Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
Review of the Commission's Rules Regarding The Pricing of Unbundled Network Elements And the Resale of Service by Incumbent Local Exchange Carriers	)	WC Docket No. 03-173

COMMENTS OF Z-TEL COMMUNICATIONS, INC.

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December 16, 2003

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On September 15, 2003, within two weeks of completing a "Triennial Review" of its unbundled network element policies that lasted nearly two years, the Commission proposed wide-reaching and ill-conceived changes to the methodology by which those network elements are priced.[1] With this submission, Z-Tel Communications, Inc. (Z-Tel) has now been obliged to file over 1300 pages of comments, attachments, and studies in the last year (in dockets CC 01-338, WC 03-157 and now WC 03-173), in proceedings that will determine whether Z-Tel is able to stay in business and continue to provide services to its customers. Far from promoting "regulatory certainty," the Commission's continual revisiting of even the most basic of questions has ensured that CLEC business plans remain subject to never-ending regulatory review. Moreover, the Commission's current proposal to radically transform its pricing principles for

[1] *Review of the Commission's Rules Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers*, WC Docket No. 03-173, Notice of Proposed Rulemaking (rel. Sep. 15, 2003) ("*TELRIC Notice*" or "*Notice*").

unbundled network elements ("UNEs") dramatically undercuts its *Triennial Review Order*,[2] by rendering meaningless the granular analyses mandated there. Those analyses are, of course, necessarily based on competitive entry to date, made possible by the very pricing principles that the Commission now proposes to abandon.

Calling itself a "comprehensive review,"[3] the *TELRIC Notice* comprehensively unsettles the Commission's unbundling regime, by placing in question the critical methodology for calculating the prices that incumbents may charge for UNEs. Pricing is critical, of course, because incorrect pricing of UNEs – pricing that permits incumbent LECs to charge supercompetitive or monopoly prices – will destroy competition. And UNE prices that fail to reflect, as accurately as possible, the minimum economic cost of reproducing the functionality of an element – precisely what TELRIC approximates – send incorrect price signals to entrants and destroy the balance between the impairment analysis of §251(d)(2)(B) and the efficient duplication of incumbent facilities.[4]

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[2] *In re Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, CC Docket Nos. 01-338, 96-98, 98-147 (rel. Aug. 21, 2003) ("*TRO*").

[3] *Id.* at ¶ 1.

[4] Congress struck this balance by limiting unbundling to elements without which the requesting CLEC would be either altogether *prevented* from providing the services it seeks to offer (§ 251(d)(2)(a)) or *impaired* in its ability to provide such services (§251(d)(2)(b)). By setting "cost" equal to the minimum economic cost of reproducing the functionality of an element (*i.e.*, TELRIC), the FCC ensured that the joint implementation of §251 and §252 would not deter efficient investment decisions by CLECs. Specifically, if the CLEC could produce the element itself at something approximating minimum economic cost, then the CLEC would have incentive to do so. If the CLEC could not self-provide at something approximating minimum economic costs, the CLEC would have the incentive to purchase the element and thereby avoid the socially inefficient duplication of existing network.

In this review, the Commission must recognize that the *TRO* placed significant restrictions on CLECs' ability to access unbundled network elements through section 251. Indeed, because the *TRO* restricted access to ILEC "fiber loops" (and other advanced network elements), one of the Commission's stated purposes of its TELRIC rules – to "provide incumbent LECs an opportunity to recover the forward-looking costs of providing UNEs"[5] – is now both inappropriate and logically unsound. It is inappropriate because ILECs cannot properly recover from CLECs the costs of network elements to which CLECs have been denied access. And it is logically unsound because UNE pricing rules can have no conceivable effect on ILEC incentives to deploy network facilities that are (under the *TRO*) no longer UNEs.[6]

In addition, the Commission should recognize its relatively limited experience with forward-looking cost methodologies. Unlike this Commission – which had never analyzed or adopted a forward-looking cost methodology until the Hybrid-Cost Proxy Model for universal service support in 1998[7] – state commissions have routinely utilized forward-looking analysis as

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[5] *Id.* at ¶ 38.

[6] *See* TRO at ¶ 448 ("given that we do not require packet switches to be unbundled, there is little, if any, basis for an argument that our treatment of circuit switches gives LECs a disincentive to upgrade their switches."); n.1365 ("we no longer unbundled packet switching and the advanced networks used with such switching. This means that to the extent there are significant disincentives caused by unbundling of circuit switching, incumbents can avoid them by deploying more advanced packet switching. This would suggest that incumbenrs have every incentive to deploy these more advanced networks, which is precisely the kind of facilities deployment we wish to encourage.").

[7] *Federal-State Joint Board on Universal Service*, CC Docket Nos. 96-45, 97-160, Fifth Report and Order, 13 FCC Rcd 21323, 21335-62, paras. 26-92 (1998) (*USF Platform Order*); *USF Inputs Order*, 14 FCC Rcd at 20171-350, paras. 29-439. When the Commission has engaged in forward-looking cost estimation, the BOCs have been exceedingly critical of these efforts. For example, witnesses for Verizon alleged that HCPM "does not conform to the Bellcore engineering standards, which guide real-world network planning;" that the model uses "imprecise and outdated data;" that the model "ignores real-world considerations;" that the model has "fundamental errors in the switching and interoffice module;" and that the model is "incapable of accounting for significant attributes of a given carrier's network and the specific

a rate-setting tool for telecommunications, electric, and other services. Rather than basing its "comprehensive review" (¶1) on vague "concerns" (¶2) about a purported need to "simplify" the pricing methodology (¶ 4), the Commission should empirically examine whether TELRIC, as implemented by the states, has had the undesirable effects the Commission fears.

In these Opening Comments, Z-Tel provides strong empirical evidence that it has not. Z-Tel shows that TELRIC pricing has not discouraged ILEC investment, but rather that such investment has been *greater* in areas with *more* unbundling. In addition, Z-Tel demonstrates that the state commissions have, on the whole, established rates for unbundled loops that match or exceed long-run forward-looking costs. In fact, Z-Tel's analysis shows that state commissions seem to have consistently priced unbundled circuit switching well *above* long-run forward-looking costs.[8] Finally, empirical evidence shows that there is no troubling "variability" in state-by-state TELRIC implementation. Accordingly, the very purpose behind the Commission's proposals to "simplify" TELRIC is ephemeral.

I. PLACING THE TELRIC DEBATE IN CONTEXT: COST-BENEFIT ANALYSIS OF TELRIC "REFORMS"

If history is any guide, this comment cycle will generate innumerable submissions from the industry that the Commission will need months or even years to digest. This section provides a general framework for reviewing these voluminous contributions.

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operating realities faced by that carrier." *See* Surrebuttal Testimony of Dr. Timothy J. Tardiff and Mr. Francis J. Murphy on Behalf of Verizon Florida Inc., March 18, 2002, Florida Docket No. 990649B-TP, 15-21.

[8] Ironically, Bell companies have have requested the Commission to forbear from its TELRIC rules for circuit switching. *See, generally,* Petition for Expedited Forbearance of the Verizon Telephone Companies, WC Docket No. 03-157 (filed July 1, 2003); Joint Petition of Qwest Corporation, BellSouth Telecommunications, Inc. and SBC Communications Inc. for Expedited Forbearance, WC Docket No. 03-189 (filed July 31, 2003).

Because the Commission and state commissions will be staffed with humans for the foreseeable future, the prices for unbundled network elements will always contain some error. Indeed, given the hundreds of rate elements that are established pursuant to the TELRIC methodology, there will always be opportunities for one party or another to highlight mistakes. Such colloquial evidence, while rhetorically useful, is of little value in setting policy. Policy should, of course, be set with an eye to reducing the number and severity of errors. At the same time, however, one must keep in mind that the additional cost of minimizing some kinds of errors may actually exceed the harm that the errors caused in the first place. Radically reformulating the costing standard just as state regulators have become skilled in implementing TELRIC seems a very high-cost solution to a problem of unevaluated (at least by the Commission) magnitude.

Take, for example, the Commission's "tentative conclusion" that "our TELRIC rules should more closely account for the real-world attributes of the routing and topography of an incumbent's network in the development of forward-looking costs." ¶ 52. The Commission should engage in a cost-benefit analysis of that proposed change. Generally, TELRIC models today utilize complex algorithims developed over many years to estimate the length of copper wire or fiber it would take to "wire" a neighborhood. Incumbent LECs can no doubt find neighborhoods in which the algorithim will turn up the "wrong" number – for example, the calculations may not take into account the presence of a river, bridge, or a recalcitrant property owner. The CLECs, alternately, could provide examples where the calculations err in the direction of too much plant.

But the price of fixing such errors by further complicating or replacing already complex and data-intensive algorithms may far exceed the benefits. Would regulators look to detailed

ILEC inventories of all their local loops, including the actual length of all in-service loops and all not in-service? Does that information exist, and how often is it updated? How would state commissions and competitors be able to verify such information?[9] If inventories are not kept or up-to-date, what would be the cost of gathering, reviewing and updating that information? Who would bear the cost, and would that cost recovery impact UNE rates and, ultimately, CLEC entry? Would requiring more detailed local network routing and topography maps actually "product results that are more consistent across states," (¶ 54), or would it reflect disparities resulting from good data and records in some states and poor data in other states? These are questions that the Commission should seek to answer.

The Commission's cost-benefit analysis should assess whether creating actual routing and topography maps will produce sufficiently "better" results than the current algorithims, in the sense of creating improved price signals for investment. Setting aside the issue that actual topography mapping would lock-in inefficient ILEC network deployment decisions made in the past,[10] actual mapping could only improve the output of today's "hypothetical" algorithims by a certain level. Is that improvement – whatever the Commission thinks it may be – worth the time and effort? Probably not. For example, actual-network deviations from the current, hypothetical system may be, at most, 5% (in either direction), but the costs of collecting and assessing

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[9] The Supreme Court has noted that incumbent LEC books may not accurately reflect actual plant in service. *Verizon Communications Inc. v. FCC*, 535 U.S. at 512, 518 ("the temptation would remain to overstate book costs to ratemaking commissions and so perpetuate the intractable problems that led to the price-cap innovation"); *id* at 517-18 ("the 'book' value or embedded costs of capital presented to traditional ratemaking bodies often bore little resemblance to the economic value of capital"); *id*. at 518 ("book costs may be overstated by approximately $5 billion").

[10] As the Supreme Court has indicated, if "leased elements were priced according to embedded costs, the incumbents could pass these [embedded] inefficiencies to competitors in need of their

detailed loop run information may be enormous.[11] Only after the collection and assessment costs of compete routing and topography maps are estimated and compared to the costs of the alleged estimation error can the regulator even begin to determine whether engaging in this Herculean effort will be worth it. Z-Tel suspects that such analysis will demonstrate that moving closer to the existing network topography from an efficient network topography will probably yield cost estimates *less* efficient than those currently in place, rendering the Commission's proposal merely a costly means by which to distort price signals. Such a proposal would obviously flunk the cost-benefit test.

The Commission's review should subject all proposals to "reform" TELRIC to this type of cost-benefit analysis. The goal is not to obtain "perfect" prices – such prices are not obtainable by human institutions. Rather, the Commission's goal should be to determine whether proposed changes are worth the costs of implementation, weighing actual benefits against the burdens upon parties and state commissions.[12] "Reforms" that correct one perceived error while creating the potential for an even greater error are not really reforms at all. In addition, as discussed below, "reforms" that purport to advance what is now a logically invalid purpose – promoting ILEC "investment" in advanced, un-unbundled network facilities – at the

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wholesale elements, and to that extent defeat the competitive purpose of forcing efficient choices on all carriers whether incumbents or entrants."). *Verizon*, 535 U.S. at 512.

[11] If the Commission acts on its tentative conclusion that TELRIC studies should incorporate "the real-world attributes of the routing and topography of an incumbent's network," ¶ 52, the Commission should forbid the usage of partial surveys of "actual routing and topography" in TELRIC studies. If the goal is to discover the "actual routing and topography" of the local network, the entire local network must be surveyed – not simply extrapolated from a partial survey. Extrapolating from partial surveys suffers from the same alleged flaw as existing algorithims, and replacing today's algorithims with partial surveys would simply replace one form of "hypothetical" estimate with another.

[12] As the Commission noted in the *Notice*, "[t]he drain on resources for the state commissions and interested parties can be tremendous." *Notice* at ¶6.

expense of the Commission's statutory mandate of promoting competition are unlawful.[13]

In the following section, Z-Tel addresses the recurrent ILEC refrain that TELRIC pricing must be changed to promote ILEC investment. Z-Tel demonstrates that that argument makes little sense after the *TRO* and, in any event, that the current TELRIC pricing methodology supplies appropriate incentives.

II. TO THE EXTENT IT REMAINS A RELEVANT INQUIRY, TELRIC PRICING OF UNES PROMOTES TELECOM INDUSTRY ENTRY AND INVESTMENT.

In paragraph 39 of the *Notice*, the Commission states that one of the "objectives" of the UNE pricing rules is to "provide appropriate economic signals with respect to efficient competitive entry and investment while providing incumbent LECs with the opportunity to recover the forward-looking costs of providing UNEs." After the *TRO,* that "objective" no longer holds water.

Given the radical reshaping of unbundling policies set forth in the *TRO*, when it comes to promoting "investment," there remains little for the TELRIC rules to accomplish. The *TRO* establishes that incumbent LECs need not provide section 251(c)(3) unbundled access to a large number of advanced network elements. According to the *TRO*, the determination to "refrain from unbundling incumbent LEC next-generation networks . . . will stimulate facilities-based deployment in two ways":

> First, with the certainty that their fiber optic and packet-based networks will remain free of unbundling requirements, incumbent LECs will have the opportunity to expand their deployment of these networks, enter new lines of business, and reap the rewards of delivering broadband services to the mass market. Thus, we conclude that relieving incumbent LECs from unbundling

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[13] *Motor Vehicles Manufacturers Ass'n. v. State Farm Mutual Automobile Insurance Co.*, 463 U.S. 29, 42-43 (1983) (agency decisions must be "rational, based on the consideration of the relevant factors and within the scope of the authority delegated to the agency by the statute").

> requirements for these networks will promote investment in, and deployment of, next-generation networks. Second, with the knowledge that incumbent LEC next-generation networks will not be available on an unbundled basis, competitive LECs will need to continue to seek innovative network access options to serve end users and to fully compete against incumbent LECs in the mass market.[14]

In other words, the Commission has found that *removing* broadband elements from the list of items to be unbundled will promote investment in new network technology by incumbents and competitors alike. Since the Commission's UNE pricing rules only apply to *unbundled* network elements, those rules can have no impact whatsoever on incentives surrounding broadband investment and deployment. As the Commission found with respect to its decision not to order section 251 unbundling of packet switching, "to the extent there are significant disincentives caused by unbundling of circuit switching, incumbents can avoid them by deploying more advanced packet switching. This would suggest that incumbents have *every incentive* to deploy these more advanced networks, which is precisely the kind of facilities deployment we wish to encourage."[15]

Even setting this issue aside – and ignoring that the purpose of Commission policy should be to promote *consumer welfare* and not necessary *capital expenditures*[16] – it is now readily apparent that TELRIC rules have not, in fact, deterred investment. Empirical evidence that shows a significant positive correlation between unbundling and investment continues to pile up against the ILECs.

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[14] *TRO* at ¶ 272.

[15] *Id.* at n.1365 (emphasis added).

[16] In fact, over-investment can cause considerable economic harm. For instance, many industry commenters blame the current telecom industry downturn on *too much* investment in telecom

Attachment 1 to these Comments (Phoenix Center Policy Bulletin No. 5) is a comprehensive study reviewing ARMIS data filed before the FCC. It plainly shows that Bell Operating Companies (BOCs) have actually invested *more* into local telecommunications plant in states where there is *more* unbundled entry.[17] If the current TELRIC rules genuinely discouraged BOC investment, the results of the Phoenix Center analysis would be precisely the opposite.

The BOCs' attempt to rebut this analysis – introduced by Verizon in CC Docket 03-157 – only provides further support for the Phoenix Center findings. Attachment 2 contains a Phoenix Center study (Policy Bulletin No. 6) that incorporates the comments and suggestions of the BOC's advocates, and again shows that availability of the UNE platform has spurred incumbent LEC investment. Indeed, incorporating the BOC advocates' suggestions into the original Phoenix Center model actually strengthens the results.

These Phoenix Center studies confirm a plethora of econometric studies showing that unbundling at TELRIC rates and competitive entry have promoted competitive investment.[18]

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infrastructure. Z-Tel submits that the Commission's seeming commitment to re-inflating the telecom industry "bubble" of the late 1990s could cause considerable harm to the public.

[17] The study shows that BOC average net investment in telecommunications plant increased $759 for each UNE-P line in service, and that BOC investments were more-heavily allocated to states where more unbundling had taken place. Attachment 1.

[18] *See, e.g.,* T.R. Beard, G.S. Ford and T.M. Koutsky, "Mandated Access and the Make-or-Buy Decision: The Case of Local Telecommunications Competition," www.telepolicy.com/BKFfinal.pdf (2002) (analyzing relationship between pricing of UNEs and competitive deployment of switches); G.S. Ford and M.D. Pelcovits, "Unbundling and Facilities-Based Entry by CLECs: Two Empirical Tests," www.telepolicy.com/twotest.pdf (2002) (higher UNE rates reduce facilities-based entry); "An Empirical Examination of the Unbundled Local Switching Restriction," Z-Tel Policy Paper No. 3, www.telepolicy.com/zpp3.pdf (2002); "Does Unbundling Really Discourage Facilities-Based Entry? An Econometric Examination of the Unbundled Local Switching Restriction," Z-Tel Policy Paper No. 4, www.telepolicy.com/zpp4.pdf (2002).

These findings support the underlying theory of unbundling and forward-looking cost pricing: unbundling of incumbent LEC networks at TELRIC permits new entrants to share the economies of scale, scope and density that incumbent LECs possess with their ubiquitous networks. Without the ability to share in those economies of scale, scope and density (and without any restrictions on such access), competitors do not enter local markets and, logically, the relative absence of entry opportunities for competitors undermines their ability to subsequently invest in new networks.[19]

In the end, the familiar ILEC complaint that TELRIC discourages "investment" is a rhetorical one and the ILECs have fallen far short of producing the empirical evidence to support their case. The United States Supreme Court rejected ILEC arguments in *Verizon Communications Inc. v. FCC*, 535 U.S. 467 (2002) (*Verizon*), noting the billions of dollars of investment made by the industry since the 1996 Act was passed. "[A] regulatory scheme that can boast such substantial competitive capital spending over a 4-year period is not easily described as an unreasonable way to promote competitive investment." *Id.* at 517.[20] In fact, the

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[19] As the Commission decided in 1996, "the interconnection and unbundling obligations that the Act imposes on incumbent LECs. … pave the way for the introduction of facilities-based competition with incumbent LECs." *Implementation of the Local Competition Provisions of the Telecommunications Act of 1996,* CC Docket No. 96-98, First Report and Order, 11 FCC Rcd 15499, ¶ 177 (1996), *aff'd in part and vacated in part sub nom. Competitive Telecommunications Ass'n v. FCC*, 117 F.3d 1068 (8th Cir. 1997) and *Iowa Utils. Bd. V. FCC*, 120 F.3d 744 (8th Cir. 2000), *reversed in part sub nom. Verizon Communications Inc. v. FCC*, 535 U.S. 467 (2002) ("*Verizon*"). The Commission also noted that "a forward-looking incremental cost methodology creates the right investment incentives for competitive facilities-based entry and creates incentives for the market to move towards competition while preserving opportunities for competition even if some network elements prove to be resistant to competition." *Id.,* 11 FCC Rcd 15499 at ¶ 634).

[20] As pointed out by Commissioner Copps, with regard to TELRIC, the Commission is "building on solid ground." *TRO,* Statement of Commissioner Michael J. Copps, Approving in Part and Dissenting in Part ("In adopting TELRIC rules, [w]e did the right thing. The Supreme Court

Bell's count of 1,300 CLEC voice switches likewise belies the notion that access to unbundled switching has deterred investment in such switching (although data also shows that over 75% of those facilities-based CLECs have disappeared).[21]

III. A SYSTEMATIC STUDY OF TELRIC PROCEEDINGS DEMONSTRATES FEW, IF ANY, "VARIABLE RESULTS" TO JUSTIFY MODIFICATION OF THE TELRIC METHODOLOGY

According to the *Notice,* the Commission's "objective" is to "help state commissions" and "provide more certainty and consistency in the results of these state proceedings."[22] While laudable, that objective begs the question whether there is, in fact, significant uncertainty and inconsistency in state TELRIC proceedings.

As discussed above, changes to the TELRIC methodology directed to "help[ing] state commissions" would be useful only if cost-justified. As the Commission has recognized, TELRIC proceedings drain the resources of state commissions and the industry (see note 12, *supra*). To date, other than two recently-filed petitions by incumbent LECs for forbearance from TELRIC for unbundled local switching, in seven years, no state commission, incumbent, or competitor has formally asked for "help" from this Commission with regard to clarifying or modifying its TELRIC rules. No incumbent LECs has challenged in a court of law – much less successfully challenged – any specific UNE price established by a state commission as confiscatory.

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blessed our action – pretty heady stuff for a Commission not always accustomed to such approbations from above.").

[21] *TRO* at ¶¶ 435-42 (number of switches deployed by competitive LECs); *see id.* at ¶ 37 (noting that from 2000 to 2002, the number of facilities based competitive LECs shrunk from "about 300" to "about 70").

[22] *Notice* at ¶ 9.

Importantly, the *Notice* does not contain any Commission analysis illustrating that state commissions have come up with different and inconsistent pricing decisions under the TELRIC rules. The Commission simply asserts its concern about the potential for "significant differences in rates from state to state, and even from proceeding to proceeding within a state,"[23] without examining whether these variable results exist or whether any variations are the product of TELRIC rule complexity or genuine cost differences. The FCC then hastily concluded that the "hypothetical nature" of TELRIC generates a "lack of predictability in UNE rates" that undermines the ability of UNE rates to send "correct economic signals."[24]

Even if the Commission's conclusion of "variability" in state TELRIC decisions were correct – which, as discussed below, it does not appear to be – the Commission's "solution" to this unproven problem is untenable. Specifically, the "tentative conclusion" set forth in ¶¶ 52-54 of the *Notice* would require state commissions to establish rates through a mixture of short-run and long-run cost recovery – depending upon the network facility at issue – which would only foster further uncertainty and more rate cases. This cure may well be worse than the alleged disease.

Indeed, there is no evidence that the patient is even sick. The Commission completely sidesteps the real question: Are there are "significant differences in rates from state to state" that arise from TELRIC complexity and not genuine cost differences? That is, of course, an empirical question.[25] Attachment 3 to these Comments provides an empirical answer, analyzing

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[23] *Id.* at ¶ 6.

[24] *Id.* at ¶ 7.

[25] The Commission has the resources to conduct such an inquiry – the fact that it did not do so and place it out for industry comment and input prior to proposing new rules in the *Notice* is a major flaw. Of course, if the Commission undertakes such a study, Z-Tel expects that it will not

state commission UNE loop and switching prices to determine whether there exists variability in UNE rates unjustified by "genuine cost differences." The study shows that in general, loop rates *do* track cross-state cost differences and that these prices are "improving" over time – in other words, even the limited variability in loop rates from genuine cost differences is *decreasing* over time. The study also finds that while the prices of unbundled circuit switching are proportionate to costs, those rates generally exceed costs by 60%.[26]

IV. CONCLUSION

TELRIC is not a perfect methodology. No human method of rate-setting can be perfect. But the task of regulators is not perfection; it is to carry out their statutory mandate in the way that best promotes consumer welfare. The statutory mandate of section 251(d) of the 1996 Act is to set rates that are "based on cost." Accordingly, UNE pricing rules are *not* the place to advance other social policy goals (such as encouraging "investment" or ensuring universal service). Moreover, the Commission's stated "objective" for its UNE rate rules – to provide "appropriate economic signals" for ILEC and CLEC investment – is no longer valid, given the Commission's recent decision to wall-off next-generation networks from unbundling in the *TRO*. The Commission's goal now should be to establish clear rules that promote competition, the underlying purpose of the 1996 Act and its unbundling rules.

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be an "overly simplified correlation model[] or state-to-state comparison[] lacking adequate explanation of the relevant variables." *TRO* ¶ 449 n.1373.

[26] These findings suggest that for loop and switching rates, the variation in state commission decisions proportionally tracks relative difference in costs.

State commissions have far more experience with forward-looking pricing methodologies than the Commission. Indeed, the econometric research on the appropriateness of forward-looking rate-setting methodologies emanates from state commission experience in the electric and telecom industry pre-dating both the 1996 Act and any Commission experience with forward-looking pricing. Moreover, the Commission has not shown that state commissions have, in fact, produced UNE rates that vary significantly from the Commission's objectives. Before offering to "help" state commissions to implement TELRIC, the Commission should be certain that "help" is needed.

The research attached to these Comments indicates that "help" is not needed. The Commission can rest easy regarding its concern that TELRIC may discourage "investment" – the Phoenix Center econometric research in Attachments 1 and 2 shows that unbundling at TELRIC rates has resulted in a significant *increase* in industry investment. Moreover, the Commission's concern that there may be significant state-by-state variability in UNE rates that are the result of TELRIC complexity and not genuine cost differences is unwarranted. Attachment 3 shows that over time, variability in state TELRIC rates has declined significantly. In fact the pattern is what one would expect: initial state commission implementations of the TELRIC rules generated variation, but over time that variation has decreased as states "learn by doing" (and learn from one another).

New Commission rules should not impede that progress. If anything, the Commission should applaud those developments and not call a "do-over" and throw the industry into another seven years of uncertainty.

Respectfully submitted,

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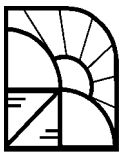
ATTACHMENT 1



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PHOENIX CENTER POLICY BULLETIN NO. 5

Updated 17 September 2003
Originally released 9 July 2003.
Changes described at end of document.

COMPETITION AND BELL COMPANY INVESTMENT IN TELECOMMUNICATIONS PLANT: THE EFFECTS OF UNE-P

Summary of Findings: After a brief discussion on expected and actual investment behavior in the telecommunications industry after the 1996 Act, an econometric model is used to quantify the relationship between UNE-P competition and Bell Operating Company investments in telecommunications plant. Using publicly-available Federal Communications Commission data, a positive relationship between UNE-P competition and BOC average net investment is found. According to the model, each UNE-P access line increased BOC average net investment by $759 per year, or about 6.4% per year in the aggregate. While BOC net investment fell by about 7% in 2002, investment dollars were more heavily allocated to states with greater levels of UNE-P competition, and this additional investment offsets the total decline in investment by about 50%.

I. Introduction: Bell Company Investment Post-1996 Act

PHOENIX CENTER POLICY BULLETIN NO. 4 examined the Telecommunications Act of 1996's general effect on investment by telecommunications firms. Using publicly-available government data on investment by telecommunications firms, that BULLETIN quantified the substantial and sustained increases in investment by telecommunications firms immediately following the 1996 Act and continuing through 2001 (the last year for which data was available).[1] The statistics reported in that BULLETIN indicated that the 1996 Act led to an

[1] PHOENIX CENTER POLICY BULLETIN NO. 4: *The Truth About Telecommunications Investment* (24 June 2003) (available at http://www.phoenix-center.org/PolicyBulletin/PolicyBulletin4Final.pdf). According to the BEA webpage, it expects to release 2002 data around September 2003.

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additional $267 billion in telecommunications investment from 1996 through 2001. Equally as important, PHOENIX CENTER POLICY BULLETIN NO. 4 demonstrated that the capital stock for this time period also grew rapidly with net capital-stock exceeding historical trend by nearly $200 billion at the end of 2001.[2] The evidence presented in that BULLETIN clearly is consistent with the hypothesis that the 1996 Act increased capital spending in the telecoms sector. As the U.S. Supreme Court recognized: it "suffices to say that a regulatory scheme [*i.e.,* requiring monopoly incumbents to unbundle key elements of their network at their Total Element Long-Run Incremental Costs or "TELRIC"] that can boast such substantial competitive capital spending over a 4-year period is not easily described as an unreasonable way to promote competitive investment in facilities."[3]

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[2] *Id.*

[3] V*erizon v. FCC*, 122 S. Ct. 1646, 1675-76 (2002). Since the FCC's adoption of TELRIC, the Bell Companies have presented a wide variety of objections, ranging the full gamut from TELRIC produces confiscatory (*i.e.,* below-cost rates that constitute an improper "takings" under the Constitution) to lack of profitability to just plain unfairness. *See, e.g., In the Matter of Petition for Forbearance From the Current Pricing Rules for the Unbundled Network Element Platform, Petition For Expedited Forbearance of the Verizon Telephone Companies* (filed 1 July 2003). Unfortunately for the Bells, however, such a claim is supported neither by the law, economics or facts. To wit, the Court in *Verizon* expressly found that, among other things: (1) the Bells are monopolists and, as such, Congress intended to treat them differently and impose asymmetrical regulation to mitigate their market power; (2) "Convergence" of networks (*i.e.*, so called "inter-modal" competition") is ephemeral at best, and consumers generally do not view other distribution technologies as close substitutes for the Bells' local access networks; (3) BOC sabotage against their rivals for wholesale "last mile" access remains real and must be addressed; (4) Because the local market is far from competitive (just as when the Bell system was first broken up), the BOCs today can still leverage their market power in the last mile into the ancillary markets such as long distance, terminal equipment and data; and (5) Rivals who enter via unbundled network elements are *not* "parasitic competitors" and that any notion that TELRIC stymies facilities-based competition "founders on fact." For a full discussion of the *Verizon* Opinion and the current FCC broadband initiatives, *see* Lawrence J. Spiwak, *The Telecoms Twilight Zone: Navigating the Legal Morass Among the Supreme Court, the D.C. Circuit and the Federal Communications Commission*, PHOENIX CENTER POLICY PAPER SERIES NO. 13 (August 2002) (http://www.phoenix-center.org/pcpp/PCPP13Final.pdf); COMMUNICATIONS WEEK INTERNATIONAL, *Opinion: U.S. Competition Policy – The Four Horsemen of the Broadband Apocalypse* (01 April 2002) (available at http://www.phoenix-center.org/commentaries/CWIHorsemen.pdf).

Moreover, the record simply does not support the BOCs' position. PHOENIX CENTER POLICY PAPER NO. 16 reveals that the States have been extremely careful to ensure that TELRIC rates accurately reflect the Bells' forward looking costs. Moreover, the States have actually preserved some BOC profit in a politically-sensible "50/50" split between the desired outcomes of new entrants and the incumbents. Accordingly, the fact that BOC margins are declining is an intended consequence of the Telecommunications Act 1996 and a rational public policy that, deliberately, does not incorporate the monopoly rents the Bells have traditionally enjoyed in the wholesale prices for unbundled network elements. T. Randolph Beard and George S. Ford, W*hat Determines Wholesale Prices for Network Elements in Telephony? An Econometric Evaluation,* PHOENIX CENTER POLICY PAPER NO. 16 (September 2002) (http://www.phoenix-center.org/pcpp/PCPP16.pdf).

Similarly, the BOCs' argument is particularly odd under any scenario because the BOCs will lose *more money* if they lose a customer to a facilities-based competitor outright. As PHOENIX CENTER POLICY PAPER NO. 15 demonstrates,

(Footnote Continued….)

This BULLETIN goes beyond PHOENIX CENTER POLICY BULLETIN NO. 4 to analyze how particular pro-competitive policies of the 1996 Act have specifically affected investment by the Bell Operating Companies ("BOCs") in telecommunications plant. In particular, this BULLETIN evaluates the impact on BOC investment of the 1996 Act's requirement that the BOCs (and other local exchange carriers) offer to competitors the unbundled element combination of loop, switching and transport elements at TELRIC pricing, commonly referred to as Unbundled Network Element – Platform or "UNE-P." In an effort to address this question, this BULLETIN constructs a data set of investment and related information from the Automated Reporting Management Information System ("ARMIS"). These investment data are analyzed together with the number of access lines provisioned over the UNE-Platform in each State. With these data, it is possible to specify an empirical model that measures the relationship between UNE-P competition and BOC investment.

The D.C. Circuit Court of Appeals remand in *United States Telephone Association v. FCC* requires us to measure directly and specifically the effect of UNE-P on investment rather than to speculate about the effect with unfounded assertions derived from economy- or sector-wide trends and data aggregates.[4] Specifically, the court opined "the existence of investment of a

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when losing a customer to a facilities-based provider, the BOCs would: (1) receive no revenue for that last line; and also (2) would continue to incur the sunk costs of building their respective networks out to that customer in the first instance. With UNE-P, however, the BOCs still receive a steady revenue stream from that line that covers their forward-looking costs of these facilities plus a reasonable rate of return. The only plausible explanation of this apparently economically irrational behavior is that the BOCs' fully understand that facilities-based competition will be nascent for the foreseeable future and, as such, eliminating UNE-P virtually assures the BOCs' ability to recover monopoly rents from their dominance of the "last mile." See George S. Ford, *A Fox in the Hen House: An Evaluation of Bell Company Proposals to Eliminate their Monopoly Position in Local Telecommunications Markets*, PHOENIX CENTER POLICY PAPER NO. 15 (September 2002) (http://www.phoenix-center.org/pcpp/PCPP15%20Final.pdf); *see also* Thomas W. Hazlett & George S. Ford, *The Fallacy of Regulatory Symmetry: An Economic Analysis of the "Level Playing Field," in Cable TV Franchising Statutes*, 3 BUSINESS AND POLITICS 21 (2001) (available for download at: http://www.egroupassociates.com/Reports/fallacy.pdf) (incumbents understand all too well the economics of facilities-based entry, and therefore "strategically compete in the political realm to create legislation that protects rents of established operators").

Finally, PHOENIX CENTER POLICY PAPER NO. 17 finds that the Bells are, in fact, profitable wholesale suppliers of unbundled network elements as required by the 1996 Telecommunications Act. T. Randolph Beard and Christopher C. Klein, *Bell Companies as Profitable Wholesale Firms: The Financial Implications of UNE-P*, PHOENIX CENTER POLICY PAPER NO. 17 (November 2002) (http://www.phoenix-center.org/pcpp/PCPP17Final.pdf). Specifically, PHOENIX CENTER POLICY PAPER NO. 17 estimates that: (a) wholesale operating costs are about $10 per line across the BOCs; (b) EBITDA (earnings before interest, taxes, depreciation and amortization) margins are positive and average over $14 per line per month; and (c) operating margins (or EBIT, earning before interests and taxes) are also positive, and average 40% of revenues.

[4] 290 F.3d 415 (D.C. Cir. 2002), *cert. denied sub nom.* 123 S.Ct. 1571 (2003). For a particularly bold example of unfounded assertions, *see* S. B. Pociask, *The Effects of Bargain Wholesale Prices on Local Telephone Competition: Does Helping Competitors Help Consumers?*, New Millennium Research Council and Competitive Enterprise Institute (June

(Footnote Continued….)

specified level tells us little or nothing about incentive effects. The question is how such investment compares with what would have occurred in the absence of the prospect of unbundling, an issue on which the record appears silent."[5] A precise assessment of incentives, the court stated, is best determined by "multiple regression analyses."[6] This BULLETIN provides such regression analysis, as did POLICY BULLETIN NO. 4, and shows that UNE-P contributes positively to BOC investment.

This BULLETIN reaches several findings:

- Our empirical analysis indicates that competition from UNE-P *does affect* BOC investment. Specifically, the BOCs invest significantly more in states where UNE-P competition is further developed.[7] This finding conflicts with empirically unsupported analyses regarding the negative effects of UNE-P on BOC investment.[8] While poor economic conditions are curtailing investment in most sectors of the economy including telecommunications, the specific effect of UNE-P on investment is positive.[9]

- Other forms of competitive entry, such as UNE-L and Total Service Resale, are found to have no statistically significant effect on BOC investment.

- The patterns of telecommunications investment and capital stock observed over the past few years are entirely consistent with expectations and with the hypothesis that the 1996 Act increased investment.

2003) ("Assuming half of the [economy wide] decline in [IT] investment was the result of UNE-P regulation (at 20)"). Pociask fails to account for the fact that IT investment by telecommunications firms represents only 15.6% of total IT investment. Incorporating this fact into his calculations, the alleged $101 per household harm caused by UNE-P is reduced to $15.75.

5 *Id.* at 425 (citations omitted).

6 *Id.*

7 For our sample, the total change in net investment between 2002 and 2001 was –$648 million, whereas total net investment in 2001 was $8.8 billion.4

8 *See, e.g.,* Pociask, *supra* n. 4; J. A. Eisenach and T. M. Lenard, *Telecom Deregulation and the Economy: The Impact of UNE-P on Jobs, Investment and Growth*, Progress & Freedom Foundation, PROGRESS ON POINT, RELEASE 10.3 (Jan. 03); J. Eisner and D. Lehman, *Regulatory Behavior and Competitive Entry* (June 2001). These studies assume rather than test whether UNE-P has affected investment.

9 *See* PHOENIX CENTER POLICY BULLETIN NO. 4, *supra* n. 1; R. O. Beil, G. S. Ford, and J. D. Jackson, *On the Relationship between Telecommunications Investment and Economic Growth in the United States* (June 2003) (www.telepolicy.com).

- Despite claims to the contrary, BOC Total Plant in Service continues to rise.

Combined with the findings from POLICY BULLETIN NO. 4 and other papers evaluating econometrically the relationship between unbundling and investment, including Ford and Pelcovits (2002), Beard *et al.* (2002a, 2002b, 2002c), Willig *et al.* (2002), and Hassett and Kotlikoff (2002), the empirical evidence is mounting against the oft-repeated claim that the unbundling policies of the 1996 Act reduce investment by both incumbents and entrants.[10] Ford and Pelcovits (2002) show, using two separate econometric tests motivated by the economic theory of entry, that facilities-based entry is higher in states with lower unbundled element prices. This finding suggests a complementary relationship between UNE and facilities-based entry. Beard, Ford and Koutsky (2002a) provide a theoretical analysis of why a complementary relationship exists, and their empirical analysis of CLEC switch deployment indicates that the complementary relationship between unbundling and facilities-based entry is larger than the substitution relationship advocated by the BOCs. A recent paper by Beard, Ford and Ekelund (2002b), in addition to providing an insightful economic definition of the impairment standard of the 1996 Act's section 251(d)(2)(B), present econometric evidence showing that self-supplied and unbundled switching are not effective substitutes, implying the two forms of switching are used to serve different markets. Beard and Ford (2002c) provide supporting evidence of the same proposition. Willig *et al.* (2002) use a panel dataset to evaluate the relationship between unbundling and investment, and find a positive link between the two. Using a simulation analysis based on a theoretical model, Hassett *et al.* (2002) illustrate how competitive entry in telecommunications markets improves economic performance.

To date, there is no reliable econometric evidence of which we are aware that indicates unbundling discourages investment by either the BOCs or CLECs, or otherwise has any negative impact on economic performance in the telecommunications industry.[11] However, the

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[10] *See* G. S. Ford and M. D. Pelcovits, *Unbundling and Facilities-Based Entry by CLECs: Two Empirical Tests* (July 2002): www.telepolicy.com; T. R. Beard, R. B. Ekelund Jr., and G.S. Ford, *Pursuing Competition in Local Telephony: The Law and Economics of Unbundling and Impairment* (November 2002): www.telepolicy.com; T. R. Beard, G. S. Ford, and T.M. Koutsky, *Mandated Access and the Make-or-Buy Decision: The Case of Local Telecommunications Competition* (December 2002): www.telepolicy.com; R. D. Willig, W. H. Lehr, J. P. Bigelow, and S. B. Levinson, *Stimulating Investment and the Telecommunications Act of 1996*, Unpublished Manuscript (October 2002); K A. Hassett and L. J. Kotlikoff, *The Role of Competition in Stimulating Telecom Investment,* AEI PUBLICATION (October 2, 2002) (www.aei.org/publications/pubID.14873/pub_detail.asp). Hassett *et al.* (2002) perform a simulation rather than using actual data. *See also, Does Unbundling Really Discourage Facilities-Based Entry? An Econometric Examination of the Unbundled Local Switching Restriction*, Z-Tel Policy Paper No. 4 (February 2002): www.telepolicy.com.

[11] Filed on behalf of Qwest in the FCC's Triennial Review proceeding, Strategic Policy Research (a consulting firm) presented econometric evidence for which they claimed showed that low unbundled loop rates reduce BOC investment. However, their finding was found to be very sensitive to model specification, with a contradictory results arising from a minor modification to the empirical model. *See* Letter to Mr. William Maher from T.M.

(Footnote Continued….)

competition facilitated by unbundling has been shown to lead to substantial price declines and innovation in telecommunications markets.[12]

II. How Should the 1996 Act Affect Investment by Telecommunication Firms?

Notwithstanding the compelling evidence provided by government statistics on investment by telecommunications firms, some continue to argue that the 1996 Act still failed because investment in the sector has tapered off in the past few quarters.[13] Such simple thinking ignores the basic relationship between the capital stock and investment. Serving the demand of a particular market requires a given capital stock, which represents all assets used to produce goods and services to consumers. Investment represents additions to this capital stock, whereas

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Koutsky and G.S. Ford, Z-Tel Communications, CC Docket No. 01-338, Oct. 7, 2002 ("SPR's analysis is not robust, in that the model produces conflicting results with only minor modifications to specification (at 16).")

[12] See the "'Projected Savings …" reports published by Telecommunications Research and Action Center (TRAC) in 2001-2002 (www.trac.org/publications); Comptel's Consumer Savings Analysis, January 2003 (www.comptel.org); Y. M. Braunstein, *The Role of UNE-P in Vertically Integrated Telephone Networks: Ensuring Healthy and Competitive Local, Long-Distance and DSL Markets*, Working Paper, University of California-Berkeley (May 2003);: www.sims.berkeley.edu/~bigyale/UNE/index.html; L. L. Selwyn and S. M. Gately, *Business Telecom Consumers Benefit from UNE-P Based Competition*, Unpublished Manuscript (Dec. 2002); *UNE-P Saves Businesses $6 Billion*, THE DIGEST (January 27, 2003). A recent report by the Consumer Federal of America (http://www.consumersunion.org/telecom/teledc201.htm) describes the benefits of competition in New York State:

> As a result of genuinely open markets, consumers in New York have switched companies in droves (2 million local and 1.5 million long distance). Companies have engaged in 'tit-for-tat' competition, matching each other's offers. Prices for both local and long distance service have dropped substantially (approximately 20 percent for those who shop).

Frequent Bell Company witness and former Chief Economist of the FCC attributes the diffusion of DSL to the consumer market as a direct consequence of unbundling:

> In the case of DSL, the technology was not deployed at all to provide retail, high-speed data services when local exchange companies had regional monopolies. … Carriers did not offer DSL service as a consumer product on its own until late in 1996. That year, the Telecommunications Act of 1996 ("the Act") opened the local telephone market to competition. The Act required incumbent telephone companies to lease out elements of their systems for competitors to use to provide service. New entrants were then able to lease copper "loops" that link central offices to customers, install their own DSL equipment and connections to the internet, and offer high-speed data service to customers that was cheaper and easier to obtain than T1 service.

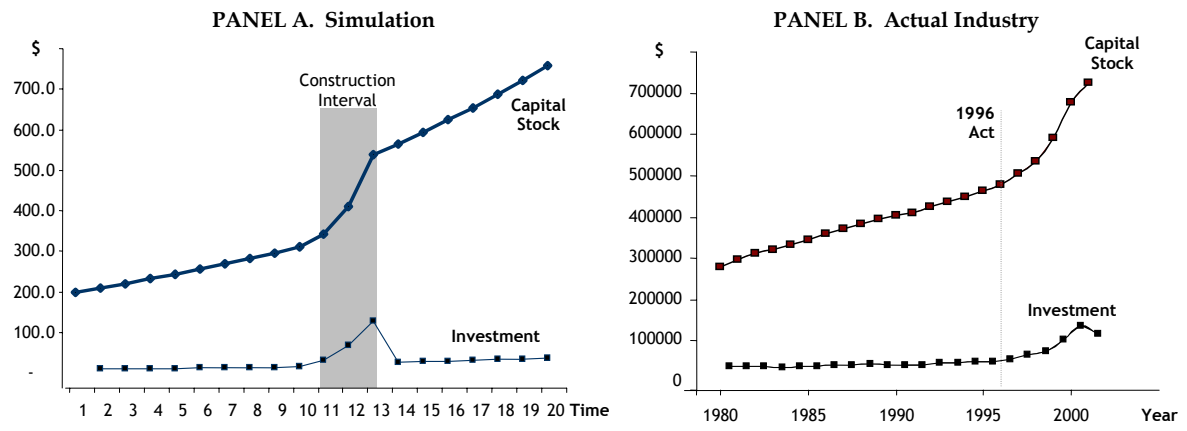
H. A. Shelanski, Competition & Deployment of New Technology in U.S. Telecommunications, U. CHI. LEGAL F. 85 (2000).

[13] *See* COMMUNICATIONS DAILY, *Telecom Investment Soared After the 1996 Act* (25 June 2003) (According to the United States Telephone Association, PHOENIX CENTER POLICY BULLETIN NO. 4 "conveniently stops at 2001," when industry spending began slowing down: "As everyone who follows telecom knows, over the last 18 months, this sector has been extremely challenged and capital expenditures are down significantly.")

depreciation represents subtractions from it. Constructing a network requires substantial investment in the early years as the required capital stock of the entrant is developed. Once construction is complete, investment slows down considerably as the network need only be maintained and extended in relatively limited circumstances. A sensible expectation of the effects of the 1996 Act on investment is, therefore, an immediate rise in investment and capital stock and the eventual decline in investment once new network construction nears completion, with capital stock remaining substantially above pre-Act levels.

Illustration No. 1, Panel A, below demonstrates this point by graphing the results of a simple simulation, where an entrant replicates a monopoly network. For the simulation, the following is assumed: (a) a monopoly network serves the entire customer base (100 units, growing at 5% annually) for periods 1 through 10; (b) the capital stock required to serve the customer base is $1 per unit of total market (*i.e.*, homes passed) plus $1 per unit sold; (c) the entrant constructs a network in periods 11 through 12 capable of serving the entire market (passing 10% of homes in the first year, 40% the second year, and all homes during the third year); d) the entrant has 5% market share the first year, 25% the second year, and 50% for the remainder of the simulation. Illustration No. 1, Panel A, illustrates both the capital stock and investment (for both incumbent and entrant) from this simulation. This simple simulation establishes reasonable expectations about how investment and capital stock should change when entry is allowed in a monopolistic market.

Illustration No. 1. Simulated Construction of Competing Network



For years 1 through 10, the capital stock rises 5% annually as the network grows with the customer base (5% annually). Investment is simply the difference in the capital stock between years (*i.e.*, there is no depreciation for simplicity). In year 11, the entrant begins constructing its network; note the rise in both capital stock and investment. This construction continues in

years 12 and 13 with capital stock and investment rising sharply. In year 14, the entrant's construction is complete and investment plummets; future growth now is related only to the growth in the size of the market (total units sold grows 5% annually, of which the entrant gets half). The capital stock is now (about) twice its monopolistic level.[14] Thus, it is the capital stock and not investment that serves as a better indicator of the effects on investment of a "pro-entry" regulatory agenda.[15]

Now, compare Panel A and Panel B in Illustration No. 1, the latter illustrating actual capital stock and investment by telecommunications firms in the U.S. over the period 1980 through 2001.[16] The similarity between the illustrated trends in capital stock and investment is as undeniable as it is expected. After the 1996 Act, the capital stock and investment levels of telecommunications firms began rising sharply. In 2001, investment declined, indicating that the capital stock was leveling off at its new "equilibrium" level (about $200 billion above what would be expected in 2001 based on historical investment).[17] Therefore, the decline in investment in 2001 through today is entirely consistent with expectations following the 1996 Act, and no cause for alarm.

Reductions in investment levels following an unprecedented rise in capital stock are required; the combination of events is entirely consistent with an effective pro-competitive agenda. Importantly, other things affect investment as well, including the sluggish economy experienced in the U.S. over the past few years.[18] Additionally, if facilities-based competition is as widespread as the BOCs assert, then BOC investment should be declining. After all, the BOC

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[14] Importantly, it is not clear that such replication is socially desirable. If one firm can serve the entire demand most efficiently, then replicating the network may be undesirable. Of course, the effect on output price and the efficiency with which the incumbent operates as a monopolist cannot be ignored in such an analysis. *See* G. Mankiw and M. Whinston, *Free Entry and Social Inefficiency*, RAND JOURNAL OF ECONOMICS, 17, Spring 1986, 48-58.

[15] If entrants over-invest (perhaps due to misjudging their future market share), then capital stock may actually decline until it reaches a level consistent with the entrant's market share. Given rampant failure of facilities-based CLECs, a decline in total capital stock in the telecom industry is to be expected.

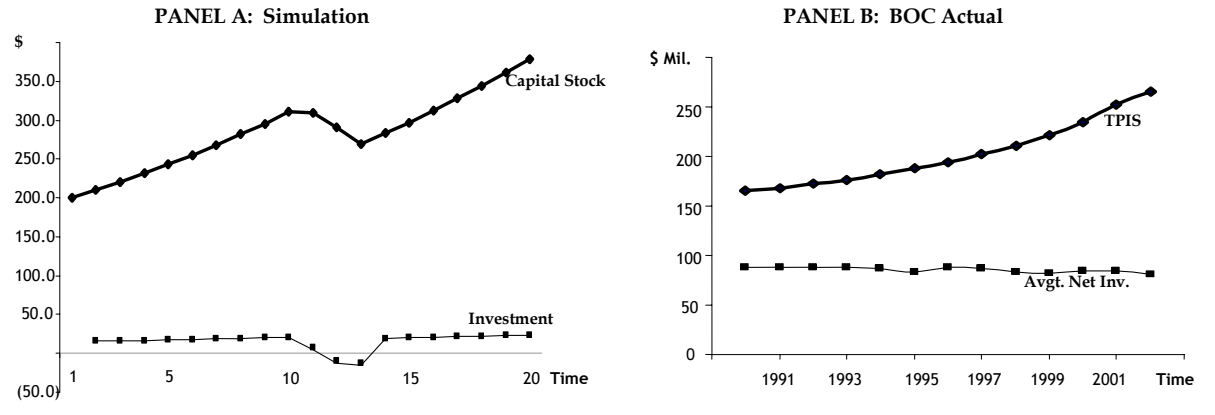
[16] This figure uses the same data as POLICY BULLETIN NO. 4.

[17] *See* PHOENIX CENTER POLICY BULLETIN NO. 4, *supra* n. 1.

[18] Beil *et al., supra* n. 9 (2003) show that investment by telecommunications firms *is caused by* economic growth (but not vice versa). Some research suggests information technology ("IT") investment contributes positively to Gross Domestic Product and productivity, but these studies do not focus solely on investment by telecommunications firms nor test for causality (just correlation). *See, e.g.,* D. W. Jorgenson, *Information Technology and the U.S. Economy*, 91 AMERICAN ECONOMIC REVIEW 1-32 (2001) and S. D. Oliner and D. E. Sichel, *The Resurgence of Growth in the Late 1990s: Is Information Technology the Story?*," 14 JOURNAL OF ECONOMIC PERSPECTIVES 3-22 (2000). Investment by telecommunications firms represents only 16% of total IT investment (based on BEA data). Oliner and Sichel (2000) show that investment in information technology (IT), such as computer hardware and software, has a substantially stronger correlation with economic growth than investment in communications equipment.

networks were required to serve the entire telecommunications local exchange and access demand prior to the 1996 Act, but now demand is shared among multiple carriers. Thus, by definition, BOC investment should be lower today than in previous years. For the simulation, the decline in the incumbent's capital stock and investment is illustrated in Illustration No. 2, Panel A.[19] In Panel B, actual BOC Total Plant in Service ("TPIS") and Average Net Investment are illustrated (Qwest data for 2002 is unavailable, so the data is BellSouth, SBC, and Verizon only). The steady rise in TPIS and relatively flat Average Net Investment suggests that facilities-based competition is relatively limited in local exchange markets today, since no substantial decline in either capital stock or investment is observed. Further, Average Net Investment declines in six of the last twelve years, suggesting reduction in net investment is neither a rare nor a new phenomenon.

Illustration No. 2. Incumbent Capital Stock and Investment



Further, aggregate investment levels depend not only on the quantity of assets purchased, but the price at which such assets are acquired. If there truly is as much excess (*i.e.*, underutilized) capacity of sunk assets in the market as some claim, then – as the FCC itself concedes – investment should also logically decline as firms can acquire assets far cheaper at bankruptcy fire sales than buy building new networks from scratch.[20]

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[19] The negative investment levels can be viewed as plant retirements.

[20] *See, e.g., In re Implementation of Local Competition in Telecommunications Act of 1996,* First Report and Order, 11 FCC Rcd 15499 (1996) at ¶ 688; *In re Access Charge Reform*, Fifth Report and Order and Further Notice of Proposed Rulemaking, ___ FCC Rcd ___, FCC 99-206 (rel. 27 Aug. 1999) at ¶ 80.

Further, and perhaps most importantly, reductions in investment are not *per se* undesirable. Economic performance in an industry is improved when industry output is produced with lower quantities of capital and/or labor. If output in the telecommunications industry rises or is constant and this output is produced with less investment, then society is probably better off for it.[21] ***Accordingly, investment itself is not a valid policy goal; economic performance is the proper standard for measuring the success or failures of particular policies.***

These aggregate statistics are no doubt interesting, but do not allow us to measure the effect of particular competition policies on investment. In the next section, we combine less aggregated data with an econometric model to quantify the effect of UNE-P on BOC investment. Unlike the unsupported claims by the BOCs (and their advocates) that UNE-P causes all ills in telecommunications, the data indicate that UNE-P increases BOC investment by a significant amount.

III. Bell Company Investment in Response to UNE-P

This analysis begins by constructing a dataset with state-level investment data provided by ARMIS and UNE-P line data from the FCC's Form 477 (years 2000, 2001 and 2002).[22] ARMIS does not currently provide 2002 investment data for Qwest, so the analysis is restricted to BellSouth, SBC, and Verizon states (excluding the former GTE states). Excluding Qwest from the analysis, while necessary, is also desirable, since that the company is in exceedingly poor financial health relative to its BOC colleagues.[23] Further, there is very little UNE-P competition in the Qwest region (only 4.9% of UNE-P lines, but 11% of total access lines). Merging ARMIS with Form 477 data renders a dataset consisting of 52 observations, which is more than adequate for econometric analysis and traditional hypothesis testing.

Turning to the empirical model, assume that the BOC's net capital stock in state i at time t (K_{it}) is a function of market size (R_{it}), the amount of UNE-P competition (U_{it}), time-variant

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[21] Relative efficiency requires information as to whether other less productive inputs are being substituted for capital (*e.g.*, labor).

[22] ARMIS data is available at the FCC's website free of charge (www.fcc.gov/wcb/armis). Capital stock and investment is from ARMIS Form 43-01 (Subject to Separations, Total Operating Revenues and Average Net Investment). Capital stock is measured as "Average Net Investment," and investment is measured as the change in this value. UNE-P lines are measured as of June of each year.

[23] *See, e.g.*, A. Bryer, *Qwest Indictments Capped Year-long Troubles at Telco*, Denver Business Journal (March 3, 2003): www.bizjournals.com/denver/stories/2003/03/03/story2.html; *Qwest Posts $1.14B 2Q Loss*, CNN/Money (August 8, 2002) (money.cnn.com/2002/08/08/news/companies/qwest); *Nacchio out at Qwest*, CNN/Money (June 17, 2002) (money.cnn.com/2002/06/17/news/ceos/qwest/). Even Qwest describes it accounting practices as "questionable." *See Qwest Gets More Time to Finish Audits*, TR DAILY (July 1, 2003).

factors that are identical across states such as the cost of capital (Z_t), and state specific factors that are constant over short periods of time such as state tax rates (X_i). (To avoid unnecessary notation, assume there is a single Z and X.)[24] Symbolically, we have the regression function

$$K_{i,t} = \beta_t Z_t + \alpha_1 R_{i,t} + \alpha_2 U_{i,t} + \alpha_3 X_i + \varepsilon \tag{1}$$

where ε is the econometric disturbance term and β and the α are estimated coefficients (since Z_t is identical across states, β_t is the constant term of the regression). In Equation (1), a linear functional form is assumed and the coefficients α are assumed to be constant over short-intervals of time. Rewriting Equation (1) as a first-difference equation, we have:

$$\Delta K = \beta_t Z_t + \beta_{t-1} Z_{t-1} + \alpha_1 \Delta R + \alpha_2 \Delta U + \Delta\varepsilon \tag{2}$$

where Δ indicates a first difference. The dependent variable, ΔK, is equal to investment. Since X_i is time invariant, the coefficient α_3 from Equation (1) is eliminated by subtraction. Using Newey-West robust standard errors is recommended for first-difference models due to the (potential) properties of the disturbance term, and we do so.[25]

From Equation (2), the coefficient on ΔR (α_1) measures the influence of the BOC's market size on its investment, and the expectation is that α_1 will be positive. For our model, market size is measured by BOC total operating revenues in the state. The coefficient on ΔU (α_2) is of primary interest because it measures the influence of UNE-P competition on BOC net investment. If UNE-P competition increases net investment in plant, then α_2 will be positive; alternately, if UNE-P competition reduces net investment in plant, then α_2 will be negative. We make no *a priori* expectation with respect to α_2, allowing the data to inform us as to the relationship between UNE-P and net investment. Finally, the coefficients β_t are estimated using a constant term for the regression and a dummy variable that equals 1 for the second period (2001 to 2002), 0 otherwise. This dummy variable captures the effect of any change in the coefficients β over time (and is a statistical test of such changes) due to differences in all other relevant factors between the periods that do not vary by state (interest rates, etc).

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[24] The Z_t, because they are equal across states, will be collinear. Thus, their total effect is captured by dummy variables.

[25] *See* J. M. Wooldridge, ECONOMETRIC ANALYSIS OF CROSS SECTION AND PANEL DATA 2002, Section 10.6. We do not find strong evidence of correlation in the error terms (using Wooldridge Equation 10.71), but we still use Newey-West robust standard errors due to the limited sample size available for the correlation test. The Newey-West robust standard errors are typically smaller, thus the reported t-statistics are higher than if computed using the traditional least squares standard errors. However, UNE-P lines is the statistically significant (at the 5% level) whether Newey-West and least squares standard errors are used.

Estimates from three versions of Equation (2) are summarized in Table 1. Model 1 expresses the variables without adjustment; Model 2 expresses the variables ΔK, ΔR, and ΔU on a per-access line basis; and Model 3 is estimated by weighted least squares, where the inverse of access lines is the weight.[26] Model specification tests (White and RESET) indicate Model 2 and Model 3 is better specified, passing both tests easily.[27] Model 3 has the highest levels of statistical significance. Thus, discussion of the results will be limited to Model 2 and 3 (unless otherwise stated). Given the parsimonious and linear specification of Equation (2), the inability to reject the null hypothesis of the RESET test is encouraging, since RESET, while a rather general specification test, is highly effective at detecting omitted variables and incorrect functional form.[28] As illustrated in Table 1, the results between the two models are not much different for the coefficient of interest (ΔU, α_2), although the coefficients in Model 2 and Model 3 are smaller than Model 1. (The difference in the coefficients for constant term and dummy variable are caused by the scaling of the dependent variable.)

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[26] Total access lines are provided by Form 477. Weighted least squares is a technique implemented to correct for heteroscedasticity of a known form. For a discussion of weighted least squares, *see* D. N. Gujarati, 3 BASIC ECONOMETRICS 1995, at 381-382.

[27] The null hypothesis of the White test is "homoscedastic disturbances" and the null of RESET is "no specification error." Ideally, neither hypothesis would be rejected and neither is for Model 2, but both nulls are rejected for Model 1. For a description of these tests, *see* Gujarati, at 379 and 464.

[28] *See* J. R. Thursby, *Alternative Specification Error Tests: A Comparative Study*, 74 JOURNAL OF THE AMERICAN STATISTICAL ASSOCIATION 222-225 (1979). In an alternate specification, total access lines in the state was included as a regressor to insure that the market size was not responsible for the estimated relationship between investment and UNE-P lines. The results were unchanged (for the most part), and the access lines variable was not statistically significant.

Table 1. Summary of Results

Variable	Model 1	Model 2	Model 3
β_{t-1}	-1.3E+07 (0.23)	-13.34 (-1.23)	2.6E+07 (3.07)*
ΔR (α_1)	0.92 (1.10)*	0.42 (1.89)**	0.85 (4.12)*
ΔU (α_2)	815.6 (2.42)*	759.1 (3.57)*	594.1 (3.46)*
$\beta_t - \beta_{t-1}$	-1.9+08 (-1.84)**	-70.94 (-4.41)*	-7.7E+07 (-3.65)*
R^2	0.33	0.48	…
White χ^2	18.58*	4.20	3.00
RESET	20.10*	0.13	1.83

* Statistically significant at the 5% level or better.
** Statistically significant at the 10% level or better.

RESET indicates Model 1 is mis-specified, so we do not dwell on the results from that model. Both Models 2 and 3 exhibit good statistical significance, with nearly 50% of the total variation in BOC net investment explained by Model 2.[29] The coefficient on ΔR is statistically significant in Models 2 and 3 at traditional levels, but is only significant at the 10% level in Model 2. The estimated coefficients indicate that investment increases by about $0.42 to $0.85 for every additional dollar of annual revenue, other things constant. In both Models 2 and 3, the coefficient on ΔU is statistically different from zero at traditional significance levels.

Most importantly, the regression analysis indicates that UNE-P competition increases BOC net investment, with each UNE-P line increasing net investment by $594 to $759 per year. Our discussion will focus on Model 2. In June 2002, UNE-P lines summed to about 6.8 million (in BellSouth, SBC, and Verizon regions), implying UNE-P competition translates into about $5.2 billion in additional net investment.[30] (As of December 2002, UNE-P lines totaled 10.1 million across all regions.)[31] At the end of 2002, BOC total net investment was $81.1 billion, so UNE-P competition increases net investment by about 6.4% (on average, using $759 per UNE-P line).[32] While UNE-P competition is related to increased investment at the state level, this finding does not imply total investment was higher. BOC net plant grew by about 3% in 2001, but fell by 7%

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29 R^2 is not valid for weighted least squares, since the regression is estimated without a constant term. Gujarati, at 74.

30 The calculation assumes constant returns.

31 *See* FCC Form 477 data and UNE-P Fact Report, January 2003 (Pace Coalition: www.pacecoalition.org).

32 ARMIS Form 43-01, Average Net Investment, Subject to Separations (all BOCs).

in 2002. However, absent UNE-P, BOC net investment would have fallen even more in 2002, with an expected total decline of about 13%. Thus, UNE-P attenuated investment declines by about 50% (=6.4%/13%). No growth in investment would have been realized in 2001 absent UNE-P competition, based on the 4.2 million UNE-P lines in 2001 (measured in June of that year).

Quantifying the impact of alternative forms of entry – primarily UNE-L (loops purchased without switching and transport) and Total Service Resale – is accomplished by incorporating data for these forms of entry to our dataset. Adding variables for these alternate forms of entry to the analysis indicates that neither is a statistically significant determinant of BOC net investment, and we cannot reject the hypothesis that the coefficients UNE-L and Total Service Resale are jointly zero (i.e., the variables do not improve the explanatory power of the regression).[33] Thus, the data indicate that UNE-L and resale do not stimulate investment by the BOCs.[34] The coefficient for UNE-P (ΔU, α_2) remains statistically significant at better than the 5% level for both model specifications (Models 1 and 2). The findings are sufficiently similar that we forgo a detailed discussion of the results.

IV. Conclusion and Policy Recommendations

The empirical evidence is mounting against the claim that the pro-competitive unbundling policies of the 1996 Act have reduced investment in the telecommunications industry. In this POLICY BULLETIN, 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%. Overall, each UNE-P line increases BOC investment by about $759 per year. Alternative forms of entry – UNE-L and Total Service Resale – are found to have no effect on BOC net investment.

Since the *USTA* decision, there has been much discussion about the costs and benefits of unbundling, with the effects of unbundling on investment receiving the most attention. The benefits of unbundling – and in particular UNE-P – are undeniable. Millions of households are

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[33] The models are identical to Models 1 and 2 except that UNE-L and Total Service Resale lines are included as additional regressors. A table summarizing the results is available upon request.

[34] The expected effect of UNE-L on BOC investment is ambiguous. Because UNE-L does not require switching, BOC investment in switching plant should decline. Alternately, CLEC switches typically use BOC high capacity circuits for transport and require colocation space, both of which may require BOC investment (non-recurring charges suggest investment is probably required).

now purchasing service from competitor suppliers of local telephone service and price competition in the industry is increasingly intense.[35] New, advanced services are being developed and deployed across the country, with UNE-P providers contributing substantially this innovation. With regard to investment, the weight of the empirical research indicates that there is nothing to fear from unbundling and UNE-P. The empirical evidence consistently shows that unbundling stimulates investment by both entrants and incumbents implying that investment and unbundling are more like complements than substitutes. We find no evidence, in our own analyses or that of others, that unbundling or UNE-P reduce investment.

Accordingly, the current cynicism, ideological bias and outright ignorance towards UNE-P and TELRIC pricing must come to an end.[36] Like it or not, "Congress passed a ratesetting statute with the aim not just to balance interests between sellers and buyers, *but to reorganize markets by rendering regulated utilities' monopolies vulnerable to interlopers, even if that meant swallowing the traditional federal reluctance to intrude into local telephone markets*."[37] As TELRIC does not result in confiscatory rates (if anything, they still remain on the "creamy" side in many jurisdictions[38]), the growing push for BOC sector-specific relief (and, *a fortiori*, a decline in competitive pressures) is specious at best and raises troubling indications of regulatory capture at worst.

If policymakers really want to maximize consumer welfare by protecting competition and not individual competitors (*i.e.,* the BOCs), then U.S. policymakers should stop dreaming that a monopolist will change its spots and invest in new facilities if only it received relief from "pesky" competitive pressures. Instead, if policymakers focus on their core and interrelated

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35 FCC Status of Local Competition Report (rel. 3 June 2003) (available at www.fcc.gov/wcb/stats).

36 *Powell Expects "Triennial Review" Order To Be Released Monday*, TRDAILY (June 25, 2003) (Powell "also joked about the unbundled network element-platform (UNE-P) when discussing the popularity of wireless 'hot spots.' 'Really, these hot spots are great,' he said. 'You just walk right up and get access for next to nothing. Sort of like UNE-P.'"); Kathleen Q. Abernathy, *My View from the Doorstep of FCC Change,* 54 FED. COM. L.J. 199, 206-7 (2002) ("Excessive sharing of facilities destroys the investment incentives of both incumbents and new entrants alike: rational incumbents avoid risking capital on new facilities if rivals can get a free ride, and rational entrants will refrain from deploying their own facilities if they have unrestricted access to incumbents' networks at cost-based rates. This stifling of investment incentives is all the more problematic where supposedly "cost-based" rates are, as in some cases, based on a model that makes unrealistic economic assumptions and accordingly turn out to be *below* actual cost. In striving to stimulate *some* form of local telephone competition, by creating expansive resale and unbundling opportunities, we have adopted rules that have failed to engender, and may have actually hampered, *facilities-based* competition—which is the most viable strategy in the long term and the one most likely to benefit consumers.") (emphasis in original); James J. Cramer, *Wrong Guys Victorious at FCC Today*, THESTREET.COM (20 February 2003).

37 *Verizon v. FCC*, *supra* n. 3 at 1661 (emphasis supplied).

38 *See* PHOENIX CENTER POLICY PAPER NO. 16, *supra* n. 3.

statutory mandates – *i.e.,* (a) prevent dominant firms under their jurisdictions from exercising their market power by raising prices and restricting output; and (b) reduce entry barriers for new firms – then we might just get out of the current telecoms slump before it is too late.

Changes to Original Version: Due to comments received on the original version by various parties, the following changes were made to the original version of Policy Bulletin No. 5: i) the notation and discussion of Equations (1) and (2) have been altered for clarity; ii) the discussion of the dependent variable is made more clear; iii) Table 1 has changed to reflect use of the Newey-West robust standard errors and the addition of a model estimated using weighted least squares; iv) Illustration No. 2 and accompanying text has been altered to include labels.

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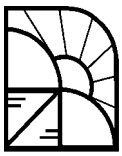
ATTACHMENT 2



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PHOENIX CENTER POLICY BULLETIN NO. 6

17 September 2003

UNE-P DRIVES BELL INVESTMENT: A SYNTHESIS MODEL

Abstract: The purpose of this POLICY BULLETIN is to evaluate the robustness of the empirical results presented in PHOENIX CENTER POLICY BULLETIN NO. 5, *Competition and Bell Company Investment in Telecommunications Plant: The Effects of UNE-P*. To accomplish this goal, this POLICY BULLETIN incorporates the constructive comments made by Drs. Thomas Hazlett, Arthur Havenner and Coleman Bazelon ("HHB") and by Dr. Carter Hill about POLICY BULLETIN NO. 5 and, accordingly, estimates twenty new specifications models of the Bell Company investment equation. While these new specifications represent a synthesis of the modeling preferences of the Phoenix Center and the aforementioned economists, they nonetheless remain true to the neoclassical model of investment and valid econometric practice. These new specifications vary by estimation technique, explanatory variables included, and the measure of investment. Despite wide variations in model specification, all our new empirical specifications, especially those based on the suggestions of Drs. Hazlett *et al.*, confirm that UNE-P competition increases Bell Company investment in local telecommunications plant. *In all twenty models, the effect of UNE-P competition is positive and statistically significant.* Despite the changes to specification, the new models continue to perform well in specification tests, which is, of course, encouraging. As such, the models set forth in this *Policy Bulletin* affirm both the results and specification of the empirical models in POLICY BULLETIN NO. 5.

TABLE OF CONTENTS:

I. Preface and Introduction 2
II. The Phoenix-Investment Empirical Model.....3
  A. General Empirical Framework.....5
  B. Model Specification Issues 7
  C. Summary of Results.....8
  D. Levels versus Changes 10
  E. Summary 11
III. Conclusion 11

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I. Preface and Introduction

Since its inception, the Phoenix Center has sought to create a forum where rigorous debate about the complex policy issues facing our society can find fertile ground. For this reason, consistent with our mandate under Section 501(c)(3) of the U.S. Internal Revenue Code, the Phoenix Center does not seek to influence the political process by participating as a party in any regulatory proceeding or engaging in lobbying of legislatures. To the contrary, the Phoenix Center attempts to provide and disseminate freely through its web page thorough analytical research and analysis for the public dialectic.

We are very pleased to report that our recently-released POLICY BULLETIN NO. 5, *Competition and Bell Company Investment in Telecommunications Plant: The Effects of UNE-P* (July 2003)[1] has fostered our desired Socratic debate. As a bit of recap, POLICY BULLETIN NO. 5 evaluated, using a simple economic and econometric model, the relationship between UNE-P and Bell Company investment in telecommunications plant at the state level. For the analysis, data from the Automated Reporting and Management Information System ("ARMIS") and other publicly-available data were used. This state-level data provides sufficient variation and sample size to estimate econometrically the parameters of an investment model. From the results of an econometric analysis, we concluded that UNE-P had a positive and sizeable effect on BOC investment in telecommunications plant, with each UNE-P line increasing on average BOC net investment by about $759.00.

Subsequently, two formal responses to the analysis set forth in POLICY BULLETIN NO. 5 were released. On one hand, in a document filed in Verizon's Forbearance Petition (WC Docket No. 03-157), Verizon employed Drs. Thomas Hazlett (the Manhattan Institute), Arthur Havenner (Univ. California – Davis), and Coleman Bazelon (Analysis Group) to comment on the empirical analysis contained in the BULLETIN.[2] Verizon's advocates propose several modifications to our model, and present a few alternate specifications.[3] On the other hand, Z-Tel Communications,

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[1] http://www.phoenix-center.org/PolicyBulletin/PolicyBulletin5.pdf.

[2] 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 Sept. 2, 2003) (available at: http://gullfoss2.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6514783810 and is also posted on the Phoenix Center's web page).

[3] The declaration of HHB also includes an anecdotal discussion of investment and UNE-P, but we do not dwell on that discussion here. Because HHB's anecdotes include little more than quotes from investment analysts and the observation that investment is falling while UNE-P is rising. This *post hoc* fallacy line of reasoning is standard Bell Company argument, and brings nothing new to the debate. Further, investment analysts, for the most part, report to investors what they hear from corporate executives. Consequently, the analysts' claim that there is a link between UNE-P and investment often is based on little more than the fact a Bell executive told them that such a

(Footnote Continued….)

Inc. asked Dr. Carter Hill (Louisiana State University) to review the declaration of Hazlett, Havenner, and Bazelon as well as provide comments on the econometric model in POLICY BULLETIN NO. 5.[4]

In response both to the comments of Hazlett, Havenner and Bazelon ("HHB") and to Carter Hill ("Hill"), this POLICY BULLETIN summarizes an extensive effort to evaluate the robustness of the empirical results reported in POLICY BULLETIN NO. 5. While these new specifications represent a synthesis of the modeling preferences of the Phoenix Center and the aforementioned economists, they nonetheless remain true to the neoclassical model of investment and valid econometric practice. These new specifications vary by estimation technique, explanatory variables included, and the measure of investment. Despite wide variations in model specification, all our new empirical models, especially those based on the suggestions of HHB, confirm that UNE-P competition increases Bell Company investment in local telecommunications plant. *In all twenty specifications, the effect of UNE-P competition is positive and statistically significant*. Despite the changes to specification, the new models continue to perform well in specification tests, which is, of course, encouraging. As such, our new models affirm both the results and specification of the empirical models in POLICY BULLETIN NO. 5.

This POLICY BULLETIN proceeds as follows. In Section II, we describe our investment models and define the variables included in the analysis. Section III includes a discussion of the results and related topics. Conclusions are then provided in Section IV.

II. The Phoenix-Investment Empirical Model

In specifying our empirical models, the primary objective is consistency with economic and econometric theory, and the neo-classical model of investment, developed by Dale Jorgenson (1963), serves as our theoretical foundation.[5] While this body of work is rather technical, the empirical relationship of interest can be summarized generally as follows:

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link existed. Analysts rarely, if ever, conduct their own, independent econometric analysis of causality. The other problem with a heavy reliance on investment analysts is that they are not known generally for their accuracy. As Martin Weiss pointed out in a recent editorial, at one time "nine out of 10 or more … brokerages [had] 'buy' or 'hold' ratings on bankrupt companies." *Analyzing the analysts: A conversation with Martin Weiss, of Weiss Ratings*. WALL STREET WEEK (Jan. 31, 2003).

[4] 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). Dr. Hill generously provided us a draft copy of his comments prior to the filing date and the final version will be posted on the Phoenix Center's web page.

[5] D. W. Jorgenson, *Capital Theory and Investment Behavior*, AMERICAN ECONOMIC REVIEW, Vol. 53, Issue 2, (May 1963) at 247-259.

$$I = \Delta K = f(\Delta R, \Delta C, \Delta X) + \delta K, \quad (1)$$

where investment (I) equals the change in capital stock (ΔK) and is a function of changes in the monetary value of output (ΔR), changes in the cost of capital (ΔC), changes in other relevant factors (ΔX), and the existing capital stock *K* (δ is the replacement portion of capital).[6] Particular assumptions about functional forms and lag structures offer a wide variety of empirical specifications for the neo-classical model of investment.[7]

In POLICY BULLETIN NO. 5, we presented two models generally consistent with Equation (1). The monetary value of output (ΔR) was measured by changes in total operating revenues, and changes in the cost of capital (ΔC) were subsumed into a period dummy variable under the assumption that the cost of capital was constant across the Bell Companies. Existing capital stock (K) was not included in the regression, but as we discuss later, this exclusion did not bias our earlier results. Model 2 from the BULLETIN estimated that Bell Company investment rose an average of $759.00 per UNE-P line in the state. Despite Model 2's parsimonious specification, statistical tests of model specification indicated that the results of that model were unbiased estimates of the true parameters of interest (the goal of regression analysis), confirmation of which is provided by our new model specifications.

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.[8] Second, they recommend letting the cost of capital vary by Bell Company.[9] Third, they propose estimating the models using weighted least squares where all variables are weighted by (the inverse of) access lines.[10] Many of our new empirical models incorporate these suggestions, and in some cases adopt more dynamic specifications than proposed by HHB.[11] In every instance, these changes *affirm and*, *in many cases*, *strengthen* the conclusion that Bell Company investment is positively related to UNE-P competition.

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6 *See, e.g.*, D. W. Jorgenson and J. A. Stephenson, *Investment Behavior in U.S. Manufacturing*, 1947-1960, ECONOMETRICA, Vol. 35, No. 2 (April 1967) at 169-220.

7 Typically, academic research uses time series data when analyzing investment. We do not, however, have long data series on either investment or UNE-P lines. Nevertheless, it is important to use theory as our guide to specification.

8 HHB Appendix at ¶15 and n. 7.

9 HHB Appendix at ¶17.

10 HHB Appendix at ¶3. The inverse of access lines is used as the weight.

11 HHB specify a dynamic structure by including initial (or lagged) capital stock. We include this variable, as well as lagged investment and lagged market size in some of our models.

Z-Tel's expert Dr. Carter Hill recommends altering the symbolic discussion of the empirical models, and his recommendations are now incorporated into the latest version of Policy Bulletin No. 5 (released September 19, 2003). Dr. Hill also points to a potential problem with the econometric error terms in our regression, and suggests basing our t-statistics on Newey-West robust standard errors. We incorporate this suggestion into our analysis, and update Policy Bulletin No. 5 accordingly. Hill also recommends assessing the robustness of our earlier estimates through alternate specifications. To comply, this document summarizes twenty different specifications of the investment equation.

A. *General Empirical Framework*

For the twenty empirical models estimated here, the general framework is as follows. The change in capital stock, or net investment, is taken to be a function of the annual change in revenue (ΔR), the annual change in UNE-P lines (ΔU), the annual change in the cost of capital (ΔC), the existing (or "lagged" or "beginning" capital stock) capital stock (K), a dummy variable that equals (1) for the period 2001 to 2002, (0) otherwise, and a constant term. We do deviate from this general framework in some cases in order to employ different measures of relevant variables and to illustrate that the estimated coefficients are not very sensitive to specification. Most of the models are estimated using weighted least squares ("WLS") as recommended by HHB. The data is measured at the state level, unless otherwise indicated. All models are estimated using 52 observations as before.[12] States included are from the BellSouth, SBC, and Verizon (excluding GTE) regions only. Qwest data for year 2002 is not available.

The variables used in the analysis include:

I = Annual change in Average Net Investment, Subject to Separations, from ARMIS Form 43-01;

I′ = Annual change in Total Plant in Service less Accumulated Depreciation and Accumulated Amortization, Subject to Separations, from ARMIS Form 43-01;

ΔR = Annual change in Total Operating Revenue, Subject to Separations, from ARMIS Form 43-01;

[12] We do not, as suggested by HHB, unnecessarily reduce variation and sample size by aggregating data up to the Bell Company level (HHB Appendix at ¶10).

ΔU = Annual change in UNE-P lines measured from June of each year as reported in the FCC's Form 477 data;[13]

ΔC = Annual change in the weighted average cost of capital for the relevant Bell Company;

K_{t-1} = The prior year's Average Net Investment, Subject to Separations, from ARMIS Form 43-01 (i.e., lagged net investment);

K'_{t-1} = The prior year's Total Plant in Service less Accumulated Depreciation and Accumulated Amortization, Subject to Separations, from ARMIS Form 43-01 (i.e., lagged net investment);

Period = A dummy variable that equals 1 for investment in year 2002, 0 otherwise;

$\Delta(R/c)$ = Annual change in Total Operating Revenue, Subject to Separations, divided by the user cost of capital;[14]

$\Delta(R/c)_{t-1}$ = The prior year's value of $\Delta(R/c)$;

I_{t-1} = The prior year's value of I;

I'_{t-1} = The prior year's value of I'.

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[13] The weighted-average cost of capital is computed using the following: (i) debt costs are assumed to equal the Aa corporate bond yields for June 2000, 2001, and 2002, (ii) the cost of equity is computed using the Capital Asset Pricing Model, where the 10-year Treasury Bond yield (June) is the risk-free rate, the risk-premium is 5%, and the Betas are computed as 5-year Betas (using weekly data) ending in December for the relevant year for Bellsouth, SBC, and Verizon. The risk premium is from Tom Copeland, Tim Koller, and Jack Murrin, VALUATION: MEASURING AND MANAGING THE VALUE OF COMPANIES, 3rd Ed., McKinsey & Company, Inc. (2000), at 216 ("In early 2000, we were recommending using a 4½ percent to 5 percent historically estimated market risk premium for U.S. companies."). Stock prices provided by Yahoo finance. Bond yields provided by the St. Louis Federal Reserve Bank (http://research.stlouisfed.org/fred2/) and the U.S. Treasury (http://www.ustreas.gov/offices/domestic-finance/debt-management/interest-rate/index.html). Capital structure is assumed to be 40% debt, 60% equity. The variable is expressed in percentage points.

[14] The user cost of capital is estimated as the producer price index for telephone communications multiplied by the sum of the weighted average cost of capital and the depreciation rate. The depreciation rate is measured as the average annual difference in Accumulated Depreciation divided by Average Net Investment for years 2000 and 2002. *See* Larry Neal, *Investment Behavior by American Railroads: 1987-1914,* REVIEW OF ECONOMICS AND STATISTICS, Vol. 51, No. 2 (May 1969) at 126-135. The price index is provided by the Bureau of Labor Statistics (http://www.bls.gov).

We employ $\Delta(R/c)$ as a substitute for both variables ΔR and ΔC, since $\Delta(R/c)$ is computed using revenue (R) and the user cost of capital (c).[15] Lagged values of $\Delta(R/c)$ appear in a few of the alternate specifications, as recommended by HHB.[16] Two different versions of the capital stock and investment are available in ARMIS (K, K′ and I, I′). Models 1 through 10 use the variables K and I, whereas Models 11 through 20 use the variables K′ and I′. Models 11 through 20 are comparable to Models 1 through 10, with the only difference being the substitution of these two variables.

B. *Model Specification Issues*

If a regression equation is not specified correctly, the estimated coefficients may be biased estimates of the true population parameters.[17] In a policy context, it is important, therefore, to subject empirical models to specification tests in an effort to determine whether (and what type of) specification errors are present. Specification tests are important when somewhat parsimonious specifications are employed.[18]

Ramsey's RESET is a very general test of specification error, capable of detecting omitted variables bias, incorrect functional form, and the consequences of simultaneity bias.[19] While the test is desirable in that it is relatively powerful and is easy to implement, it only indicates that some type of specification error is present, providing no guidance as to how to remedy the problem.[20] The null hypothesis of RESET is "no specification error." If the RESET F statistic does not exceed the critical value, the null is not rejected. The null of RESET is not rejected for

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[15] This specification of the revenue/cost of capital variable is frequently used in the empirical analysis of investment. *See, e.g.,* Jorgenson and Stephenson, *supra* n. 6.

[16] HHB Appendix at n. 7.

[17] D. N. Gujarati, BASIC ECONOMETRICS (1995) at 454-459.

[18] Parsimony is not a flaw, as explained by Gujarati:

> A model can never be a completely accurate description of reality; to describe reality one may have to develop such a complex model that it will be of little practical use. Some amount of abstraction or simplification is inevitable in any model building. The Occam's razor [], or the principle of parsimony, states that a model be kept as simple as possible or, as Milton Friedman would say, "A hypothesis [model] is important if it 'explains' much by little …" What this means is that one should introduce in the model a few key variables that capture the essence of the phenomenon under study and relegate all minor and random influences to the error term u_t.

Although parsimony is desirable, it is important to subject a parsimonious specification to careful scrutiny, to ensure that specification errors, which often have severe statistical consequences, are not present. Gujarati, *supra* n. 17 at 453-4 (emphasis in original).

[19] *Id.* at 464-466; *see also* J.B. Ramsey, *Tests for Specification Errors in Classical Linear Least Squares Regression Analysis*, JOURNAL OF THE ROYAL STATISTICAL SOCIETY, SERIES B, VOL. 31 (1969) at pp. 350-371.

[20] Gujarati, *supra* n. 17 at 466.

18 of the 20 models, and the 2 rejections were expected (given the results from POLICY BULLETIN NO. 5).

Another common problem with regression is heteroscedasticity, which is an undesirable property of the random disturbance term of the regression.[21] The presence of heteroscedasticity implies the estimated standard errors of the estimated coefficients are inefficient, meaning they are either too large or too small.[22] The estimated coefficients themselves, however, are unbiased.[23] If heteroscedasticity is of a known form, then the equation can be weighted accordingly to render efficient standard errors (*i.e.,* weighted least squares or WLS).[24] If unknown, then other methods are available to compute asymptotically valid standard errors such as the White and Newey-West procedures.[25] Based on the comments of Hill, whose recommendations are based on the properties of error terms in first-difference models, all reported t-statistics in the table are computed using Newey-West robust standard errors.[26] The White test statistic is reported for all models.

C. *Summary of Results*

The estimates from our twenty models are summarized in Tables 1 and 2. Because the standard R^2 (a measure of goodness of fit) is not valid for WLS, for those regressions estimated by WLS we provide a Pseudo-R^2 computed as the squared correlation coefficient between the actual and fitted value of the weighted regression.[27] We are encouraged that the signs, magnitudes, and significance levels of the estimated coefficients are reasonably stable across comparable models. Absence of such stability could indicate problems with model specification.

Models 1 and 2 would be identical to Models 1 and 2 from POLICY BULLETIN NO. 5 except for the inclusion of two additional explanatory variables – the cost of capital (ΔC) and existing (or lagged) capital stock (K_{t-1}). These additional variables were proposed by HHB. As in BULLETIN

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[21] *Id.* at 355-358.

[22] *Id.* at 366-367.

[23] *Id.* at 362.

[24] *Id.* at 381-382.

[25] *Id.* at 382-383.

[26] J. M. Wooldridge, ECONOMETRIC ANALYSIS OF CROSS SECTION AND PANEL DATA (2002) at 282-3; W. Newey and K. West, *A Simple Positive Semi-Definite, Heteroscedasticity and Autocorrelation Consistent Covariance Matrix*, ECONOMETRICA, 55, 1987a, pp. 703-708. Some researchers recommend always reporting robust standard errors. Gujarati, *supra* n. 17 at 383.

[27] R^2 is a rather standard measure of goodness of fit that takes on values between 0 and 1. It is interpreted as the percent of variation in the dependent variable explained by the regression. Gujarati, *supra* n. 17 at 74. R^2 and Pseudo-R^2 across the regressions are not comparable.

NO. 5, the null of RESET is easily rejected for Model 1, indicating the model is mis-specified in some way. Consequently, we do not discuss the results from that model. Model 2, alternately, easily survives RESET. Our prior Model 2 from BULLETIN NO. 5 also passed RESET, indicating that model likely did not suffer from specification errors. The results for Model 2 reported here support that finding. Neither of the two additional explanatory variables is statistically significant, and the coefficient on ΔU is barely affected ($757.50 versus $759.00).[28]

Model 3 is simply Model 2 estimated by WLS. This alternate estimation technique results in larger t-statistics, indicating the weighting procedure improved efficiency. Five of the six explanatory variables are now statistically significant. The estimated coefficient on UNE-P lines is $931.80, which is about 23% higher than the estimate reported in POLICY BULLETIN NO. 2. Other statistically significant variables include revenues (ΔR), lagged capital stock (K_{t-1}), the period dummy variable, and the constant term. The cost of capital is not statistically different from zero, but has the correct sign (negative).[29]

In Model 4, the revenue (ΔR) and cost of capital (ΔC) variables are replaced with a substitute variable measured as total revenues divided by the user cost of capital Δ(R/c). This variable is commonly employed in investment regressions such as those estimated here, and serves as a proxy for the optimal capital stock.[30] All of the explanatory variables in Model 4 are statistically significant at the 5% level or better. The coefficient on UNE-P lines is $688.10. Models 5 and 6 are more dynamic in their specification than proposed by HHB, including lagged values of Δ(R/c) and the dependent variable (I_{t-1}). These more dynamic specifications do not perform any better than the more simple models, and the sign, size, and significance of the UNE-P variable (ΔU) is unaffected.

Models 7 through 10 are varied specifications of the investment equation, and the results from these models are generally comparable with the others. In every case, the coefficient on UNE-P lines is positive, large, and statistically significant. The models perform well, with a high degree of statistical significance and no evidence they are mis-specified (by RESET). Across the full range of usable models (Models 2 through 10), the coefficient on UNE-P ranges from $1011.40 to $665.80, with an average coefficient of $808.30.

For Models 11 through 20 (Table 2), the dependent variable is measured using our alternate measure of capital stock and investment (K′, I′). Otherwise, these models are identical to Models 1 through 10. Models 12 through 20 pass RESET easily, suggesting the estimated

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[28] Passing the RESET does not imply that all potentially statistically significant variables are in the regression, only that the variables omitted from the regression do not bias the coefficients. The stability of the coefficient, therefore, is encouraging.

[29] Contrariwise, HHB report a positive and statistically significant coefficient on the cost of capital.

[30] Jorgenson and Stephenson, *supra* n. 6.

coefficients are not influenced by specification error. In all ten models, the coefficient on UNE-P lines is positive and statistically significant. Across Models 12 through 20 (those passing RESET), the coefficient on UNE-P ranges from $868.40 to $523.80, with an average coefficient of $655.20. Relative to Models 1 through 10, we observe less statistical significance of the existing capital stock (K) and period dummy variable in Models 11 through 20. The cost of capital (ΔC) is correctly signed and statistical significant in half the models in which it is included. As before, the more dynamic specifications are of little statistical consequence. Thus, we find no support for HHB's supposition that more dynamic specifications would alter our earlier conclusions.

D. *Levels versus Changes*

In the alternate models presented by HHB the explanatory variables are expressed in their annual levels rather than annual changes in levels as prescribed by the neo-classical model of investment. Besides being an atheoretic and arbitrary model choice, there are potentially severe econometric consequences of HHB's re-specification as described by Hill. Nevertheless, if we ignore the serious defects in using the levels rather than changes in the variables, we can evaluate whether or not the investment equation is better estimated using either the annual changes in the explanatory variables (as in POLICY BULLETIN NO. 5 and here) or the levels of the variables (as in HHB). We test the alternative specifications using the Davidson-MacKinnon *J* Test.[31]

The Davidson-MacKinnon *J*-test is performed by adding the predicated values from two rival regressions, say Phoenix and HHB, as an additional explanatory variable in the rival model. If this additional regressor is statistically significant in rival model HHB, but not in rival model Phoenix, then model Phoenix is the preferred specification (and vice versa).[32] More specifically, say Model Phoenix can be summarized as $I = a\Delta X$ and the HHB model as $I = bX$. The fitted values from each regression, respectively, are $\hat{I}_P$ and $\hat{I}_H$. The supplementary test regressions are:

$$\text{Phoenix:} \qquad I = a\Delta X + d\cdot\hat{I}_H$$

$$\text{HHB:} \qquad I = bX + e\cdot\hat{I}_P.$$

If the hypothesis $d = 0$ is not rejected, but the hypothesis $e = 0$ is rejected, then the Phoenix model is the better specification. Alternately, if the hypothesis $d = 0$ is rejected, but the hypothesis $e = 0$ is not rejected, then the HHB model is the better specification. This conclusion

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[31] Gujarati, *supra* n. 17 at 490-491.

[32] *Id.* at 491. A shortcoming of this approach is that we may observe statistical significance or insignificance in both models, which renders an ambiguous result. The *J*-test is only asymptotically valid, implying it may not perform well in very small samples.

is based on the fact that the influence of the variables in Model HHB, captured by the fitted value from that model, adds no additional explanatory power beyond that contributed by Model Phoenix.

We use Model 3 (from Table 1) to compare the rival specifications, one using changes in the explanatory variables (the Phoenix approach) versus the levels of the explanatory variables (the HHB approach). Inserting the predicted value from the HHB regression of investment in the Phoenix model, the estimated coefficient is 0.53 and the t-statistic is 0.54, which is *not* statistically significant. For the HHB regression, the predicted value from the Phoenix model is included as a regressor and the estimated coefficient is 1.0 and the t-statistic is 3.48, which *is highly* statistically significant. Thus, by the *J*-test, the Phoenix specification is preferred and the explanatory variables should be expressed as annual differences and not levels. Further, when the explanatory variables are expressed in levels, the estimated regression easily fails RESET, indicating that specification error is present.[33]

E. *Summary*

In sum, we find no evidence of 'weakness' in the results; the results are, in fact, extremely robust. We tried alternative measures of some variables, alternate estimation techniques, and dynamic model specifications, and none of these changes produced evidence conflicting with our earlier finding. Based on the analysis summarized here and the comments of HHB, we find no reason to question the empirical results from POLICY BULLETIN NO. 5. While our models cannot explain why investment responds to UNE-P competition, the results provide strong evidence that investment is impacted by such competition.

III. Conclusion

In POLICY BULLETIN NO. 5, we showed using econometric analysis and publicly availably data that Bell Company investment is positively related to UNE-P competition. Here, we show that this result is robust across a wide range of model specifications. These alternate specifications were recommended by Tom Hazlett, Art Havenner, and Coleman Bazelon (on behalf of Verizon) and Carter Hill (on behalf of Z-Tel). Despite re-specification and different estimation techniques, the measured effect of UNE-P competition on Bell investment remains large and statistically significant (in all models). These new empirical results are generally comparable to our earlier estimates, supporting the reasonableness of our chosen specification.

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[33] The RESET F is 4.59, which is significant at better than the 1% level.

We also show that, using statistical tests, our specification of the investment relationship is preferred to the arbitrary specification adopted by Verizon's advocates.[34]

Accordingly, the conclusion reached in POLICY BULLETIN NO. 5 below (citations omitted) continues to ring true:

> … the current cynicism, ideological bias and outright ignorance towards UNE-P and TELRIC pricing must come to an end. Like it or not, "Congress passed a ratesetting statute with the aim not just to balance interests between sellers and buyers, *but to reorganize markets by rendering regulated utilities' monopolies vulnerable to interlopers, even if that meant swallowing the traditional federal reluctance to intrude into local telephone markets*." As TELRIC does not result in confiscatory rates (if anything, they still remain on the "creamy" side in many jurisdictions), the growing push for BOC sector-specific relief (and, *a fortiori*, a decline in competitive pressures) is specious at best and raises troubling indications of regulatory capture at worst.
>
> If policymakers really want to maximize consumer welfare by protecting competition and not individual competitors (*i.e.,* the BOCs), then U.S. policymakers should stop dreaming that a monopolist will change its spots and invest in new facilities if only it received relief from "pesky" competitive

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[34] Despite the fact the data provide strong evidence of a positive relationship between Bell Company investment and UNE-P competition, we do not encourage policymakers to make investment a policy target. As noted in POLICY PAPER NO. 18, *Set It and Forget It? Market Power and the Consequences of Premature Deregulation in Telecommunications Markets* (July 2003) (http://www.phoenix-center.org/pcpp/PCPP18.pdf) a single-minded focus on capital expenditures by telecommunications firms is misplaced, since the impact to consumer and social welfare of increased capital expenditures is not always positive. Policymakers should focus on the efficient provision of telecommunications services, not whether or not the provision of such services is sufficiently capital intensive to satisfy equipment vendors.

pressures. Instead, if policymakers focus on their core and interrelated statutory mandates – *i.e.,* (a) prevent dominant firms under their jurisdictions from exercising their market power by raising prices and restricting output; and (b) reduce entry barriers for new firms – then we might just get out of the current telecoms slump before it is too late.

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Table 1. Summary of Results

(Dep. Variable: ΔK = I)

	Model 1, OLS	Model 2, OLS	Model 3, WLS	Model 4, WLS	Model 5, WLS	Model 6, WLS	Model 7, WLS	Model 8, WLS	Model 9, WLS	Model 10, WLS
Constant	1.5+08	40.94	4.7+07	5.3+07	5.6+07	5.4+07	3.3+07	5.0+07	5.2+07	-1.6+06
	(2.23)*	(1.07)	(2.25)*	(4.27)*	(3.94)*	(3.69)*	(1.38)	(3.91)*	(3.97)*	(-0.12)
ΔR	0.84	0.45	0.75	…	…	…	0.89	0.74	…	1.21
	(1.49)	(1.72)**	(3.19)*				(3.53)*	(4.05)*		(6.35)*
ΔU	**1388.0**	**757.5**	**931.8**	**688.1**	**666.6**	**665.8**	**1011.4**	**927.0**	**688.9**	**937.6**
	(3.27)*	**(3.46)***	**(4.21)***	**(2.76)***	**(2.81)***	**(2.73)***	**(3.99)***	**(4.46)***	**(2.63)***	**(4.16)***
ΔC	-1.2+08	6.87	-6.3+07	…	…	…	-4.1+07	…	…	…
	(-0.68)	(0.33)	(-0.10)				(-0.54)			
K_{t-1}	-0.076	-0.036	-0.035	-0.065	-0.045	-0.036	-0.02	-0.035	-0.058	…
	(-2.71)*	(-0.71)	(-2.58)*	(-4.51)*	(-2.10)*	(-1.76)**	(-1.19)	(-2.71)*	(-3.24)*	
Period	-1.9+07	-67.57	-8.0+07	-8.3+07	-8.5+07	-8.2+07	-6.6+07	-8.1+07	-8.0+07	…
	(-2.02)*	(-3.78)*	(-3.84)*	(-5.55)*	(-5.34)*	(-4.77)*	(-3.06)*	(-4.58)*	(-4.93)*	
Δ(R/c)	…	…	…	8.95	5.34	4.63	…	…	8.55	…
				(2.82)*	(1.23)	(1.14)			(2.69)*	
$\Delta(R/c)_{t-1}$		…	…		-4.11	-4.44	…	…		…
					(-0.96)	(-1.08)				
Net I_{t-1}	…	…	…		…	-0.17	-0.31	…	-0.15	-0.48
						(-0.78)	(-1.58)		(-0.72)	(-3.11)*
Adj. R^2	0.57	0.43	…		…	…	…	…	…	…
Pseudo.-R^2	…	…	0.28	0.29	0.29	0.29	0.31	0.28	0.30	0.21
RESET F	9.10*	1.51	1.52	1.53	1.36	1.81	1.91	1.49	1.77	1.07
White χ^2	33.91*	13.05	12.22	10.17	12.73	21.41**	26.42*	8.60	22.17*	13.26**

* Statistically Significant at the 5% level or better.
** Statistically Significant at the 10% level or better.
Notes: All t-statistics computed using Newey-West robust standard errors. Pseudo-R^2 is computed as the squared correlation coefficient between the actual and fitted dependent variable. In Model 2, I, ΔR, ΔU, and K_{t-1} are all divided by total switched access lines.

Table 2. Summary of Results

(Dep. Variable: ΔK′ = I′)

	Model 1, OLS	Model 2, OLS	Model 3, WLS	Model 4, WLS	Model 5, WLS	Model 6, WLS	Model 7, WLS	Model 8, WLS	Model 9, WLS	Model 10, WLS
Constant	4.5+08	7.08	-1.5+07	3.0+07	2.9+07	2.8+07	-2.0+07	2.9+07	2.8+07	-2.1+07
	(1.42)	(0.20)	(-0.85)	(4.14)*	(4.00)*	(3.72)*	(-1.16)	(3.23)*	(3.96)*	(-2.22)*
ΔR	0.58	0.32	0.77	…	…	…	0.75	0.51	…	0.60
	(2.88)*	(2.19)*	(4.84)*				(4.80)*	(3.41)*		(3.32)*
ΔU	**807.1**	**589.6**	**763.0**	**542.6**	**552.1**	**533.6**	**728.0**	**644.0**	**523.8**	**868.4**
	(6.66)*	**(4.70)***	**(5.15)***	**(3.19)***	**(3.09)***	**(2.89)***	**(4.90)***	**(3.30)***	**(2.93)***	**(3.85)***
ΔC	-5.6+06	-28.05	-1.7+07	…	…	…	-1.7+08	…	…	…
	(-0.06)	(-1.50)	(-3.08)*				(-3.12)*			
K'_{t-1}	-0.024	0.028	-0.019	-0.008	-0.012	-0.006	0.029	-0.013	-0.002	…
	(-4.10)*	(0.71)	(-2.04)*	(-0.83)	(-0.84)	(-0.40)	(2.52)*	(-1.35)	(-0.13)	
Period	-1.4+08	-46.61	-1.9+07	-3.6+07	-3.6+07	-3.4+07	-1.2+07	-3.9+07	-3.4+07	…
	(-3.25)*	(-3.15)*	(-1.00)	(-2.14)*	(-2.07)*	(-1.75)**	(-0.60)	(-1.98)**	(-1.82)**	
Δ(R/c)	…	…	…	8.22	9.14	8.75	…	…	7.77	…
				(4.85)*	(3.09)*	(3.35)*			(3.86)*	
$\Delta(R/c)_{t-1}$		…	…		-1.04	-1.10	…	…		…
					(-0.40)	(-0.43)				
Net I'_{t-1}	…	…	…		…	-0.12	-0.25	…	-0.12	-0.06
						(-0.48)	(-1.15)		(-0.48)	(-0.32)
Adj. R^2	0.71	0.38	…		…	…	…	…	…	…
Pseudo.-R^2	…	…	0.40	0.23	0.22	0.23	0.20	0.20	0.23	0.19
RESET F	4.94*	1.01	0.53	0.54	0.59	0.55	0.38	1.16	0.48	0.75
White χ^2	18.63*	5.51	7.03	6.16	7.64	10.25	8.38	8.30	9.17	1.05

* Statistically Significant at the 5% level or better.
** Statistically Significant at the 10% level or better.
Notes: All t-statistics computed using Newey-West robust standard errors. Pseudo-R^2 is computed as the squared correlation coefficient between the actual and fitted dependent variable. In Model 2, I′, ΔR, ΔU, and K'_{t-1} are all divided by total switched access lines.

ATTACHMENT 3

Some Thoughts on the FCC's Inquiry into TELRIC

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I. Introduction

The Federal Communications Commission has suffered many legal setbacks in its efforts to implement the unbundling mandates of the 1996 Telecommunications Act. Since the passage of the Act, none of the attempts of the Commission to implement an impairment standard (§251(d)(2)(B) of the Act), which is the governing principle regarding what is to be unbundled, has survived legal scrutiny. In contrast, the agency's standard for pricing unbundled elements – that is, Total Element Long Run Incremental Cost or TELRIC – was deemed appropriate by the Supreme Court in *Verizon v. FCC*.[1] Apparently unsatisfied with its success, the Commission is now seeking comment on potential changes to the TELRIC standard in a *Notice of Proposed Rulemaking*.[2]

TELRIC is nothing more than long-run incremental cost ("LRIC") with an allocation of common cost, where the increment is the total supply of the element.[3] Unlike a strict incremental cost standard, TELRIC includes an allocation of common expenses.[4] In essence, TELRIC is equivalent to the long-run average cost of an efficient provider. To the economist, TELRIC is the preferred standard for setting prices for unbundled elements.[5] Historically, the Incumbent Local Exchange Carriers ("ILECs") have preferred long-run

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[1] TELRIC was first defined in FIRST REPORT AND ORDER, CC Docket No. 96-98 (August 8, 1996) ("FIRST ORDER"). *Verizon*, 122 S. Ct. at 167 ("*Verizon v. FCC*").

[2] NOTICE OF PROPOSED RULEMAKING, WC Docket No. 03-173 (Sept. 15, 2003) ("NPRM").

[3] NPRM at ¶18 ("TELRIC calculates the long-run average incremental cost of a network element").

[4] First Order at ¶693.

[5] See, e,g., John Mayo, *Efficient Forward-Looking Telecommunications Networks as a Foundation for TELRIC*, Working Paper (December 2003).

incremental cost as the proper measure of cost for pricing purposes, but that was before the costing standard was used to promote competition in their market.[6]

There are many puzzling aspects of the Commission's proposal to revisit TELRIC. First, nothing in the NPRM even remotely resembles a simplification of TELRIC estimation. Since the costs of developing the models used to estimate TELRIC are now sunk, any substantial changes to the core assumptions of the network would be exceedingly complex and expensive. Second, the TELRIC pricing standard now has a somewhat limited applicability. In fact, any fears regarding ILEC upgrades to network, one of the core concerns of the Commission, is moot. In its Triennial Review Order ("TRO"), the Commission excluded from the unbundling obligations virtually all elements that represent an upgrade to the ILEC network.[7]

Clearly, as the Commission acknowledged in the TRO, the elements making up the UNE-Platform have no consequence for ILEC upgrades because none of the elements are being upgraded. For example, with respect to unbundled switching the Commission observed:

> given that we do not require packet switches to be unbundled, there is little, if any, basis for an argument that our treatment of circuit switches gives LECs a disincentive to upgrade their switches. TRO, ¶ 448.
>
> [and[Section 706's directive to promote advanced telecommunications is not undermined by the unbundling of local circuit switching because such unbundling imposes requirements with respect to the legacy telephone network, and thus does not deter carriers' investment in advanced telecommunications capabilities. TRO, ¶ 450.

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[6] See Indiana Utility Regulatory Commission, Cause No. 38561 (October 4, 1989) (Lexus 1989 Ind. PUC LEXIS 361; 107 P.U.R.4th 366) ("Indiana Bell's witness, Bruce A. Hazelett, recommended utilizing the direct, incremental costs for providing the service. He defined the incremental cost to include: 1) The LEC's investment in switching equipment, outside plant cable, and transmission equipment; 2) capital costs including depreciation, return, and taxes calculated directly from the investments; 3) operating expenses, including maintenance costs, property taxes, administrative costs, sales costs, and gross receipts taxes. …Dr. Alessio's testimony, subsequently sponsored by Mr. Steve Parsons on behalf of Indiana Bell, explained Alessio's belief that incremental cost is the only appropriate cost standard because it captures all of the costs caused by the decision to provide the CSO and none of the costs that are not affected by that decision. Incremental costs are forward-looking costs, according to Dr. Alessio's testimony. He stated that these costs do not reflect past costs, nor do they include any common costs such as personnel, medical, cafeteria costs, etc., which are not incurred as a direct result of the decision to offer the new product or service and are not changed by that decision (at 27)."

[7] REPORT AND ORDER AND ORDER ON REMAND AND FURTHER NOTICE OF PROPOSED RULEMAKING, CC Docket No. 01-338 (August 21, 2003) ("Triennial Review Order" or "TRO").

In light of these views, expending effort on improving TELRIC for unbundled circuit switching due to potential ILEC investment incentives seems like a substantial waste of time and money.

The importance of modifying TELRIC based on its implications for CLEC investment is also suspect. As for unbundled switching, there can be no legitimate claim that unbundling has deterred CLEC investment in Class 5 circuit switching. If anything, the current switching rates have encouraged considerable inefficient investment in circuit switching equipment by CLECs. Hundreds of millions have been invested in Class 5 switching gear, and hundreds of millions lost.[8] CLECs have deployed more than 1,000 voice switches since 1996 – of course, the FCC decided in the Triennial Review Order that these switches were not being used to serve mass market consumers for good operational and economic reasons.[9] A public policy designed to incent further investment by CLECs in circuit switching is dubious.

A central question, then, is where is the sizeable mis-allocation or mis-direction of resources caused by the current TELRIC regime that warrants spending millions more on revamping the pricing standard? The Commission provides zero examples; in fact, there is not even the mention in the NPRM of any real, observed inefficiency caused by TELRIC. It appears, at least to us, that the Commission's concern regarding TELRIC is solely a response to the ILECs' incessant assault on the cost standard (which, given the effect on their market power, is expected). The ILECs' criticisms have little to do with the appropriateness of TELRIC as a policy matter or its implications for consumers, but everything to do with the reduction in market power made possible by the ability of rivals to acquire unbundled elements at rates allowing some price competition and innovation in local markets, two characteristics of the local

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[8] See, e.g., ALTS Annual Report: The State of Local Competition 2003 (April 2003), http://www.alts.org/Filings/2003AnnualReport.pdf; Larry F. Darby, Jeffrey A. Eisenach, and Joseph S. Kraemer, The CLEC Experiment: Anatomy of a Meltdown, Progress and Freedom Foundation (September 2002) ("more than fifty CLECs have filed for bankruptcy and several others have simply disappeared over the last two years. Indeed, of the approximately 300 'facilities based' CLECs in operation three years ago, only about 70 remained as of early 2002. The market capitalization of publicly traded CLECs fell more than 60 percent in 2000 from its 1999 high, then lost 80 percent of even that diminished value in 2001. Shareholders and investors have lost billions of dollars in what is now referred to by some as the 'CLEC meltdown.'").

[9] The standard Class 5 switches (Lucent 5E and Nortel DMS-500) have a maximum capacity of about 100,000 line-side (DS0) ports. There are about 100 million households with telephone service. TRENDS IN TELEPHONE SERVICE (August 2003). There are, of course, substantial barriers to entry for CLEC switches being used to serve residential customers. See, generally, the TRO at ¶¶419-528.

exchange market absent prior to 1996. What is abundantly clear, though perhaps not to the current FCC, is that the advice of a monopolist on how to promote competition in its markets is not good advice, and the incumbents' attacks on TELRIC should be weighed accordingly.

A full review of TELRIC and the consequences of the standard is not the purpose of this brief paper. We do, however, discuss generally some aspects of TELRIC and the concerns expressed in the NPRM. First, we contend that all changes to TELRIC must be sifted through a cost-benefit analysis. Due to the human element of TELRIC rate setting, TELRIC-based prices will always include error, but reducing this error component comes at a cost. If knowledge, time, skill, and intellect were free, the error could be reduced to zero. But, given that scarce resources have value, only changes that involve a positive net benefit should be accepted. Second, we explain why the "internal tension" described by the Commission is of no concern, and is the consequence of confusion regarding the correct economic price for unbundled elements and analogies to that price. Third, we evaluate whether or not the variation in unbundled element price (loops in particular) are consistent with cost variations across markets. The answer is unequivocally yes, implying the Commission's concerns in this regard are also misplaced. We also consider the consequences of the above-cost nature of switching prices and propose some solutions to the problem that represent real simplifications and improvements to computing TELRIC.

II. A Framework for Analysis

Regulatory agencies are staffed by mere mortal men – they are not all-knowing and do not have unlimited resources. Consequently, UNE prices will always deviate from "true" minimum economic cost to some degree. In some cases, this deviation is systematically introduced by constraints on the estimation algorithms, such as the scorched node constraint.

We could write the UNE price as

$$P = \hat{C} = C + \delta$$

where P is the price, $\hat{C}$ is the estimated TELRIC cost, C is the "true" minimum cost of reproducing the functionality provided by the UNE (i.e., the "true" TELRIC), and δ is an error component that consists of systematic, idiosyncratic, and potentially random components. Ideally, we would have P equal to C so that $\delta = 0$, but this is an unrealistic expectation. Thus, we must accept that $\delta \neq 0$. We do, however, wish to minimize δ, but such minimization should be subject to a cost-benefit analysis. In other words, if the incremental cost of reducing δ

exceeds the incremental benefit of doing so, then don't do it. Likewise, proposals for simplifying TELRIC should also satisfy this cost-benefit analysis. If a simplification increases error, but the costs of that error are less than the benefits of simplification, then incorporate the simplification.

Given that we must accept the fact that $\delta \neq 0$ and recognize that we wish to minimize this error when it is cost-effective to do so, empirical evidence is exceedingly relevant. For example, we need to know whether or not the UNE price is set at a level such that investment by CLECs is reduced? If so, then we must ask why this is true, how we fix it, and if the expected benefit is higher than the cost of fixing it. It would seem obvious, at this point, that potential conceptual flaws with TELRIC would take a backseat to the observed consequences of incorrect price signals. No matter how elegant the proposed computations, the Commission is well aware that TELRIC can be implemented with error (and, supposedly, may contain some error). So, the relevant question today is what is the cumulative effect of these errors on the observed prices (in the end, the only thing that really matters).[10]

To date, there is no empirical evidence to suggest that UNE prices are substantially below "true" TELRIC. CLEC investment, if anything, is excessive (leading to hundreds of bankruptcies and failures).[11] Further, empirical evidence indicates that the ILECs are compensated for their wholesale costs, on average, even when comparing TELRIC-based prices to current and embedded costs.[12] Further, the highest court in the land has embraced TELRIC, so there is no legal cost to its maintenance.

Exactly what drives the Commission's concern on TELRIC, other than pure politics or excessive CLEC investment, is unclear. The NPRM cites no specific evidence suggesting there is a problem with incentives produced by the current regime. Nevertheless, the Commission has proposed radical changes to the methodology for no apparent reason. By the Commission's own admission (¶7), these changes will impose substantial regulatory sunk costs on entrants to debate an issue that is, according to the evidence and court decisions, satisfactorily resolved.

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[10] NPRM at ¶27.

[11] Supra nt. 8.

[12] T. R. Beard, G. S. Ford, and C. Klein, *The Financial Implications of the UNE-Platform: A Review of the Evidence*, COMMLAW CONSPECTUS (Forthcoming 2004). Also see William J. Baumol, *TELRIC-Based Prices are Compensatory Payment*, Working Paper (December 2003).

III. Facilities-based Competition and TELRIC: Fact or Folklore

In the TELRIC NPRM, the FCC mentions the presence of a "key internal tension" resulting from the modeling assumptions used in estimating TELRIC. Specifically, the Commission observes that the models used to estimate TELRIC include "the assumption that for some purposes rates should reflect a market with widespread facilities-based competition but, for other purposes, rates should reflect a market with a single dominant carrier." NPRM at ¶4. Obviously, the Commission is confused. TELRIC is the minimum economic cost of production, and has nothing *per se* to do with the level or type of competition in a market.

This apparent tension appears to be a fabrication; nothing in the FIRST ORDER -- which establishes the meaning of TELRIC -- indicates that TELRIC "rates should reflect a market with widespread facilities-based competition." Indeed, the term "widespread facilities-based competition" does not even appear in the FIRST ORDER, and there is no discussion that TELRIC-based prices are intended to mimic the prices arising from some particular form of competition (or competition at all). *Setting UNE prices equal to the minimum economic cost of reproducing the functionality of the element is not desirable because it is equal to the competitive price, competition is desirable because the resulting price equals minimum economic cost*.[13] This "facilities-based competition" characteristic of TELRIC is folklore. TELRIC is intended only to mimic the minimum economic cost of producing the element; the rest is simply confusing decoration added over time.

Even if the "competition" characteristic of TELRIC was legitimate, the alleged tension remains an illusion formed from the confusion between two forms of competition, i.e., *competition in the field* versus *competition for the field*.[14] The basic

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[13] *See*, e.g., P. R. G. Layard and A. A. Walters, *Microeconomic Theory* (1978) ("So far [] we have simply described the technical conditions which must hold at the optimum. Now the question is: What form of organization will bring us nearest to the optimum? If it had all the information, a computer could, in principle, solve the problem we have posed. In a centrally planned economy the government, if it had the power, could then implement the solution. That is one approach. But how would a freely functioning capitalist economy perform? Remarkably well, if we make four sweeping assumptions[]. The key assumption is that in every market there are so many buyers and sellers that all behave as though their actions individually cannot affect the price, or, in other words, that we have perfect competition (at 19).")

[14] Edwin Chadwick, Results of Different Principles of Legislation and Administration in Europe: of Competition for the Field, As Compared with Competition within the Field of Service," Journal of the Royal Statistical Society (1859) 22: 381-420; Harold Demsetz, "Why Regulate Utilities," Journal of Law and Economics (1968) 11: 55-65; and William M. Crain and Robert B. Ekelund, Jr. "Chadwick and Demsetz on Competition and Regulation," Journal of Law and Economics (1976) 19: 149-62.

textbook model of competition would emphasize competition as a model wherein there are many sellers, many buyers, homogeneous products, low or no transactions costs, free entry and exit and a litany of characteristics producing an "efficient" equilibrium. Naturally, this is one form of rivalry – or "competition in the field." Another, and more ancient, kind of rivalry is described by the contest to obtain an *exclusive* right to serve in the context of natural monopoly. The great economic thinker Edwin Chadwick, who first formally identified this system, observed that the competitive price could be obtained by a "competition for the field" rather than "competition in the field."[15]

With competition for the field, potential suppliers would bid for the exclusive right to serve. The rivalry described by this form of competition is temporary and discontinuous, as compared to the continuous and quasi-perpetual rivalry of perfect competition. It usually takes the form of competitive bidding to secure a franchise. Importantly, in the presence of natural monopoly and properly designed contractual safeguards, franchise bidding will result in the manufacture and sale of goods at the minimum (average) economic cost of production (that is, TELRIC). Thus, the resulting price from competition *for* the field is minimum average economic cost of the most efficient provider (e.g., TELRIC as currently envisioned).[16]

In some cases, particularly in local telecommunications, the minimum economic cost may the cost of a single provider (i.e., natural monopoly). This fact does not negate the efficiency of using minimum economic cost (TELRIC) as the appropriate standard, or suggest that it is somehow inappropriate to base TELRIC on the costs of a dominant or monopoly firm. Being equal to minimum economic costs is the most important characteristic of TELRIC; the fact that the competitive price mimics TELRIC is interesting but not terribly important. Nevertheless, the presence of a monopoly or dominant firm does not eliminate the fact that the minimum economic cost can also be described as the competitive price, once the scope of competition is expanded beyond the naïve textbook model of perfect competition.

Thus, there is no internal tension if folklore is distinguished from fact, or the form of competition is appropriately specified. Widespread competition among facilities-based providers is an unrealistic assumption for local telecommunications markets, but fortunately it is an unnecessary assumption for

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[15] *Id*.

[16] *Id*. Due to scale economies, the competitive price is equal to average cost rather than marginal cost. Notably, TELRIC is an average cost standard.

TELRIC. In addition, whether or not competition is "in the field" or "for the field," the correct price for unbundled elements is the same – the minimum economic cost of producing the functionality provided by the element.

IV. The Variation in the Price and Cost of Unbundled Elements

The Commission's concerns over TELRIC are motivated in part by the observed variability in UNE rates across states and over time within a state. As the Commission observes:

> …for any given carrier, there may be significant differences in rates from state to state, and even from proceeding to proceeding within a state. We are concerned that such variable results may not reflect genuine cost differences but instead may be the product of the complexity of the issues, the very general nature of our rules, and uncertainty about how to apply those rules. NPRM at ¶6.

Without any further analysis, the Commission blames this "lack of predictability in UNE rates" on the "hypothetical nature" of TELRIC. NPRM at ¶7. Yet, the Commission makes no effort to assess whether or not this variability is consistent with cost variability across states, although it has done an analogous comparison repeatedly in the context of §271 proceedings. NPRM at ¶27.

There is little doubt that UNE prices vary considerably across states, but so do costs. The question is whether or not the variation is prices is consistent with the variation in costs, and answering this question is not particularly difficult. We present the results of a test that suggests that the variation in the rates set by state commissions for unbundled loops and switching are, in large part, consistent with genuine cost differences. As a result, the data does not support Commission's hypothesis that its TELRIC rules are so complicated as to lead to widely disparate results.

Our test can be used to evaluate the relationship of UNE prices to costs across states as well as how this relationship changes from "proceeding to proceeding within a state," another issue with which the Commission expressed concern. Following the Act, many state commissions established interim rates as a placeholder until the lengthy and complex process of estimating TELRIC could be properly conducted. Changes to these interim rates would be expected after completion of the full cost proceeding.[17] Notably, in some cases, UNE price

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[17] Bell companies have argued vociferously before the Commission in a number of forbearance petitions that recent state commission actions to lower UNE rates are evidence that those rates are "below cost." Petition for Expedited Forbearance of the Verizon Telephone Companies, WC Docket No. 03-157 (filed July 1, 2003); Joint Petition of Qwest Corporation,

changes between proceedings reflected adjustments required to remedy errors caused by disingenuous contributions to the record by the ILECs.[18] Further, given the complexity of the process, it is not unreasonable to suspect that regulatory commissions would get better over time at determining TELRIC, perhaps learning from the decisions and processes of other states. Learning-by-doing effects would be exhibited by price reflecting cost variations more closely over time.

Whether or not UNE prices reflect cost and whether the changes in UNE prices over time are arbitrary or simply reflect improvements in the estimates of TELRIC are relevant empirical questions. A simple test of these hypotheses is to estimate the following regressions:

$$\ln P_t^L = \alpha_0 + \alpha_1 \ln C^L + \varepsilon_t \tag{1}$$

$$\ln P_{t+1}^L = \beta_0 + \beta_1 \ln C^L + \varepsilon_{t+1} \tag{2}$$

whereas P_L is the loop price in period t, C_L is the long run forward-looking cost of the loop which is independent of state-specific non-cost related factors, and ε is a well-behaved econometric disturbance term.

The test proceeds as follows. If unbundled loop prices more accurately reflect costs over time, then the regression estimates should indicate the following. First, the coefficient β_1 should be closer to 1.00 than the coefficient α_1. Second, the fit of Equation (2) should be better than Equation (1), implying that a greater portion of the variability in the loop price is explained by variations in forward-looking costs across states. Note that if loop prices are strictly proportional to TELRIC in either period, the coefficients α_1 or β_1 should be statistically indistinguishable from 1.0.

BellSouth Telecommunications, Inc. and SBC Communications Inc. for Expedited Forbearance, WC Docket No. 03-189 (filed July 31, 2003). Logically, however, the fact that a rate has been lowered from a previous higher level says nothing as to whether the new rate is above or below cost – at most, all that action says is that the regulator now considers that the *old* (higher) rate was above-cost.

[18] ORDER ON UNBUNDLED NETWORK ELEMENT RATES, New York Public Service Commission, Case 98-C-1357 (January 23, 2002) at 21-2 ("We were unimpressed by Verizon's belittling, as "inadvertent misstatement," of its own assertion that the higher discounts were uniquely associated with the analog-to-digital replacements and by its suggestion that the new information lacked significance because of the manner in which switches are purchased.").

For our test, loop prices are measured as of January 2002 (t) and July 2003 (t + 1).[19] Forward-looking costs are measured by the HAI Cost Model (v. 5), but the FCC's Proxy prices from the FIRST ORDER produce comparable results.[20] The parameters of Eqs. (1) and (2) are estimated with 49 observations, and can be summarized as:

$$\ln P_t^L = 0.91 + 0.70 \ln C^L + \varepsilon_t \qquad (1')$$

$$\ln P_{t+1}^L = 0.18 + 0.94 \ln C^L + \varepsilon_{t+1} \qquad (2')$$

where all the coefficients are statistically significant at the 5% level except β_0. The R^2 of the Equation (1') is 0.42, but is 0.69 for Equation (2'), indicating more of the dependent variable's variation is explained by costs in July 2003 than in January 2002. Additionally, the coefficient β_1 is much larger than α_1 (0.94 versus 0.70) and the hypothesis that $\beta_1 = 1$ cannot be rejected at anything near standard significance levels, so we can conclude the variation in loop prices is strictly proportional to the variation in loop costs.[21] The hypothesis that $\alpha_1 = 1$ is rejected at the 5% level.[22]

In summary, these results show that the Commission's concern that variation in UNE prices (both across states and over-time within states) is driven by factors other than "genuine cost differences" or the state regulator's inability to implement TELRIC is unsupported by the data. In fact, our results are consistent

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[19] Billy Jack Gregg, *A Survey of Unbundled Network Element Prices in the United States* (Updated January 2002 and July 2003). The January 2002 from Gregg results are very similar to those reported in *Status & Implications of UNE-Platform in Regional Bell Markets*, Capital Commerce Markets (November 2002), as the resulting econometric estimates. Year 2003 prices are not provided by Capital Commerce Markets.

[20] Comparable results were also obtained using the estimates from the HCPM, particularly is the state of Georgia was excluded from the analysis. There appears to be a problem with the Georgia loop cost estimates in the output spreadsheets from the HCPM (available at fcc.gov), so we do not report the results. The use of the HAI model (or any of the cost model) does not imply an assumption that the level of the HAI estimates is "correct," but only that the relative costs across states are accurate (at least with respect to the coefficients α_1 and β_1). For example, we could divide the HAI loop costs by the mean so that the series has a mean of 1.00. The results for the slope coefficients α_1 and β_1 would be unchanged relative to using the level of the cost estimates.

[21] Because the constant term is zero, we can accept the hypothesis that UNE loop prices are not a multiple of cost greater than 1.0. Differences could arise in an additive sense. From the linear regression akin to Equation (2), the constant term is 2.64 and statistically different from zero, suggesting that on average loop rates exceeds HAI costs by about $2.64.

[22] All of these results hold if the Proxy rates are used instead of the HAI costs.

with the hypothesis that in setting unbundled loop rates, state commissions have reduced the contribution of non-cost factors (such as concerns over ILEC subsidy flows) to setting UNE prices over time. Indeed, our results show that variations in loop rates across states, as of July 2003, are *strictly* proportional to variations in forward-looking costs across states. Therefore, with regard to unbundled local loop rates, state commissions appear to have "learned-by-doing" and the data does not suggest that the Commission's rules need to be changed to correct undue "variability" or disparate prices set by state commissions.

When it comes to the debate over TELRIC, it is the price of unbundling switching that draws the most fire. Since most of the criticisms of TELRIC are motivated by the BOC's desire to maintain their profits, it is little surprise that attention focuses on the most successful forms of competitive entry (that is, the UNE-Platform, which makes use of unbundled switching).

We have already provided evidence that loop prices closely track costs, but what is the relationship of switching prices to TELRIC? While the accuracy of public data on switching prices is questionable, we nevertheless estimate Equation (2) to evaluate whether or not switching prices are proportional to costs, keeping in mind the quality of the data affects the quality of the results.[23] Notably, if the errors in the switching prices are not systematic, the estimated slope coefficients are unbiased and consistent (as long as the error is uncorrelated with costs).[24]

The switching price variable (P^S) is measured by Commerce Capital Markets (November 2002), which is believed to be the best public measure of switching rates.[25] Switching costs (C^S) are measured by the HAI Model.[26] The estimated model is

$$\ln P_t^S = 0.43 + 0.97 \ln C^S + \varepsilon_t \tag{3}$$

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[23] While reasonably accurate at the aggregate level, the correlation of public estimates of costs to actual costs is relatively low. See Beard, Ford, and Klein (2004), supra nt. 12. For an analysis of UNE-P prices and costs, see T. R. Beard and G.S Ford, *What Determines Wholesale Prices for Network Elements in Telephony? An Econometric Evaluation*, PHOENIX CENTER POLICY PAPER NO. 16 (September 2002): http://www.phoenix-center.org/pcpp/PCPP16.pdf.

[24] R. Pindyck and D. Rubinfeld, ECONOMETRIC MODELS & ECONOMIC FORECASTS (1991) at 159-160.

[25] Commerce Capital Markets, supra nt. 19. Beard, Ford, and Klein (2004), supra nt. 12, indicate that CCM's estimates are about 10% too low and positively, though not strongly, correlated with actual prices.

[26] Results using the HCPM are very similar.

where the slope coefficient is statistically significant at better than the 5% level and not statistically different from 1.0. Thus, it appears that switching prices are also are strictly proportional to differences in cost across states.[27] We do not evaluate switching prices over time given the generally poor quality of the switching price data from earlier periods.[28]

Being proportional to cost does not imply being equal to cost. Tables 1 and 2 summarize descriptive statistics on estimates of loop and switching prices and costs from a variety of sources. In Year 2002, the average loop prices were about $16.67. The HCPM and Proxy loop prices averaged $16.76 and $16.53, which are very close to the average price at the time. The HAI model has an average loop cost of about $14.21, and that cost is most similar to the average loop price of $14.48 as of July 2003. Again, the average loop rates are roughly equal to the estimates of costs, with no more than a 15-20% deviation across all the figures.[29] Table 1 illustrates that the loop prices generally comport with the estimated level of loop cost from the models.

Table 1. Loop Cost and Prices

	Cost Models			UNE Loop Prices		
	HAI v. 5	HCPM	Proxy	Gregg (1/02)	Gregg (7/03)	CCM (11/02)
Mean	14.21	16.76	16.53	16.67	14.48	16.74
St. Dev.	3.97	4.92	3.88	4.58	3.97	4.64
Coef. Of Variation	0.28	0.29	0.23	0.27	0.27	0.28

To the extent that the models produce reasonable estimates of the levels of cost, as the loop rate data suggests is the case, switching prices appear to be well above forward-looking cost on average. The HAI and HCPM estimate switching costs to be about $4.60 per line month (on average). In contrast, the average switching rate (according to Commerce Capital Markets) is $7.53, about 60% above estimates of costs (and there is reason to believe the Commerce Capital Market' estimates of "prices" are too low).[30]

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[27] The constant term of this regression is significant at about the 15% level, and implies a markup of about 70%, which is consistent with the difference in the means reported in Table 2.

[28] While the results are consistent with improved implementation of TELRIC, we believe the data to be so poor that we do not report the results.

[29] Those average loop rates/costs that are close in value are not statistically different. However, the $16-plus loop rates are statistically different from the HAI loop cost of $14.21. The HAI loop cost is statistically different from the other cost estimates.

[30] See Beard, Ford, and Klein (2004), supra nt. 12. The difference in means is statistically significant.

Table 2. Switching/Transport Cost and Prices

	Cost Models		UNE Prices
	HAI v. 5	HCPM	CCM (11/02)
Mean	4.90	4.31	7.53
St. Dev.	0.99	0.99	2.76
Coef. Of Variation	0.20	0.23	0.36

While this cost variability for unbundled circuit switching and transport certainly deserves more study, a few important observations can be made. First, Bell company arguments that the price for circuit switching and transport is "below cost" is directly contravened by this data. Prices for unbundled circuit switching and transport are significantly higher than estimates of cost. This could be the result of the Commission's rate structure rules for switching and shared transport, which permit recovery of switching and shared transport costs on the basis of usage. These rate structure rules significantly complicate the state commission's task in setting these rates. In contrast, loop rates are flat-rated, and the resulting estimates more accurate. It may be that the complicating factor of usage-pricing for switching and transport have made it more difficult for state commissions to learn from their own experiences and from that of other state commissions, or to catch the ILECs schemes to understate usage (and therefore inflate per-minute rates).[31] A genuine and significant simplication to TELRIC-based pricing would be price all switching (including transport) and a per-line basis, thereby eliminating any dispute over the correct level of usage.[32] Additionally, the Commission could encourage state regulators to make public the calculations for switching, so the inputs could be evaluated across states thereby facilitating more educated decisions.

CLEC investment behavior comports with the theoretical consequences of above-cost switching prices. CLECs have invested hundreds of millions in switching equipment, the vast majority of which is now in the hands of bankrupt or entirely defunct firms.[33] According to the BOCs, there are 1,300 CLEC-owned

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[31] See G. S. Ford, *How Many Days in a Year: Creative Cost Modeling and the Cost to Competition* (July 2002): www.telepolicy.com; ORDER ON UNBUNDLED NETWORK ELEMENT RATES, New York Public Service Commission, Case 98-C-1357 at 36 ("But the Judge found, and WorldCom's and Z-Tel's arguments on exceptions confirm, that Verizon's calculations do not calculate that ratio properly and have the effect, Verizon's arguments to the contrary notwithstanding, of spreading switching costs only over business day MOUs, not total MOUs.").

[32] The FIRST ORDER allows "States [to] consider for guidance rate structures developed in competitive markets" when setting UNE prices. Competitive prices for retail phone service are clearly moving in the direction of flat fees for unlimited usage.

[33] Supra nt. 8.

Class 5 switches; a number which belies any claim that switching prices have in some way deterred switching investment.[34] By any credible evaluation, the above-cost switching rates have led to considerable inefficient investment in Class 5 circuit switching by CLECs.

V. Conclusion

This paper provides an economic examination of some aspects of the TELRIC standard, proclaimed appropriate by the U. S. Supreme Court in *Verizon v. FCC*. We argue that the standard is consistent with the fundamental notion of economic efficiency, e.g., that it is a sound measure of long-run incremental cost (containing an element of common cost). Our empirical analysis shows that FCC concerns about rates properly reflecting cost differences across states is unjustified because variations in prices across markets are in fact proportional to cost differences. Further, there is no evidence of any misallocation of resources caused by the current TELRIC prices that would warrant modifying TELRIC, except maybe to reduce the current switching prices. Contrary to concerns about underinvestment by CLECs, these entrants have invested substantially in switching and other equipment (with many firms in bankruptcy). In sum, we find no theoretical or empirical grounds for the FCC's reconsideration of current TELRIC applications. That standard does and will provide efficient economic price signals to both incumbents and entrants into local telephony.

While TELRIC is plainly appropriate as a theoretical and empirical matter, the cost standard does suffer from two major "flaws" (which, are in fact, only considered flaws by some parties). First, TELRIC was terminology invented by the Commission. Void of any history, TELRIC was an easy target for attack, since outsiders knew nothing about this new terminology. Although long-run incremental costing has been used for decades in telecommunications, in many cases argued for vociferously by the ILECs themselves, the acronym TELRIC was sufficiently different from the acronym LRIC to allow for a successful propaganda campaign against the cost standard in which the standard was characterized as some radical new idea. In fact, as previously mentioned, TELRIC is simply LRIC where the increment of analysis is the "total element." One potential significant improvement in the element pricing regime is to abandon the term TELRIC altogether, and redefine the cost standard as "long-run incremental cost including a reasonable allocation of common expenses, where the increment of analysis is the total element." Given its rich history, LRIC should be more resilient to disingenuous criticism than TELRIC has proven to be.

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[34] USTA FACT REPORT 2002 (April 2002).

Second, a major problem with TELRIC is that in many cases it actually allowed competitive entry to develop, much to the potential benefit of consumers but to the distaste of the politically and financially powerful ILECs. If TELRIC has been ineffective at promoting competitive entry, then perhaps the standard would have suited the incumbent monopolists. Because it did lead to competitive entry, however, an adversary of immense political clout was created. The ILECs are strongly committed to undermining the validity of TELRIC by any means possible, and they have funded a massive propaganda campaign against the standard. With the release of the TELRIC NPRM, it appears that the ILECs efforts to undermine TELRIC by political means were successful.

These two "flaws," however, are no reason to change TELRIC. The ILECs' distaste for TELRIC is expected if TELRIC performs its intended purpose. Only when TELRIC in rendered impotent at promoting competitive entry will the ILECs be satisfied. So any change short of increasing TELRIC to a level that will prohibit competitive entry will not satisfy the ILECs, and their assault on the TELRIC at the Commission will continue. Changes to TELRIC without eliminating the hope for competitive entry serve only to raise entry costs and reduce the prospects for competition in local telecommunications markets.