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BOULT ▪ CUMMINGS
CONNERS ▪ BERRY PLC

March 17, 2004

Honorable Deborah Taylor Tate, Chairman
Tennessee Regulatory Authority
460 James Robertson Parkway
Nashville, TN 37243-0505

In Re: Implementation of the Federal Communications Commission's Triennial Review Order (Nine-month Proceeding) (Switching)
Docket No 03-00491

Dear Chairman Tate.

Enclosed please find the original and fourteen (14) copies of Dr. Mark T. Bryant's surrebuttal testimony filed on behalf of MClmetro Access Transmission Services, Inc and Brooks Fiber Communications of Tennessee, Inc. (collectively "MCI") in the above-referenced docket Copies of the testimony have been served on all parties of record.

Very truly yours,

BOULT, CUMMINGS, CONNERS & BERRY, PLC

By: Jon Hastings
Jon E. Hastings

JEH/th

Enclosures

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I hereby certify that on March 17, 2004 a copy of the foregoing document was served on the parties of record, via electronically, US mail or hand delivery:

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Jon E Hastings

BEFORE THE TENNESSEE REGULATORY AUTHORITY
NASHVILLE, TENNESSEE

IN RE:

Implementation of the Federal	)	
Communication's Commission's	)	**DOCKET NO.**
Triennial Review Order – 9 MONTH	)	**03-00491**
PROCEEDING – SWITCHING	)	

SURREBUTTAL TESTIMONY OF DR MARK T BRYANT

On Behalf Of

MCIMETRO ACCESS TRANSMISSION SERVICES, LLC

And

BROOKS FIBER COMMUNICATIONS OF TENNESSEE, INC

March 17, 2004

Q. PLEASE STATE YOUR NAME AND BUSINESS ADDRESS.

A My name is Mark T Bryant, and my business address is 4209 Park Hollow Court, Austin, Texas

Q. ARE YOU THE SAME MARK T. BRYANT WHO PREVIOUSLY FILED DIRECT AND REBUTTAL TESTIMONY IN THIS PROCEEDING?

A Yes, I am

Q. WHAT IS THE PURPOSE OF YOUR SURREBUTTAL TESTIMONY?

A The purpose of my rebuttal testimony is to respond to the rebuttal testimony of BST witnesses Aron, Pleatsikas, and Blake

I Response to Rebuttal Testimony of Dr Aron

Q. DR. ARON HAS CHARACTERIZED YOUR TESTIMONY REGARDING THE SOCIAL COSTS OF AN ERRONEOUS FINDING OF NON-IMPAIRMENT AS "UNSUPPORTED" AND "SERIOUSLY MISGUIDED." HOW DO YOU RESPOND TO DR. ARON'S CRITICISMS?

A Dr Aron argues that the social costs of an erroneous finding of non-impairment are in lost investment, innovation, and economic development whereas the social cost of an erroneous finding of impairment is "merely" the foregone entry of carriers that rely entirely on the network of the incumbent to provide service Dr Aron's arguments misstate the situation facing the Authority and are both unsupported and misleading

Q. IN WHAT WAY IS DR. ARON'S TESTIMONY MISLEADING?

A In my direct testimony, I urged the Authority to be cautious in assessing the degree to which CLECs are impaired without access to unbundled switching, and to act to eliminate the availability of unbundled local switching only where a lack of impairment is unambiguously proven In her rebuttal testimony, Dr Aron appears to be suggesting that my recommendation was that impairment be found for all markets, whether it exists or not Dr Aron, for example, comments that I envisioned (in discussing the exit from the market of UNE-P based providers in the case of an erroneous finding of non-impairment) "instances in which a CLEC would rather exit the market than pursue the UNE-L opportunity " Aron Rebuttal at 6 She goes on to note that the exit of carriers that cannot survive in a UNE-L based market would create opportunities for those that can survive Contrary to Dr Aron's suggestion, however, an erroneous finding of impairment means that unbundled local switching would be eliminated where CLECs are, in fact, impaired without access to unbundled switching Thus, an erroneous finding of non-impairment would eliminate *all* current competitors, even the most efficient ones, from the local exchange market

I do not recommend that the Authority find impairment where none exists What I do recommend is that the Authority be very certain that impairment does not exist, in view of the irreversible consequences of an erroneous finding of non-impairment

Q. DR. ARON MAINTAINS THAT AN ERRONEOUS FINDING OF IMPAIRMENT WOULD DAMAGE THE INCENTIVES OF BOTH THE

CLECS AND THE ILECS TO INVEST IN NETWORK INFRASTRUCTURE, AND THAT INNOVATION WOULD BE SUPPRESSED. DO YOU AGREE?

A No, I do not While I do agree that reliance upon the ILEC's switching facilities limits, to some extent, the ability of CLECs to develop certain types of new services, I do not agree that CLECs have failed to bring new services to market The innovation of bundled offerings of local service, long distance service, and vertical features was one introduced to the market by CLECs, and the ILECs have been quick to follow suit UNE-P based CLECs such as MCI and Z-tel have introduced sophisticated voice mail services that were not previously available from the ILECs It simply is not true, as Dr Aron implies through her use of terms such as "synthetic competition," that UNE-P based competition is without value

That said, however, there is no question that CLECs would prefer to offer service using their own switches where it is economically feasible to do so Doing so would give the CLEC greater control over its own service offerings and permit the introduction of more new service offerings than is possible with the use of UNE-P A CLEC owning its own switch also would gain additional flexibility in the pricing of its services, since its prices would not be governed by the rate structure imposed by the ILEC for use of unbundled switching These are powerful incentives for the CLEC to invest in switching facilities – that more CLECs have not begun to offer mass market local exchange service using their

own switches is thus equally powerful evidence that there are operational and economic barriers to doing so that have not been overcome

Q. IS THERE ANY EVIDENCE TO SUPPORT DR. ARON'S CLAIM THAT THE CONTINUED AVAILABILITY OF UNBUNDLED LOCAL SWITCHING WILL SUPPRESS INVESTMENT BY THE INCUMBENT CARRIERS?

A No In fact, the available evidence is to the contrary Prior to the passage of the Telecommunications Act of 1996, with its requirement that the ILECs make available unbundled network elements to CLECs, BellSouth's investment in its facilities was essentially flat Beginning in 1996, BellSouth's plant additions increased dramatically, reaching a peak in 2001 In 2002, plant additions declined somewhat from this peak, but remained substantially above pre-1996 levels Exhibit MTB-13 attached to this testimony is a chart illustrating the investment additions that BellSouth has made in its plant during the period 1990-2002 If the availability of unbundled network elements is a serious disincentive to ILEC investment, the empirical evidence should show a decline since 1996 It only makes sense that the increased competition resulting from the entry of new firms into the local exchange market would stimulate investment by the incumbent, and that is exactly what the evidence shows

Q. HAVE YOU SEEN OTHER EVIDENCE THAT THE INCREASED COMPETITION RESULTING FROM THE AVAILABILITY OF

UNBUNDLED NETWORK ELEMENTS HAS STIMULATED ILEC INVESTMENT?

A Yes, in a recent essay addressing this topic, Professor Robert D Willig of Princeton University has examined the available evidence and concluded that the availability of unbundled network elements stimulates incumbent investment Robert D Willig, "Investment is Appropriately Stimulated by TELRIC " Prof Willig further found that decreases in rates for UNEs actually are correlated with in an increase in ILEC investments According to Prof Willig, " raising TELRIC or restricting access to UNEs, as the ILECs advocate, would both reduce the competitive alternatives available to consumers and reduce the ILEC's capital spending on their own networks " *Id* at 3 10 Exhibit MTB-14 attached to this testimony is a copy of the essay by Prof Willig

Q. DR. ARON ARGUES THAT A FINDING OF NO IMPAIRMENT INTRODUCES CONSISTENCY FOR THE USE OF LOCAL AND LONG DISTANCE NETWORKS. DO YOU AGREE?

A No Dr Aron attempts to form an analogy between the availability of long distance network capacity and the market-based prices that obtain in that market and the supposed availability of local switching at market-based prices if a ruling of no impairment for local switching is made The analogy fails because there simply is no market for local switching in existence in Tennessee To my knowledge, no carrier has stated in this proceeding that it makes available local switching on a wholesale basis This being the case, and because BellSouth has

every incentive to raise its rivals' costs and the ability to do so in the absence of competitive switching supply, one could not reasonably expect that CLECs would pay anything like a cost-based rate for local switching if BellSouth were freed from the obligation to charge TELRIC-based rates

Q. DR. ARON CRITICIZES YOUR IMPAIRMENT ANALYSIS TOOL FOR ADOPTING AN IMPROPER FRAMEWORK FOR THE ANALYSIS OF THE CLEC PROFITABILITY IN THE ABSENCE OF UNBUNDLED LOCAL SWITCHING. DO YOU HAVE A RESPONSE?

A Yes Dr Aron's criticism is that the model fails to recognize that certain costs are incurred in the early periods of a company's operation, when revenues are low and net revenues therefore are likely to be negative This is not the case The impairment analysis tool that I presented with my direct testimony performs an annualization of capital costs over the depreciation life of each category of investment This calculation involves a calculation of the net present value of future capital costs in order to levelize these costs over the life of the investment Thus, with regard to capital costs, the model does not, as Dr Aron claims, ignore the effect of high startup costs on CLEC profitability The approach taken in the impairment analysis tool is similar to that that has been used in setting rates for unbundled network elements, an approach designed to determine the forward-looking cost of an efficient network operator

Dr Aron goes on to criticize the impairment analysis tool for failing to consider growth in revenue or market share over time While it is true that the

model considers a "steady state" single period in time, the input assumptions can be varied to consider any level of market share or price that is of interest

II Response to Rebuttal Testimony of Dr Pleatsikas

Q. DR. PLEATSIKAS CLAIMS THAT YOU PROVIDE NO UNAMBIGUOUS INDICATION OF WHICH MARKET DEFINITION TO USE FOR PURPOSES OF THIS PROCEEDING. IS THAT THE CASE?

A No I believe I unambiguously stated that the appropriate market definition is the wire center My discussion of a possible market definition that would comprise individual customer locations was intended to illustrate the different characteristics of customers that contribute to differences in wire center costs

Q. DR. PLEATSIKAS CLAIMS THAT AGGREGATIONS OF WIRE CENTERS THAT SHARE SIMILAR COST AND REVENUE CHARACTERISTICS MAY CONSTITUTE AN APPROPRIATE MARKET DEFINITION. DO YOU AGREE?

A No, I do not One certainly can aggregate markets for administrative convenience, perhaps, but such an aggregation is not a market definition In order to determine, as Dr Pleatsikas suggests, that "wire centers in a geographic area share certain cost and other economic characteristics," it is necessary first to examine the costs and economic characteristics *for each wire center* Dr Pleatsikas seems to assume that because UNE rates are applicable to all wire centers in a particular UNE rate zone, those wire centers must share similar cost characteristics The rate for

unbundled network elements, however, is only one factor that affects the costs and revenues that in turn affect a CLEC's entry decision Wire centers also vary along other dimensions The number of customers served from each wire center, the mix of business and residential customers in each wire center, the proportion of customers served via digital loop carrier equipment, the demographic characteristics of the customers in the wire center, and the distance of the wire center from the CLEC's switch all have an impact on the potential profitability of providing service in the wire center

Q. DR. PLEATSIKAS STATES THAT "COLLOCATION COSTS CAN INFLUENCE WHERE A CLEC MAY SEEK TO OFFER SERVICES IN A MARKET, BUT THEY DO NOT, BY THEMSELVES, DETERMINE THE GEOGRAPHIC SCOPE OF THE MARKET." (PLEATSIKAS REBUTTAL AT 7). DOES THE FCC OFFER ANY GUIDANCE ON THE GEOGRAPHIC SCOPE OF A MARKET, WHERE A CLEC CANNOT SERVE THE ENTIRE MARKET?

A Yes As I noted in my direct testimony, at paragraph 499 of the TRO, note 1552, the FCC states that " where switch providers (or the resellers that rely on them) are identified as serving, or capable of serving, only part of the market, the state commission may choose to consider defining that portion of the market as a separate market for that portion of its analysis "

Q. DR. PLEATSIKAS CITES A RESPONSE BY FCCA TO A BST INTERROGATORY IN FLORIDA TO THE EFFECT THAT ONLY TWO

OF THE MEMBER COMPANIES DECIDE TO ENTER A MARKET ON A WIRE CENTER BASIS AS SUPPORT FOR THE PROPOSITION THAT CLECS DO NOT, IN FACT, DECIDE TO ENTER MARKETS WIRE CENTER BY WIRE CENTER. DO YOU HAVE A RESPONSE TO THIS TESTIMONY?

A Yes The interrogatory question cited by Dr Pleatsikas was not specific enough to yield useful information on the situation that would be faced by CLECs in a post UNE-P environment The question asked is as follows

> Identify each individual carrier that comprises the FCCA and state whether each such carrier decides to enter a market at the wire-center level

The question does not state the market to be served, nor does it state the circumstances to be assumed in answering the question A carrier providing mass market service today using UNE-P might interpret the question to refer to its current situation Such a carrier naturally would not consider the market in terms of individual wire centers, but would be focused on the cost of UNE rates as they vary among rate zones, and perhaps on the entire state of Florida as a potential market If the same carrier were asked whether it would consider wire center specific costs in making entry decisions under the assumption that unbundled local switching is no longer available, and that, in order to provide local exchange service, it would have to establish collocations in each wire center, almost certainly would consider the question in a different light I do not know how the CLECs answering the question interpreted it, but the question is so vague that no confidence should be placed in the quality of the answers received

In addition to the two CLECs in the FCCA interrogatory response that replied that they do make entry decisions at the wire center level, at least one other CLEC has responded to discovery indicating that it does, in fact, make entry decisions by considering the characteristics of individual wire centers In response to BellSouth's Interrogatory number 95 in Florida, Allegiance responded as follows,

> Question
>
> 95 Describe the criteria you consider to enter a specific market offering qualified services In your response please detail how, and the extent to which, you rely on both business customers and residential customers to meet the financial criteria Also identify the criteria used to select the customer that are marketed to or contacted in your marketing campaigns
>
> Answer
>
> Allegiance deployed a switch in Miami as part of its strategy to become a national local service provider The geographic location of the switch was based on several factors including minimizing backhaul costs from collocation sites, space availability and where Allegiance could get access to CAPs
>
> The single most important criterion for Allegiance in determining where to build a collocation is the number of lines served by the individual wire center Given the costs of collocation construction, equipment, power, and the like, a CLEC must be reasonably confident it can acquire enough customers in a wire center to cover those costs and earn a profit in order to proceed with construction of the collocation Allegiance generally has not built collocations in wire centers with fewer than 9,000 - 10,000 business lines

The factors cited by Allegiance in its response are some of the same factors that I have noted in defining the relevant market as the ILEC wire center

Q. DR. PLEATSIKAS STATES THAT A PROPER MARKET DEFINITION MUST CONSIDER BOTH DEMAND-SIDE AND SUPPLY-SIDE SUBSTITUTABILITY. DO YOU AGREE?

A Yes, I agree that supply-side substitutability should be considered in defining a market I also agree that the cost of a CLEC switch and some of the costs incurred by a CLEC in marketing services apply to a geographic area larger than the wire center The real question, however, is whether the economies of scale achievable through recovery of these costs over a larger customer base are sufficient to overcome the cost differences that exist among wire centers As I demonstrated in my rebuttal testimony, the greater proportion of the economies of scale that are present in switch costs are achieved very rapidly, and, once the CLEC has gained a relatively small share of the market, acquisition of additional customers does not result in significant additional cost savings This being the case, a CLEC contemplating adding a collocation to a wire center where profitability is marginal or negative must balance the losses that it will incur by collocating in that wire center against the cost savings that it will achieve in its switch costs A wire center that is losing two or three dollars per line per month will not be made to look profitable if the cost savings in switch costs are a few pennies per line per month In effect, Dr Pleatsikas is ignoring the 800-pound gorilla of collocation and backhaul costs in his exclusive attention on the gnat that is economies of scale in switching and marketing costs

Q. HAS BELLSOUTH PRESENTED EVIDENCE IN THE PAST THAT WIRE CENTER SIZE MAY BE A SIGNIFICANT FACTOR IN DETERMINING CLEC PROFITABILITY?

A Yes In fact, the FCC cited a study presented by BellSouth in paragraph 484 of the TRO that purportedly calculated the profitability of CLECs in wire centers of various sizes

> BellSouth found that for wire centers of under 5,000 lines, a competitor would likely experience a net loss of $1 93 per line assuming BellSouth's average retail local revenues However, as discussed above, there was significant disagreement concerning whether entry would be economic for larger wire centers

Q. ARE ANY OF THE WIRE CENTERS IN THE BELLSOUTH-DEFINED MARKETS FOR WHICH BELLSOUTH CLAIMS THAT CLECS ARE NOT IMPAIRED SMALLER THAN 5,000 LINES?

A Yes If the Authority were to accept BellSouth's proposed market definition and non-impairment claims, five wire centers of less than 5,000 lines – wire centers which, according to BellSouth's own earlier analysis, cannot be profitably served by CLECs – would be found to be not impaired If the Allegiance analysis cited earlier is closer to the truth, and wire centers of less than 10,000 lines cannot even be considered for collocation by a CLEC, then the number of wire centers included in BellSouth's proposed non-impaired markets in which CLECs cannot profitably provide service rises to 10

Clearly, BellSouth's proposed market definition obscures important factors that influence a CLEC's decision to provide service If the Authority were

to adopt the market definition proposed by Dr Pleatsikas, there is a risk that customers in smaller wire centers could be left without competitive alternatives

III Response to the Rebuttal Testimony of Ms Blake

Q. MS. BLAKE CLAIMS THAT YOUR WIRE CENTER MARKET DEFINITION IS INCONSISTENT WITH TESTIMONY PREVIOUSLY FILED BY A WITNESS ON BEHALF OF MCI STATING THAT MCI SWITCHES SERVE A LARGER GEOGRAPHIC AREA THAN ILEC SWITCHES. IS THIS INDEED AN INCONSISTENCY?

A No, it is not I have never stated that CLEC switches are not potentially capable of serving a large geographic area The consistent thrust of my testimony has been that the cost of placing a switch is not the most significant factor affecting a CLEC's decision to enter a particular market Rather, it is the cost of establishing collocations and the potential revenues available in each wire center that will determine CLEC profitability

In the testimony cited by Ms Blake, the witness was describing MCI provision of service to enterprise customers that are located in buildings served by MCI's metropolitan fiber networks These networks have been designed to reach buildings and campus environments that have a sufficiently large concentration of customers with a high enough demand for telecommunications services that the construction of fiber optic networks to serve those concentrations is economically justified

This is an entirely different proposition than attempting to provide service to the mass market, where customers are widely dispersed, and where the cost of establishing collocation and transport facilities to aggregate customer traffic at the CLEC switch may render the provision of service unprofitable There is no contradiction at all in the testimony cited by Ms Blake and my own testimony

Q. DOES THIS CONCLUDE YOUR SURREBUTTAL TESTIMONY?

A Yes, it does

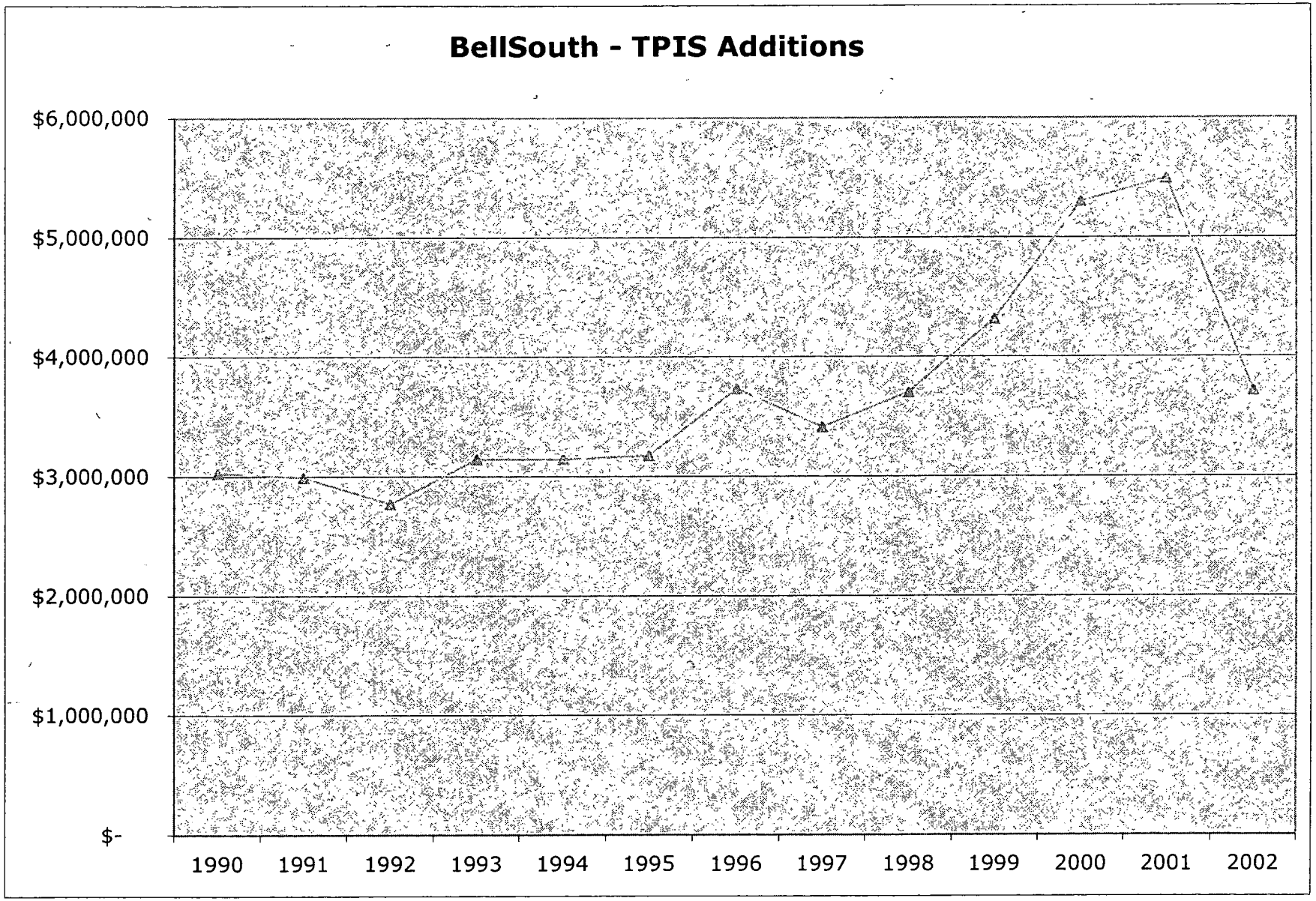
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EXHIBIT MTB-14

INVESTMENT IS APPROPRIATELY STIMULATED BY TELRIC

Robert D Willig[1]

1. Introduction

In the debate over the implementation of the Telecommunications Act of 1996, incumbent local exchange carriers (ILECs) have claimed that its requirements suppress incentives for investment in network infrastructure They argue that they are denied a compensatory ("fair") return on their investments by the requirement that they unbundle their local networks and lease use of the unbundled network elements (UNEs) at prices based on total element long-run incremental cost (TELRIC) The ILECs further argue that the mandated availability of UNEs at these regulated prices permits competitive local exchange carriers (CLECs) to "free ride" on ILEC networks and discourages CLEC investments, as well their own Based on their claims that both CLECs' and their own investments are suppressed, the ILECs argue that policy changes should be made to remove requirements that they provide CLECs with access to TELRIC-priced UNEs

In sharp contrast, the CLECs assert that the availability of UNEs at TELRIC based prices is necessary for competition It is this competition that enables them to invest, and that motivates the ILECs to increase their investment in network facilities The CLECs argue that the competition created by access to UNEs brings about lower prices, better quality and more service, and does not discourage any efficient ILEC investment Under this view, the previous lack of competition in monopoly local

[1] Professor of Economics and Public Affairs, Princeton University

telephone markets may have dissuaded the ILECs from making certain investments, and the competitive stimulus from CLEC entry under the 1996 Act may have encouraged greater investment by both the ILECs and the CLECs

These two competing views may be termed the *Investment Deterrence Hypothesis* and the *Competitive Stimulus Hypothesis*, respectively These hypotheses can be examined from both theoretical and empirical standpoints I believe that the *Competitive Stimulus Hypothesis* stands on much firmer theoretical ground than the *Investment Deterrence Hypothesis* in this setting Nonetheless, I recognize that amidst the contention and complex regulatory dynamics that surround local telecommunications today, the question of which hypothesis is correct should be put to a sound empirical test

This essay concludes both that the *Investment Deterrence Hypothesis* is refuted by the empirical evidence and that the data provide reasonable support for the *Competitive Stimulus Hypothesis* The analysis shows that there is no valid foundation for the view that investment would be enhanced by any effort to reinterpret current TELRIC rules in a manner that raises UNE prices To the contrary, the data indicate that higher UNE prices would weaken competition and discourage investment by both ILECs and CLECs

2. Investment Theory

The *Competitive Stimulus Hypothesis* is far more consistent with economic theory than the *Investment Deterrence Hypothesis* in the setting of local telecommunications today The availability of UNEs facilitates entry and activity by local telephone competitors, and total industry investment expands as this competition results in lower prices, increased demand, and improved customer choice and service quality

Indeed, without access to TELRIC-priced UNEs, CLEC investment may well be suppressed because the ILECs enjoy enormous advantages over new entrants as a result of their legacy as protected franchise monopolists that currently serve over 90% of existing demand ILECs benefit from large economies of scale and scope and enjoy important first mover advantages relative to CLECs with respect to rights-of-way and placement of outside plant and its supporting structures The ILECs are also protected by sunk cost entry barriers – *i e* , competitive facilities-based entry by CLECs would be very risky because much of the costs of local network facilities are sunk, and therefore cannot be recovered if the CLEC ultimately is unable to remain viable in its competition with the incumbents The economies of scale and scope endemic to local telephony imply that CLEC entry with cost-efficient facilities would be likely to create excess supply and strong pressure to move prices downwards towards marginal costs and below average costs Thus, without access to UNEs at competitive prices, it is unlikely that CLECs could overcome profitably the daunting barriers to entry, and local telephony would remain the domain of monopoly

According to the *Investment Deterrence Hypothesis*, the availability of UNEs for lease at TELRIC-based prices discourages ILEC investment by rendering it less profitable than it would be without the unbundling mandate In this view, unbundling rules compel the ILEC to lease portions of its local exchange network to CLECs at returns that are lower than it could earn if it used this network to provide retail services

directly to customers [2] The combined return accruing to the ILEC from its local network investment is thereby diminished, and along with this return (it is argued) goes the ILECs' incentive to invest

The ILECs contend that the TELRIC methodology adopted by the Federal Communications Commission (FCC) to determine the rates that CLECs pay for UNEs does not adequately compensate ILECs for their investments in assets that are long-lived and may be partially or wholly sunk [3] Although it goes without saying that the ILECs are motivated to seek from regulation more rather than less compensation, the key issue is whether TELRIC compensation provides for efficient investment by the ILECs By its very definition TELRIC allows the ILECs to recover their full economic costs, including the risk-adjusted competitive rates of return on capital and forward-looking depreciation with lives that reflect both technological and economic obsolescence [4] Thus, because TELRIC provides ILECs with the same investment incentives as are faced by participants in competitive markets, the ILECs' *Investment Deterrence Hypothesis* would appear to be either an illogical indictment of investment incentives in competitive markets generally, or just a complaint about the regulatory process constraining their pricing and profits

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[2] The proponents of this theory are rarely clear as to whether their retail pricing benchmark is an efficient structure of regulated retail prices, or substantially higher prices that regulation has somehow allowed the ILECs to impose on their captive retail customers

[3] Reply Affidavit of Jerry A Hausman, In the Matter of Implementation of Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No 96-98 (filed May 30, 1996) For a critique of the foregoing, see R Glenn Hubbard and William H Lehr, "Capital Recovery Issues In TSLRIC Pricing Response To Professor Jerry A Hausman", submitted *ex parte* by AT&T to the FCC, In the Matter of Implementation of Local Competition Provisions in the Telecommunications Act of 1996, CC Docket No 96-98 (July 18, 1996)

[4] See companion essays by William Baumol, Glenn Hubbard and William Lehr, and Richard Clarke for further elaboration of the compensatory nature of TELRIC

There is powerful economic logic that goes the other way in showing that competition is an impetus to investment, as compared to monopoly Consider a monopoly ILEC that does not face mandatory unbundling Like any rational firm, the firm's investment will be governed by the perspective that the firm will install further units of capital so long as the incremental expected revenues from these units exceed the costs (inclusive of risks) of acquiring them Because the services produced by this further capital may compete with (and bid down the price for) other services produced by the ILEC's current capital, the profitability of additional investment by the monopoly ILEC is attenuated

Competition changes the ILEC's perspective on what is profitable In a competitive environment, new investment by the ILEC doesn't simply have the effect of reducing the profitability of its former production Rather, this investment may be used as a competitive weapon (*e g* , by producing more and higher quality service) to increase the ILEC's overall business by defending and taking market share from its competitors Due to these potential positive effects of investment on the profitability of an ILEC exposed to competition and the heightened threat of loss of business to rivals, the ILEC (and its rival CLECs) are impelled to lower prices, produce more, innovate and invest more to accomplish these goals The result is that incentives for investment and innovation are greater under the pressures of a competitive environment [5]

[5] The only set of circumstances under which this comparison might be distorted by CLECs' use of UNEs would be if CLECs' use of UNEs degraded the potential productivity of these facilities in serving the ILECs' customers I am aware of no evidence that this is the case

A classic illustration of these investment incentives is provided by the digital subscriber line (DSL) experience of the late 1990s Prior to the '90s, T1 was the only available technology for data services, and it was controlled by the ILECs Although the ILECs developed more efficient DSL technologies in the early '90s, they chose not to invest and deploy these innovative technologies because this would bid down the price of their pre-existing monopoly T1 data services With the advent of competitive cable modem technology in the late '90s and the ability of CLECs to use UNEs to provision their own competitive DSL services, ILEC investment in DSL technology exploded in response

Thus far, this discussion has focused on the incentives for ILEC investment I now turn to CLEC investment When it is economically viable to do so, a CLEC would likely prefer to deploy its own facilities and avoid being dependent on its largest competitor for essential inputs But because of scale economies, it is not economically practical for CLECs to replicate ILEC networks or, in many instances, even particular portions of the extant networks UNEs, however, permit CLECs to share incumbent scale economies and provide efficient competition using shared facilities in those many instances where deploying alternative facilities is not economically feasible

UNEs can facilitate deployment of alternative facilities by CLECs when it is potentially economic to do so For example, UNEs allow CLECs to acquire a customer base and adequate scale to justify investment in their own facilities and, thus, may allow a CLEC dynamically to overcome sunk cost entry barriers

Overall, the *Competitive Stimulus Hypothesis* follows naturally from basic economic theory and its understanding of competitive markets Increased competition enabled by UNEs can be expected to result in lower retail prices both because of efficiency improvements induced by competition and because of the pressure competition places on above-cost pricing Lower prices result in increased demand Growing demand will induce additional facilities investment by both ILECs and CLECs Additionally, in a competitive environment, both the incumbent and the entrant will face enhanced incentives to improve quality and innovate with respect to services, leading to further investment

3. The Historical Record

The theory behind the *Competitive Stimulus Hypothesis* is borne out by a rigorous econometric empirical analysis of CLEC and ILEC investment behavior since the passage of the Telecommunications Act in 1996 But before describing the econometrics, it is useful to review summary data on the recent history of telecommunications investment The attached chart shows the course of investment by ILECs in local telecommunications for the 1992-2001 period,[6] and by the CLECs over the 1996-2002 period

[Insert Chart here]

The first point to note is that over the half decade prior to the '96 Act, investment by the monopoly ILECs was stagnant With the advent of the Act, it accelerated markedly for

[6] Although 2002 data are also available from BellSouth, SBC and Verizon, due to accounting irregularities, Qwest has not yet filed audited financial reports with the FCC for 2002

four years, then in 2000 began to tail off CLEC investment followed the same pattern – dramatic growth for the first four years after the Act, then a decline

Some analysts have looked at this history and focused on only the most recent several years From evidence of the decline that occurred since 2000, they have concluded that CLECs' use of UNEs priced at TELRIC was the cause of this fall-off [7] Other analysts have focused on evidence of the stagnancy of ILEC investment in the pre-competitive era and the flowering of investment immediately following the Act They have concluded that CLEC competitive pressure affirmatively stimulated investment [8] The later tail-off in investment is ascribed to transition towards a more sustainable long-run path, and it is observed that despite this tail-off, net telecommunications plant remains well above its levels prior to the '96 Act [9]

4. Empirical Tests and Results

I now discuss empirical research that I have performed, along with studies performed by others, that address the issue of whether the availability of UNEs at TELRIC-based prices enhances or detracts from telecommunications investment

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[7] See, for example, J A Eisenach and T M Leonard, *Telecom Deregulation and the Economy The Impact of UNE-P on Jobs, Investment and Growth*, Progress & Freedom Foundation, Progress On Point, Release 10 3 (January 2003)

[8] See, for example, Phoenix Center for Advanced Legal and Economic Studies, "The Truth about Telecommunications Investment," Phoenix Center Policy Bulletin, No 4, June 24, 2003

[9] Nortel chief executive Frank Dunn also agrees that telecommunications capital spending rose to unsustainable levels in the late '90s ' Everybody is looking for this big capital spending to start again Well it's not going to happen What was spent in 1999-2000 was unaffordable Carriers were running to some 20 to 22 percent of their revenue in capex spending There is no business model that could afford that kind of spending So we're back down to the low teens And, historically, that's where this industry has always been And that's where it should be " *Reuters*, "Nortel CEO Sees No Surge in Telecoms Spending," November 17, 2003

A. My Own Analysis

As discussed above, the *Investment Deterrence* and *Competitive Stimulus Hypotheses* make different predictions regarding the effect of UNE prices on ILEC investment In an analysis that I developed with several co-authors, we employed a state-by-state cross section of data to carry out regression analyses to test which of these two hypotheses has greater empirical support [10] The cross-sectional variation in the terms and conditions at which UNEs are available in the different states allows us to determine the linkages among the availability of UNEs, CLEC competitive activity and ILEC investment in network infrastructure

This analysis employed standard econometric tools that are widely accepted in the field We used a variety of these techniques to estimate directly how ILEC network investment is positively influenced by competition from CLECs – and to measure how CLEC entry is positively influenced by the availability of UNEs The directions and magnitudes of these impacts are estimated controlling for state-by-state variations in other supply and demand influences on CLEC activity and ILEC investment This research design avoids the ambiguity of time series analysis of investment that is unable to control for all of the other forces likely to bear on the recent progress of local telecommunications investment

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[10] See, "Stimulating Investment and the Telecommunications Act of 1996," by Robert D Willig, William H Lehr, John P Bigelow and Stephen B Levinson, October 2002, attached to *ex parte* letter of Joan Marsh, AT&T, to Marlene Dortch, FCC, In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, CC Docket No 01-338, (October 11, 2002)

As explained in greater detail in the Technical Appendix to this essay, our results unambiguously refute the *Investment Deterrence Hypothesis* and provide strong support for the *Competitive Stimulus Hypothesis* Overall, we estimated that each 1% *reduction* in UNE rates corresponds with rigorous statistical significance to approximately a 2 1% to 2 9% *increase* in ILEC investment Thus, raising TELRIC or restricting access to UNEs, as the ILECs advocate, would *both* reduce the competitive alternatives available to consumers *and* reduce the ILECs' capital spending on their own networks

B. Complementary Analyses

Numerous other empirical studies have similarly concluded that the availability of UNEs at TELRIC has not impeded telecommunications investment

One study by the Phoenix Center examined data from the Commerce Department's Bureau of Economic Analysis (BEA), and found that an additional $267 billion in telecommunications industry capital spending was generated between 1996 and 2001 [11] That is, the BEA reported total telecommunications investment of $572 billion during the period 1996-2001, compared to investment of only $305 billion that would have been expected based on historic investment levels from the fifteen years preceding the '96 Act According to this Phoenix study

> Plainly, investment by telecommunications firms skyrocketed after the passage of the 1996 Act From 1980 through 1995, investment by telecommunications firms grew at an annual rate of 2 8%, with average investment level of about $38 8 billion After the 1996 Act, investment by telecommunications firm[s] has grown at an average annual rate of 22 3%, with $95 3 billion invested annually (on average) for a total of about $572 billion during this time

[11] Phoenix Center for Advanced Legal and Economic Studies, "The Truth about Telecommunications Investment," Phoenix Center Policy Bulletin, No 4, June 24, 2003

A second Phoenix study used a model that regressed indicators of UNE competition and RBOC size on net investment by state, and demonstrated that the RBOCs invested more heavily in their networks in states where the competition they faced was most intense [12] This study found that net investment by BellSouth, SBC and Verizon increased on average by $759 for every UNE-P access line leased by a CLEC The study further concluded

> UNE-P competition is shown to positively affect BOC net investment So, while BOC net investment may be down relative to previous years due to economic conditions and other factors, *UNE-P itself exerts a positive influence on investment* Thus, it appears that factors other than UNE-P are fully responsible for the lower investment levels by the BOCs in 2002 In fact, UNE-P competition is shown to offset investment reductions in 2002 by about 50% [13]

The empirical model estimated in this Phoenix study provoked a debate among several economic analysts [14] The Phoenix Center responded to these criticisms by observing

> In their review of BULLETIN NO 5, HHB recommend three major changes to our empirical model First, HHB suggest making the empirical model dynamic by including the existing capital stock in the regression and lagged values of some explanatory variables Second, they recommend letting the cost of capital vary by Bell Company Third, they propose estimating the models using weighted least squares where all variables are weighted by (the inverse of) access lines Many of our new empirical models incorporate these suggestions, and in some cases adopt more dynamic specifications than proposed by HHB In every

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[12] Phoenix Center for Advanced Legal and Economic Studies, "Competition and Bell Company Investment in Telecommunications Plant The Effects of UNE-P," Phoenix Center Policy Bulletin, No 5, July 9, 2003, updated September 17, 2003 The study is based on 2002 data filed by BellSouth, SBC and Verizon with the FCC Qwest had not yet filed its 2002 financial data at the time of the study

[13] *Ibid* at p 14

[14] See, Declaration of Thomas W Hazlett, Ph D , Arthur M Havenner, Ph D , and Coleman Bazelon, Ph D , on Behalf of Verizon Communications, Inc , Reply Comments of Verizon Telephone Companies in Support of Petition for Expedited Forbearance from the Current Pricing Rules for the Unbundled Network Element Platform, WC Docket No 03-157 (filed September 2, 2003), and Declaration of R Carter Hill, Ph D , on Behalf of Z-Tel Communications, Inc , In the Matter of Petition for Forbearance From the Current Pricing Rules for the Unbundled Network Element Platform, WC Docket No 03-157 (September 18, 2003)

> instance, these changes *affirm and, in many cases, strengthen* the conclusion that Bell Company investment is positively related to UNE-P competition [15]

Another study has examined the state-by-state leased element purchases by a major CLEC, AT&T, and compares the level of these purchases with the extent to which AT&T has deployed its own local network facilities in that state [16] This analysis finds that no matter what measure of AT&T investment deployment is used (*i e* , number of local switches, number of switch terminations or route miles of local fiber), there is a significant positive relationship between AT&T's use of leased network elements and its investment in its own local network facilities

Finally, empirical findings that competitive access to network elements stimulates rather than deters investment are not unique to just the U S experience with unbundling The Organization for Economic Cooperation and Development (OECD) has found that in the thirty developed countries that constitute its membership, "the evidence indicates that opening access networks, and network elements, to competitive forces increases investment and the pace of development "[17] The OECD also notes that, "to date the major criticisms of unbundling or line sharing are that such policies allegedly discourage investment in new infrastructure No evidence has been forwarded to substantiate this claim "[18]

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[15] Phoenix Center for Advanced Legal and Economic Studies, "UNE-P Drives Bell Investment A Synthesis Model, ' Phoenix Center Policy Bulletin, No 6, September 17, 2003, p 4

[16] Declaration of Richard N Clarke, attached to Reply Comments of AT&T Corp , In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, CC Docket No 01-338, (filed July 17, 2002)

[17] Organization for Economic Cooperation and Development, *The Development of Broadband Access in OECD Countries*, October 29, 2001, p 4 ("*OECD Report*")

[18] *OECD Report*, p 15

C. Dissenting Analyses

John Haring *et al* purport to explain the relationship between ILEC investment and UNE pricing by regressing RBOC net plant in a state on the number of RBOC loops, the number of unemployed persons in the state, real gross state product, and the product of the number of RBOC loops and the UNE loop price for zone 1 [19] This relationship has neither any basis nor any meaningful interpretation in economic theory In fact, Haring, *et al* have effectively performed the equivalent of a regression tautology These authors use RBOC net plant in a state as the dependent variable, but then employ an equation where that dependent variable is a function of loops They then examine whether total net plant is larger when the aggregate value of loops is larger (assuming loops are valued at the zone 1 UNE loop price) Not surprisingly, they find that this is the case This analysis is flawed because loops constitute a significant portion of net plant, so the result will likely be a positive relationship as a matter of arithmetic rather than as a policy-relevant causal relationship Further, use of net plant as the dependent variable is flawed because the relevant issue is how the availability of UNEs affects *investment* Investment is the *change* in net plant rather than the simple level of net plant

Another flawed study was prepared directly by BellSouth, SBC and Verizon to examine the relationship between total ILEC investment per line and CLEC UNE-P lines

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[19] John Haring, Margaret L Rettle, Jeffrey H Rohlfs, and Harry M Shooshan III of Strategic Policy Research, "UNE Prices and Telecommunications Investment," attached to the Reply Comments of Qwest, In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, CC Docket No 01-338, (July 17, 2002)

per 1000 RBOC access lines [20] The authors' chief result is their finding that RBOC investment per line does not increase when the number of CLEC UNE-P lines increases They conclude from this that there is no relationship between UNE unbundling and ILEC investment This conclusion, however, is not supported by the regressions estimated in the report First, it appears that the authors make the same mistake as Haring, *et al* , in that they conflate the *stock* of capital per line with investment (which is the *change* in the stock of capital per line) Second, the RBOC authors fail to control for other significant factors that could reasonably influence the relationship between ILEC capital per line and the proportion of lines served by CLECs using UNE-P Such factors include demand conditions, the cost of telecommunications infrastructure or the effects of regulation As a matter of basic econometrics, the omission of such highly relevant variables means that the estimates obtained are likely biased and unreliable Third, the data relied upon for this analysis are incomplete and severely flawed [21]

5. Conclusions

The results of the empirical analyses reported here should come as welcome news for regulators and policymakers Had the *Investment Deterrence Hypothesis* found valid empirical support, policymakers and regulators would face an uncomfortable trade-off between the pro-competitive dictates of the Telecommunications Act and the growth-promoting effects of investment Fortunately, the empirical evidence we have studied

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[20] " UNE-P and Investment," Prepared for and Submitted by BellSouth, SBC, and Verizon, In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers CC Docket No 01-338, (July 17, 2002)

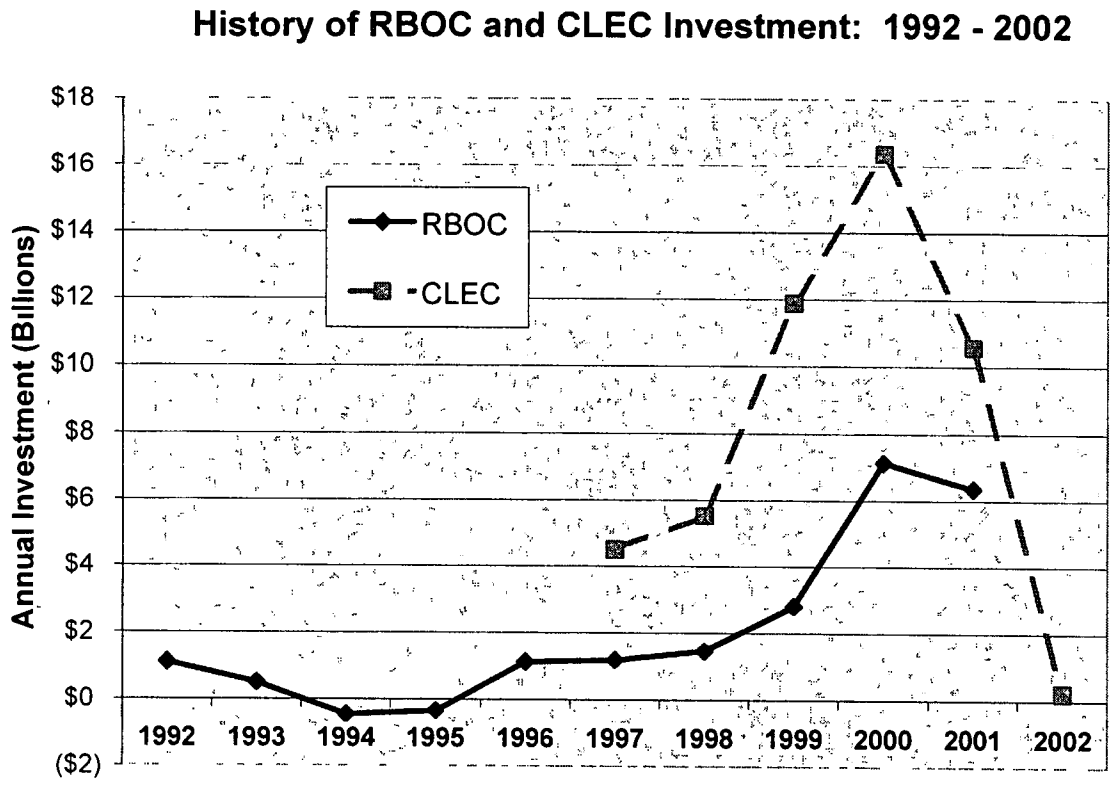
[21] *See*, C Michael Pfau, "Correcting the RBOCs' Empirical Analyses of the Linkage Between UNE-P and Investment," *ex parte* letter from Joan Marsh, AT&T to Ms Marlene Dortch, Secretary, FCC in CC Docket No 01-338, filed October 16, 2002

supports the *Competitive Stimulus Hypothesis* that the efficiency-enhancing effects of competition also promote investment Therefore, no such trade-off is necessary Regulatory policies that support access to unbundled network elements encourage both competition and investment

Regulators may take further comfort that this empirical conclusion is also consistent with sound economic theory As a general matter in economics, competitive markets produce greater output, which leads to greater investment, at lower prices than their monopolistic counterparts So, policy mechanisms like the provision of UNEs at TELRIC-based prices, which encourage competition, should also encourage investment This mechanism forms the basis for recent work by Kotlikoff and Hassett in which they analyze a dynamic and strategic model of entry and competition in telecommunications-related markets [22] They find, among other things, that telecommunications competition stimulates investment, a conclusion that is consistent with our finding of empirical support for the *Competitive Stimulus Hypothesis* The significance they attach to that finding for future economic growth is consistent with our finding that the elasticity of ILEC investment with respect to UNE prices is such that a 1% reduction in UNE prices may be expected to lead to an increase in ILEC investment of between 2 1 and 2 9%

[22] Kevin A Hassett and Laurence J Kotlikoff, "The Economics of Telecom Investment," mimeo (September 2002)

Chart



Data sources:

- RBOC investment data is year over year change in net plant from RBOC ARMIS reports to the FCC
- CLEC data are cumulative capital expenditures from 2003 Association for Local Telecommunications (ALTS) Report, reduced by 10% annual depreciation

Technical Appendix

Overview of Our Empirical Analysis

The empirical analysis in my work with Lehr, Bigelow and Levinson proceeded in two stages First, to distinguish between the competing predictions made by the two hypotheses, we conducted an analysis of the "reduced-form" relationship between ILEC investment and UNE prices To the extent that this relationship is positive, *i e* if higher UNE prices are associated with greater ILEC investment, the *Investment Deterrence Hypothesis* is supported To the extent that this relationship is negative, *i e* , if lower UNE prices are associated with greater ILEC investment, the *Competitive Stimulus Hypothesis* is supported Second, to examine more rigorously the linkages suggested by the *Competitive Stimulus Hypothesis* among UNE prices, CLEC participation in local telephone markets and ILEC investment, we conducted a further set of "structural form" regressions

Specification of the Reduced-Form Regression

The first analysis we performed of the relationship between UNE prices and ILEC investment is based on a reduced-form specification of the determinants of ILEC investment A reduced-form specification is one that is derived from a more complex set of simultaneously interacting relationships In a reduced-form specification, interactions between variables that exert mutual effects on one another are pushed into the background and the relationship to be estimated is a straightforward one between predetermined independent (or "exogenous") variables and a single dependent (or

endogenous") variable By contrast, structural-form relationships embody the interactions between endogenous and exogenous variables explicitly, have meaningful behavioral interpretations, and generally must be viewed as a system of relationships Their interaction, however, is more complex Reduced-form relationships are simpler because a variety of behavioral relationships have been subsumed into them [23]

In the analysis developed in the paper, the reduced-form relationship is between ILEC investment as the dependent variable, and a group of exogenous variables that influence ILEC investment either directly or indirectly through their effects on CLEC activity The reduced-form relationship takes the form

$$\begin{pmatrix} ILEC \\ Investment \end{pmatrix} = R\begin{pmatrix} Demand \\ Factors \end{pmatrix}, \begin{pmatrix} Current \\ Revenue \end{pmatrix}, \begin{pmatrix} ILEC\ Cost\ of \\ Investment \end{pmatrix}, \begin{pmatrix} CLEC\ Cost\ of \\ Participation \end{pmatrix}, \begin{pmatrix} Regulatory \\ Regime \end{pmatrix}$$

The Demand Factors, ILEC Cost of Investment, and Regulatory Regime variables are included to control for the effects of other factors on ILEC investment decisions –

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[23] For example, in the standard economic model of a competitive market, the quantity demanded of a good is determined by its price, the levels and distribution of income of its consumers, the prices of substitute and complementary goods, and parameters that reflect tastes Likewise, the quantity supplied of a good is determined by its price, the prices of goods and services used to produce the good, and parameters describing the technology for producing the good In the marketplace, the price of the good is determined by simultaneous operation of the demand relationship, the supply relationship, and the equilibrium condition that the quantity demanded should be equal to the quantity supplied In this model the demand relationship and the supply relationship interact simultaneously to determine two variables, *i e* , the quantity of the good changing hands in the market and the market price The values of these two "endogenous" variables are simultaneously determined by the demand and supply relationships and the values of the predetermined or exogenous variables such as income, prices of substitutes and complements, taste parameters, prices of factors of production, and technology parameters If one knew the demand and supply relationships, one could use them to calculate the market equilibrium price as a function of the exogenous variables The resulting relationship is called a "reduced form," because the simultaneous interaction of multiple relationships and variables has been reduced to a single relationship between the endogenous dependent variable and the exogenous independent variables

that is, factors not associated with UNE-based unbundling requirements Demand factors and the level of current revenue (an indication of current market prices) are included because they may be expected to influence ILEC investment directly, inasmuch as increased demand or higher prices should be expected to encourage investment, and indirectly, because they may have the same effect on CLEC activity The cost to an ILEC of its own investment should certainly influence the level of ILEC investment Variables relevant to describing the nature of the regulatory regime are also included because the character of regulation may be expected to have an effect on ILEC investment

The CLEC Cost-of-Participation variable is the variable whose coefficient provides the basis for distinguishing between the two competing hypotheses According to the *Investment Deterrence Hypothesis*, increases in UNE prices, which increase the cost of CLEC participation via UNEs, should increase ILEC investment That is, higher UNE prices render UNE-based entry less economically viable for CLECs, thereby alleviating the risk of alleged "free-riding" by CLECs According to the *Investment Deterrence Hypothesis*, this should increase the ILEC's incentive to invest In contrast, the *Competitive Stimulus Hypothesis* predicts that higher UNE prices will reduce ILEC investment because less economically-viable network element unbundling reduces CLEC competitive activity and the spur that such activity would otherwise provide for ILEC investment

Thus, empirically one may distinguish between these two hypotheses by examining the sign and the level of statistical significance of the estimated coefficient on the CLEC Cost-of-Participation variable

Specification of the Structural-Form Regressions

In order to test directly the *Competitive Stimulus Hypothesis*, we used a structural approach The *Competitive Stimulus Hypothesis* does not merely predict the negative relationship between UNE pricing and ILEC investment confirmed in the previous section That prediction is based on further empirically testable predictions that the level of CLEC competition will be negatively related to UNE pricing and that the level of ILEC investment will be positively related to the level of CLEC competitive activity Thus, according to the full economic structure of the *Competitive Stimulus Hypothesis*, it is the combination of these two effects that gives rise to the overall negative relationship observed between ILEC investment and UNE pricing

In order to investigate empirically these two effects, we employ a specification that looks beyond the summary relationships embodied in the reduced-form This specification involves a system of two equations The first,

$$\begin{pmatrix} ILEC \\ Investment \end{pmatrix} = f\begin{pmatrix} Demand \\ Factors \end{pmatrix}, \begin{matrix} Current \\ Revenue \end{matrix}, \begin{matrix} ILEC\ Cost\ of \\ Investment \end{matrix}, \begin{matrix} Regulatory \\ Regime \end{matrix}, \begin{matrix} CLEC \\ Activity \end{matrix},$$

posits that ILEC investment is a function of demand factors, current revenue, the cost of investment to ILEC firms, the form of the regulatory regime, and the level of competitive activity by CLEC firms This equation reflects the direct determinants of the ILECs' behavior

The second equation reflects the determinants of the behavior of CLECs It takes the form

$$\begin{pmatrix} CLEC \\ Activity \end{pmatrix} = g\left(\begin{matrix} Demand \\ Factors \end{matrix}, \begin{matrix} Current \\ Revenue \end{matrix}, \begin{matrix} CLEC\ Cost\ of \\ Participat\ ion \end{matrix} \right)$$

In this equation the cost of participation to a CLEC is measured by the UNE prices

Taken together, these two equations form a system that determines two endogenous variables, ILEC investment and CLEC activity, as functions of the exogenous variables In this system, support for the *Competitive Stimulus Hypothesis* would take the form of a finding that CLEC Cost-of-Participation is negatively related to CLEC activity in the second equation and that the level of ILEC investment is positively related to the level of CLEC activity in the first equation

Results

We found statistical evidence that the relationship between UNE pricing and ILEC investment is negative and, therefore, that the empirical evidence refutes the *Investment Deterrence Hypothesis* and is consistent with the *Competitive Stimulus Hypothesis* Our reduced-form regressions are statistically significant and explain a large share of the variation in the dependent variable, ILEC investment Moreover, the estimated effects of various other independent control variables include statistically significant estimates that are consistent with the underlying economic theory

Having found confirmation of the *Competitive Stimulus Hypothesis'* prediction in the first stage we also tested directly the mechanism of *the Competitive Stimulus Hypothesis* using "structural-form" relationships According to the *Competitive Stimulus*

Hypothesis, lower UNE prices lead to greater CLEC activity, and greater CLEC activity leads to greater ILEC investment We therefore estimate the effect of UNE prices on CLEC activity and the effect of CLEC activity on ILEC investment Again, we found a negative relationship between UNE prices and CLEC activity, *i e* , that higher UNE prices lead to less CLEC activity, and a positive relationship between CLEC activity and ILEC investment, *i e* , that greater CLEC activity leads to greater ILEC investment Notably, these results are obtained from regressions that are themselves statistically significant, explain a high share of the variation in the dependent variable and produce estimates consistent with economic theory [24]

[24] An earlier version of the analysis described above (which was based on a less complete data set) was included in a filing to the FCC in the *Declaration of Robert D Willig on Behalf of AT&T*, In the Matter of Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers, CC Docket No 01-338, (April 5, 2002)

The principal challenge made to that earlier analysis was that it relied on UNE-P rates from June 2002 to explain CLEC activity and ILEC investment from earlier periods The results we report in this analysis were obtained using UNE price data from a variety of sources compiled at various times between 1996 and 2002 Our data include UNE-P rates compiled by AT&T in 2002 as well as Regulatory Research Associates *TeleFOCUS* estimates from August 2000, the National Regulatory Research Institute's estimates from Spring 2001 and July 2002, and the loop proxy rates established by the FCC in its August 1996 *First Report and Order* in CC Docket No 96-98 We have continued to find empirical support for the *Competitive Stimulus Hypothesis* and support adequate to reject the *Investment Deterrence Hypothesis* using UNE price data from as early as 1996 as well as with data from 2002 Thus, our conclusions are not dependent on the time at which the UNE-P rates were compiled