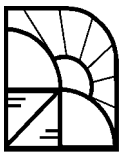

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# PHOENIX CENTER POLICY BULLETIN NO. 5

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## 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.

**PHOENIX CENTER FOR ADVANCED LEGAL & ECONOMIC PUBLIC POLICY STUDIES**
**5335 Wisconsin Avenue, NW, Suite 440**
**Washington, D.C. 20015**
**Tel: (+1) (202) 274-0235 Fax: (+1) (202) 244-8257//9342 e-Fax: (+1) (202) 318-4909**
www.phoenix-center.org

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.

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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, s*upra* 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.

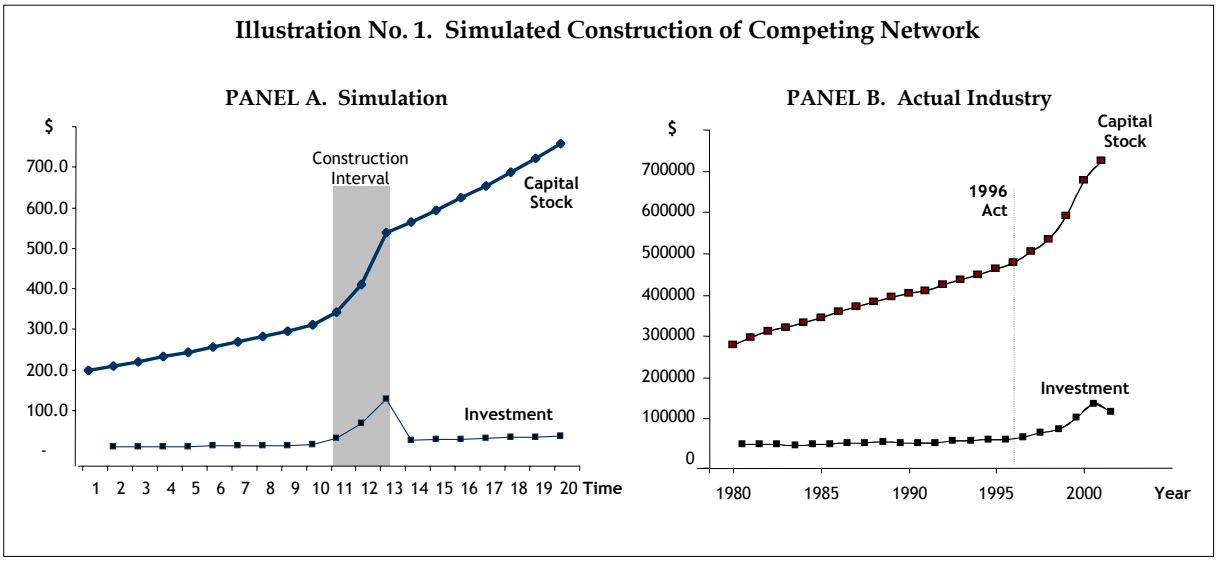
H. A. Shelanski, Competition & Deployment of New Technology in U.S. Telecommunications, U. CHI. LEGAL F. 85 (2000).

[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.

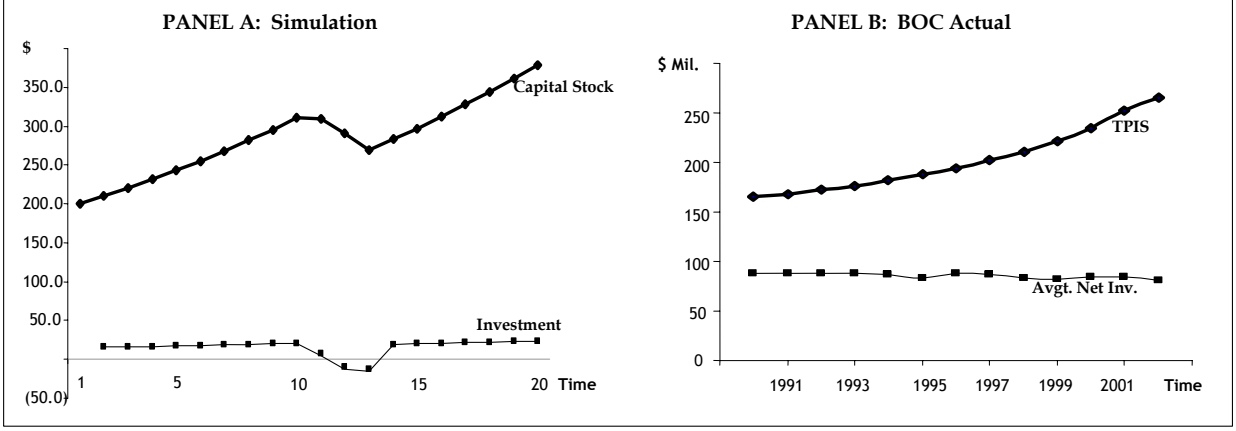
[16] This figure uses the same data as POLICY BULLETIN NO. 4.

[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

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

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

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

where $\Delta$ indicates a first difference. The dependent variable, $\Delta K$, is equal to investment. Since $X_i$ is time invariant, the coefficient $\alpha_3$ 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 $\Delta R$ ($\alpha_1$) measures the influence of the BOC's market size on its investment, and the expectation is that $\alpha_1$ will be positive. For our model, market size is measured by BOC total operating revenues in the state. The coefficient on $\Delta U$ ($\alpha_2$) 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 $\alpha_2$ will be positive; alternately, if UNE-P competition reduces net investment in plant, then $\alpha_2$ will be negative. We make no *a priori* expectation with respect to $\alpha_2$, allowing the data to inform us as to the relationship between UNE-P and net investment. Finally, the coefficients $\beta_t$ 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 $\beta$ 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 $\Delta K$, $\Delta R$, and $\Delta U$ 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 ($\Delta U$, $\alpha_2$), 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 |
|---|---|---|---|
| $\beta_{t-1}$ | -1.3E+07 | -13.34 | 2.6E+07 |
| | (0.23) | (-1.23) | (3.07)* |
| $\Delta R$ ($\alpha_1$) | 0.92 | 0.42 | 0.85 |
| | (1.10)* | (1.89)** | (4.12)* |
| $\Delta U$ ($\alpha_2$) | 815.6 | 759.1 | 594.1 |
| | (2.42)* | (3.57)* | (3.46)* |
| $\beta_t - \beta_{t-1}$ | -1.9+08 | -70.94 | -7.7E+07 |
| | (-1.84)** | (-4.41)* | (-3.65)* |
| $R^2$ | 0.33 | 0.48 | … |
| White $\chi^2$ | 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 $\Delta R$ 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 $\Delta U$ 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 ($\Delta U$, $\alpha_2$) 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.

**PHOENIX CENTER FOR ADVANCED LEGAL & ECONOMIC PUBLIC POLICY STUDIES**
**5335 Wisconsin Avenue, NW, Suite 440**
**Washington, D.C. 20015**
**Tel: (+1) (202) 274-0235 Fax: (+1) (202) 244-8257//9342 e-Fax: (+1) (202) 318-4909**
www.phoenix-center.org

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.

**PHOENIX CENTER FOR ADVANCED LEGAL & ECONOMIC PUBLIC POLICY STUDIES**
**5335 Wisconsin Avenue, NW, Suite 440**
**Washington, D.C. 20015**
**Tel: (+1) (202) 274-0235 Fax: (+1) (202) 244-8257//9342 e-Fax: (+1) (202) 318-4909**
www.phoenix-center.org