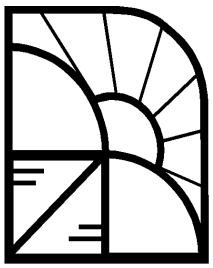

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What Determines Wholesale Prices for Network Elements in Telephony? An Econometric Evaluation

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Phoenix Center Policy Paper No. 16
What Determines Wholesale Prices for Network Elements in Telephony? An Econometric Evaluation

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Abstract: The Bell Operating Companies ("BOCs") argue that Total Element Long Run Incremental Cost (TELRIC) prices set by State public service commissions have no nexus to the BOCs' actual forward-looking costs but are, instead, based on retail prices with the goal of ensuring that competitors have an adequate (if not outright excessive) margin, thus resulting in "parasitic" competition. This Policy Paper, however, empirically demonstrates that the data do not support the Bells' contentions, finding that the wholesale price for combination of unbundled elements is motivated primarily by forward-looking costs and secondarily by BOC retail profit margins. Simply stated, *wholesale prices for UNE-P are not directly related to retail prices for local telephone service*. In fact, rather than set rates below costs, the States more often than not have actually preserved some BOC profit in a politically-sensible "50/50" split between the desired outcomes of new entrants and the incumbents. The fact that BOC margins are declining is an intended consequence of Section 251(d) the 1996 Act and a rational public policy, because TELRIC pricing deliberately does not incorporate the monopoly rents the BOCs have traditionally enjoyed in the wholesale prices for UNEs.

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Equally as important, a financial analysis of the BOCs' own publicly stated retail and wholesale revenues and operational costs for local phone service refutes the BOCs' claim that wholesale revenues are insufficient to cover wholesale operational costs. Quite to the contrary, the data indicate that even though EBITDA margins for wholesale lines are approximately half that of retail lines, *the BOCs' wholesale margins are nonetheless positive, with EBITDA margins in percentage terms (revenues minus cost divided by revenues) for retail and wholesale services averaging 55% and 40%, respectively, and the wholesale EBITDA margin averaging about 40% of the retail EBITDA margin.*

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I. Introduction

The Bell Operating Companies ("BOCs") have recently launched a new campaign against the wholesale prices for unbundled elements ("UNEs") set under the Federal Communications Commission's cost standard – Total Element Long Run Incremental Cost or TELRIC. According to the Bells, TELRIC prices set by State commissions have no nexus to the BOCs' actual forward-looking

costs but are, instead, based on retail prices with the goal of ensuring that competitors have an adequate (if not outright excessive) margin. The BOCs therefore contend that current wholesale prices for UNEs produce "parasitic" competition,[1] reduce BOC revenues below operational costs,[2] and threaten the investment in the local exchange network.[3] This Policy Paper, however, empirically demonstrates that the data simply do not support the Bells' contentions.

Econometric analysis presented in this Policy Paper indicates that, on average, the wholesale price for combination of unbundled elements called UNE-P (loop, switching, and transport) is motivated primarily by forward-looking costs (TELRIC) and secondarily by BOC retail profit margins.[4] As such, contrary to the BOCs' contentions, wholesale prices for UNE-P are not directly related to retail prices for local telephone service.

In fact, contrary to the BOCs' claims and criticisms of State ratemaking proceedings[5] (proceeding which, incidentally, are open for public participation and were recently described by the United States Supreme Court as "smoothly running" affairs[6]), it appears that the States not only have been extremely careful

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1 *See, e.g.*, September 13, 2002 Comments of USTA President Walter M McCormick: The FCC's UNE-P and TELRIC policies have created "parasites that are content to feed off and weaken the host." Glenn Bischoff, *USTA Calls For the End of UNE-P, TELRIC,* TELEPHONYONLINE.COM (Sept. 13 2002).

2 *See, e.g.*, SBC Press Release (September 17, 2002) where, according to SBC President Richard Daley, TELRIC pricing is "below cost" and is an "irrational and unsustainable subsidy that is threatening the future of our telecommunications infrastructure."

3 *Id.*

4 Because other factors influence the determination of wholesale prices, it is not correct to interpret these findings to mean that the wholesale price for the UNE-P is half-way between forward-looking cost and average retail revenues. Econometric analysis is a *ceteris paribus* (other things constant) analysis, estimating the unique contribution of each regressor to variation in the dependent variable.

5 *See, e.g., Washington Telecom Newswire* (September 9, 2002) (According to Verizon CEO Ivan Seidenberg: "State commissions don't get it. They don't have a clue because they are trapped" in an old view of regulatory policy.") Such criticisms are particularly puzzling given that the Bells' publicly reported to the FCC that States imposed TELRIC pricing as a pre-condition of receiving authority under Section 271 of the Telecommunications Act to provide in-region inter-LATA service.

6 *See infra* nn,. 25 and 27.

to ensure that TELRIC rates accurately reflect the BOCs' forward looking costs, but moreover – particularly as telecoms is such a political business – States have actually preserved some BOC profit in a politically-sensible "50/50" split between the desired outcomes of new entrants and the incumbents. While retail margins matter, forward-looking costs explain three times as much of the variation in wholesale prices across states as does the retail margin, and six times as much as retail prices. The fact that BOC margins are declining is an intended consequence of Section 251(d) the 1996 Act and a rational public policy, because TELRIC pricing deliberately does not incorporate the monopoly rents the BOCs have traditionally enjoyed in the wholesale prices for UNEs.

Equally as important, a financial analysis of the BOCs' own publicly stated retail and wholesale revenues and operational costs for local phone service, along with a critical analysis of the investment reports frequently cited by the BOCs regarding the purported ill's of UNE-P, refutes the BOCs' claim that wholesale revenues are insufficient to cover wholesale operational costs. Quite to the contrary, the data indicate that even though EBITDA margins for wholesale lines are approximately half that of retail lines, *the BOCs' wholesale margins are nonetheless positive*. In fact, *the Bells' EBITDA margins in percentage terms (revenues minus cost divided by revenues) for retail and wholesale services average 55% and 40%, respectively, and the wholesale EBITDA margin averages about 40% of the retail EBITDA margin.*[7]

II. Background

Prior to the 1996 Telecommunications Act, the local exchange telecommunications market consisted of integrated wholesale and retail market segments, with the entire market dominated by the incumbent local exchange carriers ("ILECS").[8] Competition was all but absent in both segments. In an

[7] EBITDA margins are not profit margins per se. The EBITDA margin must be sufficient to cover economic depreciation and amortization (*i.e.,* EBIT or free cash flow) for the firm to "profitable" in any traditional sense of the term. The focus on EBITDA margins in this paper mirrors the BOCs recent policy statements. Further, economic depreciation is difficult to measure. *C.f.,* September 23, 2002 Ex Parte Communications from Z-Tel Communications in FCC CC Docket No. 01-338 examining the impact of the UNE Platform on Bell Company financial results, showing that BOC EBITA margins are higher than those calculated herein.

[8] While there are literally thousands of ILECs in the United States, most are exempt from the unbundling obligations of the Act. In fact, the unbundling obligations so far have been relevant only for the Regional Bell Operating Companies ("BOCs") including BellSouth, Qwest (formerly US West), SBC, and Verizon.

effort to promote competition in local telecommunications markets, the 1996 Act split the integrated market into its wholesale and retail components by requiring incumbent local phone companies to provide elements of its network to rival telecommunications carriers at regulated wholesale prices.[9]

Unbundling was never supposed to be an end in and of itself, however; rather – similar to the successful *Competitive Carrier* paradigm that brought competition in the long distance industry before it – Congress recognized that a mandatory wholesale market for local access is the most effective mechanism to "grow the market" and stimulate sufficient new non-incumbent demand for the wholesale local exchange network to warrant the construction of new local access networks by firms other than the ILECs.[10] Because entrants could be expected to build some network components more easily than others, and the cost-benefit calculus varies substantially among CLECs with different business strategies, it was vital that the ILECs' networks be made available on both a piece-part and combined basis.

Moreover, even though the Act requires that the ILECs provide these unbundled network elements ("UNEs") to retail telecommunications firms until the removal of the unbundling obligations has no material impact on retail competition,[11] policymakers must understand that given the complex supply-side

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[9] *See* S. 652, H. Rpt. 104-458, 104th Cong., 2d Sess. (1996); *see also* David L. Kaserman and John W. Mayo, GOVERNMENT AND BUSINESS: THE ECONOMICS OF ANTITRUST AND REGULATIONS (1995) at pp 310-312 for a review of the effects of vertical integration on competitive entry.

[10] Given the above, it is extremely unclear why FCC Chairman Michael Powell would recently describe the unbundling provisions of the 1996 Act simply as a requirement that Bells "undergo[] a new layer of regulation" as a *quid pro quo* for the "rapidly dwindling" carrot of entry into the long-distance market, TELECOM AM, *Telecom Industry Woes Not Consequence of Telecom Act, Powell Says* (19 September 2002), when the need to stimulate new non-incumbent demand to warrant the construction of new "last mile" networks, from an economic perspective, is irrelevant to whatever political "deal" was made to get the 1996 enacted into law. Like it or not, if policy makers remove the ability to stimulate sufficient non-incumbent demand via UNE-P, then the only other policy option that will provide sufficient economic incentive to construct new network facilities – the goal that so many politicians claim to prefer – is to go back to state-protected monopolies with guaranteed rates of return. For a full explanation of the history and rationale behind the unbundling provisions of the 1996 Act, *see* Mark Naftel and Lawrence J. Spiwak, The TELECOMS TRADE WAR: THE UNITED STATES, THE EUROPEAN UNION AND THE WTO (Hart 2001), Chapter 9 *passim*.

[11] Sections 251(d)(2)(A)-(B) require the ILEC to provide unbundled elements as long as "the failure to provide access to such network element would impair the ability to provide the services that [the requesting carrier] seeks to offer."

economics of the local exchange network – *i.e.*, because firms must commit huge sunk costs and need to achieve scale economies quickly, the local market will be highly concentrated[12] – there is a tremendous amount of work that must be accomplished before anyone can plausibly argue that there is a workably competitive market for wholesale local exchange network elements.[13] Accordingly, relaxing the unbundling obligations of the 1996 at this time is plainly premature.[14]

A. *Relevant Statutory Provisions of the 1996 Act and the Allocation of Responsibilities Between the States and the Federal Government*

Like most statutes of this nature, Congress split the responsibilities for administering the provisions of 1996 Act between the FCC and the States in respect for the Constitutional principle of Federalism.

On one hand, Section 252(d)(A)(i) of the 1996 Act requires that wholesale prices for the unbundled network elements be "based on the cost (determined without reference to a rate-of-return or other rate-based proceeding) of providing the … network element." Congress left the details of the particular cost standard to the Federal Communications Commission ("FCC"), and the FCC established a forward-looking cost standard called Total Element Long-run Incremental Cost ("TELRIC"). The FCC concluded that a "cost-based pricing methodology based on forward-looking economic costs … best furthers the goals of the 1996 Act. In dynamic competitive markets, firms take action based not on embedded costs, but on the relationship between market-determined prices and forward-looking

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12 *See* T. Randolph Beard, George S. Ford and Lawrence J. Spiwak, *Why ADCo? Why Now? An Economic Exploration into the Future of Industry Structure for the "Last Mile" in Local Telecommunications Markets,* PHOENIX CENTER POLICY PAPER SERIES NO. 12 (2001) (http://www.phoenix-center.org/pcpp/PCPP12.pdf); *reprinted in* 54 FED. COM. L. J. 421 (May 2002) (http://www.law.indiana.edu/fclj/pubs/v54/no3/spiwak.pdf.

13 Moreover, despite BOC claims, the 1996 Act does not require CLECs to transition from UNEs to their own facilities. Indeed, the number of retail telecommunications firms should exceed the number of wholesale firms (probably by a substantial amount). *Id.*

14 *See, e.g.*, PHOENIX CENTER POLICY PAPER NO. 14, *Make or Buy? Unbundled Elements as Substitutes for Competitive Facilities in the Local Exchange Network,* (September 2002). (http://www.phoenix-center.org/pcpp/PCPP14%20Final.pdf); PHOENIX CENTER POLICY PAPER NO. 15, *A Fox in the Hen House: An Evaluation of Bell Company Proposals to Eliminate their Monopoly Position in Local Telecommunications Markets,* (September 2002) (http://www.phoenix-center.org/pcpp/PCPP15%20Final.pdf).

economic costs."[15] The FCC further concluded, "[C]ontrary to assertions by some [incumbents], regulation does not and should not guarantee full recovery of their embedded costs."[16]

On the other hand, it is also important to understand that while the FCC defined the relevant cost standard, it is the *State* regulatory commissions that implement the standard when setting wholesale prices for unbundled elements.[17] As recognized by the Supreme Court in *AT&T Corp. v. Iowa Utilities Board*,[18] the FCC cannot establish a cost standard so strict that the standard effectively sets the wholesale price.[19] Unquestionably, Section 252 of the 1996 Act gives the States the right to set wholesale prices. States therefore have substantial latitude in setting wholesale prices, and are constrained only by the necessarily general forward-looking cost framework established by the FCC (*i.e.,* TELRIC).

A similar statutory division of authority applies to what network elements are unbundled. The 1996 Act gives the FCC authority only to establish a *minimum* list of unbundled elements (an issue that continues to work its way around the courts[20]), and the States can freely expand the list as each State sees fit.[21] In fact, many States, including, for example, Illinois[22] and Texas[23], have mandated unbundling under State statutes.

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15 *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, CC Docket No. 96-98, 11 FCC Rcd 15499, 15782-807, (1996) at ¶ 619).

16 *Id.* at ¶ 706.

17 47 U.S.C. § 252(d)(1).

18 *AT&T Corp. v. Iowa Utilities Board,* 525 U.S. 366, 119 S.Ct. 721, 142 L.Ed.2d 835 (1999).

19 *See id.*, 525 U.S. at 423 ("The FCC's prescription, through rulemaking, of a requisite pricing methodology no more prevents the States from establishing rates than do the statutory "Pricing standards" set forth in §252(d). It is the States that will apply those standards and implement that methodology, determining the concrete result in particular circumstances. That is enough to constitute the establishment of rates."); *accord Sprint v. FCC*, 274 F.3d 549 (D.C. Cir. 2001).

20 *See, e.g., United States Telecom Association et al. v. FCC,* 290 F.3d 415 (D.C. Cir. 2002).

21 Section 251(d)(3) of the 1996 Act provides the State commissions with the authority to establish unbundling obligations in above and beyond the FCC's national minimums, so long as those obligations are consistent with the purposes of the Act. This section of the Act was necessary because many States had already begun to promote competition by mandating unbundling by the time the 1996 Act was passed.

22 Illinois Public Utilities Act §§ 5/13-505.6; 514; and 801.

B. *The Dispute at Bar*

As expected, the incumbents have fought "tooth and nail" for the last six years against the FCC's proposed TELRIC methodology, arguing instead that the FCC should have adopted either an embedded cost or efficient component pricing rule ("ECPR") schemes.[24] Last Spring, however, the United States Supreme Court in its landmark case *Verizon v. FCC*[25] conclusively ended this debate, upholding the FCC's TELRIC methodology in its entirety.[26] In so doing, the Majority in *Verizon* very conscientiously and very deliberately took great pains to address and dispel the arguments made against TELRIC by the BOCs since the 1996 Act was first enacted, particularly that TELRIC produced confiscatory rates and that entrants using unbundled elements were "parasitic" competitors.[27]

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[23] Texas Utilities Code §§ 60.021-022.

[24] *See, e.g.*, December 19, 2001 Comments of Verizon Communications Inc. Before the National Telecommunications and Information Administration, In the Matter of Request for Comments on Deployment of Broadband Networks and Advanced Telecommunications, Docket No. 011109273-1273-01 (available at http://www.ntia.doc.gov/ntiahome/broadband/comments/verizon/verizon.htm); December 19, 2001 Comments of Verizon Communications Inc. Before the National Telecommunications and Information Administration, In the Matter of Request for Comments on Deployment of Broadband Networks and Advanced Telecommunications, Docket No. 011109273-1273-01 (available at http://www.ntia.doc.gov/ntiahome/broadband/comments/SBCComments.htm); December 19, 2001 Comments of BellSouth Communications Inc. Before the National Telecommunications and Information Administration, In the Matter of Request for Comments on Deployment of Broadband Networks and Advanced Telecommunications, Docket No. 011109273-1273-01 (available at http://www.ntia.doc.gov/ntiahome/broadband/comments3/BellSouth.htm). According to the ECPR, "the access fee paid by the rival to the monopolist should be equal to the monopolist's opportunity costs of providing access, including any forgone revenues from a concomitant reduction in the monopolist's sales of the complementary component." Nicholas Economides and Lawrence J. White, *Access and Interconnection Pricing: How Efficient is the Efficient Component Pricing Rule?* 40 ANTITRUST BULLETIN (1995), p. 557-79.

[25] *Verizon Communications Inc. v. FCC*, 122 S. Ct. 1646 (2002).

[26] *Id.* at 1677 ("The incumbents have failed to show that TELRIC is unreasonable on its own terms …. Nor have they shown it was unreasonable for the FCC to pick TELRIC over alternative methods …").

[27] 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. 12 (August 2002) (http://www.phoenix-center.org/pcpp/PCPP13Final.pdf); COMMUNICATIONS WEEK INTERNATIONAL, *Opinion: U.S. Competition Policy – The Four Horsemen of the*

(Footnote Continued. . . .)

Despite the Supreme Court's holding in *Verizon*, the BOCs continue to push policy-makers to abandon (or at minimum weaken) TELRIC pricing.[28] Having lost on the choice of overall ratemaking methodology, however, the BOCs are now criticizing how the rate methodology is applied. In particular, the BOCs contend that wholesale prices for UNEs have no nexus to their true forward-looking costs, but are instead set based upon retail prices so as to ensure that new entrants have an adequate (if not outright excessive) margin to arbitrage (*ergo* producing "parasitic" competition). For example:

- Verizon Communications CEO Ivan Seidenberg recently told the FCC Commissioners that "[S]tates have set discounts against below cost residential retail rates rather than on any realistic measure of cost."[29]

- SBC President William Daley recently opined that "[regulators] choose inputs that will achieve a predetermined end-result: a TELRIC rate that will give AT&T the 45% margin it demands before it will enter local markets [using the unbundled network element platform]."[30]

- In an recent investor interview with Bear Sterns, senior SBC management stated that: (a) in California, because "competition intensified in California after UNE rates were lowered in May", SBC expects to file a cost docket with the California PUC (CPUC) in hopes of *raising* UNE rates to what SBC believes is a cost-based rate; (b) in the old Ameritech region, high retail rates and far below cost UNE rates ($14-$15) were a key reason for continued line losses in the region, going so far as to note that

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Broadband Apocalypse (01 April 2002) (available at http://www.phoenix-center.org/commentaries/CWIHorsemen.pdf).

[28] Letter to FCC Chairman Michael K. Powell from William H. Daley, President, SBC Communications, September 4, 2002.

[29] Ex Parte Presenation, Messrs. I. Seidenberg, W. Barr, and T. Tauke and Ms. D. Toben, representing Verizon, met separately with Chairman Powell and Mr. C. Libertelli, Commissioner Abernathy and Mr. M. Brill, Commissioner Copps and Mr. J. Goldstein, and Commissioner Martin and Mr. D. Gonzales (Ms. Toben did not attend this meeting), WC Docket No. 01-202 Verizon Petition for Emergency Declaratory and Other Relief; CC Docket No. 01-338 Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers: CC Docket No. 96-98 Implementation of the Local Competition Provisions in the Telecommunications Act of 1996: and CC Docket No.98147 Deployment of Wireline Services Offering Advanced Telecommunications Capability, August 16, 2002, at 16. *See also* CCMs (2002) and UBSWarburg (2002).

[30] *Telecommunications Reports Daily*, September 12, 2002.

> approximately 70% of SBC's UNE-P growth and access line losses are in the Ameritech region alone; but that (c) in the SBC States, "competitive penetration of the region's local market has flattened in the 15%-20% range" because of "reasonably-priced UNE rates (in the $20 range)."[31]

Of course, the issue of whether wholesale UNE prices are based on something other than forward-looking costs is an empirical question, and "empirical questions cannot be answered by non-empirical arguments."[32] Fortunately, the question of how wholesale prices for UNEs are determined is ideally suited for multivariate econometric analysis, and that approach to answering this empirical question is taken up in the following sections. As demonstrated empirically in Section III, the BOCs' arguments highlighted above plainly fail on the merits.

C. *What Determines TELRIC Pricing?*

Conceptually, forward-looking costs should be the primary driver of wholesale prices. Other factors, however, can influence the price-determining decisions. Of the potential factors driving wholesale price determination, by far the most recognizable other than forward-looking costs include (a) embedded costs; (b) retail opportunity cost, *i.e.* the margins lost by the ILEC, when a customer shifts from its retail service to a UNEP-based CLECs; and (c) retail prices. Pricing to protect existing margins is termed the efficient component pricing rule ("ECPR"), and ECPR is the most preferred pricing methodology of the BOCs.[33]

More importantly, even accepting the BOCs' position *arguendo* that retail prices play a meaningful role in the determination of wholesale prices, it is still not clear that a consideration of retail prices when setting wholesale prices is even problematic. That is to say, in order for a rate to be "just and reasonable," prices only need to fall within a "zone of reasonableness"– that is, that these rates must be neither "excessive" (rates that permit the firm to recover monopoly rents

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[31] Bear, Stearns & Co. Inc. Equity Research, *SBC Communications Inc. – Outperform: Highlights From Meeting With SBC Management* (September 10, 2002).

[32] George Stigler, THE ORGANIZATION OF INDUSTRY (1968), at 115.

[33] *See* Economides and White, *supra* n. 24; *see also* Beard, Ford, and Spiwak *supra* n. 12.

or "creamy returns") nor "confiscatory" (rates that do not permit the regulated firm to recover its costs).[34]

Yet, while this standard is not very precise, the phrase "just and reasonable" is clearly more than a "mere vessel into which meaning must be poured."[35] Rather, the delineation of the "zone of reasonableness" in a particular case will involve a "complex inquiry into a myriad of factors."[36] These myriads of factors, however, may include both *cost and non-cost* factors to determine whether particular rates fall within the zone.[37] Accordingly, if the "zone of reasonableness" of TELRIC is bound by cost estimates C_{LO} and C_{HI}, then choosing a wholesale price close to C_{LO} generates more competition than a wholesale price near C_{HI} and any wholesale price between C_{LO} and C_{HI} is *a priori* just and reasonable.

The D.C. Circuit recently addressed this very issue in *Sprint v. FCC*.[38] In *Sprint*, the D.C. Circuit concluded in although in "an otherwise undistorted market, firms capable of efficiently supplying the non-BOC elements should be able to compete….",[39] the "issue is not guarantees of profitability, but whether

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[34] *Farmers Union Cent. Exch., Inc. v. FERC*, 734 F.2d 1486, 1502. (D.C. Cir. 1984). Courts generally give administrative agencies substantial discretion to define this zone. Indeed, as the D.C. Circuit Court once explained, when examining an agency's determination that a particular rate falls within the zone of reasonableness, it is not a court's "function . . . to impose [its] own standards of reasonableness upon the Commission, but rather to ensure that the Commission's order is supported by substantial record evidence and is neither arbitrary, capricious, nor an abuse of discretion."; *see also Ralph Nader v. FCC*, 520 F.2d 182, 192 (D.C. Cir. 1975)(citations omitted). However, the court was also quick to point out that, "[i]n terms of ratemaking, the agency's expertise allows us to accept its judgment after it defines the zone of reasonableness; *but we cannot rely on claims of judgment to explain how the agency arrived at the zone*." *Id.* at 193 (emphasis added).

[35] *See Farmers Union*, 734 F.2d at 1504.

[36] *Id.* at 1502.

[37] *Id*. When considering the latter, courts have upheld the legitimate role non-cost factors may play in order to achieve a particular public policy objective (e.g., a desire to establish additional supply), so long as the agency specifies the nature of the relevant non-cost factor and offers a reasoned explanation of how the factor justifies the resulting rates. *Id.* at 1502-03 (citations omitted); *see also National Ass'n of Regulatory Utility Comm'rs v. FCC*, 737 F.2d 1095, 1137 (D.C. Cir. 1984); *National Rural Telecom Ass'n v. FCC*, 988 F.2d 174, 182-83 (D.C. Cir. 1993) (affirming price cap regulation although not tied directly to cost).

[38] 274 F.3d 549 (D.C. Cir. 2001).

[39] *Id.* at 270.

the UNE pricing selected [*i.e.,* TELRIC] here *doomed* competitors to failure."[40] Indeed, because the court found that: (a) "the [1996] Act aims directly at stimulating competition"[41]; and (b) TELRIC is not an "exact science" and produces a "wide zone of reasonableness,"[42] wholesale prices for UNEs can be related to both forward-looking costs and retail prices so long as wholesale prices based on TELRIC at least produce sufficient margin for competition.

Accordingly, the relationships of wholesale prices to forward-looking cost, embedded cost, retail opportunity costs (*i.e.,* ECPR), and retail prices are key policy issues and the corresponding ability to understand the significance of the determinants of wholesale prices for UNEs is crucial going forward. The primary purpose of this Policy Paper, therefore, is to decipher empirically the relative contribution of these four factors – forward-looking cost, embedded cost, retail opportunity cost or ECPR, and retail prices – to wholesale prices for UNEs. The model conclusively demonstrates that variations in wholesale prices are unrelated to variations in retail prices – *i.e.,* that prices are in fact primarily set on the incumbents' forward-looking costs and not arbitrarily in order to preserve an arbitrage opportunity for entrants pursuing a UNE-P strategy.

III. The Model: Empirical Evidence of Wholesale Price Determination for UNEs

A. *Analytical Framework*

The wholesale price for UNEs (P), as determined by State regulatory commissions, can be viewed as a function of forward-looking costs (C) plus an additive term (Δ):

$$P = g(C) + \Delta(Z, \varepsilon) \quad (1)$$

where this additive term (either positive or negative) reflects the systematic (Z) and idiosyncratic influences (ε) on wholesale price determination. As previously mentioned, systematic influences may include the embedded/current costs and revenues, since the ILECs want wholesale prices sufficiently high to cover these costs or, alternately, to make them financially whole despite competition (*i.e.*, the

40 *Id.* at 271 (Emphasis in original).

41 *Id.* at 555.

42 *Id.* (citations omitted)

result of the ECPR). In contrast, because competitive entry is the stated goal of the 1996 Act, retail prices also may contribute to the determination of wholesale prices. If wholesale prices are not sufficiently low to induce entry, the entire process could be considered wasted effort.

Without question, the most hotly contested telecommunications policy issue today is the availability and/or price for the UNE-P. Thus, an econometric model based on Equation (1) is specified that allows for the estimation of the relative influence of a variety of factors on the wholesale price for the UNE-P. The UNE-P is a combination of an unbundled loop, switching functionality, and transport. The UNE-P allows competitive local exchange carriers ("CLECs") to provide local phone service using primarily the ILECs' network, thereby reducing the sizeable up-front and sunk investment typical of facilities-based entry into the local exchange market. UNE-P is the most successful and highest growth mode of competitive entry for residential consumers in the industry today and, as such, is the mode of entry most under attack by the BOCs.

Generally, a statistical test for the relative influence of cost (forward-looking and embedded) and retail prices on wholesale prices takes the general form:

$$P = \alpha_0 + \alpha_1 C + \alpha_2 T + \alpha_3 M + \alpha_4 E + \alpha_5 X + \varepsilon, \quad (2)$$

where P is wholesale price, C is forward-looking cost, T is retail price for residential local telephone service, M is the retail opportunity cost (average revenue minus forward-looking cost), E is embedded cost, X is a portmanteau variable summarizing other variables that may affect P, ε is a well-behaved econometric disturbance term, and the α's are the estimated coefficients of the least squares regression.[43] The disturbance term ε captures the random, idiosyncratic differences among State commissions in setting wholesale prices that are not captured by the variables in the model.

The variables of primary interest in an econometric analysis of wholesale prices include C, T, M, and E. While both the size and statistical significance of the estimated coefficients for each of these variables is important, the primary

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[43] Jack Johnston and John DiNardo, ECONOMETRIC METHODS (4th Ed. 1997), at 16-7. We also tested for a bias against low wholesale prices by estimating the coefficient α_1 for States with below average costs and another coefficient for those above. There was no statistical difference is the estimated coefficients.

method of evaluating their relative influence on wholesale prices (P) is to determine the contribution of each variable to explaining the variation in the wholesale price. This "contribution" is measured by the partial coefficient of determination, or partial R-squared for each of the variables of interest.[44] The larger the partial R-squared of the explanatory variable, the more that variable contributes to explaining the variation in the dependent variable P, other factors held constant. For example, if the partial R-squares of C and M are 0.30 and 0.15, then C explains twice as much of the variability in P as does M. Thus, the relative importance of each factor to wholesale price can be assessed directly, even if more than one factor is found to be a statistically significant determinant of wholesale price.

The magnitudes of the estimated coefficients (if statistically different from zero) are also of interest when testing some potential theoretical models of wholesale price determination. For example, State regulatory commissions are fond of rendering decisions that lie between the proposals of the adversaries. Computing a simple average of the two positions is not uncommon, though this "technique" is rarely cited explicitly. In the context of Equation (2), a "position averaging" approach to wholesale price determination suggests that the coefficient α_1 will equal 1.00 and α_3 will equal 0.50. In other words, the primary position of the CLECs (and the FCC) is that wholesale prices should equal forward-looking costs. The ECPR is the favored price methodology of the ILECs.[45] What the coefficient values just mentioned imply is that wholesale price is set equal to cost ($\alpha_1 = 1.00$) plus one-half ($\alpha_3 = 0.50$) of the retail opportunity cost (M), where the latter is a proxy for the ECPR. A statistical test of these coefficient restrictions will indicate whether existing wholesale prices for UNE-P have been determined using the "position averaging" approach.

The BOCs' contention that wholesale prices for UNEs are driven by retail prices is statistically evaluated by the coefficient on and partial R-squared of the retail price variable T. *A priori* expectations regarding the effect of T on P are necessarily ambiguous. While the BOCs argue lower retail prices will lead to

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[44] The partial R-square is computed using $t^2/(t^2 - n - k)$, where t is the t-statistic from the regression on the relevant variable, n is sample size (45) and k is the number of regressors in the model (7). Adrian C. Darnell, A DICTIONARY OF ECONOMETRICS (Edward Elgar, 1994), p. 302-3. The partial r-squared measures the influence of the variable assuming that it is the last variable added to the model (i.e., the effect of the other explanatory variables on the dependent variable is already accounted for).

[45] *See* Beard, Ford and, Spiwak, *supra* n. 12.

lower wholesale prices (*i.e.*, $\alpha_2 > 0$), an equally plausible expectation is that high retail prices encourage State commissions to set lower wholesale prices in the hope that competition will reduce retail margins (*i.e.*, $\alpha_2 < 0$). The econometric analysis will reveal which, if either, of these competing hypotheses better describes the data.

B. *Data*

All data is measured at the State level for Bell Company territories in the contiguous 48 States except for Connecticut, Rhode Island, and Nevada (leaving 45 observations). These States were excluded from the sample due to missing data on wholesale prices.[46] These excluded States account for fewer than one-percent of all access lines (0.8%). Descriptive statistics and sources are provided in Table 1.

Wholesale prices are measured using summary information provided by Commerce Capital Markets (2002, "CCM").[47] This source of data provides estimates of switching costs, but the estimates are in error for many States. Thus, wholesale prices for unbundled switching are computed by adjusting the CMM estimates to better match up with the actual wholesale prices for unbundled switching. These adjustments were provided to the authors by Z-Tel Communications, a competitive carrier currently serving over 40 States using UNE-P.[48] For comparison purposes, the regression also is estimated using the unadjusted CCM data and the results presented, but we do not discuss this alternate regression. The more interesting results for the two different dependent variables are virtually identical.

Forward-looking cost C is measured by the output of the publicly-available Hybrid Proxy Cost model ("HCPM"), a forward-looking cost model developed

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[46] Wholesale price data is restricted to Bell Company territories, so that Hawaii and Alaska are excluded. CCM rate data was not available for Connecticut, and switching price data was unavailable for Nevada and Rhode Island.

[47] Anna Maria Kovaks, Kristin L. Burns, and Gregory S. Vitale, *The Status of 271 and UNE-Platform in the Regional Bells' Territories,* Commerce Capital Markets Equity Research (August 22, 2002). For the dependent variable, we use "FULL UNEP ORIGINATING AND TERMINATING, Assumes DEM minutes, TOTALS" column, Exhibit 2.

[48] Computing the cost of the UNE-P is a difficult undertaking. The authors are indeed grateful to Z-Tel Communications, who has two full time employees devoted to the task of interpreting UNE tariffs, for sharing the data.

by the FCC.[49] This variable is a summary index for all the State specific exogenous (*i.e.*, geographic) effects that influence the forward-looking cost of network elements. For consistency with the ILEC position that "[S]tates have set discounts against below cost residential retail rates rather than on any realistic measure of cost," retail price T is measured by the residential retail rate. Gregg (2001) provides State-by-State measures of retail residential rates.[50] Retail opportunity costs M are computed as the difference between average revenue per line (A), computing using ARMIS data, and forward-looking cost C.[51] Embedded costs E are measured as total expenditures per access line (switched and special), and these costs are provided by ARMIS.[52]

Also included as regressors are ILEC specific dummy variables for BellSouth (DBLS), Verizon (DVZ), and Qwest (DQWST).[53] For the ILEC dummy variables, the variable equals 1.00 if the relevant carrier serves the State, zero otherwise. Given that the ILECs present very similar cases during the cost proceedings within their regions, the costs within each ILEC region may be more alike than costs between ILEC regions. These dummy variables should capture that effect, as well as any difference in the success of political influence exerted on State commissions by the ILECs (or any other ILEC specific influence on wholesale prices). The estimated coefficients on the dummy variables measure the difference between these three ILECs and SBC (the dummy for which is excluded so the model can be estimated).[54]

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[49] The model and its output can be downloaded at: http://www.fcc.gov/wcb/tapd/hcpm/. The method used to compute the cost per line (loop and switching) follows the FCC's methodology used in its latest 271 Orders. *See, e.g., In the Matter of Application of Verizon Pennsylvania Inc., et al. for Authorization to Provide In-Region, InterLATA Services in Pennsylvania*, Memorandum Opinion and Order, FCC 01-269, ___ FCC Rcd ___ (rel. Sept. 19, 2001)

[50] Gregg, Billy Jack, (2001). *A Survey of Unbundled Network Element Prices in the United States* (unpublished manuscript, updated July 1, 2001); available at http://www.nrri.ohio-state.edu/programs/telecommunications.html.

[51] *See* Table 1 for a description of the calculation.

[52] *See* Table 1 for a description of the calculation.

[53] States are assigned to each ILEC as follows: BellSouth (AL, GA, FL, KY, LA, MS, NC, SC); Verizon (NY, MA, ME, WV, VT, PA, VA, MD, NJ, DE, RI, NH); and Qwest (AZ, CO, ID, IA, MN, MT, NE, NM, ND, OR, SD, UT, WA, WY).

[54] Johnston and DiNardo, *supra* n. 43 at 134-7.

C. *Model Specification*

Equation (2) is estimated in both level and double-log form, and the alternate specifications are summarized as:

$$P = \alpha_0 + \alpha_1 C + \alpha_2 T + \alpha_3 M + \alpha_4 E + \alpha_5 BLS + \alpha_6 DVZ + \alpha_7 DQWST + \varepsilon_a, \quad (3a)$$

$$\ln(P) = \beta_0 + \beta_1 \ln(C) + \beta_2 \ln(T) + \beta_3 \ln(M) + \beta_4 \ln(E) + \beta_5 DBLS + \beta_6 DVZ + \beta_7 DQWST + \varepsilon_b. \quad (3b)$$

In level form, the estimated coefficients (α's) measures unit changes in the dependent variable for unit changes in the explanatory variables. For example, a $1 change in C leads to a α_1 change in P. In log-log form, the estimated coefficients (β's) measure elasticities. For example, a ten percent change in C equals a β_1 percent change in P. The marginal effect of a dummy variable in the log regression is measured by $e^{\beta} - 1$. The Box-Cox test indicated that the log specification provides for a better fit.[55]

Four models are estimated. Models 1, 2, and 3 use the adjusted CCM data, whereas Model 4 uses the unadjusted CCM data. Model 3 is estimated using average revenue per line A rather than the retail margin M. Model 3 is estimated to evaluate the treatment of forward-looking cost in the computation of the retail margin. Implicitly, when computing M the assumption is that C is an accurate measure of the *absolute* level of forward-looking costs, rather than just a reliable index of the *relative* level of forward-looking costs across States. By using average revenue per line rather than the retail margin, the assumption that C measures the absolute level of forward-looking cost is avoided. This change in model specification will reduce the coefficient and t-statistic on C, but the other coefficients and t-statistics in the model are unaffected (since C was held constant in the model). Both Models 3 and 4 are provided for illustrative purposes only, and the results are not discussed in any detail. All regression results are summarized in Table 2.

Econometric specification errors such as omitted variables, endogenous explanatory variables, errors in measurement, and an incorrect functional form

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55 A. H. Studenmund, USING ECONOMETRICS (1992) at pp. 228 and 250.

can each cause least-squares estimates to be biased, inconsistent, and inefficient.[56] The RESET test is a rather general test of specification error, and is capable of detecting all of the specification problems listed above (Ramsey 1969), and the test is particularly sensitive to omitted variables and incorrect functional form.[57] The null hypothesis for RESET is "no specification error," so specification error is indicated if the null-hypothesis is rejected. The RESET F-statistics are provided in Table 2, and none of the statistics is near statistically significance for Models 1, 2, and 3, so there is no evidence of specification error (*i.e.*, null-hypothesis of "no specification error" cannot be rejected at standard significance levels). Accordingly, the RESET test indicates that the regression equations do not suffer from these important specification errors. The null hypothesis of no specification error is rejected for Model 4.

Another test for specification error is the White test, which is used as a test for heteroscedasticity.[58] Heteroscedasticity results in unbiased but inefficient coefficient estimates, implying the standard errors of the estimated coefficients are too large (and, consequently, the t-statistics are too small). We are unable to reject the null hypothesis of the White test (homoscedastic errors) at even the 10% level for Models 1 and 2.

Because the regression includes a number of measures of prices and costs, there exists the potential for multicollinearity to influence the efficiency of the standard errors (and thus the t-statistics). The correlation coefficients of the variables are provided in Table 1, and none of these coefficients exceeds 0.60. So, while there is some correlation between the regressors (as always), the correlation is not particularly high.[59] Nevertheless, Variance Inflation Factors ("VIFs") were computed for each explanatory variable (C, T, M, and E), and none of the VIFs exceeded 3.45 (with 5.00 being the rule-of-thumb standard for

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[56] These errors violate the least squares assumption of a null mean for the theoretical disturbance vector. *See* Johnston and DiNardo, *supra* n. 43, Ch. 4.

[57] The RESET Test is valid only for least-squares regressions. Ramsey's RESET Test is performed by including as regressors the powers of the predicted values of the regression. The joint significance of these additional regressors is evaluated, and the null hypothesis of "no specification error" is rejected if the RESET F-Statistic exceeds the critical value (*i.e.*, the test of the joint restriction that all of the additional coefficients equal zero is statistically significant).

[58] Johnston and DiNardo, *supra* n. 43 at 166-7.

[59] Some researchers use 0.80 as a rule-of-thumb for meaningful multicollinearity. *See* Studenmund, *supra* n. 55 at p. 273.

meaningful multicollinearity).[60] Furthermore, multicollinearity typically leads to low t-statistics and a high R-squared. While the R-squares of the regressions are high, so are the t-statistics. Thus, the efficiency of the estimates does not appear to be affected adversely by correlation among the regressors.

IV. Summary of Findings

Results from the least squares estimation of Equations (3a) and (3b) are summarized in Table 2 as Models 1 and 2. Most of the explanatory variables are statistically significant at the 5% level, and both Models 1 and 2 explain about 75% of the variation in the wholesale price for UNE-P.[61] R-square is often low for cross sectional data, so the relatively high R-squares (0.73 to 0.77) for the regressions are encouraging.[62] The marginal impacts from both specifications are nearly identical, so the summary of the results is based on Model 1, which is easier to interpret.

Variables of primary interest include the cost variable (C), the retail price variable (T), the retail opportunity cost (M), and the embedded cost variable (E). In both regressions (Models 1 and 2), the forward-looking cost variable is a statistically significant determinant of the wholesale price (at better than the 5% level). Clearly, forward-looking cost is an important factor in setting wholesale prices for unbundled elements. Model 1 indicates that wholesale prices adjust on a dollar-for-dollar basis ($\alpha_1 = 1.03$) with forward-looking cost (*ceteris paribus*).[63] The partial R-squared for C in Model 1 is 0.33 and 0.35 in Model 2.

In neither of the two regressions is the coefficient on retail price (T) statistically different from zero (and its sign is negative). *Thus, retail price is found to have no statistically significant effect on wholesale prices for the UNE-P.* The partial R-squared for retail price is 0.05 and 0.07 in Models 1 and 2, indicating very little of the variation in wholesale prices is explained by retail prices. Likewise,

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60 *See id.*, p. 275.

61 R-square is defined as the explained variability in the data divided by the total variability of data, measured as the sum of squared deviations. Thus, R-square indicates the percentage of variability of the dependent variable that is explained by the econometric equation. R-square has values equal to or between 0 and 1. An R-square of 1 indicates that the model explains all the variation in the dependent variable. Johnston and DiNardo, *supra* n. 43 at 21-2.

62 Studenmund, *supra* n. 55 at 47.

63 The null hypotheses that $\alpha_1 = 1.00$ and $\beta_1(P/C) = 1.00$ could not be rejected (where P and C are measured at their sample means).

embedded cost E is not statistically significant in either model. The variable's partial R-squared ranges from 0.01 to 0.05.

In both models, the retail opportunity cost M is statistically significant and the coefficient is positive. Thus, BOC attempts to incorporate retail margins into wholesale prices has met with some success. These efforts are unquestionably indirect, since the proposed wholesale prices of the BOCs are always characterized as "TELRIC compliant." Of course, there is nothing to hinder the BOCs from calling an ECPR price, or any price for that matter, TELRIC-compliant. The estimated coefficient α_3 in Model 1 indicates that wholesale prices increase by about $0.46 for every $1.00 increase in the retail opportunity cost of the ILEC. Partial R-squared for M ranges from 0.10 to 0.11. Interestingly, it is not possible to reject the hypothesis that $\alpha_3 = 0.50$.[64] Because we cannot reject the hypotheses that $\alpha_1 = 1.00$ and $\alpha_3 = 0.50$, the "position averaging" hypothesis cannot be rejected statistically; the empirical evidence supports the notion that wholesale prices for UNEs are determined (*ceteris paribus*) by averaging forward-looking cost and ECPR.[65]

Reviewing the partial R-squares of variables C, T, M, and E, the evidence consistently supports the notion that wholesale prices are strongly influenced by forward-looking costs. Forward-looking costs explain about six times as much of the variation in wholesale prices than do retail prices, about three-times as much as retail opportunity costs, and about twelve times as much as embedded cost. The second largest determinant of wholesale prices (of these four variables) is retail opportunity cost M, explaining nearly twice as much as retail price and nearly four times as much as embedded cost. Neither retail price T nor embedded costs E contributes significantly to explaining variations in wholesale prices. An F-test on the restriction that the coefficients on both T and E are zero cannot be rejected (F = 0.95).

There exist systematic and sizeable non-cost based differences in wholesale prices for UNEs across the BOCs; all the ILEC dummy variables are positive and statistically significant. Relative to SBC, all three Bell Companies appear to have attained successfully higher wholesale prices on average, for reasons other than those factors included in the regression. On average and holding forward-

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64 The null hypotheses that $\alpha_3 = 0.50$ and $\beta_3(P/M) = 0.50$ could not be rejected (where P and M are measured at the sample means).

65 For Model 3, the "position averaging" hypothesis ($\alpha_1 = \alpha_3 = 0.50$) cannot be rejected.

looking costs (and other regressors) constant, BellSouth and Verizon's wholesale price for UNE-P are about $10 higher than SBC and $6 higher than Qwest.[66] Qwest's UNE-P price is $4 more than SBC's UNE-P price, on average and *ceteris paribus*. Thus, the econometric evidence provides perhaps an explanation as to why SBC is the most vocal opponent of UNE-P across the BOCs.

V. Relationship of UNE Prices to ILEC Costs

In addition to the contention that wholesale prices for UNEs are not based on forward-looking costs, the BOCs further claim that prices for the UNE-P are "below operational costs."[67] Combining the retail and wholesale revenues per line used for the regression analysis above with data on current operational costs per line, it is possible to assess the claim that UNE-P prices are "below operational costs."

Per-line operational costs for retail and wholesale customers is computed using Form 43-03 of the ARMIS data (Year 2001).[68] Line 720 reports total operational expenses at the State level, from which is subtracted depreciation and amortization expenses (Line 6560). The remainder is divided by total access lines (ARMIS Form 43-08, Year 2001) to produce retail operational cost per access line.[69] Wholesale operational costs per line are computed by subtracting from total operational costs (excluding depreciation) all marketing and customers services costs (Lines 6610, 6620) and Access Expenses (Line 6540).[70] Again, these expenses are divided by total access lines (switched plus special). The average retail expense per line is $18.20, whereas the average wholesale cost per line is $12.30.[71] Thus, wholesale expenses are about 32% less than retail expenses per

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66 The null hypothesis of equality of the coefficients on DBLS and DVZ could not be rejected (F =0.42). These two coefficients were statistically different than the coefficient on DQWST.

67 *See, e.g., supra* n. 2.

68 The ARMIS data is available at the FCC's website: www.fcc.gov/wcb/armis/db.

69 Access lines include both switched and special access lines. This approach to computing average cost per access line assumes that costs are appropriately spread proportionally across the different types of access lines.

70 Access Expenses are charges paid by the ILEC to other ILECs. A UNE-P carrier is responsible for these charges for its customers.

71 The standard deviations are 2.86 and 2.31, respectively.

line. The differential of $5.90 is broadly consistent with avoided cost computed using the resale discounts (which apply to retail revenues).[72]

The EBITDA margin of the BOCs for retail and wholesale customers is computed by subtracting revenues from these operational expenses. The average retail margin is $21.86, and the average wholesale margin is $8.03. BOC specific revenues, costs, and margins are summarized in Table 3.[73] The EBITDA margins in percentage terms (revenues minus cost divided by revenues) for retail and wholesale services average 55% and 40%, respectively. The wholesale EBITDA margin averages about 40% of the retail EBITDA margin.

For the computation of per-line expenses it was assumed that expenses are proportionately allocated between switched and special access lines (the latter measured on a voice-grade equivalent basis). Further, ARMIS "Total" expenses were used rather than "Regulated" expenses. There is good reason to exclude "Non-Regulated" expenses because "Non-Regulated" services cannot be purchased as unbundled network elements. Table 4 summarizes wholesale cost calculations using alternate assumptions and inputs. Specifically, "Regulated" expense data from ARMIS is used rather than "Total" expenses (including expenses from regulated and non-regulated services). Three alternative allocation methods are employed. For Method 1, "Regulated" expenses are divided by switched and special access lines as before. Because regulated expenses are less than total expenses, the per-line wholesale costs are less for Method 1 than those provided in Table 3. Method 2 allocates expenses between switched and special lines using the allocation factor derived from ARMIS Form 43-01.[74] Expenses allocated to switched access lines are then divided by switched-access lines only to compute per-line costs. Because the BOCs are incented for regulatory purposes to over allocate expenses to switched access lines, Method 3 reduces the allocation factor by 75%. As illustrated by Table 4, these alternative methods do not materially affect the findings summarized above.

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[72] According to UBS Warburg's model, per-line avoided costs (based on resale discounts) are about $5 per month.

[73] The values in the table represent access line weighted averages.

[74] The allocation factor for each state is computed by dividing "Special Access" expenses ("Total Operating Expenses") by expenses "Subject to Separations." One minus this number is the share of expenses allocated (by the BOCs for regulatory purposes) to switched access lines.

VI. Conclusion

Despite the claims made by numerous ILEC executives to Congress, to the Bush Administration and to the FCC, State commissions simply have *not* set wholesale prices for UNEs based on retail prices instead of forward-looking costs. By far, forward-looking costs contribute most to the determination of wholesale UNE prices for UNE-P when compared to embedded costs, retail prices, or the retail opportunity cost of the ILEC. Econometric evidence suggests that retail opportunity cost (ECPR) also plays an important role in wholesale price setting. Overall, the evidence presented in this Policy Paper suggests that State regulators have, to a large extent, set wholesale prices between forward-looking cost and the ECPR rate. It appears, as is common in regulatory proceedings, the interests of both parties have been balanced. This Policy Paper also provides evidence that BOC second-hand claims that UNE-P revenues are below operational costs are incorrect. Estimates of retail and wholesale revenues and operational costs reveal positive EBITDA margins for all BOCs, with EBITDA margins for retail and wholesale of 55% and 40%.

All said, therefore, the States are doing a good job of implementing their responsibilities under the 1996 Act. The fact that BOC margins are declining is an intended consequence of Section 251(d) the 1996 Act and a rational public policy, because TELRIC pricing deliberately does not incorporate the monopoly rents the BOCs have traditionally enjoyed in the wholesale prices for UNEs.

Table 1. Descriptive Statistics

Variable	Definition	Mean	St. Dev.	Source
P	Price for the UNE-P.	26.17	8.17	(1)
	[Unadj. Capital Commerce Mkt data]	[23.42]	[5.68]	(2)
C	Estimate of Statewide average cost for loop and switching.	21.37	5.44	(3)
T	Residential retail rate for local phone service.	21.07	3.75	(4)
M	Average revenue per switched access line minus C.	21.54	5.20	(5)
E	Estimate of Statewide average embedded costs per voice-grade line.	36.12	5.15	(5)
A	Average revenue per switched access line.	42.80	6.66	(5)
DBLS	Dummy variable for BellSouth States.	0.20	…	
DVZ	Dummy variable for Verizon States.	0.24	…	
DQWST	Dummy variable for Qwest States.	0.31	…	

Correlation Matrix

(Log-form upper right, Level form lower left)

	P	C	T	M	E
P	1.00	0.72	0.45	-0.05	0.59
C	0.72	1.00	0.47	-0.18	0.57
T	0.45	0.51	1.00	0.16	0.58
M	-0.04	-0.21	0.10	1.00	0.08
E	0.54	0.59	0.60	0.08	1.00

(1) CCMs (2002) adjusted by Z-Tel Communications (Confidential).
(2) CCMs (2002).
(3) FCC's Hybrid Proxy Cost Model.
(4) Gregg (2001).
(5) ARMIS 43-03 (2001). Computed as sum of Row 5001, 5002, 5050, 5060, 5069, 5081, 5082, 5084, 5110, and 5160, divided by switched access lines (from ARMIS 43-08, 2001).

Table 2. Regression Results

	Model 1 (Eq. 3a)	Model 2 (Eq. 3b)	Partial R^2	Model 3 (Level)	Model 4 (Level)
Variable	Coefficients	Coefficients			Coefficients
Constant	-8.08 (--1.33)*	-0.839 (-1.19)*	…	-8.08 (--1.33)*	-4.916 (-1.01)*
C	1.028 (4.31)*	0.811 (4.50)*	(0.33, 0.35)	0.056 (2.94)*	0.982 (5.15)*
T	-0.364 (-1.34)	-0.305 (-1.63)	(0.05, 0.07)	-0.364 (-1.34)	-0.385 (-1.78)
M	0.462 (2.05)*	0.344 (2.15)*	(0.10, 0.11)	…	0.670 (3.72)*
E	0.122 (0.59)	0.344 (1.36)	(0.01, 0.05)	0.122 (0.59)	-0.080 (-0.49)
DBLS	8.56 (3.50)*	0.360 (4.25)*	…	8.56 (3.50)*	-0.259 (-0.133)
DVZ	10.708 (3.88)*	0.457 (4.49)*	…	10.708 (3.88)*	8.812 (4.00)*
DQWST	3.981 (2.06)*	0.205 (2.97)*	…	3.981 (2.06)*	6.155 (3.99)*
A	…	…	…	0.462 (2.05)*	…
R^2	0.73	0.77		0.73	0.65
Adj. R^2	0.68	0.72		0.68	0.58
F-Statistic	14.45*	17.44*		14.45*	9.79*
RESET F	0.10	0.38		0.10	4.84*

* Statistically Significant at 5% level or better (two-tailed test).
** Statistically Significant at 10% level or better (two-tailed test).

Table 3. Retail and Wholesale Margins for the BOCs

	Revenues		**Operational Costs**		**Margin**	
	Ret.	Whol.	Ret.	Whol.	Ret.	Whol.
BellSouth	$49.04	$24.38	$16.84	$10.74	$32.20	$13.64
Qwest	42.14	23.98	17.99	12.24	$24.15	$11.74
SBC	35.16	20.29	17.69	11.62	$17.47	$8.67
Verizon	39.13	17.31	19.86	14.23	$19.27	$3.08
Avg.	40.06	20.33	18.20	12.3	$21.86	$8.03

Note: Access line weighted averages.

Table 4. Alternative Calculations for Wholesale Costs Per Line

	From Table 3	Method 1	Method 2	Method 3
BellSouth	$10.74	$8.65	$13.77	$10.06
Qwest	12.24	11.07	14.53	10.80
SBC	11.62	9.71	14.51	10.74
Verizon	14.23	12.71	15.88	12.69
Avg.	12.30	10.53	14.80	11.23