ORIGINAL

BEFORE THE
FLORIDA PUBLIC SERVICE COMMISSION

IN RE: COMPLAINT OF GLOBAL NAPS, INC., AGAINST BELLSOUTH TELECOMMUNICATIONS, INC.) FOR ENFORCEMENT OF SECTION VI(B) OF ITS INTERCONNECTION AGREEMENT WITH BELLSOUTH TELECOMMUNICATIONS, INC., AND REQUEST FOR RELIEF	)	DOCKET NO. 991267-TP

REBUTTAL TESTIMONY

OF

ANIRUDDHA BANERJEE, Ph.D.

ON BEHALF OF

BELLSOUTH TELECOMMUNICATIONS, INC.

DECEMBER 20, 1999

REBUTTAL TESTIMONY OF ANIRUDDHA BANERJEE, Ph.D.

TABLE OF CONTENTS

I. Introduction and Summary

Q. PLEASE STATE YOUR NAME, BUSINESS ADDRESS, AND CURRENT POSITION.

A. My name is Aniruddha (Andy) Banerjee. I am Senior Consultant at National Economic Research Associates, Inc. ("NERA") located at One Main Street, Cambridge, Massachusetts 02142.

Q. PLEASE DESCRIBE YOUR EDUCATIONAL, PROFESSIONAL, AND BUSINESS EXPERIENCE.

A. I earned a Bachelor of Arts (with Honors) and a Master of Arts degree in Economics from the University of Delhi, India, in 1975 and 1977 respectively. I received a Ph.D. in Agricultural Economics from the Pennsylvania State University in 1985. I have over eight years of experience teaching undergraduate and graduate courses in various fields of Economics, and have conducted academic research that has led to several publications and conference presentations.

Since 1988, I have held various positions in the telecommunications industry. Prior to my present position, I have been an economist in the Market Analysis & Forecasting Division at AT&T Communications in Bedminster, NJ, a Member of Technical Staff at Bell Communications Research in Livingston, NJ, and a Research Economist at BellSouth

Telecommunications in Birmingham, AL. In these positions, I was responsible for conducting economic and market analysis, building quantitative demand models for telecommunication services, developing economic positions and strategies, and providing expert testimony support on regulatory economic matters. In my present capacity, I provide quantitative and regulatory economic analysis for telecommunications industry clients principally on matters of concern to local exchange carriers. My curriculum vitae is attached to this testimony as Exhibit AXB-1.

Q. PLEASE DESCRIBE NERA, YOUR PLACE OF EMPLOYMENT.

A. Founded in 1961, National Economic Research Associates or NERA is an internationally known economic consulting firm. It specializes in devising economic solutions to problems involving competition, regulation, finance, and public policy. Currently, NERA has more than 275 professionals (mostly highly experienced and credentialed economists) with 10 offices in the U.S. and overseas offices in Europe (London and Madrid) and Sydney, Australia. In addition, NERA has on staff several internationally renowned academic economists as Special Consultants who provide their professional expertise and testimony when called upon.

The Communications Practice (to which I belong) is a major part of NERA. For over 30 years, it has advised a large number of

communications firms both within and outside the U.S. Those include the regional Bell companies and their subsidiaries, independent telephone companies, long distance companies, cable companies, and telephone operations abroad (e.g., Canada, Mexico, Europe, Japan and East Asia, Australia, and South America). In addition, this practice has provided testimony or other input to governmental entities such as the Federal Communications Commission ("FCC"), the Department of Justice, the U.S. Congress, state regulatory commissions and legislatures, and courts of law. Other clients include industry forums like the Unites States Telephone Association.

Q. WHAT IS THE PURPOSE OF YOUR TESTIMONY?

A. I have been asked by BellSouth Telecommunications, Inc. ("BellSouth")—an incumbent local exchange carrier ("ILEC")—to address economic issues raised in the complaint by Global NAPs, Inc. ("Global NAPs")—an alternative local exchange carrier ("ALEC")—over its interconnection agreement with BellSouth. To this end, I review and comment on the testimonies of witnesses for Global NAPs, including Lee L. Selwyn, William J. Rooney, and Fred R. Goldstein, regarding the payment of reciprocal compensation for traffic sent to Internet service providers ("ISPs").

Q. PLEASE SUMMARIZE YOUR POSITION ON THE ISSUE OF RECIPROCAL COMPENSATION FOR ISP-BOUND TRAFFIC.

A. My position on that issue is summarized as follows:

1. The FCC has ruled that ISP-bound calls are jurisdictionally interstate, not local. Therefore, the proper model of interconnection that applies to ISP-bound calls is not that between an originating ILEC and a terminating ALEC, but that between an originating ILEC and an inter-exchange carrier ("IXC").

2. Reciprocal compensation should not be paid by the originating ILEC for ISP-bound calls. Instead, the ISP should compensate that carrier (and any other carrier that switches the ISP-bound call) for the end-to-end cost caused by the ISP customer, and recover that cost directly from the ISP customer.

3. Contrary to Global NAPs' view, the ISP is not an end-user (of a serving ALEC) but rather a carrier. Therefore, like the IXC that pays carrier access charges to defray the cost of originating and terminating a long distance call, the ISP should—in ideal circumstances—pay analogous usage-based charges to defray costs incurred by other carriers on its behalf to originate an ISP-bound call.

4. Persisting with reciprocal compensation (from the ISP customer's originating ILEC to the ALEC that ultimately switches the call to the

ISP) would generate an inefficient subsidy for Internet use, distort the local exchange market, and generate unintended arbitrage opportunities for Global NAPs and other ALECs. These would be opportunities for those ALECs to specialize in serving ISPs with the sole aim of accumulating reciprocal compensation revenues.

5. Based on the FCC ruling that ISP-bound calls are primarily interstate, four states (Massachusetts, New Jersey, South Carolina, and Louisiana) have declared that the payment of reciprocal compensation by ILECs originating ISP-bound calls be stopped. Massachusetts regulators, in particular, have noted that by encouraging arbitrage opportunities, the reciprocal compensation regime of inter-carrier compensation for ISP-bound calls subverts real local exchange competition.

Q. PLEASE SUMMARIZE YOUR RESPONSE TO THE POSITIONS TAKEN BY WITNESSES FOR GLOBAL NAPS.

A. My response to the testimony of Global NAPs' witnesses is summarized as follows:

1. Witnesses for Global NAPs (particularly, Dr. Selwyn) expend a significant amount of effort to justify the erroneous view held in certain quarters that ISP-bound traffic is "local" in nature and, therefore, deserving of reciprocal compensation. They avoid any meaningful analysis of the real economic issues such as cost

causation, cost recovery, the relative magnitudes of cost to terminate local voice calls and switch ISP-bound calls, implications of alternative forms of inter-carrier compensation for economic efficiency, subsidies and arbitrage opportunities, and the impact on local exchange competition.

2. The Global NAPs witnesses invest heavily in the argument that ISP-bound calls are technically indistinguishable from local (voice) calls and should, therefore, be compensated the same as local calls. This position—also erroneous—fails to recognize that while Internet access (through the ISP) may require only seven-digit or ten-digit dialing, actual use of the Internet most likely involves an interstate connection. Moreover, the ISP's customers do not seek Internet access for its own sake; rather, it is an intermediate step to the desired Internet destination. This means that the Internet call should be viewed from end to end, not just up to the ISP. Finally, the cost to switch a long-duration Internet call is considerably lower than the cost to a carrier-of-last-resort ILEC to terminate a shorter-duration local voice call. Under a reciprocal compensation plan for ISP-bound traffic, a termination charge set equal to the termination cost experienced for *local voice traffic* creates a powerful incentive for the ALEC to specialize only in serving ISPs and accumulate reciprocal compensation revenues.

II. Inter-Carrier Compensation for ISP-Bound Calls

Q. GLOBAL NAPS' WITNESSES TAKE THE POSITION THAT ISP-BOUND CALLS ARE LOCAL CALLS AND RECIPROCAL COMPENSATION SHOULD BE CONTINUED TO BE PAID FOR SUCH CALLS. DO YOU AGREE?

A. No, for two reasons. First, as the FCC has already correctly determined, calls made to Internet destinations are more likely to be jurisdictionally interstate than local.[1] Second, the cost causation principle implies that the relationship between the end-user and the ISP is analogous to that between the end-user and an inter-exchange carrier ("IXC"). Therefore, ideally, the ISP should be required to pay usage-based charges to the ILEC and/or ALEC akin to the access charges currently paid by IXCs to the ILEC for all long distance calls carried.

Q. PLEASE EXPLAIN THE FCC'S FINDING THAT ISP-BOUND CALLS ARE JURISDICTIONALLY MORE LIKELY TO BE INTERSTATE.

[1] FCC, *In the Matter of Implementation of the Local Competition Provisions in the Telecommunications Act of 1996* and *Inter-Carrier Compensation for ISP-Bound Traffic*, CC Docket Nos. 96-98 and 99-68, Declaratory Ruling in CC Docket No. 96-98 and Notice of Proposed Rulemaking in CC Docket No. 99-68 ("*ISP Declaratory Ruling*"), released February 26, 1999.

A. This finding has been discussed in depth by BellSouth witness Albert Halprin. I note briefly here the FCC's stated view that the jurisdictional nature of communications has traditionally been determined by the *end points* of the communication, not by intermediate points of switching or exchanges between carriers.[2] More importantly, based on this premise, the FCC explained that calls made to the Internet do not terminate at the ISP's local server (in the sense a local voice call terminates at a carrier's switch) but, rather, continue on to Internet destinations that are frequently located in other states.

The FCC also noted that while jurisdiction is determined unambiguously when a call originates and terminates entirely within the circuit-switched network, it is a very different matter when the call crosses over from the circuit-switched network into the packet-switched network (that comprises the Internet's backbone network and Internet web sites) along the way to its destination.[3] This distinction is particularly important because the packet-switched network is a "connectionless" network in which termination, in the sense understood within the circuit-switched network, technically does not happen. For example, before it is over, the same Internet call may reach several destination points on the Internet. Also, calls are switched or, more accurately, "routed" over the packet-switched network in a dynamic manner. This means that the Internet call, rearranged in the form of

[2] *ISP Declaratory Ruling*, ¶10.
[3] *ISP Declaratory Ruling*, ¶18.

data packets of given length, are sent in a scrambled manner along different available paths within the backbone network, and the "call" is then reconstituted when all of the packets reach the intended Internet destination. This method of transport and routing is nothing like the termination that occurs within the circuit-switched network where, for every call originated and terminated, a dedicated call path is established for the duration of the call. These crucial differences make it all the more likely that an Internet call will cross several state boundaries—and in a random manner—before it reaches its destination. At best, such a call would be "jurisdictionally mixed," as the FCC has already correctly determined.

Q. PLEASE EXPLAIN HOW COST CAUSATION DETERMINES THAT ISPS ARE ANALOGOUS TO IXCS AND SHOULD, IDEALLY, PAY CHARGES SIMILAR TO ACCESS CHARGES.

A. To understand this point, it is first necessary to recapitulate the erroneous view of the network that underlies many ALECs' belief (including Global NAPs') that an Internet call is jurisdictionally local. Implicit in this erroneous view are two crucial assumptions:

1. The ILEC subscriber that calls the Internet is acting as a *customer* of the originating ILEC,[4] even when the call goes through the ISP to which he or she pays a monthly access fee.[5]

2. The ISP itself is not a carrier but an end-user of the ALEC that terminates the Internet call for the ISP.

These assumptions are epitomized by two assertions by Dr. Selwyn:

> [L]ocal calls are sent paid, which means that the originating carrier charges the end user to get the call all the way to the destination; reciprocal compensation is designed to reflect that economic fact by requiring the originating carrier to pay the terminating carrier for doing some of the work of carrying the call ... ISP-bound calling unquestionably falls into the "local" call model.[6]

and

> ... ISPs [are allowed] to connect to the network as business customers, not as carriers, and to receive locally-dialed calls from end users that are priced, to the end user, as local calls.[7]

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[4] I distinguish here between a "subscriber" and a "customer" in order to show cost causation. I *subscribe* to my local carrier in order to have *access* to the public switched network, but I act as a customer of that local carrier in order to *use* Call Waiting service or as a customer of a long distance carrier in order to *use* interstate long distance service. When I am a customer of the local carrier, I cause usage-based cost for that carrier. Similarly, I cause cost for the long distance carrier when I use *its* long distance service.

[5] The ISP is assumed to have a point of presence in the local calling area of the Internet caller.

[6] Direct testimony of Lee L. Selwyn, at 12 and 14.

[7] *Id.*, at 14.

The first statement confirms Global NAPs's view that the cost of an ISP-bound call made by the ILEC's subscriber must be recovered from the ILEC. The second statement reflects Global NAPs's view that an ISP is akin to all end-users.

Under these assumptions, the ILEC subscriber that makes the Internet call appears to be an end-user of the originating ILEC (paying local residential rates for line charges) and the ISP appears to be an end-user of the terminating ALEC (paying local business rates for line charges). The monthly Internet access charges paid by the ILEC subscriber to the ISP and the leased high-speed line charges paid by the ISP to Internet backbone networks are only incidental to this model and have no further role in determining jurisdiction. In this view of the network, therefore, the portion of the Internet call that lies entirely within the circuit-switched network, i.e., up to the ISP, resembles a local call under an interconnection arrangement between two local carriers. From this it would appear that the ALEC that terminates the ISP-bound call is entitled to reciprocal compensation under the FCC's rules.

This conclusion is fundamentally incorrect because it ignores cost causation, specifically, that the ILEC subscriber that makes the Internet call does so *while acting as a customer of the ISP* to which it pays monthly fees for Internet access and which, in return, markets directly to the customer and provides a point of presence in the customer's local calling area in order to provide easy access. Thus, the same

subscriber that acts in the capacity of a customer of the originating ILEC when making a local voice call is seen to act in the capacity of a customer of the ISP when making an Internet call. This situation is not an unfamiliar one; in fact, it is exactly analogous to the subscriber acting in the capacity of a customer of an IXC when making a long distance call.

This analogy—and the proper cost causation view of Internet calling—rests on two different assumptions:

1. The ILEC subscriber that calls the Internet is acting as a customer of the ISP to which he or she pays a monthly access fee, even though the call is facilitated by both the originating ILEC and the ALEC serving the ISP.

2. The ISP is viewed as a carrier—akin to an enhanced service provider ("ESP")—that routes the Internet call through the backbone network to its final destination. The ISP performs standard carrier functions such as transport and routing, as well as maintains leased facilities within the backbone network.

These assumptions appropriately depict the Internet-bound call as being much closer in character to an interstate long distance call than to a local call that is contained entirely within the local calling area. They also dispel the notion that an Internet-bound call is really two calls: the first call ending at the ALEC serving the ISP, and the second

call routed by the ISP through the backbone network to its Internet destination. Indeed, it is quite evident from Dr. Selwyn's testimony that he regards an Internet-bound *call* as equivalent to Internet *access* through the ISP. These are really two completely different entities. It is perfectly possible, indeed commonplace, for Internet access (through an ISP) to occur by dialing "local" or seven-digit numbers;[8] the logic of competition makes it inevitable that ISPs will try to make Internet access as convenient as possible to its customers. However, that is quite different from the fact that the end-to-end Internet call crosses state and jurisdictional boundaries with a very high likelihood.

Validity for the latter set of assumptions comes from the principle of cost causation. This principle suggests that, *for the purposes of an Internet call*, the subscriber is properly viewed as a customer of the ISP, not of the originating ILEC (or even of the ALEC serving the ISP). The ILEC and the ALEC simply provide access-like functions to help the Internet call on its way, just as they might provide originating or terminating carrier access to help an IXC carry an interstate long distance call. Therefore, with the proper network model being

[8] Dr. Selwyn [at 16] dwells a fair bit on this issue, as does Mr. Goldstein [at 3-4]. Both miss two essential points completely. First, as BellSouth witness Keith Milner explains in his rebuttal testimony, seven-digit dialing does not automatically make the call jurisdictionally local. Second, Internet users do not place calls to the ISP; rather, they call Internet destinations. The ISP merely facilitates access to those destinations through the packet-switched network. In every regard, then, ISPs are carriers that facilitate the completion of end-to-end Internet calls; the Internet access they provide are not *ends* in themselves. Unfortunately, regarding ISPs as "end-users" for the purpose of the access charge exemption (provided by the FCC in order to support an infant Internet "industry" rather than because Internet calls are local) completely clouds this all-important distinction.

analogous to ILEC-IXC interconnection (access), rather than to ILEC-ALEC interconnection, the proper form of inter-carrier compensation should ideally be usage-based charges analogous to carrier access charges for long distance calls, rather than reciprocal compensation.

Q. PLEASE EXPLAIN THE CONTRAST BETWEEN THESE TWO "MODELS" OF INTERCONNECTION IN MORE DETAIL.

A. ***ILEC-ALEC Interconnection Model.*** When a BellSouth subscriber places a local call that terminates to a ALEC subscriber, what functions does BellSouth perform? Obviously, it originates the call, providing dialtone, local switching, and transport to the ALEC's point of interconnection. In addition, BellSouth has marketed the service to its subscriber (and customer of local calls), determining the price and price structure and other terms and conditions under which the customer decides to place the call. BellSouth will determine if the call has been completed, bill the customer for the call (if measured service applies) or for flat-rate service, answer questions regarding the bill or the service and collect money from the customer or lose the revenue if it is unable to collect from the customer. The story is precisely symmetric if the originating party is a ALEC customer and BellSouth or another ALEC terminates the call.

Thus, under ILEC-ALEC interconnection, the originating subscriber is the cost-causing party and is the customer of the originating ILEC. That originating ILEC charges its cost-causing customer for the entire

end-to-end call and compensates the ALEC that terminates the call. The originating ILEC's network costs plus the compensation it pays is—in theory—recovered from the local call charge it levies on its (originating) customer. The terminating ALEC's costs are recovered from the compensation payment it receives from the originating ILEC. In this arrangement, both parties recover their costs, and the cost-causer is (again, in principle) billed for the entire cost he or she causes both carriers to incur. Thus, this arrangement is not an arbitrary regulatory or legal construction: for local interconnection between an ILEC and a ALEC, it makes economic sense. It could arise spontaneously in unregulated competitive markets where the ILEC serving the originating subscriber acts effectively as its agent in making necessary network and financial arrangements with a ALEC to terminate the call, just as General Motors may purchase goods or services from Ford or Bendix to include in an automobile purchased by a General Motors customer.

ILEC-IXC Interconnection Model. In contrast, when a BellSouth subscriber places a long distance call using, e.g., AT&T, BellSouth's function is limited to recognizing the carrier code (or implementing presubscription in its switch) and switching and transporting the call to AT&T's point of presence. While at some level, the functions its network performs are similar to those used to deliver local traffic to a

ALEC[9], the *economic* functions are very different. It is AT&T that has marketed the service to its customer, determined the price and price structure and other terms and conditions of the call. AT&T will send, explain, and collect the bill from the customer or lose the revenue if it cannot. Thus, under ILEC-IXC interconnection, the originating subscriber is, from an economic perspective, the customer of the IXC, not the originating ILEC.

When an ILEC (or ALEC) subscriber places long distance calls, he acts as a cost-causing customer of the IXC. The ILEC subscriber, acting as an IXC customer, causes costs at various points in the networks involved: for the ILECs/ALECs that originate and terminate the long distance call, as well as for the IXC that transports it between local exchanges. The IXC receives revenue from the customer which it uses, in turn, to pay originating and terminating access charges to the ILECs/ALECs involved and to cover its own network and administration costs. In effect, the IXC acts as its customer's agent in assembling the necessary local exchange components of the call. The ILECs/ALECs involved recover their costs from access charges. If more than one such carrier is involved in delivering the call from the end user to the IXC, they typically divide the access charges paid by the IXC in proportion to the costs incurred to provision the access portion of the call. Thus, in principle, the cost-causing customer faces a price that

[9] BellSouth supplies the customer's loop and provides dialtone, local switching, and transport to AT&T's point of presence.

reflects all of the costs the call engenders, and all parties that incur costs to provision the call have a claim on the cost-causer's payment.

Thus, from an economic perspective, ILEC-IXC interconnection and ILEC-ALEC interconnection have fundamentally similar characteristics but the actors play different economic roles. In both cases, the originating ILEC subscriber is the cost-causer, and it pays its supplier (the party with whom it has contracted for service) for the end-to-end service it receives in both regimes. The difference is that in the ILEC-ALEC local interconnection regime, the cost-causer is acting as the customer of the originating ILEC, while in the ILEC-IXC regime, the cost-causer acts as the customer of the IXC.

Q. WHY DOES ILEC-ALEC-ISP INTERCONNECTION RESEMBLE THAT BETWEEN THE ILEC AND THE IXC BUT NOT THAT BETWEEN THE ILEC AND THE ALEC?

A. The question at issue is when multiple ILECs/ALECs combine to deliver traffic to an ISP, are they interconnecting in an ILEC-ALEC local interconnection regime or an ILEC-IXC interstate access charge regime? The FCC has characterized the link from an end-user to an ISP as an *interstate* access service and absent other considerations, ISPs would be subject to charges analogous to interstate access charges. As Mr. Halprin has noted in his testimony, the FCC concluded as far back as 1983 that ESPs (which, today, would include ISPs) are

"among a variety of users of access service" in that they "obtain local exchange services or facilities which are used, in part or in whole, for the purpose of completing interstate calls."[10]

The service provided by an ISP exists to enable the ISP's customers to access information and information-related services stored on special computers or web servers at various locations around the world. The ISP typically facilitates such access by selling a flat-rated monthly or yearly Internet access service that, in most cases, calls for that ISP customer to make only a local call in order to reach the ISP's modems. Besides price, ISPs compete on the extent of geographic coverage, specifically, the number of local calling areas they can offer to ISP customers as possible points of connection ("POCs"), as well as on various components of service quality including provision of specialized information services.[11] The ISP markets directly to the originating ILEC's subscriber, attempting to maximize its number of customers and the amount of traffic *incoming* to it by publishing and advertising as many local calling numbers (at its POCs) as possible, and doing everything within its power to help the potential customer avoid having to incur per-minute or toll charges to have Internet access. If necessary, ISPs may use foreign exchange ("FX") lines to haul Internet traffic from considerable distances while still offering service to the ISP

[10] FCC, *In Re: MTS and WATS Market Structure*, CC Docket No. 78-72, Memorandum Opinion and Order ("*MTS/WATS Order*"), 1983.

[11] The POCs are points at which the carrier serving the ISP (which may be a ALEC) terminates the ISP-directed call and routes it to the ISP.

customer for the price of a local call.[12] Some ISPs offer 800 service for their customers to access their network when flat-rate local calling is unavailable, although there are some which impose a per-minute charge on the subscriber for such access. Some ISPs maintain Internet gateways for their customers and earn revenue from advertisers that depend more or less directly on the number of customers and the number of times its customers access advertised sites. The ISP bills its customers for their access and usage, and it is the ISP that loses money if it cannot collect from them. From an economic perspective, then, the party that causes the cost associated with ISP-bound traffic is the originating ILEC's subscriber who acts in the capacity of an ISP customer. In this sense, ISP-bound traffic has the same characteristics as IXC-bound traffic in the ILEC-IXC regime and has characteristics opposite to ALEC-bound traffic in the ILEC-ALEC local interconnection regime.

Q. ARE THERE DIFFERENCES BETWEEN AN IXC-BOUND CALL AND AN ISP-BOUND CALL?

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[12] In that respect, the implicit contract is analogous to that which exists between a party with a toll-free "800" telephone number and other parties that are invited to call that number. The holder of the 800 number causes cost by signaling others to call him or her and accepts that cost by being willing to pay for it. Moreover, the holder of the 800 number may control the number of potential callers by choosing the method for disclosing the number (e.g., directory information, word of mouth, special invitation, etc.). Similarly, ISPs that use FX lines to provide local connectivity to distant customers signal a willingness to accept—and pay for—the generally higher cost of providing Internet access to those customers. They too can control the number of potential ISP customers by choosing both how many points of connection to offer for providing local connectivity and pricing options for its Internet access service.

A. A theoretical difference is that an ILEC subscriber that places a long distance call does not incur a local usage charge on the originating end, while an ISP customer, in principle, does. As a practical matter, however, this difference is irrelevant. Flat and measured basic local exchange rates have *not* been set to reflect the added cost of serving ISP-bound traffic, and a longstanding public policy concern with the level of basic exchange rates limits the ability of the regulator to recover these costs from all local exchange customers.[13] In addition, ISPs compete, in part, by providing local exchange numbers so that their customers can reach them without incurring per-minute charges from the serving ILEC or ALEC. Because ISP-bound traffic is caused by the ISP's customer, the ISP would generally bear the cost of the local connection, just as the IXC does for long distance traffic. And, as I stated earlier, competitive forces in the ISP market encourage ISPs to incur costs and lease facilities so that their customers do not pay additional local exchange costs. For both of these reasons, it would be naïve to think that the originating ILEC's subscriber fully compensates that ILEC for the end-to-end cost of the ISP-bound call.[14]

[13] Indeed, if the longer holding times of ISP-bound traffic impose costs different from those for ordinary voice traffic, raising prices for all local exchange customers to recover costs imposed by the ISP's customers would constitute a subsidy to ISP access. ILECs that originate ISP-bound traffic would effectively charge ISP customers less than incremental cost and ordinary voice customers more than otherwise for local exchange usage.

[14] This problem is likely to be even more acute when the ILEC's subscriber pays flat-rated local charges rather than per-call rates for local service.

All of these are reasons why instead of the ILEC paying reciprocal compensation (or, a terminating charge) to ALECs as in the ILEC-ALEC local interconnection regime, for Internet calls by the ILEC subscriber, ISPs should pay the ILEC (and the ALEC that also serves it) usage charges analogous to carrier access charges paid by IXCs. Only such a payment will close the gap between the full cost of the call up to the ISP and the local call charge that is assessed to the end-user by the originating ILEC. In this economically correct view of inter-carrier compensation, the ALEC that switches Internet calls for the ISP is compensated not from reciprocal compensation paid by the originating ILEC but from usage-based charges paid to it by the ISP.

Q. BOTH DR. SELWYN [AT 16] AND MR. GOLDSTEIN [AT 3-4] ASSERT THAT ISP-BOUND TRAFFIC AND LOCAL VOICE TRAFFIC ARE, IN EFFECT, FUNCTIONALLY OR "TECHNICALLY" IDENTICAL. THEREFORE, THEY ARGUE, RECIPROCAL COMPENSATION OUGHT TO APPLY TO ISP-BOUND TRAFFIC JUST AS IT DOES FOR LOCAL VOICE TRAFFIC. DO YOU AGREE?

A. No. First, the basic Selwyn-Goldstein premise here is incorrect because it completely ignores cost causation. I explained earlier the cost-causative differences between ISP-bound traffic and other local traffic, whatever the degree of *functional* resemblance between them. Even if it were true that the two types of traffic are functionally or

technically identical—which, as Mr. Milner has explained at length in his rebuttal testimony, they are not—both Dr. Selwyn and Mr. Goldstein miss or ignore the fundamental point: cost recovery necessarily depends on who causes the cost in question, *not* on the level of cost or technical characteristics of the underlying service. Those technical characteristics or the level of cost may be items of interest in themselves, but they are totally irrelevant for determining who should be made to pay for the cost. Even if the two types of traffic were functionally identical and generated the same level of cost, it would still be economically inappropriate to apply reciprocal compensation to both.

Second, if the cost *per minute* to terminate a local voice call were truly the same as that cost for an ISP-bound call, I could still understand (though not accept) Mr. Goldstein's statement [at 6]:

> My point is simply that there is, indeed, no *technical* basis for making such a distinction between ISP-bound calls and other local calls. Consequently, any claim that contracting parties would have had any technical or cost-related reason for distinguishing ISP-bound calls from other local calls is false.[15]

[15] Emphasis in original.

However, the costs per minute for the two types of calls are *not* likely to be the same because of several reasons (many of which are documented in Mr. Milner's rebuttal testimony). From an economic perspective, there are significant differences between the two types of calls in terms of (1) average call durations and (2) customer, service, and service location characteristics. This alone would be reason to reject the Selwyn-Goldstein claim about functional equivalence of the two types of calls.

Q. PLEASE EXPLAIN AGAIN YOUR POINT THAT THE ECONOMICALLY APPROPRIATE FORM OF INTER-CARRIER COMPENSATION SHOULD DEPEND ON COST CAUSATION, NOT ON THE LEVEL OF COST OR FUNCTIONAL EQUIVALENCE.

A. *How* cost is recovered must always depend on cost causation, i.e., the economic decision or transaction that is the source of the cost. *How much* cost should be recovered (i.e., the level of cost) is of only incidental interest to this issue: it determines the *magnitude* of recovery but not the form of compensation or recovery itself. To explain this point, I note first that the cost-causer for both a local voice call and an Internet call is the same entity: the ILEC subscriber that places either type of call. That same subscriber is also the cost-causer when he places a *long distance* call through an IXC. Therefore, in all three cases, cost recovery must start with that subscriber (the source of the economic decision to make a call that gives rise to cost). The

question is: how should the payment received from that subscriber be used to compensate various carriers that participate in carrying each type of call?

The answer to that question is provided by cost causation. Following a crucial distinction I made earlier, for a local voice call, the ILEC subscriber is also a *customer* of the ILEC (the supplier of local voice connections). For a long distance call, the ILEC subscriber is a customer of the IXC (the supplier of long distance connections). And, for an Internet call, the ILEC subscriber is a customer of the ISP (the supplier of Internet connections). This trichotomy indicating how the same ILEC subscriber can be a customer of different carriers for different services is particularly important. Indeed, it determines which supplier has the right to charge (recover cost) from the end-user for each service and helps to understand how cost causation works. As a subscriber to the ILEC, that individual maintains a link to the public switched network over which all three types of services are delivered. With that link in place, that individual has the *option* to purchase various types of telecommunications services. Without that link, he cannot consume any of the three services. However, without the ILEC, the IXC, and the ISP offering and marketing the three types of services to that subscriber, there wouldn't be any service to consume.

The long practice of the IXC recovering the cost of a long distance call from the ILEC subscriber and then using that payment to compensate

all facilitating carriers (e.g., those providing switched access) is economically sensible and serves as the proper model for compensation in the other two cases. For a local voice call, the ILEC must recover the cost of that call directly from its subscriber (acting as its customer) and then compensate all other facilitating carriers (e.g., the ALEC that provides interconnection if the local call crosses network boundaries). In the same vein, the ISP must recover the cost of the Internet call directly from the ILEC subscriber (acting as the ISP's customer) and then compensate all other facilitating carriers (e.g., the ILEC, the ALEC, the backbone network providers, etc.).

Q. IS COST CAUSATION-BASED COMPENSATION THE ONLY FORM OF INTER-CARRIER COMPENSATION FOR ISP-BOUND CALLS THAT THE COMMISSION SHOULD CONSIDER?

A. Yes. From the economic standpoint, any method of inter-carrier compensation for ISP-bound calls should be based on cost causation. Ideally, such compensation should occur in the form of usage-based charges (analogous to carrier access charges) paid by the ISP to the ILEC and the ALEC that transport and switch Internet calls to it. However, because the FCC currently exempts ISPs from paying access charges, the next-best cost-causative form of compensation would be an equitable sharing (between the ILEC and the ALEC) of revenues earned by the ALEC from the lines and local exchange usage that it sells to the ISP. This form of revenue sharing may not be

sufficient for the ILEC and ALEC that jointly provide access service to fully recover their costs, but the degree to which they under-recover those costs (or, equivalently, subsidize Internet service) will be the same proportion of their respective costs and, hence, competitively neutral. The third-best and a reasonable interim form of compensation would be bill and keep or, in effect, exchange of ISP-bound traffic between the ILEC and the ALEC at no charge to each other. Reciprocal compensation of the form being requested by Global NAPs should be a distant fourth option. In my opinion, because it is not based on cost causation, reciprocal compensation for Internet-bound traffic should really not be an option at all.

Q. DOES THIS FORM OF COMPENSATION DENY AN ALEC LIKE GLOBAL NAPS FAIR PAYMENT FOR USE OF ITS NETWORK BY AN ISP-BOUND CALL FROM AN ILEC (BELLSOUTH) SUBSCRIBER, AS ALLEGED BY MR. ROONEY [AT 3]?

A. Absolutely not. Mr. Rooney leaves the distinct impression that BellSouth intends to deny Global NAPs any compensation for its part in carrying an ISP-bound call. Nothing could be farther from the truth. The point at issue here is whether *BellSouth* (the ILEC) should compensate Global NAPs (the ALEC) for the cost the latter incurs in carrying Internet calls to the ISPs it serves. As I explained above, while Global NAPs is entitled to recover fully the cost it incurs for ISP-bound calls, such recovery (compensation) ought to come—in accordance

with cost causation—from the ISP or ISPs it serves, not from BellSouth. To have it otherwise—particularly in current circumstances in which ALECs frequently share reciprocal compensation revenues with the ISPs they serve—would only reinforce the perverse incentive to specialize in providing "termination" services for ISPs, to the exclusion of virtually all other local exchange serivces. [16]

Q. DR. SELWYN ARGUES [AT 7-12] THAT RECIPROCAL COMPENSATION FOR ISP-BOUND CALLS IS A LOGICAL OUTCOME OF THE FACT THAT LOCAL CALLING HAS TRADITIONALLY BEEN PROVIDED BY LOCAL EXCHANGE CARRIERS ON A "SENT PAID" BASIS. DO YOU ACCEPT HIS ARGUMENT?

A. No. Dr. Selwyn's historical accounting of sent-paid services in the U.S. may be comprehensive, but it is fundamentally irrelevant to the issue of whether ISP-bound calls are local or whether reciprocal compensation should be paid for those calls. There is a very sound cost-causative basis for the sent-paid arrangement for *local voice* calls. As I explained earlier, for those calls, the ILEC subscriber is also the ILEC's customer. Hence, by the principle of cost causation, the ILEC should recover the cost of the local call directly from that customer and compensate any

[16] Even though, in my opinion, the ALECs delivering Internet-bound calls to ISPs do not provide actual termination services, those ALECs routinely characterize their role in that respect as "termination."

other carrier involved in completing the call. In contrast, regardless of their alleged *technical* resemblance to local calls, ISP-bound calls are caused by the ISP's customer purchasing Internet access from the ISP. By cost causation, the economically proper form of cost recovery for such calls would be for the ISP to recover the cost of those calls fully from its customer and then to compensate both the ILEC (whose subscriber the ISP customer is) and the ALEC serving the ISP. Naturally, if this form of cost recovery is correctly implemented, ISP-bound calls would not be carried on a sent-paid basis but would resemble the manner in which IXC-bound calls are carried and billed. The fallacy that underlies Dr. Selwyn's argument here is that just because certain practices (sent-paid, reciprocal compensation, etc.) have traditionally been followed for local usage (voice) services, the same must automatically be true of ISP-bound calls. Strange as it may seem, this amounts to *inferring* that ISP-bound calls are local simply because they are *assumed* to be so. Unfortunately, this sort of illogic or circular logic appears to permeate Dr. Selwyn's entire testimony.

Q. BUT, WHAT ABOUT DR. SELWYN'S CLAIM [AT 14] THAT ISPS ARE "EXPRESSLY PERMITTED BY FCC RULINGS TO PURCHASE LOCAL BUSINESS LINES FROM LECS IN ORDER TO RECEIVE LOCAL CALLS FROM THEIR OWN SUBSCRIBERS, AND ARE EXPRESSLY *NOT* REQUIRED TO PAY ACCESS CHARGES FOR CALLS DIRECTED THEM TO THEM BY END-USERS?"

A. This is a typical example of the illogic in Dr. Selwyn's testimony. He makes this claim in an attempt to portray an ISP-bound call as a local call for purposes of compensation. However, the mere fact that ISPs are allowed to purchase local exchange services from ILECs and ALECs that serve them does not necessarily lead to the conclusion Dr. Selwyn seeks. The FCC's grant of the access charge exemption to ISPs was an attempt to protect the growth of a budding Internet "industry."[17] That grant of exemption was neither a repudiation of the FCC's oft-stated conclusion that Internet-bound calls are mostly interstate in nature, nor was it an overt acknowledgement that such calls should be treated like local voice calls for purposes of cost recovery and compensation. As the Louisiana Public Service Commission recently recognized, the FCC regards ISPs as "end-users" *only for the purposes of the access charge exemption.*[18] That does not in any way alter the fundamental fact that ISPs are not end-users *per se*; Internet calls do not terminate at the ISPs in the manner voice calls terminate at true end-user customer locations. Rather, ISPs perform

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[17] The FCC has traditionally explained that exemption thus:

> to protect certain users of access services, such as ESPs, that had been paying the generally much lower business service rates from the rate shock that would result from immediate imposition of carrier access charges.

Internet Traffic Order, ¶5, and *MTS/WATS Order*, ¶715.

[18] In becoming the fourth state regulatory agency to deny the payment of reciprocal compensation for ISP-bound traffic, the Louisiana Commission stated:

> There is no prevailing industry custom of treating ISP traffic as "local" for reciprocal compensation purposes. FCC regulations require that ISPs be treated as end users *for only one purpose, the access charge exemption.*

Louisiana Public Service Commission, *In re Petition of KMC Telecom, Inc. Against BST to Enforce Reciprocal Compensation Provisions of the Parties' Interconnection Agreement*, Order in Docket No. U23839 ("*Louisiana ISP Compensation Order*"), October 13, 1999, at 13.

several carrier functions which result in Internet calls reaching their destinations through the packet-switched network.

Q. WOULD YOU COMMENT ON DR. SELWYN'S RESPONSE TO HIS OWN QUESTION [AT 16] ABOUT THE "ECONOMIC SIGNIFICANCE OF THE FACT THAT ISPS DO NOT PAY ACCESS CHARGES?"

A. In yet another example of his circular logic, Dr. Selwyn responds: "It means that in economic terms, ISP-bound calls are "local" in nature." This is exactly backwards: if a service is local, then it follows that its *provider does not pay access charges*, but the converse is not necessarily true. Just because the FCC has granted an exemption from access charges does not make ISP-calls local any more than any grant of that exemption to IXCs would make long distance calls local. In fact, if the FCC has accepted all along that ISP-bound calls are—from an economic standpoint—local, then there can be no conceivable explanation for it to grant an *exemption* from a burden that a provider of interstate services accepts, namely, the payment of access charges. Moreover, despite his choice of the phrase "economic significance" to characterize the access charge exemption that ISPs currently enjoy, there is nothing *economic* about the supporting arguments Dr. Selwyn offers. Instead of focusing on cost causation and the difference between how to recover cost and how much cost to recover (all *economic* issues), Dr. Selwyn falls back instead on an alleged technical resemblance between a local voice call and an ISP-bound call. As I

stated earlier, this line of reasoning is not only spurious from a technical standpoint but also ignores the true underlying economic aspects of those calls.

Q. DO ISPs PAY USAGE-BASED CHARGES (ANALOGOUS TO CARRIER ACCESS CHARGES) TODAY?

A. No. Even though the FCC has declared that ISP-bound traffic is, at best, jurisdictionally mixed and is, in most instances, interstate, no rulemaking has yet occurred to establish such charges for ISPs, and it remains uncertain as to when rules to this effect will be established. In the meantime, ISPs remain beneficiaries of the long-standing access charge exemption. As Mr. Halprin has testified, however, that exemption only applies to payment of access charges to ILECs. Thus, ALECs could, if they so chose, still assess access-like charges on ISPs that use their network.

Q. IN THE ABSENCE OF FCC ACTION TO ESTABLISH INTER-CARRIER COMPENSATION RULES, HOW HAVE THE INDIVIDUAL STATES ACTED?

A. For a period of time until the FCC's *ISP Declaratory Ruling* was issued in early 1999, a number of states pursued their own rulemaking on the issue. Those states chose to adopt the ILEC-ALEC local interconnection view of the world and required that the originating ILEC pay reciprocal compensation to "terminating" ALECs for ISP-bound

calls just as they would for local voice calls. After the FCC's *ISP Declaratory Ruling* was issued, regulators in Massachusetts, who had previously also adopted the local interconnection view, reversed themselves and declared the unqualified payment of reciprocal compensation for ISP-bound traffic to be antithetical to real competition in telecommunications.[19] Subsequently, regulators in New Jersey, in reversing an arbitrator's recommendation in October 1998, also ordered that reciprocal compensation not be paid for ISP-bound traffic.[20] More recently, South Carolina[21] and Louisiana[22] regulators have directed that such compensation not be paid.

Q. WHAT REASONS DID MASSACHUSETTS REGULATORS GIVE FOR THIS REVERSAL?

A. The Massachusetts Department of Telecommunications and Energy explained its reasons for the reversal thus:

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[19] Massachusetts Department of Telecommunications and Energy ("DTE"), *Complaint of MCI WorldCom, Inc., Against New England Telephone and Telegraph Company d/b/a Bell Atlantic-Massachusetts for Breach of Interconnection Terms Entered Into Under Sections 251 and 252 of the Telecommunications Act of 1996*, Docket No. 97-116-C, Order ("*Massachusetts ISP Compensation Order*"), May 1999. The DTE ordered that all future reciprocal compensation payments by Bell Atlantic be placed in an escrow fund until final disposition on the matter of inter-carrier compensation. The ALECs serving ISPs in Massachusetts currently do not themselves receive any compensation for ISP-bound traffic.

[20] New Jersey Board of Public Utilities, *In the Matter of the Petition of Global Naps, Inc. for Arbitration of Interconnection Rates, Terms, Conditions and Related Arrangements with Bell Atlantic-New Jersey Pursuant to Section 252(b) of the Telecommunications Act of 1996*, Docket No. T098070426, Order, July 7, 1999.

[21] South Carolina Public Service Commission, *In re Petition for Arbitration of ITC^DeltaCom Communications, Inc. With BellSouth Telecommunications, Inc. Pursuant to the Telecommunications Act of 1996*, Docket No. 1999-259-C, Order No. 1999-690, Order on Arbitration, October 4, 1999.

[22] *Louisiana ISP Compensation Order.*

The unqualified payment of reciprocal compensation for ISP-bound traffic, implicit in our October Order's construing of the 1996 Act, does not promote real competition in telecommunications. Rather, it enriches competitive local exchange carriers, Internet service providers, and Internet users at the expense of telephone customers or shareholders. This is done under the guise of what purports to be competition, but is really just an unintended arbitrage opportunity derived from regulations that were designed to promote real competition. A loophole, in a word. ... But regulatory policy ... ought not to create such loopholes or, once having recognized their effects, ought not leave them open.

Real competition is more than just shifting dollars from one person's pocket to another's. And it is even more than the mere act of some customers' choosing between contending carriers. Real competition is not an outcome in itself—it is a means to an end. The "end" in this case is *economic efficiency* ... Failure by an economic regulatory agency to insist on true competition and economic efficiency in the use of society's resources is tantamount to countenancing and, to some degree, encouraging waste of those resources. Clearly, continuing to *require* payment of reciprocal compensation ... is not an opportunity to promote the general welfare. It is an opportunity only to promote the welfare of certain CLECs, ISPs, and their customers, at the

expense of Bell Atlantic's telephone customers and shareholders.[23]

Q. WHY IS THIS PARTICULAR PASSAGE FROM THE MASSACHUSETTS DECISION SIGNIFICANT?

A. This passage is significant for two reasons. First, it clearly presents a cogent *economic* analysis of carrier incentives and their eventual outcomes under a regime of reciprocal compensation for ISP-bound traffic. Second, Dr. Selwyn [at 28] simply dismisses the Massachusetts and other decisions that refused to implement reciprocal compensation for ISP-bound traffic as "erroneous." Unfortunately, Dr. Selwyn passes up the opportunity to engage the Massachusetts and other decisions—with which he disagrees—on a true *economic* level. Nowhere in his testimony does Dr. Selwyn examine the implications of alternative methods of compensation for economic efficiency, the robustness of local exchange competition, or, more generally, the issue of carriers' economic incentives and behavior. In my opinion, this does a disservice to the responsible and well-reasoned economic analysis set forth by a few independent-minded regulatory agencies who have refused to jump on to the reciprocal compensation bandwagon.

[23] *Massachusetts ISP Compensation Order.* Emphasis added (in part) and in original (in part).

Q. WHY WOULD THE ILEC-ALEC LOCAL INTERCONNECTION REGIME WITH PAYMENT OF RECIPROCAL COMPENSATION FOR ISP-BOUND TRAFFIC HARM ECONOMIC EFFICIENCY AND FAIL TO PROMOTE TRUE COMPETITION?

A. The harm to economic efficiency in an ILEC-ALEC local interconnection regime with payment of reciprocal compensation for ISP-bound traffic occurs for three reasons:

1. Inefficient subsidization of Internet users by non-users.
2. Distortion of the local exchange market.
3. Creation of perverse incentives to arbitrage the system at the expense of basic exchange ratepayers.

Q. PLEASE EXPLAIN HOW THE ILEC-ALEC INTERCONNECTION REGIME FOR ISP-BOUND TRAFFIC COULD CAUSE INEFFICIENT SUBSIDIZATION OF INTERNET USERS BY NON-USERS.

A. The principle of cost causation requires that the *ISP customer* pay at least the cost his call imposes on the circuit-switched network.[24] Suppose inter-carrier compensation for ISP-bound traffic is treated as in the ILEC-ALEC interconnection regime. This regime assumes at the outset that the customer initiating the call has paid the originating ILEC

[24] It is assumed that the cost imposed by that customer for the packet-switched network portion of the Internet call is recovered through monthly access charges by the ISP serving that customer.

for the end-to-end carriage of the call, typically, the per-call equivalent of the local call charge. Out of what it receives, the ILEC would then pay reciprocal compensation to the ALEC that "terminates" to the ISP. This compensation is a per-minute call "termination" charge which, *ideally, should reflect the incremental cost that the ILEC avoids* by not having to handle the call itself. In this scenario, problems can emerge from two sources.

First, if the local call charge is itself inefficient, e.g., it is below the incremental cost of carrying an end-to-end local voice call, then it cannot be sufficient to allow recovery of both the ILEC's incremental cost to originate the call and the ALEC's incremental cost to handle the call. In other words, once reciprocal compensation has been paid, the ILEC would fail to recover its cost of carrying the ISP-bound call when the local call charge itself is inefficient. If the ILEC breaks even for *all* of its services in these circumstances, that would mean that Internet use (for which the cost exceeds revenue) *is being subsidized by non-*Internet and, most likely, non-local exchange services.

Second, if the cost to handle an ISP-bound call is *less* than the cost to handle the average voice call (on which most reciprocal compensation arrangements are based), then the ALEC would recover in excess of its cost. Even if the local per-call charge were compensatory, the ILEC could still end up with a higher cost liability than necessary (the sum of its own originating cost and the ALEC's inflated "termination" charge)

and a net revenue deficit from carrying the ISP-bound call. Again, the Internet user would not be paying the cost he imposes on the originating ILEC (equivalent to receiving a subsidy).

This form of subsidization of Internet use within the circuit-switched network can inefficiently stimulate demand for Internet services and further aggravate the ILEC's tenuous position under the ILEC-ALEC interconnection regime. Additional negative consequences could be (1) greater congestion at local switches engineered for voice traffic generally and, as a result, poorer quality of voice traffic, and (2) opportunistic specialization by ALECs in only handling (or, as the ALECs would characterize it, "terminating") ISP-bound traffic. I discuss the resulting distortion of the local exchange market below.

Q. HOW WOULD THE ILEC-IXC INTERCONNECTION REGIME WITH THE PAYMENT OF ACCESS-LIKE USAGE-BASED CHARGES REMEDY THIS PROBLEM?

A. In the ILEC-IXC regime, the ISP customer that initiates the call causes all of the costs that are incurred, and, except for the explicit subsidy to ISP access represented by the access charge exemption, remains responsible for paying costs of originating, transporting, and switching his traffic to the ISP. Because of the access charge exemption, ILECs and ALECs that jointly supply access services to ISPs are not compensated for those services but, in the ILEC-IXC regime, the ILECs

and ALECs that jointly provision ISP-bound calls each contribute to the ISP access subsidy no more than their proportion of costs. This arrangement is competitively neutral because all ILECs and ALECs involved contribute to the subsidy rather than just the ILECs that originate ISP-bound traffic. In this regime, an ISP has no particular incentive to become a ALEC itself, nor is the competition among ILECs and ALECs to serve ISPs distorted by incentives to seek compensation for "terminating" calls.

Q. PLEASE EXPLAIN HOW THE ILEC-ALEC INTERCONNECTION REGIME FOR ISP-BOUND TRAFFIC COULD CAUSE THE LOCAL EXCHANGE MARKET TO BE DISTORTED.

A. Under the ILEC-ALEC interconnection regime, the compensation paid to ALECs evidently exceeds the cost they incur in handling the traffic and also exceeds whatever costs BellSouth might save when ALECs handle the traffic. That the prices do not reflect costs should not be surprising. In Florida, interconnection prices are based on BellSouth's forward-looking TELRIC costs of terminating traffic averaged over a wide range of end-users.[25] In fact, the cost of terminating traffic to particular end-users varies a great deal, depending upon their location and the characteristics of the traffic. When traffic is balanced[26]

[25] Average holding times are significantly longer for ISP-bound traffic: roughly 20 minutes compared with 3 minutes for ordinary voice traffic. Thus, the cost of call setup on a per minute basis is roughly only one-seventh of the per minute cost of call setup for ordinary voice traffic.
[26] Traffic is said to be "balanced" when originating and terminating volumes are similar.

between the ILEC and the ALEC, the accuracy of the TELRIC study is less material; an ILEC that overpays to terminate traffic on the ALEC's network is compensated when the ALEC overpays to terminate traffic on the ILEC's network. Thus, when traffic is balanced, no individual ILEC or ALEC is helped or handicapped in competing for retail customers in the local exchange market by the requirement that interconnection prices be based on TELRICs averaged over all customers.

However, when traffic between the ILEC and the ALEC is grossly unbalanced, e.g., when the ALEC originates little or no traffic (a fact that Mr. Rooney acknowledges [at 2] about Global NAPs), the accuracy of the TELRIC study for the traffic served by that ALEC is critical. If the cost to BellSouth to deliver ISP-bound traffic to the ISP is the same as to a specialized ALEC collocated with the ISP, then paying reciprocal compensation at an averaged rate would cause BellSouth's total cost of local service to increase. This cost increase would not be offset by a similar increase in revenue from terminating the ALEC's traffic (because the ALEC does not originate any traffic). Thus, local exchange competition would be distorted by the inapplicability of the averaged TELRIC to ISP traffic; ALECs that primarily serve ISPs (and originate little or no traffic) would receive revenues in excess of cost while ILECs (or even other ALECs) that serve all types of customers would experience an increase in costs without a commensurate increase in revenues.

Q. DOES THAT MEAN THAT RECIPROCAL COMPENSATION IS ILL-ADVISED BECAUSE TRAFFIC BETWEEN THE ORIGINATING ILEC AND THE ALEC THAT HANDLES ISP TRAFFIC IS UNBALANCED?

A. Yes, but the problem here is not simply that traffic is unbalanced. First of all, ISP-bound traffic is *not* local and, therefore, not eligible for reciprocal compensation, a form of inter-carrier compensation reserved for local interconnection only. However, even on the matter of traffic balance, it is worth noting that reciprocal compensation was never envisioned as appropriate inter-carrier compensation when all traffic is essentially one-way. This would be particularly true when the true cost to terminate for the carrier that only *receives* traffic is actually lower than the termination cost (experienced by the carrier that *sends* traffic) on which a symmetrical compensation arrangement is based. But, even with balanced traffic, requiring reciprocal compensation payments for ISP-bound calls would violate the economic principle of recovering cost in accordance with cost causation.

Q. PLEASE EXPLAIN HOW THE ILEC-ALEC INTERCONNECTION REGIME FOR ISP-BOUND TRAFFIC COULD CREATE PERVERSE INCENTIVES TO ARBITRAGE THE SYSTEM AT THE EXPENSE OF BASIC EXCHANGE RATEPAYERS.

A. Arbitrage is frequently a response to a market distortion. As the DTE in Massachusetts clearly recognized, unintended arbitrage opportunities

can easily emerge when competition in the local exchange market is distorted by basing inter-carrier compensation for ISP-bound traffic on the ILEC-ALEC local interconnection regime. When the compensation available to the ALEC for handling ISP-bound traffic exceeds its actual cost of handling that traffic, the ALEC will have a strong incentive to receive as much ISP-bound traffic as possible. Profit maximization can elicit some very inventive schemes that take advantage of this discrepancy but, in the process, distort market outcomes and reduce the efficiency of the telecommunications network. For example, the ALEC's profits would increase whenever a BellSouth subscriber—or its computer—could be induced to call the ISP and remain on the line 24 hours a day. Sensing this pure arbitrage profit opportunity, ALECs would also have a strong incentive—indeed, have as their *raison d'être*—to specialize only in "terminating" ISP-bound traffic, to the exclusion of offering any other type of local exchange service. Again, I note that Mr. Rooney freely admits [at 2] to Global NAPs' being set up to operate that way. These "ISP-specializing" ALECs can—and do—easily form a three-way axis with the sole purpose of generating revenues from reciprocal compensation: the ALECs themselves, ISPs that have their traffic handled by those ALECs but may also receive a share of the reciprocal compensation revenues—the spoils of this arrangement—to insure their loyalty and cooperation, and ISP customers on the originating ILEC's network that generate the ISP-bound traffic. Also, the ISPs themselves are better off if their customers obtain their non-Internet local telephone service not from the

ALECs that handle ISP-only traffic but from the ILEC or other ALECs that do not serve ISPs. This is likely to create a further distortion in the local exchange market, contrary to the vision of competition embodied in the Telecommunications Act of 1996.

It is not surprising, therefore, that the DTE in Massachusetts felt compelled to opine

> that *termination* of the obligation for reciprocal compensation payments for ISP-bound traffic (because that traffic is no longer deemed local) removes the incentive for ALECs to use their regulatory status "solely (or predominately)" to funnel traffic to ISPs.[27]

Q. HAVE REGULATORS TAKEN EXPLICIT NOTE OF THE FACT THAT THESE ARBITRAGE OPPORTUNITIES ARISE BECAUSE PRICES (OR, COMPENSATION RATES) ARE OUT OF LINE WITH TERMINATION COSTS?

A. Yes. Where the cost of terminating traffic to a particular type of customer differs greatly from the average, the FCC has recognized the possibility of arbitrage and has declined to use the ILEC's TELRIC termination costs as a proxy for those of the ALEC:

[27] *Massachusetts ISP Compensation Order.*

> Using incumbent LEC's costs for termination of traffic as a proxy for paging providers' costs, when the LECs' costs are likely higher than paging providers' costs, might create uneconomic incentives for paging providers to generate traffic simply in order to receive termination compensation.[28]

Instead, the FCC has required separate cost studies to justify a cost-based termination rate which the FCC explicitly expects would be lower than the wireline ILECs' TELRIC-based rate. Note that the paging case also involves one-way calling; like ISPs, paging companies do not *originate* traffic.

Echoing this sentiment, the Massachusetts DTE has stated flatly that

> The revenues generated by reciprocal compensation for ... incoming traffic are most likely in excess of the cost of sending such traffic to ISPs. ... Not surprisingly, ISPs view themselves as beneficiaries of this "competition" and argue fervently in favor of maintaining reciprocal compensation for ISP-bound traffic. However, the benefits gained, through this regulatory distortion, by CLECs, ISPs, and their customers do not make society as a whole better off, because they come artificially at the expense of others.[29]

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[28] FCC, *In the Matter of Local Competition Provisions in the Telecommunications Act of 1996*, CC Docket No. 96-98, First Report and Order, released August 19, 1996, ¶1093.

[29] *Massachusetts ISP Compensation Order*. Emphasis added.

III. Conclusions

Q. WHAT DO YOU CONCLUDE IN LIGHT OF THESE ACKNOWLEDGEMENTS?

A. In light of these acknowledgements, it is reasonable to expect that a fairer system of inter-carrier compensation may yet be more widely adopted for all forms of one-way traffic. The ILEC-IXC interconnection regime offers one such alternative. More importantly, under that alternative:

1. perverse incentives and unintended arbitrage opportunities are removed,
2. cost causation guides cost recovery (including the payment of access-like usage-based charges by ISPs to ILECs and ALECs that handle their traffic),
3. more efficient use is made of network resources,
4. inefficient entry for the sake of earning opportunistic arbitrage profits is prevented, and
5. true competition (undistorted by the gain from specializing in terminating one-way traffic) can be realized in the local exchange market.

Q. PLEASE SUMMARIZE YOUR VIEW OF DR. SELWYN'S "ECONOMIC" TESTIMONY ON THE ISSUE OF THE PROPER COMPENSATION OF ISP-BOUND TRAFFIC.

A. In his purportedly economic testimony, Dr. Selwyn offers very little reasoned economic analysis. Instead, the general tenor of his testimony seems to be find as many ways as possible to back into the conclusion that ISP-bound traffic is "local" in nature and, therefore, deserving of reciprocal compensation treatment as is customary for local voice traffic. Unfortunately, that cart-before-the-horse approach does not have any economic foundation; despite the opportunity, Dr. Selwyn eschews any discussion of the true economic underpinnings of this issue, namely, cost causation, cost recovery as opposed to the magnitude of cost, carrier incentives, subsidies and arbitrage, implications for economic efficiency and local competition, etc.

Ironically, at one point Dr. Selwyn *does* recognize what it would take to set up the economically proper form of compensation for ISP-bound calls. He states [at 17]:

> By contrast, if ISPs *did* pay per-minute access charges just like IXCs do, the entire controversy over compensation for ISP-bound calling would not exist. The LEC serving the ISP would charge per-minute access charges. Under well-established "meet point billing" rules, either the LEC serving the ISP would charge full-bore access rates, including switching, transport and carrier common line—and share those with the originating LEC—or the terminating LEC would charge for its own activities

and allow the originating LEC to separately bill the ISP for *its* activities.

Remarkably, having arrived at this economically sound prescription, Dr. Selwyn completely deconstructs it by claiming that the payment of those access charges "would probably be devastating to the ISP industry and to the growth and usefulness of the Internet ..." and then by jumping to the *non sequitur* that "ILEC resistance to paying reciprocal compensation for [ISP] calls amounts to an effort to exploit a legalistic loophole to reach an economically nonsensical result."

While characterizing the impact of access charges on "the ISP industry" as "devastating" may be hyperbolic, it is true that the proliferation of ISPs and ALECs (that intend to only serve ISPs) made possible by the access charge exemption would most likely be slowed. After all, the access charge exemption (which denies society the most economically sound form of inter-carrier compensation for ISP-bound traffic) is a form of subsidy to ISPs, their customers, and the ALECs that serve the ISPs. As I explained earlier, that subsidy likely stimulates demand for Internet use beyond economically efficient levels—a fact not lost on anyone who has followed the phenomenal growth of Internet traffic over the past five years. However, if that subsidy to Internet users and providers (in short, the "Internet industry") were deemed to be in the public interest, then, as I explained before, it should be made explicit and provided for in a competitively neutral manner. Reciprocal

compensation in the manner envisioned by Global NAPs is simply not the answer.

Q. DOES THIS CONCLUDE YOUR TESTIMONY?

A. Yes.

Exhibit AXB-1

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Dr. Banerjee is a Senior Consultant with the Communications Practice at NERA. He is responsible for providing analysis of, and expert witness testimony on, regulatory and economic issues of concern to telecommunications companies, preparing and responding to interrogatories in regulatory proceedings, and conducting econometric/statistical analysis to support marketing and market research activities of telecommunications companies. Dr. Banerjee works on a range of issues including Internet economics, price cap and incentive regulation, local and long distance competition, pricing of interconnection and unbundled services, reciprocal compensation, resale and avoided cost, benchmark and proxy cost models, and universal service. His market research activities are carried out, as needed, in collaboration with leading providers of telecommunications data or directly with telecommunications companies.

Before coming to NERA, Dr. Banerjee was a Research Economist (and internal economic consultant) at BellSouth Telecommunications where he was responsible for providing economic policy guidelines to key decision-makers and the Officer Body, preparing testimony and cross-examination questions, responding to interrogatories, and building econometric models to answer business questions. He provided quantification support on BellSouth's design of a price cap regulatory framework, and contributed to BellSouth's policies on local and toll imputation, universal service, interconnection pricing, rate rebalancing, and per use pricing of vertical services. He also represented BellSouth's participation in the National Telecommunications Demand Study, an ongoing study of demand trends in the telecommunications industry.

Prior to BellSouth, Dr. Banerjee was an economic consultant as a Member of the Technical Staff at Bell Communications Research and a Staff Supervisor at AT&T. Dr. Banerjee has several years of experience teaching graduate and undergraduate courses in economic theory, statistics, econometrics, industrial organization, and public finance. He has conducted research on the dynamics of futures markets and various aspects of time series econometrics. He has presented a number of papers on telecommunications economics issues at national business and academic conferences.

EDUCATION

THE PENNSYLVANIA STATE UNIVERSITY

Ph. D., Agricultural Economics, 1985

UNIVERSITY OF DELHI, INDIA

M.A., Economics, 1977

UNIVERSITY OF DELHI, INDIA

B.A., Economics (Honors), 1975

EMPLOYMENT

NATIONAL ECONOMIC RESEARCH ASSOCIATES, INC.

1995- Senior Consultant, Communications Practice. Responsible for applying economic theory, regulatory economics, and econometric analysis to a variety of tasks: supporting telecommunications firms in litigation and regulatory matters, market research, and strategic planning. Provide expert witness testimony and strategic advice.

BELLSOUTH TELECOMMUNICATIONS

1992-1995 Research Economist, Statistics and Econometrics Group. Developed, led, and disseminated economic and econometric research on issues of concern to BellSouth Telecommunications in particular and the telecommunications industry in general. Contributed to each of the following areas: regulatory economics, demand analysis (growth and elasticities), market potential, diffusion, pricing, cost, new product planning, forecasting, market research, competitive analysis, and the development of strategy/policy positions for BellSouth. Supervised and collaborated with other BellSouth economists and strategic planners and outside consultants.

BELL COMMUNICATIONS RESEARCH

1989-1992 Member of Technical Staff, Regulatory Economics and Pricing Theory, Demand Response Analysis Group. Developed various statistical and econometric methods and models that are applicable to the study of demand for various types of telephone service. The focus was on analysis, forecasting, and rate design support to client companies including BellSouth, U S West, NYNEX, and Bell Atlantic. Developed software for demand and

market potential analysis using advanced mathematical/statistical languages. Transformed original techniques research into business tools for analysts within client companies.

AT&T COMMUNICATIONS

1988-1989 Staff Supervisor, Market Analysis and Forecasting, Consumer Markets and Services. Assisted and contributed to demand analysis and forecasting efforts of the group. The focus was on demand issues related to AT&T's business and residential long distance telephone services.

THE PENNSYLVANIA STATE UNIVERSITY

1985-1988 Assistant Professor, Department of Economics. Developed and taught undergraduate and graduate courses in economics and econometrics. Conducted personal research in economics and econometrics. Supervised graduate student research leading to M.S. and Ph.D. degrees in economics. Developed the econometrics component of a new graduate program in policy analysis at Penn State. And, advised undergraduate economics students on their curriculum and course selection. Taught courses on introductory macro-economic theory, introductory and intermediate micro-economic theory, industrial organization, public sector economics, statistics, and introductory econometrics. Developed and taught advanced graduate econometrics and time series courses (frequency-domain econometrics and spectral analysis, dynamic simultaneous equations systems and state space models, causality, model testing and validation, nonlinear time series, and asymptotic theory.

1982-1985 Instructor, Department of Economics. Taught a number of undergraduate economics courses including macro-economic theory, micro-economic theory, public sector economics, and statistical foundations of econometrics.

1979-1982 Research Assistant, Department of Agricultural Economics & Rural Sociology. Assisted in research activities of Professor Robert D. Weaver of the Department of Agricultural Economics. Research areas included: stabilization of prices of internationally traded agricultural commodities; choice under risk-aversion by a firm faced with multiple sources of uncertainty; impacts of public policy on risk-averse firms; market efficiency, role of information, distribution of asset returns, and market equilibrium; and productivity and cost relations in the wheat, corn, and soybean producing areas of the U.S. using crop survey data from the U.S. Department of Agriculture. Most of the work consisted of literature

research, writing computer programming, and econometric data analysis.

UNIVERSITY OF DELHI, INDIA

1977-1979 Lecturer, Department of Economics, Shri Ram College of Commerce. Taught undergraduate economics courses including micro-economic theory, public finance, and economic planning and policy.

HONORS AND AWARDS

Marquis' Who's Who in the South and Southwest, 1995-96
Gamma Sigma Delta Honor Society of Agriculture, inducted 1983
Phi Kappa Phi, inducted 1982

Department Head Award, BellSouth Telecommunications, 1993
Department Head Commendation, Bell Communications Research, 1992
Vice President's Award, Bell Communications Research, 1990

PAPERS AND PUBLICATIONS

CONTRIBUTIONS TO NERA REPORTS

"An Economic and Policy Analysis of Efficient Intercarrier Compensation Mechanisms for ISP-Bound Traffic," (with Agustin Ros and William E. Taylor), ex parte with FCC on behalf of *U S WEST Communications, Inc., November* 12, 1999.

"Determining Fair and Reasonable Rates Under Competition: Response to Major Themes at the FPSC Workshop," for BellSouth Telecommunications, Inc., November 1998.

"Costing and Pricing Principles for Determining Fair and Reasonable Rates Under Competition," for BellSouth Telecommunications, Inc., September 1998.

"Local Telecommunications Competition: An Evaluation of a Proposal by the *Communications Staff of the Florida* Public Service Commission," with William E. Taylor, for BellSouth Telecommunications, Inc., November 1997.

"Costing and Pricing Principles for Competitive Telecommunications: A Critique *of David Gabel's Recommendations," for* BellSouth Telecommunications, March 1997.

"Comments (on Universal Service and the Hatfield Model)," with William E. Taylor, for BellSouth Telecommunications, Inc. (filed with the Federal Communications Commission for CC Docket No. 96-45), August 1996.

"Telephone Company Provision of Broadband Services: Economies of Scope, Competition, and Public Policy," for BellSouth Interactive Media Services, 1995.

"Economic Welfare Benefits from Rate Rebalancing," for Stentor Resource Centre Inc., 1995.

TESTIMONY

Affidavit, on behalf of the United States Telephone Association, Review of the Depreciation Requirements for Incumbent Local Exchange Carriers, CC Docket No. 98-137, November 23, 1998 (with William Taylor).

Affidavit supporting BellSouth Telecommunications Inc.'s motion to dismiss liability case brought by Public Storage Inc. of California because of lack of personal jurisdiction, before the U.S. District Court of the Central District of California, Case No. 90-3943 R (RZX), September 1998.

Affidavit and Reply Affidavit supporting the application by BellSouth Corporation for provision of in-region, interLATA services in Louisiana, Round 2, CC Docket No. 98-121, July-August 1998.

Affidavit and Reply Affidavit supporting the application by BellSouth Corporation for provision of in-region, interLATA services in Louisiana, CC Docket No. 97-231, October-December 1997.

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Alabama, on behalf of GTE South and Contel of the South in Arbitration with AT&T, Alabama Public Service Commission, Docket No. 25704, November 1996. [Testified at Hearings, December 1996]

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Texas, on behalf of GTE Southwest in Arbitration with ASCI, Texas Public Utility Commission, Docket No. 16,473, November 1996. [Testified at Hearings, December 1996]

Testimony critiquing the Hatfield Cost Model for setting unbundled network element rates for GTE in Oklahoma, on behalf of GTE Southwest in Arbitration with AT&T, Oklahoma Corporation Commission, Cause No. PUD 960000242, November 1996. [Testified at Hearings, November 1996]

Direct Testimony critiquing the use of the Benchmark Cost Model for setting the unbundled loop rate for BellSouth in Georgia, on behalf of BellSouth

Telecommunications, to Georgia Public Service Commission, Docket 6759-U, October 1996. [Testified at Hearings, October 1996]

Consolidated Direct and Rebuttal Testimony critiquing bill and keep compensation for interconnection, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petitions by Continental Cablevision, Metropolitan Fiber Systems of Florida, and MCI Metro Access Transmission Services), November 1995. [Testified at Hearings, January 1996]

Direct Testimony on unbundling by local exchange carriers and related cost issues, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950984-TP (Petitions by Metropolitan Fiber Systems of Florida, and MCI Metro Access Transmission Services), November 1995. [Testified at Hearings, January 1996]

Rebuttal Testimony critiquing bill and keep compensation for interconnection, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petition by Teleport Communications Group), September 1995.

Direct Testimony addressing interconnection rate structure design, on behalf of BellSouth Telecommunications, to Florida Public Service Commission, Docket 950985-TP (Petition by Teleport Communications Group), September 1995.

Testified on behalf of BellSouth Telecommunications in Universal Service Proceeding, Tennessee Public Service Commission, Docket 95-02499, October 1995.

Wrote significant sections of NERA testimony/comments/affidavits presented to:

- state regulatory commissions on
    1. Price cap, local competition, interconnection, and unbundling issues (Connecticut, Kentucky, Louisiana, Mississippi, Pennsylvania, New Mexico, Vermont)
    2. Universal service issues (Alabama, Florida, Kentucky, Louisiana, Mississippi, New Jersey, New Mexico, North Carolina, South Carolina, Tennessee)
    3. Resale and avoided cost (Alabama, Louisiana, Tennessee)
    4. Cost models (Alabama, Georgia, Massachusetts, Missouri, New Jersey, New York, Oklahoma, Pennsylvania, Texas)
    5. Local company entry into interLATA long distance (Alabama, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee)
    6. TELRIC pricing of unbundled elements (Alabama, Delaware, Maryland, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, Washington DC, West Virginia)
    7. Access charge reform (Nebraska, Pennsylvania)

8. Rate rebalancing and welfare impacts (Ohio)
9. Pricing flexibility under price caps (New Mexico, North Carolina, Wyoming)
10. Cost recovery for Operations Support Systems and service quality measurement (Alabama, Florida, Georgia, Kentucky, Louisiana, Mississippi, North Carolina, South Carolina, Tennessee)
11. Reciprocal compensation for cellular, paging, and internet service providers (Alabama, Colorado, Florida, Georgia, Idaho, Kentucky, Louisiana, Massachusetts, Mississippi, New Mexico, North Carolina, Oregon, South Carolina, Tennessee, Washington)
12. Payphone rates and new services test (South Carolina)

- Federal Communications Commission in dockets or ex partes on
    1. CMRS interconnection (for NYNEX)
    2. Benchmark and proxy cost models (for BellSouth, Southwestern Bell, and NYNEX)
    3. Universal service (for BellSouth)
    4. InterLATA authority (for BellSouth)
    5. Access reform (for BellSouth)
    6. Regulatory forbearance for hicap services (for BellSouth)
    7. Depreciation reform (for USTA)
    8. Inter-carrier compensation for Internet-bound traffic (for U S WEST)

- Canadian Radio-television and Telecommunications Commission in price cap proceeding (for Manitoba Telephone System)

- Telefonica Spain, on matters of reciprocal compensation

- Civil Action No. 94-324 (GK), FreBon International Corp. v. Bell Atlantic Corp., et al., Defendant's Expert Disclosure Statement

TELECOMMUNICATIONS-RELATED PAPERS

"The Internet: Implications for Regulation and Public Policy," 1999. Co-authored with Agustin Ros.

"The Internet: Market Characteristics and Regulatory Conundrums," 1999. Co-authored with Agustin Ros.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America," 1999. Co-authored with Agustin Ros. Forthcoming in *Telecommunications Policy*.

"Using Covariances of Share Changes to Determine Substitutability" (an application to media advertising), 1997. Co-authored with Michael Salinger.

"The Case Against Imputation of Access Charges in IntraLATA Toll Prices: Economic Efficiency and Fairness Reconsidered," BellSouth *Telecommunications*, 1994.

"Pricing of Local Exchange Interconnection Service From the Perspective of Economic Theory," BellSouth Telecommunications, 1993.

"Economies of Scale and Scope, Subadditivity of Costs, and Natural Monopoly Tests for Regulated Utilities," BellSouth Telecommunications, 1993.

"Fairness and Economic Efficiency in Regulation: Imputation v. Equal Contributions in IntraLATA Toll Pricing," Report to the Task Force on Imputation of Access Charges in IntraLATA Toll Price, BellSouth Telecommunications, 1993.

"Economic Analysis of Efficient versus Imputation-Based Pricing by a Regulated Public Utility," Report to the Task Force on Imputation of Access Charges in IntraLATA Toll Price, BellSouth Telecommunications, 1993.

"E: A Maximum Likelihood Estimation Program, A User's Guide to Some Applications," Bell Communications Research, 1992.

"Error Components Panel Data Modeling of Share Equation Systems: An Application to Telecommunications Access Demand," Bell Communications Research, 1989.

"Analysis of Demand Migration and Take Rates for Special Access High Capacity Services," Bell Communications Research, 1990.

"Business Outbound Service System: An Empirical Modeling Framework," AT&T, 1989.

MISCELLANEOUS PAPERS

"Does Futures Trading Destabilize Cash Prices? Evidence for U.S. Live Beef Cattle," (with R.D. Weaver), Journal of Futures Markets, *Vol 10(1)*, 1990, (pp. 41-60).

"Market Structure and the Dynamics of Retail Food Prices," (with R.D. Weaver and P. Chattin), Northeastern Journal of Agricultural and Resource Economics, Vol 18(2), 1989, (pp. 160-170).

"Cash Price Variation in the Live Beef Cattle Market: The Causal Role of Futures Trade," (with R.D. Weaver), Journal of Futures Markets, Vol 2(4), 1982, (pp. 367-389).

"Unemployment Rate Dynamics and Persistent Unemployment Under Rational Expectations: A Comment," (with V. Moorthy), Working Paper No. 8-87-1, Department of Economics, The Pennsylvania State University, 1987.

"The Standard Errors of Characteristic Roots of a Dynamic Econometric Model: A Computational Simplification," Working Paper No. 5-87-3, Department of Economics, The Pennsylvania State University, 1987.

"Market Structure, Market Power, and Dynamic Price Determination in the Retail Food Industry," (with R.D. Weaver), Working Paper No. 5-87-2, Department of Economics, The Pennsylvania State University, 1987.

"Does Futures Trading Destabilize Cash Prices? Evidence for Live Beef Cattle," (with R.D. Weaver), Working Paper No. 5-87-1, Department of Economics, The Pennsylvania State University, 1987.

"Existence of Portfolios with Simultaneous Trading in Unrelated Speculative Assets," Working Paper No. 8-86-2, Department of Economics, The Pennsylvania State University, 1986.

"Models of Cash-Futures Market Complexes for Commodities Characterized by Production Lags," Working Paper No. 7-86-2, Department of Economics, The Pennsylvania State University, 1986.

"Cash Price Stability in the Presence of Futures Markets: A Multivariate Causality Test for Live Beef Cattle," (with R.D. Weaver), Staff Paper No. 45, Department of Agricultural Economics and Rural Sociology, The Pennsylvania State University, 1981.

"Optimal Interpolation and Distribution of Time Series by Related Series Using a Spectral Estimator for the Residual Variance," Bell Communications Research, 1990.

"Size and Power Characteristics of Three Tests of Nonlinearity in Time Series," AT&T, 1989.

"Model Testing and Selection in Applied Econometrics," AT&T, 1989.

CONFERENCE PRESENTATIONS

"The Internet: Implications for Regulation and Public Policy," (with Agustin Ros), 27th Annual Telecommunications Policy Research Conference, Alexandria, VA, September 25-27, 1999.

"The Internet: Market Characteristics and Regulatory Conundrums," (with Agustin Ros), International Communications Forecasting Conference, Denver, CO, June 15-18, 1999.

"Telecommunications Privatization and Tariff Rebalancing: Evidence from Latin America," (with Agustin Ros), 18th Annual Eastern Conference of the Advanced Workshop in Regulation and Competition, Rutgers University, Newport, RI, May 26-28, 1999.

"An Estimate of Current Universal Service Obligations and the Likely Impact of Federal and State Universal Service Plans," (with Agustin Ros and Neil Zoltowski), International Communications Forecasting Conference, St. Louis, MO, June 9-12, 1998.

"Competitive Telecommunications and its Aftermath: Economic Policy Issues and Modeling Needs," International Communications Forecasting Conference, Dallas, TX, April 16-19, 1996.

"On Modelling the Dynamics of Demand for Optional and New Services," International Communications Forecasting Conference, Toronto, Canada, June 13-16, 1995.

"The Case Against Imputation of Access Charges in IntraLATA Toll Prices: Economic Efficiency and Fairness Reconsidered," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Seventh Annual Western Conference, San Diego, CA, July 6-8, 1994.

"Future Directions in Modeling the Demand for Vertical Services," National Telecommunications Demand Study Conference, La Jolla, CA. March 24-25, 1994.

"E: A Maximum Likelihood Estimation Program," National Telecommunications Forecasting Conference, Crystal City, VA, June 1-4, 1993.

Discussant of "The National Telecommunications Demand Study," National Regulatory Research Conference on Telecommunications Demand, Denver, CO, August 3-5, 1992.

"Using Demographics to Predict New Service Take Rates: Discrete Choice Analysis vs. Categorical Data Analysis," National Telecommunications Forecasting Conference, Atlanta, GA, May 5-8, 1992.

"Price Cap Regulations for the LECs: Implications for Demand and Revenue Forecasting," National Telecommunications Forecasting Conference, Boston, MA, May 30, 1991.

"Demand Migration for Special Access High Capacity Services," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Third Annual Western Conference, San Diego, CA, July 11-13, 1990.

"Error Components Panel Data Modeling of Telecommunications Access Demand," Bellcore-Bell Canada Telecommunications Demand Analysis Conference, Hilton Head, SC, April 22-25, 1990, and Bell Atlantic Business Research Conference, Baltimore, MD, October 24-27, 1989.

"Analysis of Integrated Demand Systems," Rutgers University Advanced Workshop in Regulation and Public Utility Economics, Second Annual Western Conference, Monterey, CA, July 5-7, 1989.

Panel Discussion on "The Regulatory and Operational Impacts of Price Caps," National Telecommunications Forecasting Conference, San Francisco, CA, May, 1989.

December 20, 1999