florida Public Service Commission in this Proceeding.

more understandable, consolidation of these charges facilitates informed choices by consumers of the plan that best fits their needs.

Second, competitive firms must pass on *all* of their costs in order to remain in business. Thus, while rivalry among current long-distance carriers will place downward pressure on prices, it does not lead to prices that are below cost. Every increase in their costs will eventually be passed on to their pre-subscribed customers, perhaps after a relatively short lag. The PICCs cannot be "competed away" because they cannot be avoided by the interexchange carriers — *i.e.*, they are beyond their control. The carriers will simply pass them through to their customers while they focus their energies on lowering those costs over which they have some control.

Finally, allowing the ILEC to collect the charge directly in the form of a SLC rather than requiring a multitude of long-distance carriers to pay PICCs to the ILECs reduces transactions costs. The combination of lower transactions costs and greater transparency of the charges clearly makes the SLC superior to the PICC, ultimately reducing consumer costs and making competition work more efficiently.

IV. THE CALLS PROPOSAL PROVIDES IMPROVED INCENTIVES FOR DEPLOYING PACKET-SWITCHED HIGH-SPEED SERVICES

The CALLS proposal is a substantial step in the right direction because it moves the current rate structure in the direction of economically-efficient pricing. By reducing per-minute access charges while increasing residential and single-line business SLCs and reducing multi-line business SLCs, it creates improved incentives for investment for ILECs and CLECs alike. All these changes are required not only to reflect the cost structure of current services, but also to increase the incentives for carriers to deploy high-speed services over packet-switched networks.

A. Reduced Dependence on Switched Access Charges

Moving rates toward economically efficient levels reduces the ILECs' dependence on switched (per-minute) access charges to recover revenue deficiencies from local residential services and rural services. As a result, the ILECs have a

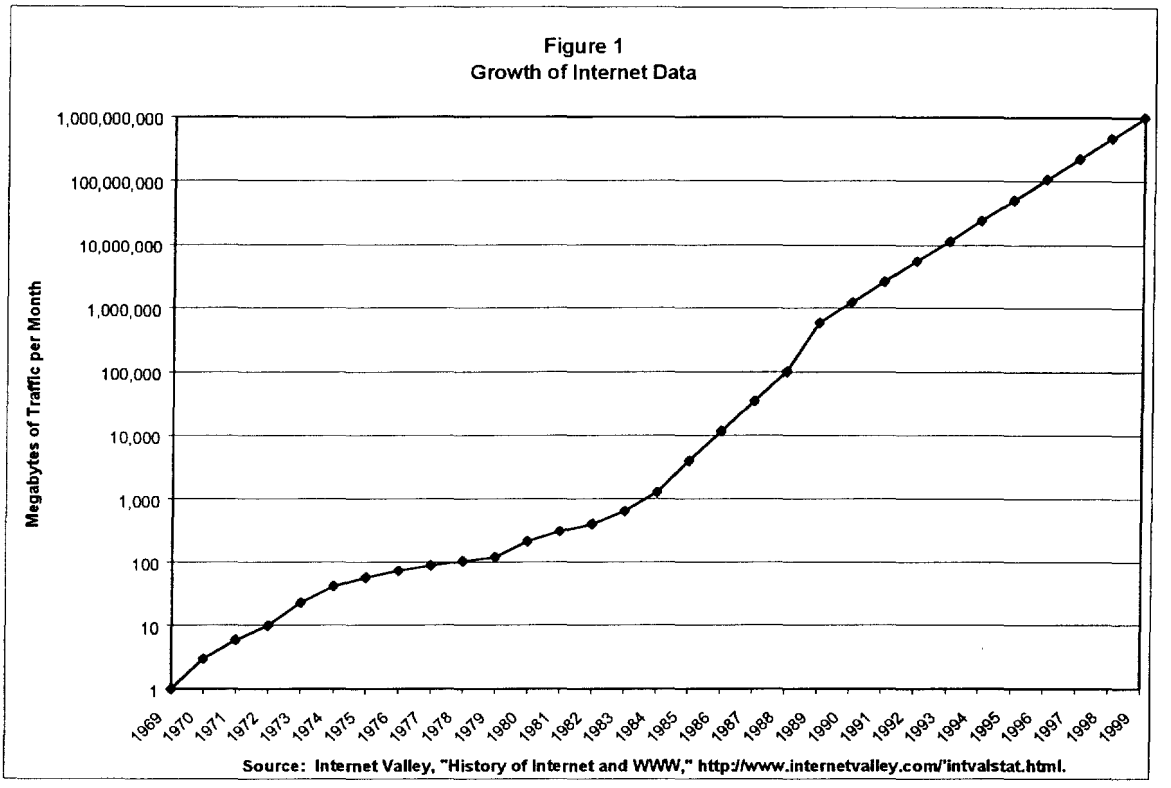
greater incentive to invest in new high-speed broadband technologies that use packet switching and a substitute for the current circuit-switched network. Without the CALLS proposal, the ILECs must rely disproportionately on per-minute access charges to recover revenue deficiencies, thereby making any technology that substitutes for circuit switching much less attractive to them.

The rapid growth of data services, particularly those associated with the Internet, has created a need to build high-speed, packet-switched networks to serve all subscribers, businesses and residences. ILEC networks have already evolved from analog to digital. The interoffice networks are now almost completely fiber optic. However, ILEC offerings continue to consist primarily of dedicated lines and circuit-switched services. Packet switching, the technology of the Internet, is still largely absent on local ILEC networks.

ILEC carriage of data has grown explosively as Internet usage has expanded in recent years. The volume of data transmitted over the U.S. backbone networks in 1999 will top 1 billion megabytes per month. Figure 1 plots the growth of data on the U.S. backbone networks since 1969, the beginning of ARPANET. Note that the vertical axis in the figure has a logarithmic scale, because such a scale is required to track the massive growth. In 30 years, the carriage of data has grown by 9 orders of magnitude.

Packet switching would be cost effective for much of the data communication carried on ILEC networks. Indeed, it is likely that ILECs will eventually offer a variety of data services to business customers, as well as Internet services to both business and residential customers, through a packet-switched architecture. Eventually, voice may also be packetized and transmitted over networks that use a packet-switched architecture. For the present, however, inefficient regulatory policies substantially dilute ILEC incentives to invest in packet switching. As a result, ILECs are likely to deploy packet switching much less rapidly than would be economically efficient. The CALLS proposal would reduce the regulatory disincentives for ILECs to invest in

packet switching and would therefore lead to more rapid deployment and improve economic efficiency.



Both dedicated and packet-switched connections have the advantage of being "always on." Usage is not measured in time, and often not measured at all. Packet services are often sold by peak transmission capacity, *e.g.*, up to 256 KBPS. By contrast, circuit-switched connections require that a dial-up connection be established each time that a call is made and a circuit path be reserved. Circuit switching traditionally has been charged on a per minute basis to reflect the fact that the costs vary with call duration. A packet architecture, however, is fundamentally inconsistent with a regulated pricing system that sets prices on a per-minute basis, particularly one that uses per-minute charges as a source of implicit support for universal service.

B. Effect of the CALLS Proposal on the Deployment of Packet Switching

Large ILEC and CLEC investments in DSL are required to meet the needs of Internet users, who have growing requirements for rapid data transmission. Nevertheless, even apart from regulation, DSL investment involves substantial risk:

- DSL is a discretionary service, and demand may grow less rapidly than expected;
- Cable companies will provide competitive two-way broadband services in many areas; and
- Other technologies (*e.g.,* wireless) may ultimately prove to be more efficient than DSL.

In themselves, these risks might be acceptable, given the potential gains from market success. However, the regulatory impediments that derive from the current pricing structure make ILEC investments in DSL much less attractive. One regulatory impediment is especially relevant to the CALLS proposal; *viz.*, *all* investments in the regulated sector, are made considerably more risky by the prospect that the inefficient regulated rate structure will collapse and with it the means of funding network investment and operations in the high-cost areas. The CALLS proposal moves signify-cantly in the direction of economically efficient pricing for current circuit-switched voice/data services. By moving prices closer to economic costs, it reduces the potential for arbitrage, inefficient entry, and a collapse of the entire regulated rate structure.

Significantly, the CALLS proposal moves rates in the direction required to make investments in new, packet-switched services economically feasible. As subscribers continue to increase their demand for data services, such as those provided through the Internet, they will be communicating with bursts of packets transmitted or received at varying intervals through a connection which is always on. This type of communications cannot be supported through the current pricing system in which per-line charges are less than the full cost of the subscriber's dedicated access line with the remainder paid for in large part by per-minute access charges that are priced far above LRMC. In the new data-intensive environment, customers must pay per-line

charges that fully defray the costs of their dedicated line and capacity charges that reflect only the burden that they place on the packet-switched infrastructure in terms of capacity. With packet switching, it is simply not possible to charge for network usage *by the minute*. Given that many new, innovative services are likely to involve packet switching and higher-speed access lines, it is imperative that regulated rates for subscriber access cover the cost of the always-on connection to the packet switch.

By moving the rate structure in an economically-efficient direction and by establishing a mechanism to support universal service outside of access rates, the CALLS plan would create improved incentives for a migration of consumers from circuit switched to packet-switched services. As consumers migrate to packet-services, policymakers would not have to fear that funding for building and operating networks in high cost areas will diminish. Universal service support is no longer a reason to impose per minute rate structures on bursty packet-based services.

In reality, as the CALLS proponents themselves recognize, the CALLS agreement is a transitional step that goes only part way toward solving the problem. Nevertheless, it is a significant step in the right direction. It increases the likelihood that ILECs will deploy packet switching and DSL where they are cost-effective and thereby provide value to customers.

The benefits of the CALLS proposal will be even greater in the future. As technology advances, the incremental cost of interstate access services will decline. This decline may be augmented if packet switching becomes cost-effective for ILECs to use for voice communications. Under these circumstances, moving toward efficient and sustainable rates, as provided in the CALLS proposal, will be all the more desirable. Indeed, it will be critical.

V. THE CALLS PROPOSAL INCREASES INCENTIVES TO INVEST IN RURAL AREAS

The current rate structure provides rural residences with local service at prices that are generally below — and often substantially below — LRMC, requiring ILECs to recover the losses from business customers and from interstate per-minute access

charges. As a result, ILECs have less incentive to invest in rural areas, and the new CLECs are also discouraged from investing in these areas, preferring to target business subscribers in urban areas instead.

Although PICCs are more efficient than per-minute charges, SLCs are more efficient than either and are collected in a manner that is more closely aligned with costs. Because interexchange carriers are forced to average rates geographically, they cannot charge higher rates to subscribers in higher-cost areas to reflect the cost of the PICC. However, the SLC varies across states with the level of non-traffic sensitive costs and therefore contributes to a rate structure that more closely aligned with costs. In addition, the CALLS proposal allows some deaveraging of SLCs *within* states, thereby further moving rates toward economic costs.

By freezing and eventually reducing the current combined level of multi-line business PICCs and SLCs while increasing the single-line residential SLC slowly, the CALLS proposal further reduces the distortions in the current rate structure. This, in turn, reduces the incentives for CLECs and ILECs to target their investments towards urban business customers and to invest in rural areas and in residential portions of urban areas.

One of the most important effects of the innovative CALLS proposal is thus to move the rate structure for *current services* closer to relative costs and to make rural areas more attractive for investment. The current local rate structure, including the PICCs and SLCs, provides much less incentive for ILECs or CLECs to invest in rural areas because a large share of rural residences do not generate sufficient revenues to cover the long-run incremental cost of serving them. As a result, incremental investments by ILECs or new investments by CLECs in these areas earn returns that are simply too low to cover the cost of capital. The CALLS proposal provides for part of the solution to this problem by aligning rates more closely with costs while freezing and even reducing multi-line business rates in all areas. Subscribers in high-cost areas are protected under the CALLS plan by a $7 SLC cap and a new explicit, portable $650 million universal-service fund.

Another way to look at this problem is by examining how carriers recover their costs in rural areas where rates are below cost. Under the current regulatory system, a carrier recovers its costs in these rural areas by serving business customers (particularly in urban areas), from long-distance customers as a portion of access charges, and from some urban consumers whose rates may be above cost. Notably, the carrier does not fully recover its costs by serving the customer in the rural area. Under the CALLS plan, a larger share of the cost of serving the rural areas is defrayed by actually serving the rural area. This would be true for CLECs as well as for ILECs.

VI. THE IMMEDIATE EFFECTS OF THE CALLS PLAN ON CONSUMER WELFARE FOR RESIDENTIAL SUBSCRIBERS

The CALLS proposal conveys substantial immediate economic benefits on consumers of telephone services by rebalancing rates towards costs — benefits that occur even before the effects of the proposal on carrier investments. These benefits derive from the lower marginal cost of interstate calls and substantially exceed the costs of increased SLCs for residential lines. In addition, the proposal insulates low-income subscribers from the higher SLCs because this increase does not apply to Lifeline customers.

Users also benefit from the lower costs of goods and services that result from lower business long-distance rates, particularly in telecommunications-intensive sectors such as travel and finance. The economy benefits because the telecommunications infrastructure is more intensively utilized as long-distance rates fall and incentives for investment in the existing network are improved. Finally, most firms in the telecommunications sector also gain from the rate restructuring in the CALLS proposal. Long-distance companies clearly benefit from the 50 percent reduction in access charges over current levels. The additional long-distance calling increases their cash flows even when retail prices are reduced fully to pass through access-charge reductions.

To estimate the gains from the CALLS plan for residential subscribers,[2] we begin with the assumed impact of the plans on long-distance and local rates. Specifically, we assume that the plan replaces the existing PICCs and results in a SLC plus universal-service charges in 2004 for primary residence lines that are an average of $0.78 per line above the sum of the current SLC and PICC. As a conservative alternative, we also show the effects with a maximum increase of $1.50 per month.[3] We assume that secondary lines' SLCs plus universal-service charges are essentially unchanged in 2004 over pre-existing SLC and PICC levels after adjusting for USF contributions and non pre-subscribed lines. Finally, we assume that interstate access charges are reduced by $0.055 on each end over current levels.[4]

We utilize a model of the contiguous 48 states plus the District of Columbia that has been calibrated for the year 1996. The model has three regions for each state — central cities, suburbs, and rural areas. Each area's population is divided into five income groups. For the purposes of this analysis, half of the lowest income group — households with $10,000 in annual income or less — is reasonably assumed to be exempt from the higher SLCs. The price sensitivity of demand for long-distance declines with rising income levels, and averages -0.7. Similarly, the demand elasticity for primary access lines declines with rising income levels and averages -0.01.

To calibrate the model, we begin with existing local and long-distance rates in 1996. Local rates are increased by $2.40 to account for increasing SLCs and PICCs in the absence of the CALLS plan. Residential long-distance rates, which averaged

---

[2] Since business long distance accounts for approximately 60 percent of all long-distance usage and because the lower long-distance rates paid by business will be passed through to consumers in lower prices of goods and services, the total increase in consumer welfare is likely to be more than twice as great as the direct efffect on residential subscribers estimated in this section.

[3] The proposal increases the SLC by an average of $1.63 over the current primary-residence SLC plus PICC. However, there are also increases in USF contributions of $650 million that must be recovered on a per-line basis. Moreover, the Fifth Circuit Court of Appeals has recently ruled that the FCC may not mandate the recovery of USF charges through increases in interstate access charges. This increases the current 1999 "baseline" because the existing USF contributions are now likely to be recovered on a per-line basis.

[4] This is based on the data filed with the CALLS proposal that show that the average access charge per MOU is currently $0.01119.

17.7 cents per minute in 1996, are reduced to 13.3 cents per minute to reflect the price declines of the past three years. In addition, total 1996 long-distance calling is increased by 25 percent to reflect the effects of exogenous growth due to economic expansion.[5] (Later Census estimates are not available.) The number of primary residence lines is increased by 9 percent over the 1996 estimate for growth.

The increase in fixed per-line charges of $1.50 affects households with incomes above $10,000 per year.[6] All households, however, benefit from lower long-distance rates. We assume that the $0.011 per minute reduction in total interstate switched access charges is fully passed through by long-distance carriers, just as the PICCs have been. Since these lower charges affect only interstate long distance which represents 67 percent of long-distance revenues, we reduce long-distance rates by 0.67 times $0.011, or by $0.0074 per minute.

We cannot know with precision what the telecommunications market will look like in 2004 when the CALLS plan is fully effective. We therefore focus our analysis on today's market as the base case. This means, for example, that there is no growth in households, access lines, or minutes of use other than those caused by the changes.

Assuming that all price-cap companies participate, the effect of the CALLS plan at 2004 SLCs and access rates but 1999 levels of access lines and long-distance usage is to improve consumer welfare by between $1.3 billion and $2.1 billion per year (*see* Table 1). This is the minimal estimate since it does not account for the intervening effects of growth or lower long-distance rates between 1999 and 2004. Nor does it account for consumer gains from the lower cost of goods and services created by lower business rates. If in the intervening five years consumer long-distance usage increases by 5 percent per year — or cumulatively by 28 percent — the consumer gains could rise to between $2.2 billion and $3 billion per year.

---

[5] Even with this increase, the estimated total residential long-distance spending is $38 billion in 1999. The Census Bureau estimates that residential long-distance spending was $42.8

[6] We assume that half of all households with incomes of less than $10,000 receive the Lifeline exemption from the SLC increase, reflecting the current number of Lifeline subscribers.

Table 1

The Effect of the CALLS Proposal on Consumer Welfare (Billions of $ per Year)

Source	1999 MOU Levels	2004 MOU Levels (=1.28*1999 Levels)
	SLC: +$1.50	
Long Distance Services	$3.03	$3.91
Local Services	-$1.73	-$1.73
Total	$1.30	$2.18
	SLC: +$0.78	
Long Distance Services	$3.03	$3.91
Local Services	-$0.90	-$0.90
Total	$2.13	$3.01

VII. CONCLUSIONS

The CALLS proposal is a sorely needed step towards improving the current inefficient pricing structure of interstate telecommunications. The adoption of the proposal would improve local carriers' incentives to invest in rural areas, speed the adoption of high-speed, packet switched services, and improve economic welfare. Indeed, we have found that the proposal, under conservative assumptions, will improve consumer welfare by at least $1.3 billion per year. In a world that is moving towards the "Information Age," the CALLS proposal will lead to a regulated pricing structure that is more compatible with new packet-switching technologies.

The CALLS proposal will also create greater incentives for incumbents and entrants alike to invest in rural and residential areas. It will simplify the current regulatory structure for collecting per-line charges. It will accelerate the deployment of new packet-switched DSL technologies by entrants and incumbents alike.

ROBERT W. CRANDALL

CURRENT POSITION:

Senior Fellow, The Brookings Institution, 1978 - Present

ADDRESS:
1775 Massachusetts Ave., NW
Washington, DC 20036

Phone No: 202-797-6291
Fax. No.: 202-797-6181
e-mail: rcrandall@brook.edu

FIELDS OF SPECIALIZATION:

Industrial Organization, Antitrust Policy, Regulation

PREVIOUS POSITIONS:

Adjunct Professor, School of Public Affairs, University of Maryland, 1987 - 1993
Deputy Director, Council on Wage and Price Stability, 1977 - 1978
Acting Director, Council on Wage and Price Stability, 1977
Adjunct Associate Professor of Economics, George Washington University, 1975 - 1977
Assistant Director, Council on Wage and Price Stability, 1975 - 1977
Associate Professor of Economics, M.I.T., 1972 - 1974
Assistant Professor of Economics, M.I.T., 1966 - 1972
Johnson Research Fellow, The Brookings Institution, 1965 - 1966
Instructor, Northwestern University, 1964 - 1965
Consultant to Environmental Protection Agency, Antitrust Division Federal Trade Commission, Treasury Department, various years

EDUCATION:

Ph.D., Economics, Northwestern University, 1968
M.A., Economics, Northwestern University, 1965
A.B., Economics, University of Cincinnati, 1962

HONORS and AWARDS:

Phi Beta Kappa

MEMBERSHIPS:

American Economic Association
Board of Directors, Baltimore Life Insurance Company
Board of Directors, Economists Incorporated

PERSONAL DATA:

Place and Date of Birth: Akron, Ohio; February 28, 1940

Home Address: 5100 - 38th Street, NW
Washington, DC 20016

PUBLICATIONS:

Books:

Cable TV: Regulation or Competition? (with Harold Furchtgott-Roth), Washington: The Brookings Institution, 1996.

Talk is Cheap: The Promise Of Regulatory Reform in North American Telecommunications. (with Leonard Waverman) Washington: The Brookings Institution, 1996.

The Extra Mile: Rethinking Energy Policy for Automotive Transportation. (with Pietro S. Nivola) Washington, DC: The Brookings Institution/Twentieth Century Fund, 1995.

Manufacturing on the Move. Washington, DC: The Brookings Institution, 1993.

After the Breakup: The U.S. Telecommunications Industry in a More Competitive Era. Washington, DC: The Brookings Institution, 1991.

Changing the Rules: Technological Change, International Competition and Regulation in Communications. (Edited with Kenneth Flamm), Washington, DC: The Brookings Institution, 1989.

Up from the Ashes: The Rise of the Steel Minimill in the United States. (With Donald F. Barnett), Washington, DC: The Brookings Institution, 1986.

Regulating the Automobile. (With Howard K. Gruenspecht, Theodore E. Keeler, and Lester B. Lave), Washington, DC: The Brookings Institution, 1986.

Controlling Industrial Pollution: The Economics and Politics of Clean Air. Washington, DC: The Brookings Institution, 1983.

The Scientific Basis of Health and Safety Regulation. (Ed. with Lester Lave), Washington, DC: The Brookings Institution, 1981.

The U.S. Steel Industry in Recurrent Crisis. Washington, DC: The Brookings Institution, 1981.

Articles, Reports, and Contributions to Edited Volumes:

"Competition in Telecom: The U.S. and Canadian Paths," (with Leonard Waverman) in Dale Orr and Thomas R. Wilson (eds.), The Electronic Village: Policy Issues in Telecommunications. Toronto: C.D. Howe Institute, 1998.

"New Zealand Spectrum Policy: A Model for the United States?" The Journal of Law and Economics, October 1998, pp. 821-839.

"The Impact of Telecommunications Deregulation on Midsize Business," in Gary D. Libecap (ed.), Advances in the Study of Entrepreneurship, Innovation, and Economic Growth: Legal, Regulatory, and Policy Changes that Affect Entrepreneurial Midsize Firms. Stamford,CT: JAI Press, 1998, pp. 23-42.

"Telephone Subsidies, Income Redistribution, and Economic Welfare," in Roger G. Noll and Monroe E. Price, A Communications Cornucopia: Markle Foundation Essays on Information Policy. Washington: The Brookings Institution, 1998.

"Electric Restructuring and Consumer Interests: Lessons from Other Industries," The Electricity Journal, Volume 11, No. 1, January/February 1998.

"Is it Time to Eliminate Telephone Regulation?" in Donald L. Alexander (ed.), Telecommunications Policy: Have Regulators Dialed the Wrong Number?, Westport, CT: Praeger, 1997, pp. 17-30.

"Competition and Regulation in the U.S. Video Market," Telecommunications Policy, Vol. 21, No. 7, 1997, pp. 649-660.

"Are We Deregulating Telephone Services? Think Again." Brookings Policy Brief, Number 13, March 1997

"Are Telecommunications Facilities 'Infrastructure?' If They Are, So What?" Regional Science and Urban Economics, 27 (1997), pp. 161-79.

"Economic Deregulation and Customer Choice: Lessons for the Electric Utility Industry," (with Jerry Ellig), Center for Market Processes, George Mason University, 1997.

"From Competitiveness to Competition: The Threat of Minimills to Large National Steel Companies," Resources Policy, Vol. 22, Nos. 1/2, March/June 1996, pp.107-118.

"Clearing the Air: EPA's Self-Assessment of Clean-Air Policy," (with Frederick H. Rueter and Wilbur A. Steger), Regulation, 1996, Number 4, pp. 35-46.

"Phone Rates in a Deregulated Market,"The Brookings Review, Summer 1996.

"Competition and Regulatory Policies for Interactive Broadband Networks," (with J. Greory Sidak), Southern California Law Review, July 1995.

"The Unregulated Infobahn," (with J. Gregory Sidak), Policy (New Zealand), Winter 1995.

"Managing the Transition to Deregulation in Telecommunications," in Steven Globerman, W.T. Stanbury, and Thomas A. Wilson (eds.), The Future of Telecommunications Policy in Canada. University of British Columbia and the University of Toronto, 1995.

"Productivity Growth in the Telephone Industry Since 1984," (with Jonathan Galst) in Patrick Harker (ed.), The Service Productivity and Quality Challenge, Dodrecht: Kluwer Academic Publishers, 1995, Chapter 14.

"Cable Television: Reinventing Regulation," The Brookings Review, Winter 1994, pp. 12-15.

"Explaining Regulatory Policy" (with Clifford Winston), Brookings Papers on Economic Activity, Microeconomics, 1994, pp. 1-31.

"Pricing Issues in Telecommunications," Maine Policy Review,Vol. 3, No. 1, May 1994.

"Regulation and the "Rights" Revolution: Can (Should) We Rescue the New Deal?" Critical Review, Vol. 7 Nos. 2-3, 1993, pp. 193-204.

"Comment: Transactions Prices," Price Measurement and Their Uses, (Murray F. Foss, Marilyn E. Manser, and Allan H. Young, eds.), University of Chicago Press, 1993.

"Pollution Controls" in David R. Henderson (ed.), The Fortune Encyclopedia of Economics, New York: Warner Books, 1993.

"Relaxing the Regulatory Stranglehold on Communications," Regulation, Summer 1992, pp. 26-35.

"Regulating Communications: Creating Monopoly While Protecting Us From It," The Brookings Review, Summer 1992, Volume 10, No. 3, pp. 34-39.

"Policy Watch: Corporate Average Fuel Economy Standards," Journal of Economic Perspectives, Spring 1992, pp. 171-80.

"Why Is the Cost of Environmental Regulation So High?" Center for the Study of American Business. St. Louis: Washington University, Policy Study No. 110, February 1992.

"Liberalization Without Deregulation: Telecommunications Policy During the 1980s," Contemporary Policy Issues, October 1991.

"Halfway Home: U.S. Telecommunications (De)Regulation in the 1970s and 1980s," in Jack High (ed.), Regulation: Economic Theory and History. Ann Arbor: The University of Michigan Press, 1991.

"Efficiency and Productivity," in Barry G. Cole (ed.), After the Breakup: Assessing the New Post-AT&T Divestiture Era. New York: Columbia University Press, 1991.

"The Politics of Energy: New Fuel Economy Standards?" (with John D. Graham), The American Enterprise, March/April 1991.

"The Clean Air Act at Twenty," Journal of Regulation and Social Costs, September 1990.

"Fragmentation of the Telephone Network" in Paula Newberg (ed.), New Directions in Telecommunications Policy. Durham, NC: Duke University Press, 1989.

"The Effect of Fuel Economy Standards on Automobile Safety," (with John D. Graham), Journal of Law and Economics, April 1989.

"Surprises from Telephone Deregulation and the AT&T Divestiture," American Economic Review, May 1988, pp. 323-327.

"The Regional Shift of U.S. Economic Activity" in Robert E. Litan, et al., American Living Standards, Washington, DC: The Brookings Institution, 1988.

"Deregulation and Divestiture in the U.S. Telecommunications Sector" in Economic Deregulation: Promise and Performance. Proceedings of the 1987 Donald S. MacNaughton Symposium, Syracuse University, 1988.

"Whatever Happened to Deregulation?" in David Boaz (ed.), Assessing the Reagan Years. Washington, DC: The CATO Institute, 1988.

"Regulatory Reform: Are We Ready for the Next Phase?" in The Brookings Review, The Brookings Institution, Winter 1988/89.

"Telecommunications Policy in the Reagan Era," Regulation, Washington, DC: American Enterprise Institute, 1988, Number 3, pp. 18-19.

"A Sectoral Perspective: Steel" in Robert M. Stern, et.al. (eds.), Perspectives on a U.S.-Canadian Free Trade Agreement, Washington, DC: The Brookings Institution, 1987.

"The Effects of U.S. Trade Protection for Autos and Steel," Brookings Papers on Economic Activity, 1987:2, The Brookings Institution.

"Has the AT&T Breakup Raised Telephone Rates?" in The Brookings Review, Winter 1987.

"Public Policy and the Private Auto," (with Theodore E. Keeler) in Gordon, et.al. (eds.), Energy: Markets and Regulation, Essays in Honor of M.A. Adelman. Cambridge, MA: MIT Press, 1986

"Materials Economics, Policy, and Management: An Overview," with Michael B. Bever, in Encyclopedia of Materials Science and Engineering, Pergamon Press, 1986.

"Metals Industries: International Structure," in Encyclopedia of Materials Science and Engineering, Pergamon Press, 1986.

"The Steel Industry in Transition," Materials and Society, Pergamon Journals Ltd., Vol. 10, No. 2, 1986.

"The Public Interest in Metals Policy," in David A. Gulley and Paul Duby (eds.), The Changing World Metals Industries. New York: Gordon and Breach, 1986.

"Economic Rents as a Barrier to Deregulation," The CATO Journal, Spring/Summer 1986.

"The Transformation of U.S. Manufacturing," Industrial Relations, Spring 1986."Investment and Productivity Growth in the Steel Industry: Some Implications for Industrial Policy," in Walter H. Goldberg, Ailing Steel: The Transoceanic Quarrel, Gower, 1986.

"The EC-US Steel Trade Crisis," in Loukas Tsoukalis (ed.), Europe, America, and the World Economy, Oxford: Basil Blackwell, 1986.

"Why Should We Regulate Fuel Economy at All?" in The Brookings Review, Spring 1985.
"An Acid Test for Congress," Regulation, September/December 1984.

"Import Quotas and the Automobile Industry: The Costs of Protectionism," The Brookings Review, Summer 1984.

"Automobile Safety Regulation and Offsetting Behavior: Some New Empirical Estimates," (with John D. Graham), American Economic Review, Papers and Proceedings, May 1984.

"The Political Economy of Clean Air: Practical Constraints on White House Review," in V. Kerry Smith, Environmental Policy Under Reagan's Executive Order: The Role of Benefit-Cost Analysis, University of North Carolina Press, 1984.

"The Marketplace: Economic Implications of Divestiture," (with Bruce M. Owen), in Harry M. Shooshan III, Discounting Bell: The Impact of the AT&T Divestiture, Pergamon Press, 1984.

"Environmental Policy in the Reagan Administration," (with Paul R. Portney), in Paul R. Portney (ed.), Natural Resources and the Environment: The Reagan Approach, The Urban Institute and Resources for the Future, 1984.

"The Emerging Competition in the U.S. Telecommunications Market" in New Opportunities for Entrepreneurship, The Kiel Institute, 1984.

"Deregulation: The U.S. Experience," Zeitschrift fur die gesamte Staatswissenshaft, October 1983, pp. 419 - 434.

Review of John Zysman and Laura Tyson, American Industry in International Competition, Science, Vol. 222, October 21, 1983.

"Air Pollution, Environmentalists, and Coal Lobby," in Roger G. Noll and Bruce M. Owen (eds.), The Political Economy of Deregulation, American Enterprise Institute, 1983.

"The Use of Environmental Policy to Reduce Economic Growth in the Sun Belt: The Role of Electric-Utility Rates" in Michael A. Crew (ed.), Regulatory Reform and Public Utilities, Lexington Books, 1982.

"The Cost of Automobile Safety and Emissions Regulation to the Consumer: Some Preliminary Results," (with Theodore E. Keeler and Lester B. Lave), American Economic Review, May 1982.

"Environmental Policy," Regulation, March/April 1982.

"Has Reagan Dropped the Ball?" in Regulation, November/December 1981.

"The Use of Cost-Benefit Analysis in Regulatory Decision-Making," Annals New York Academy of Sciences, 1981."The Deregulation of Cable Television," (with Stanley M. Besen), Law and Contemporary Problems, Duke University School of Law, Vol. 44, No. 1, Winter 1981.

"The Impossibility of Finding a Mechanism to Ration Health Care Resources Efficiently" in A New Approach to the Economics of Health Care, Mancur Olson (ed.), American Enterprise Institute for Public Policy Research, 1981.

"Pollution Controls and Productivity Growth in Basic Industries" in Productivity Measurement in Regulated Industries, Academic Press, 1981.

"Where is the Public Interest in Broadcasting Regulation?" in Regulation and the Future Economic Environment-Air to Ground, Charles F. Phillips, Jr. (ed.), December 1980.

"The Environmental Protection Agency," (On Saving the Kingdom: Advice for the President-Elect), Regulation, November/December 1980.

"Steel Imports: Dumping or Competition?" in Regulation, July/August 1980.

"Regulation and Productivity Growth" in Proceedings: Conference on Productivity, Federal Reserve Bank of Boston, Martha's Vineyard, June 1980.

"The Prospects for Regulatory Reform," Government Regulation: New Perspectives, Andrew Blair, ed., Pittsburgh: University of Pittsburgh, 1980.

"The Economics of the Current Steel Crisis in OECD Member Countries" in Steel in the 80's, Organisation for Economic Co-operation and Development, Paris, 1980.

"Environmental Control Is Out of Control," Chemical and Engineering News, Vol. 57, April 23, 1979.

"Paying for Government Policy Through the Price Level" in Clarence C. Walton (ed.), Inflation and National Survival, 1979.

"Is Government Regulation Crippling Business?" in Saturday Review, January 20, 1979.

"Federal Government Initiatives to Reduce the Price Level," Brookings Papers on Economic Activity, 1978:2.

"Competition and 'Dumping' in the U.S. Steel Market," Challenge, July/August 1978.

"Regulation of Television Broadcasting: How Costly is the 'Public Interest'?" in Regulation, January/February 1978.

"Placing a Value on the Electromagnetic Spectrum: A Suggested Approach for FCC Decision-Making," Proceedings of the Conference on Telecommunications Policy Research, Airlie House, 1977.

"Theoretical Issues in the Regulation of Communications Common Carriage" in Rate of Return Regulation, FCC Future Planning Conference, July 1976.

"The Postwar Performance of the Motion Picture Industry," The Antitrust Bulletin, Spring 1975.

"An Econometric Model of the Low-Skill Labor Market," (with C.D. MacRae and Lorene Y.L. Yap), The Journal of Human Resources, Winter 1975.

"The Economic Case for a Fourth Commercial Television Network," Public Policy, Harvard University Press, Fall 1974.

"The Profitability of Cable Television: An Analysis of Acquisition Prices," The Journal of Business, University of Chicago, October 1974.

"A Reexamination of the Prophecy of Doom for Cable Television," (with Lionel L. Fray), The Bell Journal of Economics and Management Science, Spring 1974.

"Monopoly," The Dictionary of American History, Charles Scribner's & Sons, 1973.

"FCC Regulation, Monopsony, and Network Television Program Costs," The Bell Journal of Economics and Management Science, Autumn 1972.

Study Guide for Basic Economics (with R.S. Eckaus), Little, Brown and Company, 1972.

Contemporary Issues in Economics: Selected Readings (with R.S. Eckaus), Little, Brown and Company, 1972.

"Economic Subsidies in the Urban Ghetto," (with C.D. MacRae), Social Science Quarterly, December 1971.

"The Economic Effect of Television-Network Program 'Ownership'," The Journal of Law and Economics, Vol. XIV, October 1971.

"The Decline of the Franchised Dealer in the Automobile Industry," The Journal of Business, University of Chicago, January 1970.

"Motor Vehicle Repair, Repair-Parts Production, and the Franchised Vehicle Dealer," Hearings: The Automobile Industry, U.S. Senate Antitrust Subcommittee of the Committee on the Judiciary, 1969.

"Vertical Integration and the Market for Repair Parts in the United States Automobile Industry," The Journal of Industrial Economics, Oxford: Basil Blackwell, July 1968.

STRATEGIC
POLICY
RESEARCH

7979 OLD GEORGETOWN ROAD SUITE 700 BETHESDA, MARYLAND 20814-2429 301-718-0111 FAX 301-215-4033

EMAIL spri-info@spri.com WEBSITE www.spri.com

JEFFREY H. ROHLFS

Received an A.B. degree from Amherst College and a Ph.D. in Economics from MIT. He has taught economics at the Stanford Graduate School of Business.

Dr. Rohlfs is a principal of SPR and has been a consultant since 1983. He is an economist who specializes in the telecommunications and mass media industries. He has numerous publications, including theoretical, empirical and policy analyses..

Dr. Rohlfs has consulted on telecommunications and public policy for a variety of clients with regard to ground rules for telecommunications competition, cost estimation, interconnection pricing, regulatory reform, restructuring and privatization in many countries, and policies regarding spectrum and mobile telecommunications..

Prior to his career in consulting, Dr. Rohlfs spent 14 years at Bell Labs, rising to Department Head of Economic Modeling Research. While at Bell Labs, Dr. Rohlfs wrote a seminal paper on the theory of network externalities. This theory has been widely cited and applied to universal-service policy and technical standards. Dr. Rohlfs also wrote a seminal empirical analysis on optimal telecommunications pricing and rate rebalancing.

From 1979 to 1981, Dr. Rohlfs was Manager of Microeconomic Analysis at AT&T. He provided analytical support for AT&T's regulatory and public affairs efforts.

Dr. Rohlfs has substantial international consulting experience, including Australia, Bolivia, Canada, European Union, Germany, Honduras, Hungary, Jamaica, Japan, Latvia, Mexico, New Zealand, Panama, Peru, Puerto Rico, Thailand and the United Kingdom. He has served as an expert witness for the U.K. regulatory authority, Oftel.

EDUCATION

MASSACHUSETTS INSTITUTE OF TECHNOLOGY
Ph.D., Economics, 1969

AMHERST COLLEGE
A.B., Economics, 1965

EMPLOYMENT

	STRATEGIC POLICY RESEARCH, Inc. (SPR) — Bethesda, Maryland
1992-Present	*Principal.* Telecommunications, mass media and public policy consulting services for a variety of clients in the telecommunications industry.
	NATIONAL ECONOMIC RESEARCH ASSOCIATES, INC. (NERA) — Washington, D.C.
1989-1992	*Vice President.* Telecommunications, mass media and public policy consulting services for a variety of clients in the telecommunications industry.
	SHOOSHAN & JACKSON INC. — Washington, D.C.
1983-1988	*Principal.* Telecommunications, mass media and public policy consulting services for a variety of clients in the telecommunications industry.
1981-1983 1978-1979	ECONOMIC MODELING RESEARCH DEPARTMENT, BELL LABORATORIES — Murray Hill, New Jersey *Department Head.* Economics research.
	MICROECONOMIC ANALYSIS, AT&T — New York, New York
1979-1981	*Manager.* Analytical support for AT&T's regulatory and public affairs efforts.
1975-1978 1969-1974	ECONOMICS RESEARCH, BELL LABORATORIES — Murray Hill, New Jersey *Member of Technical Staff.* Economics research.
	STANFORD BUSINESS SCHOOL — Stanford, California
1974-1975	*Visiting Lecturer.* Teaching and research in business economics.
	CHARLES RIVER ASSOCIATES — Cambridge, Massachusetts
1967-1969	*Research Associate.* Economics research.

PROFESSIONAL ACTIVITIES

Member, American Economic Association, International Telecommunications Society.

PUBLICATIONS

With others. *Review of NTT's Top Down Cost Model.* Prepared on behalf of Nippon Telegraph and Telephone Corporation for presentation before the Ministry of Posts and Telecommunications of Japan. August 23, 1999.

With others. *TELCOMP© Model Version 1.4.* Submission before the Federal Communications Commission. June 17, 1999.

With others. Submission to the Federal Communications Commission in Second Further Notice of Proposed Rulemaking, *In the Matter of Implementation of the Local Competition Provisions In the Telecommunications Act of 1996.* CC Docket No. 96-98. *Comments of Strategic Policy Research, Inc.* May 25, 1999. *Reply Comments.* June 10, 1999.

With John Haring. *Cost-of-Capital for Payphone Enterprises.* Prepared on behalf of APCC for submission at the Federal Communications Commission. May 14, 1999.

With John Haring. *Declaration of John Haring and Jeffrey H. Rohlfs.* Prepared on behalf of APCC for submission at the Federal Communications Commission. April 21, 1999.

With John Haring. *An Economically Efficient Regime for Paging Interconnection.* Prepared on behalf of APCC for submission at the Federal Communications Commission. April 14, 1999.

With John Haring. *MCI's "Further Thoughts" Yield Negative Returns.* Prepared on behalf of APCC for submission at the Federal Communications Commission. December 16, 1998.

With others. *Economic Analysis of Interconnection Charge Policy.* A report prepared by Strategic Policy Research, Inc., for OSIPTEL. February 12, 1999.

Consorcio de Strategic Policy Research, Inc. y Miller & Van Eaton P.L.L.C., *Proyecto de Consultoría, "Elaboración de Reglamentos de Telecomunicaciones" para la Comisión Nacional de Telecomunicaciones (CONATEL).* Informe Final. 8 de febrero de 1999.

With Gale R. Mosteller and Lisa H. Milofsky. "The Demand for and Taxation of Cigarettes: A Pooled Time-Series Cross-Section Analysis. October 1998.

Report on Findings: Effects of the Entrance of a Second GSM Operator on the Cellular Telecommunications Market and on the Incumbent Operator. Prepared for The World Bank. October 20. 1998.

With John Haring. *Public Policy to Deter Exclusionary Practices in the Airline Industry.* Prepared for Frontier Airlines and Spirit Airlines for presentation before the

U.S. Department of Transportation, regarding DOT's *Enforcement Policy Regarding Unfair Exclusionary Conduct in the Air Transportation Industry,* Docket OST-98-3713 (issued April 6, 1998). September 25, 1998.

With John Haring. *Comments of American Public Communications Council.* Submitted before the FCC. "Declaration of John Haring and Jeffrey H. Rohlfs. July 13, 1998. "Reply Declaration of John Haring and Jeffrey H. Rohlfs." July 27, 1998.

With Arturo Briceno (OSIPTEL, Peru). "Rate Rebalancing and Competition in Peruvian Telecommunications." ITS Twelfth Biennial Conference. *Beyond Convergence: Communication into the Next Millenium.* Stockholm, Sweden. June 21-24, 1998.

With John Haring, Calvin S. Monson and Harry M. Shooshan III. *Replacing Competitive Bans with Competitive Safeguards: The Role of Imputation.* Prepared for BellSouth. October 15, 1997.

With John Haring. "Telecommunications Pricing and Competition." *Interconnection and the Internet, Selected Papers from the 1996 Telecommunications Policy Research Conference.* G. L. Rosston and D. Waterman, eds. Lawrence Erlbaum Associates, Inc. 1997. Chapter 3.

With Kirsten M. Pehrsson. *One Size Does Not Fit All: The Inadequacy of a Single X-Factor for All Price-Cap Companies.* Submitted before the Federal Communications Commission, In the Matter of Price Cap Performance Review for Local Exchange Carriers; Access Charge Reform, CC Docket Nos. 94-1 and 96-262, Attachment to Petition for Reconsideration. July 11, 1997.

With John Haring. "Efficient Competition in Local Telecommunications without Excessive Regulation. *Information Economics and Policy.* I. Vogelsang, guest ed. Elsevier Science B.V. Vol. 9, No. 2. June 1997. 119-131.

With John Haring, Calvin S. Monson and others. *A New Set of "Top-Down" Incremental Cost Measures (Revised).* Submitted before the Federal Communications Commission, CPD Docket No. 97-2, *Comments of Strategic Policy Research, Inc.* February 18, 1997.

With John Haring. *Economic Perspectives on Access Charge Reform.* Prepared for submission before the Federal Communications Commission on behalf of BellSouth Telecommunications. *In the Matter of Access Charge Reform, Price Cap Performance Review for Local Exchange Carriers, Transport Rate Structure and Pricing, and Usage of the Public Switched Network by Information Service and Internet Access Providers,* CC Docket Nos. 96-262, 94-1, 91-213 and 96-263. January 29, 1997.

With Charles L. Jackson and Ross M. Richardson. *The Depreciation Shortfall.* Prepared for submission before the Federal Communications Commission, CC Docket

No. 96-262: *USTA Comments,* Attachment 15, filed January 29, 1997; *Reply Comments,* filed February 13, 1997.

With John Haring, Charles L. Jackson and Harry M. Shooshan III. *The Benefits of Choosing: FCC Specification of an ATV Standard.* Prepared on behalf of Capital Cities/ABC, Inc., CBS, Inc., Fox Television Stations, Inc., the Association for Maximum Service Television, the National Association of Broadcasters and National Broadcasting Company, Inc., for submission before the Federal Communications Commission, *In the Matter of Advanced Television Systems and Their Impact Upon the Existing Television Broadcast Service.* MM Docket No. 87-268. *Reply Comments of Strategic Policy Research on the Commission's Fifth Further Notice of Proposed Rulemaking.* Filed August 13, 1996.

With John Haring and Calvin S. Monson. *Comments on FCC's Industry Demand and Supply Simulation Model.* Prepared on behalf of BellSouth for submission before the Federal Communications Commission, *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996.* CC Docket No. 96-98. *Supplemental Comments.* Filed July 8, 1996.

With John Haring, Calvin S. Monson and Harry M. Shooshan III. *Interconnection and Economic Efficiency.* Prepared on behalf of BellSouth for submission before the Federal Communications Commission, *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996.* CC Docket No. 96-98. *Comments of BellSouth.* Filed May 16, 1996.

With Charles L. Jackson, John Haring, Harry M. Shooshan III and Kirsten M. Pehrsson. *Public Harms Unique to Satellite Spectrum Auctions.* A study prepared for the Satellite Industry Association. March 18, 1996. Included as Chapter 17 (Part Three, Communications Policy) in *A Communications Cornucopia, Markle Foundation Essays on Information Policy,* Roger G. Noll and Monroe E. Price, ed. (Washington, D.C.: Brookings Institution Press, 1998), pp. 448-472.

With Harry M. Shooshan III and Calvin S. Monson. *Bill-and-Keep: A Bad Solution to a Non-Problem.* Filed before the Federal Communications Commission, *In the Matter of Interconnection Between Local Exchange Carriers and Commercial Mobile Radio Service Providers* (CC Docket No. 95-185) and *Equal Access and Interconnection Obligations Pertaining to Commercial Mobile Radio Service Providers* (CC Docket No. 94-54). Attachment to the Comments of the United States Telephone Association, March 4, 1996.

With John Haring. *Comments on Pricing Flexibility Issues.* Prepared on behalf of BellSouth Telecommunications for submission before the Federal Communications Commission, *In the Matter of Price Cap Performance Review for Local Exchange Carriers.* CC Docket No. 94-1. January 10, 1996.

"Regulating Telecommunications: Lessons from U.S. Price Cap Experience." *Viewpoint.* Note No. 65. The World Bank. January 1996.

With John Haring and Charles L. Jackson. *Comments Regarding Regulation of Access to Vertically Integrated Natural Monopolies.* A submission to The New Zealand Ministry of Commerce and The Treasury. September 15, 1995.

With John Haring and Harry M. Shooshan III. *Disabilities of Continued Asymmetric Regulation of AT&T.* Prepared for AT&T. June 30, 1995.

With Charles L. Jackson. *Quantifying the Costs of Billed Party Preference.* Report filed before the Federal Communications Commission on behalf of American Public Communications Counsel, *In the Matter of Billed Party Preference for 0+ InterLATA Calls,* CC Docket No. 92-77. September 14, 1994.

With Charles L. Jackson. *The Many Costs and Few Benefits of Billed Party Preference.* Before the Federal Communications Commission on behalf of American Public Communications Counsel, *In the Matter of Billed Party Preference for 0+ InterLATA Calls,* CC Docket No. 92-77. August 1, 1994.

With John Haring, Charles L. Jackson, Calvin S. Monson and Morrison & Foerster. *A Proposal for Introducing Competition into the Mexican Telecommunications Market.* Prepared for the Government of Mexico, Secretaria de Comunicaciones y Transportes. June 10, 1994.

With Harry M. Shooshan III. *Diversification and Growth: Achieving Synergies in the Global Entertainment/Information Economy.* Prepared for Rogers Communication, Inc. for submission before the Canadian Radio-television and Telecommunications Commission. May 12, 1994.

With Harry M. Shooshan III. "New investment and the regulatory climate." *Telephony.* May 2, 1994.

With John Haring and Harry M. Shooshan III. *Regulatory Reform for the Information Age: Providing the Vision.* Prepared for the United States Telephone Association. January 11, 1994.

With John Haring and Harry M. Shooshan III. *The U.S. Stake in Competitive Global Telecommunications Services: The Economic Case for Tough Bargaining.* Prepared for AT&T. December 16, 1993.

With John Haring. *The Absence of a Public Policy Rationale for Applying Affiliate-Transaction Rules to AT&T.* Prepared for AT&T for submission at the Federal Communications Commission in CC Docket No. 93-251, adopted September 23, 1993, Amendment of Parts 32 and 64 of the Commission's Rules to Account for Transactions between Carriers and Their Nonregulated Affiliates, *Notice of Proposed Rulemaking.* December 10, 1993.

With Calvin S. Monson. *The $20 Billion Impact of Local Competition in Telecommunications*. Prepared for the United States Telephone Association. July 16, 1993. Presented to the International Telecommunications Society, Sydney, Australia. July 1994.

With Richard Schmalensee. *Productivity Gains Resulting from Interstate Price Caps for AT&T*. Prepared for AT&T. September 3, 1992. Presented at the Telecommunications Policy Research Conference. Solomons Island, Maryland. October 4, 1993.

With Harry M. Shooshan III. *Evidence of Strategic Policy Research, Inc*. Before the Canadian Radio-television and Telecommunications Commission. Prepared for Call-Net Telecommunications, Ltd. in connection with Bell Canada, General Increase in Rates, 1993. May 10, 1993.

With John Haring and Harry M. Shooshan III. *Efficient Regulation of Basic-Tier Cable Rates*. Expert report prepared for National Association of Broadcasters in connection with the FCC's rulemaking proceeding on cable rate regulation (MM Docket No. 92-266). January 26, 1993.

With John Haring. "A Theory of Price Discrimination Under Regulated Competition: With Application to Long-Distance Telecommunications." Presented to International Telecommunications Society, ITS '92. Sophia Antipolis, France. June 14-17, 1992.

With John Haring and Harry M. Shooshan III. *The Competitive Impact of the Proposed Merger between Financial News Network and Consumer News and Business Channel*. Prepared for the Dow Jones/Group W Partnership for submission at the Federal Trade Commission. Washington, D.C. April 11, 1991.

Competition in the Provision of Air-to-Ground Telephone Service. Before the Federal Communications Commission. On behalf of In-Flight Phone Corporation. November 14, 1990.

With John Haring. *A Theory of Price Discrimination Under Regulated Competition: With Application to Long-Distance Telecommunications*. Presented to International Telecommunications Society, Sophia-Antipolis, France. June 14-17, 1992.

With Harry M. Shooshan III, Kirsten Pehrsson, *et al*. *Electronic Highways: Providing the Telecommunications Infrastructure for Pennsylvania's Economic Future*. Prepared for the Pennsylvania Chamber of Business and Industry jointly by NERA and Price Waterhouse. December 19, 1991.

With Charles L. Jackson and Tracey Kelly. *Estimate of the Loss to the United States Caused by the FCC's Delay in Licensing Cellular Telecommunications*. Commissioned by AT&T. November 8, 1991 (revised). [Presented at the Telecommunications Policy Research Conference. Solomons Island, Maryland. October 1992.]

With Charles L. Jackson. "What Can You Do With a Cordless Telephone?" Presented at the 19th Annual Telecommunications Policy Research Conference. Solomons Island, Maryland. September 30, 1991.

Differences in Productivity Gains Among Telephone Companies. Prepared for Centel. September 3, 1991.

With others, *The Technology and Economics of Providing Video Services by Fiber Optic Networks: A Response to Johnson and Reed.* A study prepared for the United States Telephone Association. NERA, Washington, D.C. July 20, 1990.

Preserving the Incentive in Incentive Regulation. Before the Federal Communications Commission on behalf of Bell Atlantic, *In the Matter of Policy and Rules Concerning Rates for Dominant Carriers,* CC Docket No. 87-313. Washington, D.C. July 3, 1990.

With Harry M. Shooshan III. *Telecommunications Infrastructure, Productivity, and Economic Development.* Prepared for the United States Telephone Association. Washington, D.C. April 9, 1990.

Economic Issues Relating to Privatization of Telecommunications. Presented at the 8th Annual ITS International Conference. Venice, Italy. March 18-21, 1990.

With Richard J. Gilbert. "Forecasting Technology Adoption with an Application to Telecommunications Bypass." *Telecommunications Demand Modelling.* A. de Fontenay, M.H. Shugard, D.S. Sibley, eds. Elsevier Science Publishers B.V. (North-Holland), 1990.

With William E. Taylor. *Analysis of AT&T's Comparison of Interstate Access Charges Under Incentive Regulation and Rate of Return Regulation.* Before the Federal Communications Commission on behalf of the United States Telephone Association. July 21, 1989.

With William E. Taylor. *Incentive Regulation and Estimates of Productivity.* A study prepared for Cincinnati Bell Telephone Company. NERA, Washington, D.C. June 9, 1989.

With Charles L. Jackson, Harry M. Shooshan III and Susan W. Leisner. *'Miles to Go': The Need For Additional Reforms In Capital Recovery Methods.* Presented at the National Economic Research Associates, Inc. Telecommunications In A Competitive Environment Seminar. Scottsdale, Arizona. April 12-15, 1989.

"Bypass and Growth of Demand for Switched Access." A study commissioned by Bell Atlantic, BellSouth and Southwestern Bell. Shooshan & Jackson Inc. Washington, D.C. February 17, 1989.

With Harry M. Shooshan III. *Will Price Caps Correct Major Economic Flaws in the Current Regulatory Process?* Presented at the 20th Annual Williamsburg Conference. Williamsburg, Virginia. December 5-7, 1988.

With Harry M. Shooshan III, Charles L. Jackson and Susan W. Leisner. *ONA: Keeping The Promise*. A study commissioned by Bell Atlantic. Washington, D.C. May 1988.

With Harry M. Shooshan III, Charles L. Jackson and Susan W. Leisner. "The Negative Effects of Tax Reform on the Telephone Industry: Making Up the $15 Billion Difference." Presented at the Fifteenth Annual Telecommunications Policy Research Conference. Airlie, Virginia. September 27-30, 1987. [Also presented to meeting of Communications Committee, National Association of Regulatory Utility Commissioners, February 1987 and Maryland Public Service Commission, May 1987.]

With Harry M. Shooshan III, Charles L. Jackson and Louise A. Arnheim. *Opening the Broadband Gateway: The Need for Telephone Company Entry into the Video Services Marketplace*. Prepared for the United States Telephone Association. Washington, D.C. November 1987. Filed before the Federal Communications Commission in connection with the Notice of Inquiry, *In the matter of telephone company/cable television cross-ownership rules*, Sections 63.54-63.58, CC Docket No. 87-266 (August 1987).

With Susan W. Leisner. "Alternatives to Rate of Return Regulation for Local Telephone Companies." Prepared for The Annenberg Schools of Communications, The Washington Program's Research Forum. Washington, D.C. March 20, 1987.

"Efficient Recovery of NTS Costs." Presented at the Thirteenth Annual Rate Symposium on Pricing Electric, Gas and Telecommunication Services, Today and For the Future. St. Louis, Missouri. February 1987.

With Charles L. Jackson. "Improving the Economic Efficiency of NTS Cost Recovery." Presented at the Fifth Biennial Regulatory Information Conference. Columbus, Ohio. September 3-5, 1986.

With Charles L. Jackson. "Improving the Economic Efficiency of Interstate Access Charges." Presented at the Fourteenth Annual Telecommunications Policy Research Conference. Airlie, Virginia. April 27-30, 1986.

With Charles L. Jackson. *Access Charging and Bypass Adoption*. Shooshan & Jackson Inc. Washington, D.C. 1985. Filed before the National Telecommunications Information Administration, 1985. [Also submitted to the Federal Communications Commission, New Jersey Board of Public Utilities and Pennsylvania Public Utility Commission.]

With Richard J. Gilbert. *Forecasting Technology Adoption*. Shooshan & Jackson Inc. Washington, D.C. 1985.

"Bypass and Access Charging." Presented at 12th Annual Telecommunications Policy Research Conference. Airlie, Virginia. 1984.

"Marginal Costs of Telephone Services in Washington, D.C." Testimony before the Public Service Commission of the District of Columbia. November 1983. Presented to Econometrics Society. 1984.

With G.R. Faulhaber. "Regulation and Market Structure in Telecommunications." Presented at Conference on Economics of Telecommunications: Current Research on Demand, Pricing and Regulation. Northwestern University, Illinois. January 1980.

With others. "Whose Ox Will Be Gored By Alternative Telecommunications Policies." Presented at 8th Annual Telecommunications Policy Research Conference. Annapolis, Maryland. 1980.

"Economically Efficient Bell System Pricing." AT&T submission to Congress. 1978. Bell Labs Economic Discussion Paper #138. Presented at 7th Annual Telecommunications Policy Research Conference. Skytop, Pennsylvania. 1979.

"Comments on New Issues in Telecommunications Regulation." *Issues in Public Utility Regulation*. H. Trebing, ed. Institute of Public Utilities. Graduate School of Business Administration, Michigan State University. East Lansing, Michigan. 1979.

"Interdependent Demand and Optimal Telecommunications Pricing." Provided to AT&T for submission in Federal Communications Commission Docket 20003. 1977. Presented at 5th Annual Telecommunications Policy Research Conference. Airlie, Virginia. 1977.

"Evaluation of Changes in a Suboptimal Economy." *Review of Economic Studies*. Vol. XLIII(2). June 1976.

"A Theory of Interdependent Demand for A Communications Service." *Bell Journal of Economics and Management Science*. Spring 1974.

"Econometric Analysis of Supply in Concentrated Markets." *International Economic Review*. February 1974.

TESTIMONIES

Invited participant in FCC Workshop on Validation of Cost Models. January 16, 1997.

Invited participant in FCC Workshop on Technical Standards for Advanced Television. November 1, 1996.

With Charles L. Jackson. *Report on Capital Needs of a Telephone Company*. Direct and rebuttal testimony before the United States Tax Court. Docket Nos. 7970-91 and 7971-91. June 1994. [Confidential]

Testimony in *Turner Broadcasting System, Inc., et al., Plaintiffs, v. Federal Communications Commission, et al., Defendants.* United States District Court for the District of Columbia. Docket No. C.A. No. 92-2247 (and related cases C.A. Nos. 92-2292, 92-2494, 92-2495, 92-2558) (TPJ). *Expert's Report* filed April 21, 1995; *Expert Declaration* filed May 25, 1995.

With John Haring. *Comments on "Transition Issues."* Prepared for BellSouth for submission at the Federal Communications Commission in CC Docket No. 94-1, *In the Matter of Price Cap Performance Review for Local Exchange Carriers.* April 1994.

With John Haring. Statement re: *In the Matter of Policies and Rules Concerning Rates for Dominant Carriers.* Before the Federal Communications Commission on behalf of AT&T, *Notice of Proposed Rulemaking,* CC Docket No. 87-313. July 6, 1993.

Testimony on price cap regulation before the Florida Public Service Commission, Docket No. 891246-TL, on behalf of Central Telephone-Florida. October 1, 1990.

Testimony before Puerto Rico legislature on privatization and price-cap regulation of telecommunications. June 1990.

Critique of stand-alone cost allocations. Testimony before the Public Utilities Commission of Ohio on behalf of GTE North. May 1988.

SPEECHES

With Joseph H. Weber and Calvin S. Monson. "TELCOMP© — A Model for Determining the Viability of Local Exchange Competition. Presentation at the Telecommunications Policy Research Conference. Alexandria, Virginia. September 26, 1999.

"Network Externalities and Technical Standards for New Products and Services." Conference on Regulation in the Digital Age, sponsored jointly by the Brookings Institution and the CATO Institute. April 17, 1997.

"Design of Spectrum Auctions." Presented at the Annual Meeting of the IMF and World Bank Group. Washington, D.C. 1996.

"Competition the Easy Way (or the Hard Way)." Presentation at the Primer Encuentro Regional de Órganismos Reguladores de Telecomunicaciones de América Latina y el Caribe. Lima, Perú. May 22, 1996.

"A Future Growth of Competition in Local Telecommunications." Presented at a symposium for discussing Japanese telecommunications policy with special reference to the market dominance of NTT. Sponsored by Gakushuin University, Faculty of Economics. Tokyo, Japan. June 7, 1995.

"Trends and Information Technology." Presented to North Carolina Association of County Budget Officers. Atlantic Beach, North Carolina. August 5, 1994.

"Comments on Issues of Costing and Pricing." Presented at the International Conference on the Economics of Radio-Based Telecommunications, CREST. Paris, France. June 23-24, 1994.

"Transition to Competition Outside the United States: Current Trends and Issues." Speech presented at The Brookings Institution. Washington, D.C. October 15, 1992.

"Economic Issues Relating to Privatization of Telecommunications." Presented to the Conference on Network Economics. Sapporo, Japan. July 23-27, 1990.

"The Present Status of Research on Network Economics." Presented to the Institute for Posts and Telecommunications Policy. Tokyo, Japan. July 20, 1990.

"Comment on Incremental Capital Costs of Telephone Access and Local Usage." Presented at the 20th Annual Williamsburg Conference. Williamsburg, Virginia. December 1988.

"Aggregate Consumers' Surplus: No Apology But Some Caution." Presented at Stanford University and University of California. Berkeley, California. January 1982.

"Return for Risk and the Term Structure of Interest Rates." Presented to the Econometrics Society. Dallas, Texas. 1975.

"Analysis of Demand for Video Communication." Presented at Second Annual Telecommunications Policy Research Conference. Airlie, Virginia. 1974.

OTHER CONSULTING ASSIGNMENTS

Advisor to Telstra (Australian national carrier), 1994-1999.

Advisor to OSIPTEL (Peruvian telecommunications regulator), 1996-1999.

Advisor to Office of Utilities Regulation, Jamaica, W.I., on establishing a regulatory framework for the telecommunications sector, 1996-1997.

Advisor to Comisión Nacional de Telecomunicaciones — CONATEL (regulatory authority in Honduras), on drafting service-specific regulations for telecommunications services, 1998.

Advisor to CONATEL on drafting service-specific regulations for telecommunications services, 1998.

Advisor to Superintendencia de Telecomunicaciones (regulatory authority in Bolivia), on resolution of interconnection dispute, 1997.

Advisor to City of San Diego, California, with regard to negotiations involving spectrum licenses, 1996.

Advisor to *Secretaria de Comunicaciones y Transportes* (Mexican telecommunications regulator) under auspices of the World Bank and Inter-American Development Bank, 1989-1990.

Advisor to the New Zealand Treasury and Ministry of Commerce with regard to the privatization of Telecom New Zealand, 1989.

Advisor to Aussat (Australian satellite-telecommunications operator) with regard to interconnection issues, 1990.