

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

In the Matter of)	
)	
Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers	)	CC Docket No. 01-338
)	
Implementation of the Local Competition Provisions of the Telecommunications Act of 1996	)	CC Docket No. 96-98
)	
Deployment of Wireline Services Offering Advanced Telecommunications Capability	)	CC Docket No. 98-147
)	

**DECLARATION OF GEORGE S. FORD
ON BEHALF OF Z-TEL COMMUNICATIONS, INC.**

I, George S. Ford, do hereby declare:

1. I am Chief Economist for Z-Tel Communications, Inc. My business address is 601 South Harbor Island Boulevard, Suite 220, Tampa, Florida 33602.
2. I hold a Ph.D. degree in economics from Auburn University. A copy of my c.v. is attached as Exhibit 1.

I. Introductory Comments

3. In its Triennial Review, the Commission is evaluating its current unbundling rules, and to determine whether or not it is now prudent to maintain, expand, or reduce the availability of unbundled elements. Unbundling the incumbent local exchange carrier's network is mandated by sections 251 and 271 of the Telecommunications Act of 1996, and these mandates are a critical part of an overall scheme intended to "provide for a pro-competitive, de-regulatory national policy framework" for telecommunications

markets.¹ As the Supreme Court observed, Congress intended “to eliminate the monopolies” of the incumbent local exchange carriers (“ILECs”) and to “reorganize markets ... deliberate[ly].”² The goal of eliminating the historical Bell (and more generally ILEC) monopoly was, according the Court, an “end in itself.”

4. This Triennial Review comes at a time when many believe the competitive local exchange and interexchange industries are on the brink of total failure, and there is a genuine threat of a re-monopolization of telephone service by the Bell Companies.³ However, this review also coincides with what appears to be the earliest stages of the full and correct implementation of the unbundling rules. TELRIC pricing for network elements, a critical component of the Act’s unbundling mandates, has only recently been affirmed by the Supreme Court in *Verizon v. FCC*.⁴ Rates for unbundled elements are only now coming into line with costs in many states. For example, in June 2002, the Arizona Public Service Commission reduced the unbundled loop rate to \$12.12 from its previous value of about \$22.⁵ The non-recurring charge for a UNE-P order in Ohio fell from a whopping \$111 per order to \$0.74 in October 2001.⁶ Last month, the Indiana PSC reduced the price of unbundled switching from about \$6.50 to \$2.98, while at the same reducing the non-recurring charge for a loop-switching combination (migration) from

¹ See Preamble to the Conference Report to Accompany S. 652, H. Rpt. 104-458, 104th Cong., 2d Sess. (1996).

² *Verizon Communications, Inc. v. FCC*, 122 S. Ct. 1646, 1654, 1661 (2002).

³ See, e.g., Peter S. Goodman, *Telecom Sector May Find Past in its Future*, WASH. POST, July 8, 2002, at A1.

⁴ *Verizon*, 122 S. Ct. at 1679.

⁵ Arizona Public Service Commission Order, Case No. 64922 (June 12, 2002).

⁶ *PUCO Opens the Door for More Local Telephone Competition*, Press Release of the Public Utilities Commission of Ohio, October 4, 2001 (http://www.puc.state.oh.us/pr/2001/PR01_0078.html).

\$44 to \$0.37.⁷ Even New York, a leader in promoting competition via unbundled elements, cut loop rates by 20% and switching rates by 40% in January 2002.⁸

5. Building on the states' implementation of unbundling, MCI launched the first highly branded, nationwide, mass-market local exchange product in April 2002, using the unbundled network element platform tools created by the Commission's unbundling rules. In the few months following the launch of this innovative new product, which eliminates the distinction between local and long distance calls, hundreds of thousands of residential consumers have exercised their new-found right to choose their local service provider.

6. The coincidence of improved implementation and financial breakdown make for a precarious setting. If there is a critical point in the evolution of competition in local exchange markets, it is now. CLECs are beginning to increase significantly the number of mass-market customers they serve, most by using unbundled network elements ("UNEs"). In particular, the full combination sometimes called UNE-P (a combination of loop, switching, and transport) gives CLECs the ability to attack the market broadly and in high volume. On the other hand, if the ILECs can persuade the Commission to take actions to eliminate the UNE-P so that CLECs are much more restricted in the volume of customers that they can add or that the costs of adding customers are substantially increased by large non-recurring charges, the sunk costs of entry for CLECs will again increase. This will reduce the amount of competition that the market can sustain at equilibrium, and CLECs will be forced to abandon the market for a lack of profit margin or funding in capital markets that are essentially closed. This would surely and effectively end the 1996 Act's experiment with local exchange competition, and deprive

⁷ *In re Commission Investigation and Generic Proceeding on Ameritech Indiana's Rates for Interconnection, Service, Unbundled Elements, and Transport and Termination under the Telecommunications Act of 1996 and Related Indiana Statutes*, CAUSE NO. 40611-S1, PHASE I (Mar. 28, 2002); Ameritech's Tariff, IURC No. 20, Part 19, Section 21 (1st Revised Sheet No. 37).

⁸ *Commission Votes to Reduce Verizon's Wholesale Rates, Significant Reductions Will Foster More Robust Competition and Lower Phone Rates*, New York Public Service Commission Press Release regarding Docket No. 98-C-1357 (Jan. 23, 2002).

American consumers of the dynamic and innovative benefits that competitive markets deliver.

7. This declaration covers several critically important topics. Section II discusses the economics of market entry and provides a theoretical framework for understanding how unbundling increases entry by reducing sunk costs and allowing entrants to add value – and therefore revenue – through innovations above the physical telecommunications networks. This framework also explains how ILEC proposals to eliminate unbundled network elements at this time would decrease entry by increasing sunk costs and decreasing opportunities for innovation above the physical networks. Section III then evaluates the impairment standard of the 1996 Act in an analytical manner. The Commission has struggled to satisfy the courts with an impairment standard, and this section should help remedy this problem by providing an analytical specification of a flexible impairment standard that is rooted in the Act and tied to economic theory. Section IV reviews the recent empirical evidence relating to impairment, and discusses the policy implications of these studies. Section V evaluates the testimony of Bell Company advocate Dr. Howard Shelanski, whereas Section VI provides a review of an empirical study, by Drs. James Eisner and Dale Lehman, frequently cited by the Bell Companies as supportive of their positions. Finally, Section VII evaluates the credibility of the Bell Company proposals to promote competition.

II. The Telecommunications Act and Industry Structure

8. The Telecommunications Act of 1996 is a rather ingenious piece of legislation, incorporating into its pro-competition framework specific mandates that address the underlying economics of the local exchange market for the purpose of “uprooting the monopolies” presently serving that market.⁹ For most of the history of telephone service, the local exchange market has been believed to be a natural monopoly and has been treated as such by regulators. For example, the 1982 Consent Decree that divested AT&T

⁹ *Id.* at 1660.

of its LECs did nothing to increase competition in local exchange telecommunications service (including loop, switching, and transport), which was thought to be a natural monopoly at the time.¹⁰ Today, it is possible for competition to exist in *some* geographic and product segments of the local exchange market. Commenting on implementation of the 1996 Act, Chairman Powell recently observed, “We correctly believed these markets didn’t need to be natural monopolies and they could be competitive.”¹¹ The unbundling provisions of the 1996 Act create an environment in which segments of the local exchange where competition is feasible are revealed, and where multiple-firm supply remains impossible, the unbundling obligations provide for competition in the retail segment of the industry.¹² The unbundling provisions accomplish this task by addressing the most important factors that impede competitive entry: a) the sunk cost of deploying local exchange facilities and bringing such facilities to operational efficiency; b) pervasive economies of scale, scope, and density; and c) other first-mover advantages possessed by the incumbents.¹³

¹⁰ See, e.g., *id.* at 1654.

¹¹ Yochi J. Dreazen, FCC, *Faced with Telecom Crisis, Could Let a Bell Buy Worldcom*, WALL STREET JOURNAL, July 15, 2002, at A-1. Chairman Powell then continued, “but I think we tended to over-exaggerate how quickly and how dramatically it could become competitive.” *Id.* His second observation is also correct, especially, as described further in this declaration, the advantages ILECs possess as a result of being “hardwired” into the network as the retail service provider.

¹² *Id.* at 1661 (describing “novel rate setting designed to give aspiring competitors every possible incentive to enter local retail telephone markets, short of confiscating the incumbents’ property”).

¹³ *Id.* at 1684 (“The Act, however, proceeds on the understanding that incumbent monopolists and contending competitors are unequal.”).

1. The Economics of Entry

9. As a general proposition, fixed and sunk costs increase equilibrium industry concentration, and, if significantly large relative to market size, such costs can produce monopoly.¹⁴ Sutton (1991) shows that the equilibrium number of firms in a market (or industry) is

$$N^* = \sqrt{S/E}, \quad (1)$$

where N^* is the equilibrium number of firms (and $1/N^*$ is equilibrium concentration), S is market size measures as total expenditures, and E is the sunk cost required to provide the product or service. The equilibrium number of firms increases as sunk costs decrease relative to market size. In local telecommunications, N^* is small in virtually all markets, because sunk entry costs are large relative to market size. Reducing sunk costs and increasing total market size are therefore critical to increasing the number of competitors that the market can sustain.

10. There are differences across markets, however. Consider the difference between residential and large business customers. Large businesses, in essence, can be viewed as an aggregation of many (high usage) residential customers in a single geographic location. Because the expenditures are geographically concentrated (generally, in a single building), the sunk entry costs to serve that demand are small relative to market size. Thus, it is no surprise to observe some facilities-based entry in geographic areas where large business customers are located. Residential customers, alternately, have small demands relative to the level of sunk entry costs required to serve them. While the sunk costs may be smaller in absolute terms for residential customers than for large businesses, the market size for the smaller customer is more than proportionately

¹⁴ See JOHN SUTTON, *SUNK COST AND MARKET STRUCTURE* (1990), Ch. 3; T. Randolph Beard and George S. Ford, *Competition in Local and Long-Distance Telecommunications Markets*, in *INTERNATIONAL HANDBOOK OF TELECOMMUNICATIONS ECONOMICS*, Volume I (Gary Madden ed. 2002); and STEPHEN MARTIN, *INDUSTRIAL ECONOMICS: ECONOMIC ANALYSIS AND PUBLIC POLICY* (1988), at 197-98.

smaller leading to a higher equilibrium level of concentration (i.e., $1/N^*$ with identical firms).

11. Policies designed to promote competition in markets that have traditionally been characterized by natural monopoly or high concentration must address either market size or sunk costs (or other entry barriers), and, in most cases, sunk cost is more readily affected by policy. As Dr. Elizabeth Bailey opined:

The single most important element in the design of public policy for monopoly should be the design of arrangements which render benign the exercise of power associated with operating sunk facilities.¹⁵

Promoting competition by attenuating the influence of sunk costs on market structure lies at the very core of the Telecommunications Act of 1996 and, in particular, the unbundling mandates of the Act. By allowing entrants to lease elements of the local exchange, the 1996 Act allows firms to enter that market more freely – and sustain that entry – by avoiding the entry deterring sunk investments otherwise required to provide service.¹⁶ As the economics of entry implies, reducing sunk investments allows for more entry, thereby improving the equilibrium industry structure in the provision of retail telephone services (i.e., “uprooting the monopolies”).

12. The Act’s pro-competitive unbundling mandates were not designed solely to “render benign” the influence of sunk costs. Rather, by focusing on the services entrants seek to offer, the Act recognized that entrants would need to seek to differentiate their products from the ILECs’ products and to offer consumers a superior price-quality value. While this could be done solely through price-cutting, it is more sustainably accomplished through value-added innovations that increase total market expenditures (S), and thus make room for more entry. With unbundling, entrants would be on equal

¹⁵ E.E. Bailey, *Contestability and the Design of Regulatory and Antitrust Policy*, AMERICAN ECONOMIC REVIEW Vol. 71, at 178-183 (May 1981).

¹⁶ The Act’s unbundling mandates were not restricted solely to offset entry barriers related to sunk costs, but offered entrants access to the incumbent’s network for any reason that would impair the ability of the entrant to provide service. See 47 U.S.C. § 251(d)(2)(B).

footing with the incumbents, free to pursue the patronage of consumers by offering lower priced, higher quality, and/or innovative new services.

13. Consistency with the Act requires the Commission to consider how its policies, extant and prospective, affect market size and sunk entry costs (along with other practical entry barriers). Successful implementation of the Act by the Commission requires the reduction of sunk costs (and entry barriers generally) and the expansion of the potential market available to entrants whenever feasible. Conversely, limiting market size or increasing sunk costs reduces entry, thereby reducing competition and extending the need to regulate local exchange services. Limited access to unbundled elements in arbitrarily defined geographic and product markets unambiguously reduces market size (*e.g.*, top 50 MSAs, more than 3 access lines, etc.), and such policies should be avoided.¹⁷ Requiring competitors to self-provide critical inputs where production requires sunk investments further rigs the system against competitive entry, denying consumers the benefits of competition and thwarting the Congressional intent of “eliminating the monopolies” in the local exchange markets.

2. REORGANIZING MARKETS

14. It is difficult to overstate the practical implications of the Telecommunications Act of 1996 on the local exchange industry. The unbundling provisions of the Act drive a wedge into the local exchange, splitting the vertically integrated industry into retail and wholesale segments.¹⁸ Vertical integration is not prohibited, but neither is it required (despite the claims of the Bell Companies to the contrary).¹⁹ By freeing the retail telecommunications and value-added (such as information services) segments of the

¹⁷ A recent study by T. Randolph Beard and George S. Ford finds that the availability of unbundled elements does not limit the market size of CLECs operating their own facilities. *See* Beard & Ford, *supra* n.14.

¹⁸ *Verizon*, 122 S. Ct. at 1661, 1662, 1661 (“Congress aim[ed] to ... reorganize markets.” “[W]holesale markets for companies engaged in resale, leasing, or interconnection of facilities cannot be created without addressing rates.” “The Act...favor[ed]...novel rate setting designed to give aspiring competitors every possible incentive to enter local retail telephone markets.”).

¹⁹ This fact also is supported by general antitrust law. *See, e.g., Fishman v. Estate of Wirtz*, 807 F.2d 520 (7th Cir. 1986); DAVID L. KASERMAN & JOHN W. MAYO, *GOVERNMENT & BUSINESS* (1995), Ch. 9.

local exchange from the enormous sunk costs of the wholesale telecommunications segment, unbundling directly promotes competition in retail services.

15. Entry into the retail and value-added segments of the local exchange is neither free of entry costs nor is it easy. Cox Communications, a vertically integrated entrant in markets where it provides cable television service, claims that supporting the retail segment of its business (back office, billing, E911, NOC, OS/DA, SS7, LIDB, Carrier Relations, etc.) is “a very complex business with a steep learning curve.”²⁰ Cox describes the design and maintenance of its network as “the easy part,” relative to the complexities of attending to its retail customers. For its part, Z-Tel has invested over \$100 million in software development related to innovative services that can be provided over the local exchange network. Rather than purchase three or four local switches capable of providing the same-old, plain-old telephone service (SPOTS) available from the ILECs, Z-Tel has developed innovative new services and products that now serve as a critical component of MCI’s new nationwide, all distance residential service as well as Z-Tel’s own services.²¹

16. The differentiation of retail and wholesale segments of the local exchange market mirrors the current market structure in the interexchange industry. In 2001, more than 900 firms sold retail long distance services, including the Regional Bell Companies (who rely on unbundled access to interexchange facilities to provide long distance service).²² All of these retail services were supported by just seven nationwide long distance networks (and some more regional networks).²³ Given that the sunk cost per dollar of market potential in the local exchange market(s) is less favorable to multiple firm supply than in interexchange industry (where traffic is aggregated), an equilibrium industry

²⁰ Presentation of Jim Robbins, CEO, Cox Communications, Goldman Sachs Communacopia X Conference, Oct. 2, 2001, at 27-8.

²¹ Z-Tel has, in essence, unbundled its innovations to its wholesale customer MCI. Because Z-Tel possesses no market power, offering its innovations on a wholesale basis, even to its rivals, is done willingly. Total investment for a CLEC switch and the associated colocations in a major metropolitan area is about \$25-35 million. See Allegiance Telecommunications 2001 Form 10-K (measuring the change in “Network Equipment” expenditures divided by the change in the number of switches deployed).

²² *Trends in Telephone Service*, Table 10-4 (May 2002).

²³ The current competitive price for interexchange, wholesale capacity is simply not remunerative.

configuration with numerous CLECs relying exclusively on their own facilities to provide service is improbable. High concentration in the wholesale segment is perhaps inevitable, but monopoly is not.²⁴

17. The economic and financial infeasibility of forcing all CLECs to migrate their unbundled element customers to their own facilities does not suggest that facilities-based competition in the wholesale segment is impossible. Indeed, the risk of entry at the wholesale level is attenuated by the presence of the non-incumbent demand for network infrastructure held by entrants using unbundled elements in the retail segment. Before CLECs have substantial numbers of retail customers, there is effectively no demand for competitive telecommunications facilities. End users do not directly demand facilities; retail telecommunications carriers do. Thus, generating effective demand for facilities by promoting retail competition stimulates entry in the wholesale segment of the local exchange.²⁵ Given the likelihood that very few firms can exist in equilibrium in the wholesale segment, this non-incumbent demand for facilities, held by numerous retail competitors, can be consolidated by one or a few a wholesale entrants. The derived demand for facilities of any particular CLEC likely will not be sufficient to warrant duplication of costly network facilities. However, the consolidation of the derived demands of multiple CLECs may be sufficiently large to justify the sunk investments by allowing the wholesaler to quickly and assuredly realize minimum efficient scale. Further, the ability to establish long-term contracts with extant demand reduces the lag between the occurrence of sunk investments and the realization of revenues, thereby facilitating entry into the wholesale market.²⁶

18. Unbundling, therefore, promotes the evolution of competition in the wholesale, local exchange market by targeting the source of industry concentration: the risk accompanying sunk entry costs and other entry barriers. Entrants in the retail segment,

²⁴ See T. Randolph Beard, George S. Ford, and Lawrence W. Spiwak, *Why Adco? Why Now? An Economic Exploration into the Future of Industry Structure in Local Telecommunications Markets*, 54 FED. COMM. L. J. 421-59 (2002) (hereinafter “Beard, Ford, and Spiwak”).

²⁵ See *id.*

²⁶ See *id.*

however, are not necessarily the same firm or firms that enter the wholesale segment.²⁷ Waiting for a competitive retail service provider to deploy its own facilities is misguided, because there can be many more retail competitors than wholesale competitors. Vertical integration of retail competitors into the wholesale market has and may continue to occur on a limited basis, but will be limited to specific (product and/or geographic) markets where the entry conditions are suitable. Rather than waiting for retail entrants to invest in their own facilities, basic economics recommends watching for a wholesale entrant that has contracted to provide services to existing CLECs prior to constructing facilities. Such an entry scheme prevailed in long distance markets and it is in the earliest stages of evolution for large business markets in a handful of metropolitan areas.²⁸

19. The retail/wholesale distinction, in fact, may be too simplistic, because intermediate markets between the retail segment and the facilities providers may emerge. A wholesale agreement between Z-Tel and MCI is one example of such an intermediate, market-based arrangement. While Z-Tel provides MCI access to its own facilities, it also provides MCI access to ILEC facilities through a full suite of OSS functionality including EDI gateways, billing and customer support systems, and so forth. This agreement is evidence of how a truly competitive local telecommunications market will operate, and reveals the contrast between the behavior of carriers lacking market power (the CLECs) and those possessing it (the ILECs).

20. Economics suggests that equilibrium industry structure in the local exchange market will consist of a relatively un-concentrated retail service segment and a highly concentrated wholesale segment in most geographic areas. Because of the similarities of the retail local segment and the retail long distance industry, it is reasonable to expect that the (equilibrium) level of concentration in retail local service will be roughly equal

²⁷ As with long distance, vertical integration into the downstream retail market by wholesalers is possible. However, given the incentives created by vertical integration, it is unlikely that a wholesale entrant in the local exchange market could be a significant participant in the retail segment. *See id.*

²⁸ Citynet, a Maryland company, offers high capacity circuits on a wholesale-only basis in some metropolitan areas. *See id.*

to that observed in long distance retail services (assuming the inherent advantages of the incumbents in customer acquisition can be eliminated).²⁹ In both of these retail segments, customer acquisition costs are non-trivial and, for the most part, sunk. Thus, economic concentration in the local retail segment will not be low by traditional standards, but will be considerably less than monopolistic. Larger numbers competition in the retail segment should allow, at some point in the proximate future, for deregulation of retail services (and desired by the Act).³⁰ Thus, unbundling plainly promotes deregulation through its affirmative effect on competition and the accompanying reduction in market power.

21. Whether or not deregulation of wholesale, network services will occur any time soon is less clear, given that the wholesale segment tends more toward monopoly than the retail segment. Clearly, the deregulation of the retail segment is a substantial improvement over the existing regulation of the entire local exchange industry. Regulating the prices of unbundled elements is a much easier and less expensive task than is regulating the plethora of complex retail tariffs and other buyer-seller interactions. Further, competition in the retail segment will drive innovation and the

²⁹ In 2000, the Herfindahl Index for the long distance industry was a little over 2,000. *See id.* at 452.

³⁰ To some extent, this deregulation is underway. Recently, the New York Public Service Commission allowed Verizon some upward pricing flexibility, but that flexibility was contingent on the availability of the UNE-P at TELRIC (presumably, to help constrain the exercise of market power by Verizon). *See New York PSC Approves Verizon Regulatory Plan*, Press Release of the New York Public Service Commission (Feb. 27, 2002). Anecdotal evidence, which is all that is available at present, suggests that competition via unbundled elements reduces prices, and thus market power, to end-users. Where unbundled elements are priced reasonably, thousands of customers have migrated to competitive local exchange carriers. Presumably, customers migrate to CLECs only if offered a welfare-improving price-quality bundle. Competitive price cuts are widespread. *See SBC Ameritech Offers 169,000 Illinois Small Businesses Up To 47 Percent In Cost Savings Through New Calling Plans*, SBC Press Release (July 1, 2002); *Z-Tel Communications, Inc. v. Illinois Bell Telephone Company*, Order, Case 02-0160, May 8, 2002; *Corecomm v. Ameritech Ohio*, Case No. 08-579-TP-CSS (April 11, 2002); Arbitration Award, Texas PUC Case No. 24542 (Apr. 29, 2002)). 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)." Clearly, consumers have much to gain to from competition, and unbundling is an important component of the competitive landscape. Since these consumer gains are accompanied by a reduction in market power, unbundling increases the prospects for deregulation of retail services – a primary goal of the Act.

diffusion of such innovation.³¹ In an effort to support and extend innovation in the retail market, the wholesale segment of the industry must also innovate.³²

22. The deregulation of the wholesale segment of the industry is a possibility, albeit a long-term possibility, but it is clearly closer with than without unbundling -- economics tells us that, and Congress apparently understood the economics of the issue. Unbundling furthers the dual goals of the Telecommunications Act (competition and deregulation). A lack of unbundling and/or forced vertical integration, by re-establishing the link between sunk costs and industry structure in the local exchange market, perpetuates regulation by attenuating competitive entry. Thus, reducing the availability of unbundled elements at this time cannot be supported by a claim that such reductions help satisfy the deregulatory goals of the Act.

III. Unbundling and Impairment

23. Section 251(d)(2)(B) of the 1996 Telecommunications Act requires the Commission in determining what network elements should be made available to consider, at a minimum, whether

the failure to provide access to such network elements would impair the ability of the telecommunications carrier seeking access to provide the services that it seeks to offer.³³

This section's plain language indicates (at least) three components of the impairment standard: 1) impairment is *carrier specific*; 2) impairment is detected in the relative output of the requesting carrier with and without access to the element; and 3) impairment includes some notion of *significance* and should be non-transitory.

³¹ See, e.g., Harold Gruber, *Competition and Innovation: The Diffusion of Mobile Telecommunications in Central and Eastern Europe*, 13 INFO. ECON. & POL'Y 19-34 (2001).

³² See <http://interconnection.bellsouth.com> ("A wholesaler has to stay abreast of the latest technologies, invest in innovation, and offer a range of solutions to help you achieve your goals and serve your customers.").

³³ 47 U.S.C. § 251(d)(2)(B).

24. First, as is clear in the language of section 251(d)(2)(b), the impairment standard is *carrier specific* – the section describes “*the telecommunications carrier*” and the services “*it seeks to offer*”. In fact, given the different business plans (including target markets), financial resources, and retail products of the various CLECs, it is difficult to imagine how impairment could not be carrier specific. The Supreme Court recognized the carrier-specific nature of the impairment standard, observing:

- “If *a* requesting carrier wants access to additional elements, *it* may petition the state commission, which can make other elements available on a case-by-case basis;”³⁴
- “The 1996 Act...requir[es]...that incumbents provide access to ‘any’ requesting carrier;”³⁵
- “[C]ompetition as to ‘unshared’ elements may, in many cases, only be possible if incumbents simultaneously share with entrants some costly-to-duplicate elements jointly necessary to provide a desired telecommunications service. Such is the reality faced by the hundreds of smaller entrants (without the resources of a large competitive carrier such as AT&T or Worldcom [sic]) seeking to gain toeholds in local-exchange markets;”³⁶ and
- “[A] policy promoting lower lease prices for expensive facilities unlikely to be duplicated reduces barriers to entry (particularly for smaller competitors).”³⁷

Clearly, the Supreme Court recognized that the condition of impairment may vary among CLECs, and further observed that financial “resources” and basic “inefficiency” may be legitimate sources of such variation.³⁸

³⁴ *AT&T Corp. v. Iowa Utilities Board*, 525 U.S. 366, 388 (1999) (emphasis added).

³⁵ *Id.* at 392.

³⁶ *Verizon*, 122 S. Ct. at 1672

³⁷ *Id.* at 1668.

³⁸ *Id.* at 1672.

25. The carrier-specific nature of impairment is echoed throughout section 251(c) and also in section 257 of the Act. The Commission recognized that impairment is a carrier-specific phenomenon in the *UNE Remand Order*.³⁹

26. Second, impairment of a specific carrier is *output based*, in that impairment is satisfied if a lack of access to an element impairs the ability of the requesting carrier “to provide the services it seeks to offer.” Clearly, to impair the “ability to provide...service” is best detected in the difference in quantity of service provided (*i.e.*, output) without and with access to the unbundled element.⁴⁰ In its criticism of the Commission’s first effort to define impairment, which was a cost-based standard, the Supreme Court observed the output-based nature of impairment:

[T]he Commission’s assumption that *any* increase in cost (or decrease in quality) imposed by denial of a network element renders access to that element “necessary,” and causes the failure to provide that element to “impair” the entrant’s ability to furnish its desired services is simply not in accord with the ordinary and fair meaning of those terms.⁴¹

The Court did recognize, however, that

In a world of perfect competition ... the Commission’s total equating of increased cost (or decreased quality) with “necessity and “impairment” might be reasonable.⁴²

Indeed, in a world of perfect competition or Bertrand-style oligopolistic competition with homogeneous products, any cost disadvantage translates into zero output for the high cost firm. As competition moves away from textbook models of intense price

³⁹ See *In re Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Third Report & Order & Fourth Further Notice of Proposed Rulemaking*, 15 FCC Rcd 3696, 3726 (¶ 53) (1999) (“*UNE Remand Order*”). While carrier-specific, the Commission’s analysis also noted that the administrative costs of a case-by-case analysis may be prohibitively expensive. See *id.* (¶ 54). If the business plans and financial conditions of a group of carriers are sufficiently homogenous, the carriers possibly can be grouped for an impairment analysis without violating carrier specificity. The administrative costs also imply that impairment analysis is perhaps better left to the state regulatory commissions.

⁴⁰ *AT&T*, 525 U.S. at 388, 375 (emphasis added). The Commission’s failure to specify impairment in terms of output is the source of most of its judicial trouble with the standard. In the *UNE Remand Order*, the Commission appeared to adopt an output standard (focusing on timeliness, ubiquity, etc.), see *id.* at 3705, but failed to directly specify the standard in terms of output. Once the output distinction is made clear, the impairment analysis becomes considerably easier to describe and implement.

⁴¹ *AT&T*, 525 U.S. at 389-90.

competition, however, cost disadvantages are not so punishing to output. For example, in Cournot-style oligopolistic competition, firms with different levels of marginal cost can co-exist, although low-cost firms have higher output levels.⁴³ So, the Court clearly observed that output was the relevant index of impairment, and rebuked the Commission for not incorporating this fact into their impairment analysis.

27. Because impairment is an output-based standard, the Commission's focus on cost-differences in the *UNE Remand Order* was lacking, because it failed to provide some direct link between cost and output. Cost differences will often be the focus of attention in a practical analysis of impairment, so it is important to put forth some theoretical relationship of output to cost. Section III.4 describes the relationship of output to cost differences in Cournot and Bertrand settings, and shows that even under competitive interactions much less severe than perfect competition or Bertrand, output is highly sensitive to cost disadvantages.

28. The Supreme Court decision in *Verizon v. FCC* further supports the output component of impairment. In that decision, the Court describes a "reasonable reading" of the unbundling and interconnection provisions of the Act (*i.e.*, section 251(c)) is that they are "meant to remove practical barriers to competitive entry into local-exchange markets."⁴⁴ Under an output-based test for impairment, any "practical barrier[] to ... entry"⁴⁵ will reveal itself in the reduced output of the entrant. These "practical barriers" include the more traditional, economic concept of *barriers to entry*, as well as any other factor that attenuates competitive entry in a practical sense, such as access to financial resources and the relative inefficiency of entrants.⁴⁶ Indeed, any factor that attenuates

⁴² *Id.* at 390.

⁴³ STEPHEN MARTIN, *ADVANCED INDUSTRIAL ECONOMICS* (1993), at 19-21 ("In equilibrium the lower-cost firm enjoys greater sales.").

⁴⁴ *Verizon*, 122 S. Ct. at 1685.

⁴⁵ *Id.*

⁴⁶ Barriers to entry relate to the ease or difficulty of entry. Joe Bain defined entry barriers as "advantages which established firms in an industry have over established entrant firms." George Stigler, similarly, defines entry barriers as "a cost of producing (at some or every rate of output) which must be borne by a firm which seeks to enter an industry but is not borne by firms already in the industry."

competitive entry impedes the attainment of the Act's fundamental goals, including: "uprooting the monopolies...reorganiz[ing] markets...[and] giv[ing] aspiring competitors every possible incentive to enter local retail telephone markets."⁴⁷

29. Thus far, the analysis shows that impairment focuses on the reduction in output (not profit) experienced by an individual carrier if the carrier is not given access to an unbundled element. But how much of a reduction does the Act allow before impairment is deemed to exist? Because the dictionary definition of "impair" is "to damage or make worse by or as if by diminishing in some material respect," it seems reasonable that to constitute a statutorily cognizable impairment, there must be a small, but significant and non-transitory decrease in the requesting carrier's output.⁴⁸ The Act offers no guidance on what "significant" is, but it seems sensible that significance be "rationally related to the goals of the Act,"⁴⁹ which include the promotion of competition ("uprooting the monopolies") and deregulation. The reduction in output also should not be a transitory disability, but one which cannot be quickly and easily overcome.

30. In *Verizon v. FCC*, the Supreme Court observed that the Act was "designed to give aspiring competitors every possible incentive to enter local retail telephone markets."⁵⁰ Given that the Court stated that even small price increases of an unbundled element may reduce incentives to enter local retail telephone markets, small degrees of impairment necessarily must be material.⁵¹ While it is certainly possible to conclude that a significant difference is something perhaps akin to the 5-10% price increase used in

von Weizsacker adds to the Stiglerian definition the requirement that the barrier lead to a suboptimal allocation of resources. See MARTIN, *supra* n.43, at 5-7, 172-191; In re Implementation of Section 19 of the Cable Television Consumer Protection & Competition Act of 1992; Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, *First Report*, 9 FCC Rcd 7442, at App. H: Economic Concepts for Assessing the Extent of Competition in Video Programming Distribution Markets (1994).

⁴⁷ *Verizon*, 122 S. Ct. at 1660-61.

⁴⁸ See Merriam-Webster Dictionary Online (www.m-w.com).

⁴⁹ *AT&T*, 525 U.S. at 388.

⁵⁰ *Verizon*, 122 S. Ct. at 1661.

⁵¹ *Id.* at 1672 ("[T]he difference between such a higher rate and the TELRIC rate could be the difference that keeps a potential competitor from entering the market."); *id.* at 1675 ("[H]igh lease rates for these elements would be the rates most likely to deter market entry.").

merger analysis, a richer analysis for measuring significance is discussed later in the text.

1. THE IMPAIRMENT CONDITION

31. To give some analytical specificity to impairment, let Q^U be the quantity of services sold by the CLEC when it has access to the unbundled element, and let Q^F represent the quantity of services sold without access to the unbundled element. Services sold with the unbundled element (Q^U) may contain services provided with and without the element in question, but services sold without the element (Q^F) are provided solely without the element.⁵² For now, let the significance component be a particular percentage reduction (m) in the quantity of service sold that is “significant.” As indicated above, the impairment standard is satisfied for firm i if the following is true:

$$Q_i^U - Q_i^F > mQ_i^U, \quad (2)$$

where the condition simply states that impairment exists if the reduction in the quantity of service sold ($Q^U - Q^F$) exceeds a significant reduction in service sold (mQ^U). For example, say that a 10% reduction in the quantity of service sold is significant ($m = 0.10$). With access to the unbundled element, CLEC i sells 100 units. Without access to the element, alternately, CLEC i sells only 30 units. Because 70 units ($100 - 30$) exceeds 10 units ($0.10 \cdot 100$), the impairment condition is satisfied. In this example, if the CLEC output falls by more (less) than 10 units, the impairment condition is (is not) satisfied. Equation (2) is a simple, direct analytical re-statement of section 251(d)(2)(B). Obviously, the difference in CLEC output across the two regimes is a function of a number of

⁵² The quantity of service provided using the unbundled element (Q^U) is that quantity provided at “cost[-based]” rates and on “non-discriminatory” terms and conditions, consistent with section 252(d). Today, prices are based on total long-run incremental cost (“TELRIC”), and the Supreme Court recently upheld that pricing standard in *Verizon*, 122 S. Ct. at 1668-79, as being the most reasonable interpretation of the Act’s requirements among proffered alternatives.

factors, including the cost differences of self-provisioning the element and the availability of elements from a competitive wholesale provider.⁵³

32. It may be the case that the impairment test described by Equation (2) renders different results across geographic and product markets. While not stated explicitly in §251(d)(2)(B), it is perhaps reasonable to incorporate a geographic/product component to the condition. Further, output must be measured at some specific point in time or over some time interval. Thus, the impairment standard for firm i in market g is

$$Q_{i,g,t}^U - Q_{i,g,t}^F > mQ_{i,g,t}^U, \quad (3)$$

where the quantities are measured in period t . Consideration of impairment over some time interval ensures that a reduction in output that is merely transitory does not constitute impairment. However, a reduction in output is not transitory if there is a permanent lag, which reduces output permanently below the levels that would exist in the absence of the condition that creates the lag.⁵⁴ This is consistent with prior Commission interpretations of impairment. Geographic differences in impairment were considered with respect to unbundled switching in the Commission's *UNE Remand Order*.⁵⁵ While the switching restriction of that *Order* has been detrimental to competition and facilities deployment, the restriction was useful in that it did generate some variation across markets in element availability so the effects of unbundling or the lack thereof could be measured empirically (see Section IV below). In that same *Order*, the Commission also considered "timeliness" as a relevant factor for impairment.⁵⁶

⁵³ *AT&T*, 525 U.S. at 389.

⁵⁴ For example, if a limitation on loop provisioning limits a CLEC's growth to 50,000 lines in a year where the CLEC could have provided 100,000 lines *via* the UNE Platform, that initial 50,000-line difference (the output restriction) is apt to cause a permanent lag in that CLEC's market penetration. In this example, for the output restriction to be transitory, in Year 2, the ILEC would have to "make up" that Year 1, 50,000-line deficit in addition to serving the CLEC's Year 2 demand.

⁵⁵ See *UNE Remand Order*, 15 FCC Rcd at 3804-32 (¶¶ 241-99).

⁵⁶ See *id.* at 3704-09 (Executive Summary).

33. In analytical form, section 251(d)(2)(B) can be rewritten as

the failure to provide access to such network elements would [reduce] the [output] in time t of the telecommunications carrier [i] seeking access [in market g by m percent].

This analytical restatement of the impairment standard of the Act is true to the plain language of the Act and the apparent intent of Congress as interpreted by the Supreme Court. Practically, the final impairment condition (Equation 3) can be stated as: "Without access to the unbundled element, will the requesting carriers output in market g fall by more than m percent over some relevant time period?"

34. While the impairment condition is written here with analytical precision, it is not the case that Equation (3) can be computed directly. The purpose of this analysis is to create a conceptual framework for considering impairment so that the right empirical and theoretical questions can be posed and answered. Merger analysis under the Merger Guidelines is one example of decisions based on theoretical conjecture and available empirical evidence. Also, the Texas Public Service Commission recently performed an impairment analysis entirely consistent with the impairment condition of Equation (3).⁵⁷ Additionally, multiple regression analysis and other statistical procedures may prove helpful in assessing the impact of element availability or a lack thereof on a CLEC's (or group of CLECs') output. In fact, a number of recent studies have addressed the question of impairment using econometric analysis (see Section IV below).

2. FAILURE OF THE FIRST REPORT AND ORDER

35. In its initial Order implementing section 251 of the Act, the Commission defined the impairment standard as:

...we interpret the "impairment" standard as requiring the Commission and the states, when evaluating unbundling requirements beyond those identified in our minimum list, to consider whether the failure of an incumbent to provide access to a network element would decrease the

⁵⁷ Arbitration Award, *Petition of MCIMetro*, Texas PUC Docket No. 24542 (May 1, 2002).

quality, or increase the financial or administrative cost of the service a requesting carrier seeks to offer, compared with providing that service over other unbundled elements in the incumbent LEC's network.⁵⁸

This first interpretation of the impairment standard focused on quality and financial differentials caused by a lack of access to unbundled elements. Thus, to the extent a lack of access to a particular unbundled element reduced the quality of CLECs service offering or its profits (*i.e.*, its "financial or administrative costs"), the unbundled element was deemed to satisfy the impairment standard and its availability to CLECs was therefore required.

36. In analytical form, the Commission's first definition of impairment was

$$C^F > C^U \quad (4)$$

where C^F is the cost of the entrant without and C^U with the unbundled element, and impairment is satisfied if the cost of self-supply exceeds the cost of unbundled elements. Equation (4) is clearly different from Equation (3), and the Supreme Court did not miss this fact. As stated above, the Supreme Court rejected the Commission's first attempt to define significance because impairment is an output-based standard, not a cost- or profit-based standard. While it is true that output is inversely related to cost, only in the case of perfect competition (or Bertrand oligopolistic competition) would a cost differential of *any* amount lead to a dramatic reduction in the entrant's output. The Court observed, "[the Commission] has not established the existence of such an ideal world," and rejected the Commission's definition of impairment.⁵⁹

37. A focus on cost differentials may have been acceptable to the Court if the Commission had first correctly defined impairment in terms of output, and then established a reasonable theoretical link between cost and output. This theoretical link is

⁵⁸ In re Implementation of the Local Competition Provisions in the Telecommunications Act of 1996; Interconnection between Local Exchange Carriers & Commercial Mobile Radio Service Providers, 11 FCC Rcd 15499, 15643 (¶ 285) (1996) ("*Local Competition First Report & Order*").

⁵⁹ *AT&T*, 525 U.S. at 390.

the subject of Section III.4 of this declaration. Because cost differentials are a “practical barrier to competitive entry” and, in many cases, cost differences will be all the evidence the agency may have, this theoretical analysis may be critical to an impairment analysis.

3. SIGNIFICANCE AS EQUIVALENCY WEIGHTS

38. As discussed above, the Supreme Court established that even a small reduction in an entrant’s output if an element is denied to the entrant is significant. It is possible, however, to tie significance to the goals of the Act in a more analytical fashion, incorporating some index of significance into the impairment condition of Equation (3), and providing the greater specificity with respect to significance that the D.C. Circuit in *USTA* appeared to desire. This index of significance must be based on the primary goals of the Act, including “eliminat[ing] the monopolies” of the Bell Companies.⁶⁰ As a practical matter, the construction of the index might include (at least) some recognition of the effect of an output reduction (or expansion) by a requesting carrier on: a) the end-user and/or wholesale price for telephone services and facilities; b) the extent and type of innovation in the retail and wholesale markets; c) the level of investment by incumbents and entrants, including the impact of wasteful duplication; d) the managerial costs of regulating the wholesale and/or retail local telephone markets.

39. In analytical form, the significance factor can be written as

$$m = 1 - e_{i,g,t}^U / e_{i,g,t}^F \quad (5)$$

where e^U and e^F are equivalency weights measured on a *per-line basis* for the output provided by firm i in market g at time t either with (superscript U) or without (superscript F) the unbundled element.⁶¹ These equivalency weights measure the net benefit, on a per-line basis, of a CLEC providing service to end-users. These net benefits

⁶⁰ *Verizon*, 122 S. Ct. at 1654.

⁶¹ Note that Q^U may contain lines serviced with elements and with own facilities, so the welfare indicia are not measures of the welfare of each line provided with elements or each line provided solely on a own-facilities basis.

include the welfare gains from both CLEC and ILEC price reductions, quality enhancements, innovations, and investments, whereas the costs include the resources expended to comply with regulations.⁶² To the extent that there are substitution or complementary effects between the benefits and costs and the entry modes, the net benefit calculation should incorporate those relationships. The term “equivalency weight” is used to indicate that these weights can be used to determine the net-benefit equivalents of Q^F and Q^U .

40. A simple numerical example may be helpful. Say that entry by facilities or elements provides equal per-line benefits, but that unbundling requires more administrative costs (say, \$1 per line). The social benefit with unbundling is \$9 per line, whereas the benefit of facilities-based lines is \$10, so the significance factor is 0.10 ($= 1 - 9/10$).⁶³ In this scenario, the net benefits (presumably to society) are greater without the unbundled element as long as the entrant’s total output is not reduced by more than 10%.

41. Alternately, say that deploying facilities is wastefully duplicative (*i.e.*, increases the total cost of providing industry output, presumably due to economies of scale). In this case, the net benefit of a facilities-based line may be only \$5 to the \$9 of benefit from the lines provided using some combination of unbundled elements and facilities. In this case, the significance factor is -0.80, indicating that society is as well off with 100 units of Q^U as they are with 180 units of Q^F . Normally, the expectation is that the firm’s output with unbundling exceeds that without unbundling ($Q^F < Q^U$). So, if the expected benefit of a facilities-based line equals or falls below that of the mixed unbundling-facilities line (*i.e.*, $e^F < e^U$), then unbundling clearly should be mandated.⁶⁴

⁶² The relative production of innovation and investment is captured on the benefit side, not the cost side. It is important to determine the cost structure of compliance cost. Compliance costs that are already sunk have no bearing on the social benefit calculations going forward.

⁶³ The assumption is that the net benefit is constant and linear. Alternative, and perhaps more realistic, assumptions are available.

⁶⁴ *Verizon*, 122 S. Ct. at 1675 (discussing costly bottleneck elements, “duplication of which is neither likely nor desired”).

42. Of course, the ability to write a statement like Equation (5) does not imply that the equivalency weights can be estimated with precision. As before, this analytical approach, for the most part, provides guidance as to the relevant empirical and theoretical questions. For example, an interesting empirical question might be whether or not lines provided without unbundled elements lead to more price competition than with such access? Is there a complementary or substitution relationship between unbundling and facilities-based entry? Are the administrative costs of unbundling fixed or marginal in nature, and are such costs borne by entrants (*e.g.*, operational support systems), incumbents, or consumers (*e.g.*, number portability). As discussed in detail in Section IV, some of these relevant empirical questions have been addressed in recent studies.

4. COST DISADVANTAGES WITH SMALL NUMBERS COMPETITION

43. While the Supreme Court rejected the Commission's cost-based impairment standard by associating the implications of the standard with perfect competition, it can be shown that cost disparities exert a powerful influence on output even in economic models with less severe price competition. There are a number of ways to evaluate the theoretical relationship between cost changes and output. One particular approach, perhaps best suited for the impairment analysis, is to evaluate the impact of cost differences on output within some framework of small-numbers competition. Specifically, the analysis in this section is based on duopolistic competition in which the two firms behave as Cournot competitors.⁶⁵ Bertrand (perfect competition) will be considered later in this section.

44. For the Cournot duopoly, let market demand be

$$P = a + b(Q_1 + Q_2), \tag{6}$$

⁶⁵ In the Cournot model, rival firms choose the quantity they wish to offer for sale. Each firm maximizes profit on the assumption that the quantity produced by its rivals is not affected by its own output decisions. The Cournot equilibrium asserts that prices and quantities approach competitive levels as

where P is the market price, Q_i is the output of firm i . Note that total industry output, Q , is equal to $Q_1 + Q_2$. Further, assume that firm 1 has marginal cost C_1 and firm 2 has marginal cost λC_1 , where λ measures the cost disadvantage of firm 2 (i.e., $\lambda \geq 1$). In the case of identical firms ($\lambda = 1$), each firm has a market share (w_i) equal to 50% of the equilibrium market output Q^* .⁶⁶ As λ gets larger, however, firm 2's market share declines while firm 1's market share increases. Total industry output also declines. Our focus, however, is only on the reduction in firm 2's market share. Specific assumptions regarding the parameters a , b , and C_i can be avoided by defining considering the effect of cost differentials on market share (w_i).⁶⁷

45. It can be shown that for some price-cost margin k , the market share of firm 2 is zero (i.e., firm 1 monopolizes the market) when the cost disadvantage of firm 2 (i.e., λ) is

$$\lambda^0 = \frac{2 + k}{2(1 - k)}, \quad (8)$$

where λ^0 indicates the value of λ that reduces firm 2's market share to zero. The figure in Table 1 illustrates the relationship between firm 2's market share and λ .

46. Observe in Table 1 that the relationship between firm 2's market share (w) and λ is non-linear (i.e., the curve is concave). Table 1 also summarizes the values for λ^0 at different values of k . Assuming a price-cost margin of 40%, Table 1 shows that λ^0 is 2.00, and at a cost disadvantage of 50% ($\lambda = 1.50$), firm 2's market share is approximately 28%

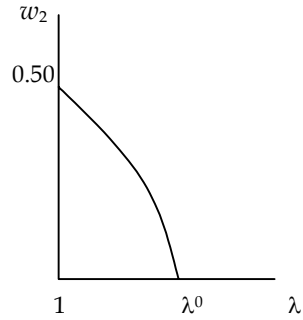
the number of firms supplying the market increases. In Bertrand competition, alternately, output and price equal the competitive levels with two firms.

⁶⁶ For firm i , equilibrium output is $[a + (c_j - 2c_i)]/3b$, and market output is $(2a - c_j - c_i)/3b$.

⁶⁷ Quantity of output is the appropriate index of impairment, but for illustrative and expositional purposes, market share is a useful index. A 25% reduction in market share will be equivalent to a 25% reduction in output, if total industry output is constant (which will not be the case in the Cournot simulation because price increases as cost increases).

(the relationship is non-linear, though the assumption of linearity does not terribly distort the actual market share).⁶⁸

k	λ, w_2	λ^0, w_2	λ, w_2
4	1.0, 50%	2.00, 0%	1.50, 28%
3	1.0, 50%	1.64, 0%	1.32, 28%
2	1.0, 50%	1.38, 0%	1.19, 28%
1	1.0, 50%	1.17, 0%	1.08, 30%



47. Even across the broad range of margins (10% to 40%), the firm’s output is very sensitive to cost disadvantages. According to the FCC’s own estimate, the margin for local, analog voice service (based on average cost, which in this model is equal to marginal cost) is about 24% on average.⁶⁹ At this margin, firm 2’s market share is zero when λ is 1.47 (i.e., $\lambda^0 = 1.47$). In this case, a mere 25% cost disadvantage ($\lambda = 1.25$) reduces firm 2’s market share by 23 percentage points, or 45%.

48. This simple Cournot simulation illustrates that as a matter of theory, small cost disadvantages can lead to substantial reductions in service provided. Thus, when analyzing cost in an impairment analysis, even small increases in costs can lead to sizeable reductions in service provided. Even for margins as high as 40%, the elasticity

⁶⁸ The actual market share is 28.5%, so a linear approximation has an error of 3.5 percentage points of market share at $\lambda = 1.5$.

⁶⁹ The FCC’s margin calculation is outlined in the order granting Verizon’s section 271 application for New York. See In re Application by Bell Atlantic New York for Authorization Under Section 271 of the Communications Act To Provide In-Region, InterLATA Service in the State of New York, *Memorandum Opinion & Order*, 15 FCC Rcd 3953, 4168 n.1332 (1999). The average margin of 24% is based on the FCC’s calculations for all states and the District of Columbia, excluding Alaska and Hawaii, and is computed using 2000 ARMIS data.

of market share with respect to the cost disadvantage is about -1.00 (suggesting a 10% increase in cost leads to a 10% reduction in market share). As the margin declines below 40%, the elasticity becomes even larger. The elasticity also becomes larger as the cost disadvantage becomes larger.⁷⁰

49. If the two firms behave as Bertrand competitors (or perfect competitors), the equilibrium market price is equal to marginal cost (assuming no fixed costs). For any value of λ exceeding 1, the market share of firm 2 is driven to zero. In other words, monopoly is the product of any cost disadvantage whatsoever. Under a Bertrand scenario, therefore, any increase in cost satisfies the impairment condition because any increase in cost eliminates the firm altogether. Generally, as the intensity of price competition increases, so does the output reduction for a given cost differential.

5. IMPAIRMENT AND THE ESSENTIAL FACILITIES DOCTRINE

50. The ILECs contend that impairment should be equilibrated to the essential facilities doctrine of antitrust.⁷¹ This contention was rejected long ago by the Commission in the *Local Competition First Order*.⁷² Nevertheless, the essential facilities doctrine remains the subject of dispute, and the doctrine was referenced in *AT&T v. Iowa Utilities Board* and *USTA v. FCC*. Neither decision, however, embraced the essential facilities doctrine. The Supreme Court held,

We need not decide whether, as a matter of law, the 1996 Act requires the Commission to apply [the essential facilities doctrine]; it may be that some other standard would provide an equivalent or better criterion for the limitation upon network-element availability that the statute has in mind.⁷³

⁷⁰ Because the relationship between market share and the cost disadvantage is concave, at higher values of λ , small changes in λ produce large changes in market share.

⁷¹ See *AT&T*, 525 U.S. at 388; *USTA*, 290 F.3d at 426.

⁷² See *Local Competition First Report & Order*, 11 FCC Rcd at 15643-44 (¶¶ 286-87).

⁷³ *AT&T*, 525 U.S. at 388.

In *USTA v. FCC*, the D.C. Circuit Court of Appeals stated, “we do not intend to suggest that the Act requires use of [essential facilities] doctrine’s criteria.”⁷⁴ This Court further indicates that the essential facilities doctrine is, as a general matter, “inadequate,” but the doctrine “may nonetheless offer useful concepts for agency guidance when Congress has directed an agency to provide competitor access in a specific industry.”⁷⁵

51. In *Verizon v. FCC*, the Supreme Court rejects implicitly the relevance of the essential facilities doctrine in an analysis of impairment. The Court’s decision assails the very foundations of the doctrine, concluding that impairment is a much different standard than is the essential facilities doctrine. First, as discussed above, the Court acknowledged that impairment is carrier specific. Antitrust, alternatively, aims to protect competition and not competitors.⁷⁶ Second, antitrust does not mandate specific market structures, yet the Court concluded that the Act was “intended to eliminate the monopolies enjoyed by the inheritors of AT&T’s local franchises,” and this purpose was an “end in itself.”⁷⁷ Further, the Court observed, “Congress passed a ... statute with the aim ... to reorganize markets.”⁷⁸

52. Third, the 1996 Act imposes a “statutory duty to provide unbundled elements.”⁷⁹ Thus, the question of intent, a highly controversial concept in antitrust, does not arise. Under an essential facilities doctrine, the intent to “create or maintain a monopoly” must be established, whereas the 1996 Act already establishes that fact.

53. Fourth, one element of the essential facilities doctrine is “a competitor’s inability practically or reasonably to duplicate the essential facilit[ies].”⁸⁰ The Act has a much less

⁷⁴ *USTA*, 290 F.3d at 427.

⁷⁵ *Id.* at 428 n.4.

⁷⁶ See, e.g., Jerry A. Hausman & J. Gregory Sidak, *A Consumer-Welfare Approach to the Mandatory Unbundling of Telecommunications Networks*, 109 *YALE L.J.* 421-23 (1999).

⁷⁷ *Verizon*, 122 S. Ct. 1654.

⁷⁸ *Id.* at 1661.

⁷⁹ *Id.* at 1683.

⁸⁰ *MCI Comm’ns Corp. v. AT&T*, 708 F.2d 1081, 1132 (7th Cir. 1982).

rigorous standard, and even Bell witness Dr. Howard Shelanski recognizes this fact.⁸¹ More importantly, the Supreme Court averred that the purpose of unbundling is to remove “practical barriers to [] entry,”⁸² and these practical barriers include firm size and financial resources, the entrant’s inefficiency, and so forth.⁸³ The Court explicitly rejected the notion that an element must be prohibitively expensive to replicate, observing “the Act allows for an entrant that may have to lease some ‘unnecessarily expensive’ elements in conjunction with building its own elements to provide a telecommunications service to consumers.”⁸⁴ A standard of “unnecessarily expensive” is clearly less demanding than “prohibitively expensive” (or “inability ... to duplicate”). The *USTA* court likewise opined, “access to UNEs may enable a CLEC to enter the market gradually, building a customer base up to the level where its own investment would be profitable.”⁸⁵ If unbundling facilitates the duplication of facilities, then the inability to duplicate the asset cannot be the controlling factor of whether or not an element is unbundled.

54. What is most peculiar about the proposed application of the essential facilities doctrine to impairment is the tautology of the recommendation. *MCI Communications Corp. v. AT&T* identified four elements necessary to establish liability under the essential facilities doctrine: 1) control of the essential facility; 2) a competitor’s inability to practically or reasonably to duplicate the essential facilities; 3) the denial of the use of the facility to a competitor; and 4) the feasibility of providing the facility. All four elements of the essential facilities doctrine are either directly incorporated into the Act, or replaced with a similar element. For example, section 251(b) and section 251(c) clearly

⁸¹ See Declaration of Howard A. Shelanski, appended as Attachment D to Comments & Contingent Petition for Forbearance of the Verizon Telephone Companies, CC Docket Nos. 96-98, 98-147, 01-338 (filed Apr. 5, 2002) (hereinafter “Shelanski Declaration”), at 18 (“As a threshold matter, one might object that the Telecommunications Act of 1996 is not meant to replicate the antitrust laws and is expressly intended to impose a different and more generous standard for unbundling than that which might be implied under the Sherman Act”).

⁸² *Verizon*, 122 S. Ct. at 1685.

⁸³ See, e.g., *id.*

⁸⁴ *Id.* at 1672 n.27.

⁸⁵ *USTA*, 290 F.3d at 424.

establish the control of the elements by the ILECs (Element 1), whereas section 251(c) addresses whether the provision of the element is technically feasible (Element 4). The obligation to deal is established by section 251(c)(1), and the desire to deny use of elements is made clear in the ILECs' filings in this very proceeding (Element 3). Finally, Element 2 of the doctrine is replaced by the impairment standard of section 251(d)(2)(B), which may be reasonably interpreted as "the failure to provide access to the unbundled element would reduce the output of the telecommunications carrier seeking access to that element in a particular market in some significant respect over a specified period of time."⁸⁶

55. The 1996 Act is very thorough in its requirements, and while one cannot criticize the suggestion that the essential facilities doctrine may offer some "useful guidance" for impairment, it is unclear what guidance the doctrine offers that is not already incorporated into the Act, or replaced with a "better criterion for the limitation upon network-element availability."⁸⁷

IV. Review of the Empirical Evidence

56. The analytical approach to impairment, as well as the ambiguity of theory with respect to the impact of unbundling on investment and innovation, makes policy-relevant empirical analysis extremely important. Much of the empirical work relating to the 1996 Act has not focused on impairment.⁸⁸ A number of recent studies have, however, shed light on a few of the most important policy questions relating to impairment.

⁸⁶ Advocates of the essential facilities doctrine attempt to apply that doctrine to the impairment standard, whereas the impairment standard is better characterized as a replacement for Element 2 of the doctrine.

⁸⁷ *AT&T*, 525 U.S. at 388.

⁸⁸ See, e.g., Agustin J. Ros and Karl McDermott, *Are Residential Local Exchange Prices Too Low?*, in EXPANDING COMPETITION IN REGULATED INDUSTRIES (Michael A. Crew ed., Kluwer Academic Publishers 2000); Fredrico Mini, *The Role of Incentives for Opening Monopoly Markets: Comparing GTE and BOC Cooperation with Local Entrants*, 49 JOURNAL OF INDUSTRIAL ECON. (Sept. 2001); James Zolnierek, James Eisner, & Ellen Burton, *An Empirical Examination of Entry Patterns in Local Telephone Markets* (FCC Working Paper, Aug. 1999); James Eisner & Dale Lehman, *Regulatory Behavior & Competitive Entry* (unpublished manuscript, June 2001).

57. In general, econometric analysis relevant to impairment takes the following general form, $Q_E = f(A)$, where some measure of the entrant's output (Q_E ; lines served, investment, innovation, etc.) is taken to be a function of element availability and prices (A).⁸⁹ Prices are relevant to impairment because price is just another index of availability (at some price, the effective demand is zero). A finding of impairment is supported if reductions in availability (or increases in price of the element above cost), reduce output by an amount sufficiently large to qualify as "significant" [*i.e.*, $Q_E(A) - Q_E(0) > mQ_E(A)$].

58. The first empirical study specifically addressing impairment was *An Empirical Examination of the Unbundled Local Switching Restriction* (Z-Tel Policy Paper Number 3).⁹⁰ In this paper, the quantity of competitive services provided to residential and small business customers was regressed on numerous factors including a proxy for the percentage of the total market where unbundled switching was not available due to the unbundled local switching restriction established in the *UNE Remand Order*. This study found that the output of competitors was significantly lower, in both statistical terms and in magnitude. The study concluded that the switching restriction "has reduced CLEC market share of residential and small business customers by an average of 36% (p. 1)." An additional finding of the study was that the switching restriction made entrants less likely to target the residential and small business markets. These findings -- subsequently replicated with a later release of the dependent variable data -- suggest that entrants are impaired with respect to unbundled switching.

59. It is the position of the ILECs that restricted access to unbundled local switching will spur CLEC investment in local switches. Along the same lines, the ILECs contend that TELRIC-based switching rates deter CLEC switch deployment. These propositions were directly tested in two papers: *Does Unbundling Really Discourage Facilities-Based Entry? An Econometric Examination of the Unbundled Local Switching Restriction* (Z-Tel Policy Paper Number 4) and *Facilities-Based Entry in Local Telecommunications: An*

⁸⁹ Of course, many other empirical tests could be relevant to impairment.

⁹⁰ *An Empirical Examination of the Unbundled Local Switching Restriction*, Z-Tel Policy Paper Number 3, Mar. 2002 (updated from Nov. 2001), available for download at <http://www.telepolicy.com>.

Empirical Investigation by Randy Beard, Thomas Koutsky, and myself.⁹¹ In these studies, the dependent variable measured the number of switches deployed by CLECs before and after the unbundled local switching restriction was implemented. The latter paper, more advanced than the former, also measured the impact of element prices (loops and switching) on switch deployment, and also evaluated the issue with a theoretical model. Both papers found that the deployment of local switches by CLECs was inversely related to the percentage of the market affected by the unbundled local switching restriction. Furthermore, the latter study found that higher unbundled switching rates reduced, not increased, CLEC switch deployment. Both studies reject the ILEC hypothesis that switch availability and TELRIC prices reduce switch deployment by CLECs.

60. The most recent empirical study related to impairment is *Make or Buy? Unbundled Elements as Substitutes for Competitive Facilities in the Local Exchange Network*.⁹² In this paper, the demand curves for unbundled loops purchased with (UNE-P) and without (UNE-L) unbundled switching are estimated. This empirical framework allows for the estimation of own-price and cross-price elasticities of demand for unbundled loops and switching. Estimation of the cross-price elasticity allows the ILEC assertion that UNE-P is a substitute for UNE-L to be tested directly.

61. This study finds that the own-price demand elasticity for unbundled switching is elastic (i.e., less than -1.00), indicating that quantity demanded is highly sensitive to price. A 10% increase in the loop rate reduces the quantity of loops leased by CLECs to provide competitive service by 17%. The hypothesis that the own-price elasticities of demand for loops purchased with and without unbundled switching (about -1.7) are equal cannot be rejected. For unbundled switching, the own-price elasticity of demand was estimated to be -1.12, which again is in elastic region of demand. The proportion of

⁹¹ *Does Unbundling Really Discourage Facilities-Based Entry? An Econometric Examination of the Unbundled Local Switching Restriction*, Z-Tel Policy Paper Number 4, Feb. 2002; R. Randolph Beard, George S. Ford, & Thomas W. Koutsky, *Facilities-Based Entry in Local Telecommunications: An Empirical Investigation* (unpublished manuscript, June 2002).

⁹² Beard & Ford, *supra* n.14.

the loop and switching price to the total price of the loop-switching combination was found to be irrelevant to quantity demanded; a \$1.00 increase in the price of the loop or the price of switching has an equivalent effect on quantity demanded. Thus, raising the switching price and lowering the loop price by an equivalent amount has no effect on demand (*i.e.*, only the total price matters). This finding is consistent with a lack of substitutability between unbundled and self-supplied switching for entrants using the UNE-P.

62. More direct evidence on substitution is provided by the estimate of the cross-price elasticity of loops with respect to the price of unbundled switching. The authors found no evidence that the price of switching impacted the demand for unbundled loops purchased without switching (*i.e.*, the null-hypothesis that the cross-price elasticity of UNE-L with respect to unbundled switching is zero could not be rejected). Thus, this study finds that UNE-P and UNE-L are unrelated in demand, implying that any reduction in the quantity demanded of UNE-P caused by an increase in the price of switching (or a reduction in access to switching) will not be made up for by an increase in the quantity of UNE-L. Any effort to handicap UNE-P will reduce overall competition by an amount equal to the reduction in UNE-P lines.

63. This new study also includes a statistical test of impairment. For this test, the authors evaluate whether the increase in the quantity of loops purchased without switching is equal to the decrease in the quantity of loops purchased with switching, given some increase in the price of unbundled switching (a test of perfect substitution). Equality of the two quantity changes is rejected statistically, and the estimated coefficients of the model suggest that the reduction in total competition provided over unbundled loops is equal to the reduction in the quantity of loop-switching combinations (*i.e.*, there is no offsetting increase in loops leased without switching). Although this procedure does not test for carrier-specific impairment, it does find impairment for CLECs as a whole. Thus, it is clear that at least some CLECs are impaired without access to unbundled switching.

64. All four of the aforementioned studies evaluated the relationship of unbundling to competitive entry into the local exchange market using multiple regression

techniques, and all relate directly to impairment. In every case, the ILECs' contentions regarding detrimental effects of unbundling are soundly rejected, but the positive relationship between unbundling and competition of all types is supported. Therefore, given the current empirical evidence, it is reasonable to conclude that the unbundling provisions of the Act are (at present) a positive factor in promoting competition and reducing regulation in local exchange telecommunications markets, and these unbundling obligations are not reducing either the investment of or the demand availability to "facilities-based" CLECs.

V. Reply to Dr. Howard Shelanski

65. The Bell Company's economic advocate on impairment is Dr. Howard Shelanski.⁹³ In his testimony, Dr. Shelanski avers, "[t]he overarching question for the Commission in this proceeding is whether competitors are currently impaired in entering the local exchange markets if they lack access to a given unbundled network element (p. 4)." Consistent with this claim, the bulk of Dr. Shelanski's testimony addresses impairment.

66. With regard to impairment, Dr. Shelanski asserts, "impairment must at a minimum mean that there is no option that would enable a carrier to compete in the local exchange market other than obtaining the element at issue from the ILEC under regulated unbundling."⁹⁴ Where Dr. Shelanski derives his definition of impairment is unstated, but it clearly does not follow from section 251(d)(2)(B) of the 1996 Act. As described above, the Act couches impairment in terms of a reduction "in the ability of the telecommunications carrier seeking access to provide the services that it seeks to offer," which is plainly carrier-specific, output-based, and contains a significance component. Dr. Shelanski considers none of these components. Further, Dr. Shelanski's suggestion that the CLEC have "no choice" implies that the unbundled element is necessary to provide service, not that the CLEC is impaired in its ability to provide

⁹³ See generally Shelanski Declaration, *supra* n.81.

⁹⁴ *Id.* at 4.

service. The Act contains both a “necessary” and “impair” standard,⁹⁵ so the two terms cannot be equivalent in meaning. Consequently, impairment cannot be a question of “no option,” as Dr. Shelanski supposes, but a question of realistic options that are closely substitutable with acquiring the element on an unbundled basis from the ILEC.

67. Likewise, Dr. Shelanski’s recommendations “to err against finding impairment” and that “the presumption against impairment should be strong”⁹⁶ find no support in the 1996 Act or the Supreme Court decisions regarding the Commission’s implementation of the Act. As discussed above, the Supreme Court describes the Act as “giv[ing] aspiring competitors every possible incentive to enter local retail telephone markets.”⁹⁷ Furthermore, the Court observed, “Congress passed a rate setting 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.”⁹⁸ Or, as Senator Breaux commented (and as quoted by the Supreme Court), “It is kind of almost a jump-start. ... I [*i.e.*, the ILECs] will do everything I have to let you into my business.”⁹⁹ In none of these statements does one find an implicit or explicit inclination “to err against finding impairment.”

68. Consistent with his failure to even consider the actual language of section 251(d)(2)(B), Dr. Shelanski further argues that impairment is not carrier specific. While it may be that a “disadvantage suffered by an individual competitor is not cognizable harm under the antitrust law,”¹⁰⁰ the Act clearly defines impairment as carrier specific (“the requesting carrier” and “services it seeks to provide”), and this fact was reiterated by the Supreme Court. The Commission also observed, “the ability of one or more competitors to serve certain customers in a particular market is not dispositive of whether competitive LECs without unbundled access to the incumbent LEC’s facilities

⁹⁵ Compare 47 U.S.C. § 251(d)(2)(A) with *id.* § 251(d)(2)(B).

⁹⁶ Shelanski Declaration, *supra* n.81, at 5.

⁹⁷ *Verizon*, 122 S. Ct. at 1661.

⁹⁸ *Id.*

⁹⁹ *Id.*

¹⁰⁰ Shelanski Declaration, *supra* n.81, at 19.

are able to compete for other customers in the same market or for customers in other markets. ¹⁰¹ Clearly, the Commission believes that impairment is a carrier specific experience. Further, from the status quo of monopoly, it is difficult to distinguish between what is protection for competitors versus protection for competition.

69. Early in Dr. Shelanski's testimony, he promises "to respond to the Commission's Notice by examining the empirical evidence to date on entry and UNE consumption."¹⁰² Yet Dr. Shelanski's examination is restricted to a document of anecdotes assembled by the Bell Companies, with no recognition of existing econometric studies of entry and UNE consumption (even the Bells' own study by Eisner and Lehman).¹⁰³ Further, Dr. Shelanski provides no empirical evidence for the more important propositions found in his testimony. For example, Dr. Shelanski claims, "when unbundling is available, its substitution effect [for facilities-based entry] is likely to be more than merely marginal (p. 11)." While large portions of his testimony rely heavily on this empirical claim, Dr. Shelanski provides not one iota of supportive evidence. Recent econometric work, discussed in Section IV, shows that Dr. Shelanski's empirical assertion is incorrect, thus invalidating much of his "theoretical" discussion that relies on the assumed empirical relationship of strong substitution.¹⁰⁴

70. Dr. Shelanski also boldly states, without a shred of evidence, "[f]acilities-based competition promises far greater benefits than does competition through unbundled access and should never be displaced by unbundling rules (p. 2)." Again, large portions of his testimony rely on this empirical assertion for which he provides no supporting

¹⁰¹ *UNE Remand Order*, 15 FCC Rcd at 3726 (¶ 54). As a practical matter, the Commission noted that "we cannot evaluate the needs of every potential carrier seeking access to each network element on a case-by-case basis." *Id.* Indeed, this is a task better left to the state regulatory commissions. The Commission clearly recognized in its conclusion, however, that it is the administrative cost that prohibits a case-by-case analysis, not the Act itself.

¹⁰² Shelanski Declaration, *supra* n.81, at 2.

¹⁰³ Z-Tel's Policy Papers 3 and 4 were available as early as November 2001. Other papers include Ros & McDermott, *supra* n.88; Mini, *supra* n.88; Zolnierek, Eisner & Burton, *supra* n.88; Eisner & Lehman, *supra* n.88; and even Shelanski's own analysis of competition and deployment of new technologies. See Harold A. Shelanski, *Competition & Deployment of New Technology in U.S. Telecommunications*, 2000 U. CHI. LEGAL F. 85 (hereinafter "Shelanski Article").

¹⁰⁴ See Beard, Ford, & Spiwak, *supra* n.22, at 421-59; Beard & Ford, *supra* n.14; Z-Tel Policy Papers 3 & 4.

empirical evidence. Theoretically, Dr. Shelanski is also on very shaky ground. First, there are cases where duplication of facilities is socially undesirable, and the Supreme Court plainly recognized this fact.¹⁰⁵ As described in more detail in the next few paragraphs, inefficient facilities-based entry may very well occur and the cost structure of the facilities-based entrant may be less efficient than the entrant using elements. Second, there is no empirical evidence that facilities-based entrants compete more aggressively in price or offer more desirable services to end-users. The fact that about half of unbundled loops are provisioned with unbundled switching belies his assertion; if a switch-based CLEC offered better services and better prices, these facilities-based entrants would drive out most of those CLECs without such facilities. Further, acquiring access to consumers via unbundled elements allows entrants to devote scarce financial resources to service innovations that may be more socially valuable than the duplication of existing facilities fully capable of serving the entire demand.

71. In a non-adversarial setting, Dr. Shelanski has previously opined, “[the] positive correlation between competition and adoption of new technology suggests that regulators and enforcement officials should be wary of claims that, by adhering to policies designed to preserve competition, they will impede firms from deploying innovations or bringing new services to consumers.... [F]aster deployment times correlate with more competitive markets.”¹⁰⁶ Further, Dr. Shelanski “concludes from [his] examination of historical case studies of technological deployment that telecommunications regulators and policymakers in the United States should approach claims that new products and services will flow from market consolidation warily.”¹⁰⁷ While Dr. Shelanski takes shots at unbundling in his unsworn declaration in this proceeding, his opinion expressed in his publications take a different view:

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

¹⁰⁵ See, e.g., MARTIN, *supra* n.14, at 198-99.

¹⁰⁶ Shelanski Article, *supra* n.103, at 85.

¹⁰⁷ *Id.* at 118.

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.¹⁰⁸

72. Clearly, Dr. Shelanski has recognized elsewhere that unbundling offers substantial benefits in terms of innovation and diffusion of innovation.

73. In sum, there is neither theoretical nor empirical support for the assertion that facilities-based competition as envisioned by Dr. Shelanski “promises far greater benefits than does competition through unbundled access.” In fact, Dr. Shelanski’s own “examination of historical case studies” concluded that innovation and diffusion are positively affected by unbundling, and negatively impacted by monopoly.

74. In fact, Dr. Shelanski provides no empirical evidence of his own, but relies strictly on data compiled by the Bell Companies -- presumably without his assistance. What Dr. Shelanski gleans from the so-called “UNE Fact Report” is that some CLECs, in some places, have deployed facilities of various types. In “light of the empirical evidence” contained in this report, Dr. Shelanski concludes, “that the FCC should reduce the current list of unbundled elements,” because “the existence of competing facilities unambiguously demonstrates the feasibility of facilities-based entry.”¹⁰⁹ The first problem with Dr. Shelanski’s far reaching conclusion is that it is based on nothing more than count data, provided without any indication of relevant markets, price effects, or any other factor necessary to interpret the anecdotes in the Fact Report. Perhaps more problematic is that Dr. Shelanski’s conclusion on page 3 of his declaration contrasts sharply with his own contention on page 5 of his declaration that unbundling should be mandated if “efficient entry into a given market would not be feasible.” These two assertions are at odds with each other.

¹⁰⁸ *Id.* at 111, 116.

¹⁰⁹ Shelanski Declaration at 3, 33. The Commission disagrees: “the ability of one or more competitors to serve certain customers in a particular market is not dispositive of whether competitive LECs without

75. To illustrate, consider a very simple economic model in which an incumbent provides a good that is produced using two inputs (in fixed proportions) at cost C_1 and C_2 . The regulated price for the output is P_R .¹¹⁰ A potential entrant faces costs D_1 and D_2 using its own facilities to produce both inputs. Also, it is possible that the incumbent is required to sell the second input to the entrant at price λC_2 .

76. If unbundling is not available, entry will occur as long as $P_R \geq D_1 + D_2$. Note, however, that this entry is efficient only if $D_1 + D_2 < C_1 + C_2$ (the cost of the entrant are lower than the incumbent). Satisfying the entry condition does not require satisfaction of the efficient entry condition, and it is this fact that renders Dr. Shelanski's analysis self-contradictory and meaningless. Because inefficient entry is possible, Dr. Shelanski's contention that observing entry is a reason to eliminate unbundling is entirely at odds with his companion contention that unbundling should be required until "efficient entry" is feasible.¹¹¹ Simply observing entry is not an indicator that entry is either efficient or inefficient.

77. Now, consider the efficiency of entry with unbundling. To make it more interesting, assume that the entrant is more efficient at the production of input 1 (i.e., $D_1 < C_1$) but less efficient at input 2 ($D_2 > C_2$). In this case, entry without unbundling may be efficient due the cost advantage of the entrant for input 1, but it is even more efficient if the entrant could produce its output using the unbundled input 2 priced at C_2 (i.e., $D_1 + D_2 > D_1 + C_2$). In fact, the entrant's ability to acquire input 2 at price C_2 ($\lambda = 1$) ensures efficient entry. Even if the input price exceeds economic cost ($\lambda > 1$), as long as it is less than D_2 , then entry is more efficient with unbundling than without. In sum, an input price equal to economic cost ensures efficient entry, because the entrant will self-

unbundled access to the incumbent LEC's facilities are able to compete for other customers in the same market or for customers in other markets. " *UNE Remand Order*, 15 FCC Rcd at 3726 (¶ 54).

¹¹⁰ It is impossible to make efficiency arguments without specifying fully the cost structures of the firms and how prices are determined in equilibrium. For simplicity, I assume the price is regulated and unchanged by entry.

¹¹¹ See MARTIN, *supra* n.43, at 29 ("In the real world, we observe rival firms that clearly have different cost functions.").

supply the input only if its own cost is less than the price (economic cost) of the input ($D_2 < C_2$).

78. Next, consider the scenario where self-supply of input 2 requires some fixed outlay F .¹¹² The full incremental cost of self-supply is now $D_1 + D_2 + F$. Any positive F unambiguously reduces the relative efficiency of self-supply, and the larger is F the less efficient is self-supply and the less likely entry will occur without the ability to purchase input 2.¹¹³ Non-recurring charges for hot-cuts is one example of the fixed outlay F (where input 2 would be self-supplied switching). Verizon contends that the cost of a hot-cut is about \$160, which amounts to about \$13 per-month for a twelve-month customer life.¹¹⁴ Even if switching could be provided at zero cost to the CLEC, the efficient entrant would use unbundled switching because the economic cost of ILEC switching is less than the cost of the hot-cut itself (in nearly every state).

79. While relying exclusively on the Bell Company UNE Fact Report, Dr. Shelanski's review of the Report was less than thorough. For example, Dr. Shelanski failed to comment on the fact that of the CLEC-deployed local circuit switches listed in the report, about 40% of the switches are operated by bankrupt or near bankrupt CLECs. Any firm can deploy a switch, but the long-term economic consequences of that deployment depend on the continued operation of the facility. Widespread financial failure of facilities-based entrants does not bode well for the flow of capital into such ventures. And while Dr. Shelanski recommends to the Commission that it should carefully consider relevant markets in their analysis (p. 19), he entirely ignores what markets the CLEC-deployed switches are serving. Dr. Shelanski provides no analysis of markets whatsoever. A descriptive statistic on the count of CLEC switching equipment provides little useful information on its own, no more than the observation that hundreds of

¹¹² All costs are measured over the same time interval.

¹¹³ The condition $P_R > D_1 + D_2 + F$ is more difficult to satisfy than $P_R > D_1 + D_2$.

¹¹⁴ See Letter from Bruce D. Cohen, Verizon-New Jersey, to Secretary Kristi Izzo, New Jersey Board of Public Utilities, Mar. 20, 2002 ("Two Wire Loop Hot Cut \$159.76"). At a churn rate of 4% per month, the expected customer life is 12.5 months (assuming linearity).

airplanes are at Washington Dulles Airport implies that a flight to Gadsden, Alabama, will be competitively priced, or even available.

80. Further, Dr. Shelanski completely ignores the Fact Report's observation that "switches are a sunk investment." Sunk costs are known for their entry deterring properties and their tendency to produce concentrated industry structures (if large).¹¹⁵ Given that switch investments are sunk, Dr. Shelanski's contention that past deployment implies the uninhibited deployment of facilities in the future is entirely at odds with economic theory. As described above, when entry requires fixed/sunk costs, there is a discrete, equilibrium number of entrants that can serve the market (Equation 1). Once the equilibrium number of entrants is reached, additional entry is precluded (or requires exit by incumbent firms). So, the fact that one carrier (or more) entered a market with facilities does not, in any way, indicate that another carrier can successfully enter and compete with its own facilities.¹¹⁶

81. Perhaps the clearest indication that Dr. Shelanski's proposal regarding unbundling and observed facilities deployment is amiss is the Act itself. In section 271 of the Act, Congress mandates that loops, switching, and transport (etc.) be unbundled as a condition of a Bell Company's ability to provide interLATA, long distance service. InterLATA relief under that same section of the Act requires that a competing provider offering services "either exclusively over their own telephone exchange service facilities or predominately over their own telephone exchange service facilities (§271(c)(1)(A))" be operational in the relevant market. If section 271 requires the contemporaneous existence of both unbundling and facilities-based competitors, then a reasonable interpretation of impairment must permit both unbundling and facilities-based competition to exist. Congress clearly intended that unbundling be available to entrants despite the presence of facilities-based entry, including cable telephony operators.¹¹⁷

¹¹⁵ See Sutton (1991); see also Stephen Martin, *Sunk Cost and Entry*, REVIEW OF INDUSTRIAL ORGANIZATION, Vol. 20, No. 4, at 291-304 (June 2002).

¹¹⁶ The Commission has recognized this fact. See *UNE Remand Order*, 15 FCC Rcd at 3726 (¶ 54).

¹¹⁷ See Joint Statement of Managers, S. Conf. Rep. No. 104-230, 104th Cong., 2d Sess., at 212 (1996).

82. Dr. Shelanski's unsupported opinion that CLECs are not impaired with respect to switching because "switching technology is now such that even very distant customers can be served from a single switch" is misguided. While it may technically possible for a single switch to serve the entire country, such a configuration would be enormously inefficient once the cost of transport is factored into the analysis (even ignoring other cost differences). First, the cost disadvantage faced by the CLEC under such an arrangement is considerable, since all traffic must be hauled back to the switch over its transport facilities. About 50% of the ILEC's local traffic is intraswitch, and no transport charges are incurred for intraswitch traffic.¹¹⁸ The CLEC, alternately, must incur transport charges for all traffic. This cost difference represents a substantial cost disadvantage and entry barrier, even if the CLEC incurs otherwise identical transport costs as the ILEC (*i.e.*, the cost differences based on the quantity of traffic alone).

83. Given substantial economies of density in transport facilities, the transport costs of the CLEC likely will be considerably higher than those for the rival ILEC. For example, Z-Tel Communications services customers located in over 4,500 central offices. Of these offices, more than 90% have fewer than 100 customers and about 80% have fewer than 50 customers. The average customers per-central office is about 50. The monthly recurring cost for transport facilities with this customer distribution, which will be typical for a mass market CLEC like Z-Tel, are clearly prohibitive – not to mention the capital and recurring cost of the switch itself.¹¹⁹ Telecommunications plant is characterized by considerable economies of density and scale, and this fact cannot be ignored in any serious analysis of impairment. Giving access to the scale, density, and scope economies of the ILEC – all of which were attained under decades of government sanctioned monopoly – is a primary component of the Act's pro-competitive agenda.

¹¹⁸ See Hybrid Proxy Cost Model, Wire Center Output, Input Sheet Cell C26 (Interoffice Local 0.54).

¹¹⁹ Transport for the 50 customers likely would require a DS1 facility, which would cost about \$300 per month (or \$6 in transport costs per customer).

VI. Bell Company Empirical Study

84. The analytical analysis of impairment described above illustrates the importance of empirical evidence on the effects of access, and the price of such access, to unbundled elements. The sole piece of empirical analysis cited by the Bell Companies is a draft paper by Drs. James Eisner and Dale Lehman entitled “Regulatory Behavior and Competitive Entry,” dated June 28, 2001. Using “confidential” data collected by the Commission from CLECs (which was available to Dr. Eisner in his capacity as an FCC employee), the study estimates numerous regression models with three dependent variables: a) the number of CLEC reported facilities-based lines served; b) the number of CLEC lines served using unbundled loops; and c) the number of CLEC lines served using total service resale. Factors that are used to explain variations in these dependent variables are chosen in a somewhat *ad hoc* fashion, with neither an appeal to any specified economic model or econometric considerations. The arbitrary selection of model specification makes the results of their analysis difficult to interpret, both for theoretical and econometric reasons. Evaluating the results in a rigorous manner is also made more difficult because the Commission has not made the entire data set available for review (by the CLECs, at least) under a protective order. I will focus on two of the paper’s self-proclaimed “relevant” findings of the paper, and in this review a number of the more important flaws of the study are revealed.

85. The Eisner-Lehman study finds a positive relationship between the price for an unbundled, analog, two-wire loop and the number of lines provided on a facilities basis by CLECs. This result is interpreted by Bell Company advocates as evidence that the promotion of facilities-based competition requires high unbundled loop rates. A second noteworthy conclusion of the Eisner-Lehman study is that the quantity demanded of unbundled loops is positively related to the price of loops. This result and conclusion is most peculiar; after all, a most fundamental tenet of economic science is that demand curves slope downward.

86. Drs. Eisner and Lehman’s *ad hoc* model specifications lead to concerns over the interpretation of the results due to omitted variables bias and other econometric problems. In fact, Eisner-Lehman’s econometric analysis is a case study in omitted

variables bias, with the authors apparently attempting to convince the reader that each of their models is incorrectly specified. For example, according to their econometric models, the HCPM estimate of loop cost is a statistically-significant determinant of lines served by CLEC facilities (see Models 7-11). Yet, this variable is absent from Models 1-6. In other words, Models 7-11 show that Models 1-6 are tainted by omitted variables bias. Thus, the estimated coefficients of Models 1-6 are biased and inconsistent (the estimated coefficients do not measure the true relationship (bias), even at large samples (inconsistency))- both characteristics being a consequence of omitted variables bias. By the same analysis, Model 24 invalidates models 21, 23, 25, and 26 (with respect to the variable "average UNE"). Models 21, 22, 23, 26, and 27 invalidate Models 20, 24, and 25 (with respect to the "271" variable). Model 27, given the results on "employment change," suggests that Models 20-26 are mis-specified. Such comparisons can show nearly every model of the study is mis-specified. The peculiar, ad hoc method of model specification basically forces the reader to conclude that all estimated models (Models 1-27) suffer from omitted variables bias; indeed, it appears as if the authors are trying to convince the reader of that fact by providing a list of omitted variables for each individual equation.¹²⁰ Additionally, the authors provide a list of potential reasons why their models may suffer from omitted variable bias (pp. B21-B22).

87. The most important omitted variable in the Eisner-Lehman models is not even considered by the authors. The authors measure market size by the number of employees in the state.¹²¹ Market size is an important determinant in the model; the number of lines served by CLEC facilities is linearly related to market size and that variable alone explains about 90% of the variability in CLEC lines (see Regression 1 in Table 2), leaving very little variation for additional factors to explain. The problem with

¹²⁰ Bias is of degree, and in some cases more efficient estimates are traded off for small amounts of bias. The instability of many of the Eisner-Lehman estimated coefficients suggests that the bias introduced by their ad hoc, hokey-pokey specifications is non-trivial.

¹²¹ The number of access lines would serve equally well as a measure of market size, given that lines and employment are highly correlated ($\rho = 0.986$). This highest value of the correlation coefficient (ρ) is 1.00, implying that the two variables are perfectly correlated. For econometric analysis, perfect correlation implies the variables are identical (except with respect to the constant term which will measure any scale differences between the two series).

the market size variable selected by Drs. Eisner and Lehman is that it makes New York, perhaps the most competitive local telecommunications market in the world (which does not say much), look a lot like Florida, Illinois, and much smaller than Texas and California.¹²² Yet, New York has far more competitive activity than any other state, even after accounting for its relative size (*i.e.*, employment); total CLEC provided lines in New York exceeds the next largest state (California) by 64%. Combine this fact with New York's above average loop rate (for the sample period), and the potential for New York to exert a powerful influence on the regression estimates is substantial.

88. To test for the influence of New York on the results of the Eisner-Lehman study, assume New York is different from the other states, and that a dummy variable indicating that state (1 for New York, 0 otherwise) can capture these differences. This dummy variable allows for a statistical test of the uniqueness of New York. Consider Model 2 from the Eisner-Lehman study. Using the version of the dataset available to CLECs (a more limited dataset than that available to Bell advocates), Eisner and Lehman's Model 2 is replicated and reported as Regression (2) in Table 2. As in the Eisner-Lehman study, a positive and statistically-significant relationship between loop rate and CLEC provided lines is found with their model specification, although the results are somewhat different given the limited data set made available to CLECs. Results from an alternative specification of Model 2, including a dummy variable for New York (DNY), are summarized as Regression (3). As revealed in the table, once the peculiarities of New York are accounted for, there is no statistically-significant relationship (meaning we cannot reject the hypothesis of no relationship) between the loop rate and lines provided over CLEC facilities.¹²³ Examination of the data also

¹²² While New York accounts for only 6.7% of total employment, 36% of UNE loops are in that state (according to the data used by Drs. Eisner and Lehman).

¹²³ To some extent, the importance of New York as an outlier was observed by Drs. Eisner and Lehman. The authors observe, "[i]t appears that the statistical significance of the average UNE rate for total CLEC entry disappears in the presence of the 271 variable (p. B19)." Since New York is one of four states included in the 271 dummy variable, the possibility that New York (or some other state) was driving the results should have been apparent to the authors – but, apparently not.

revealed that the state of Ohio was an important outlier, and the results from Regression (4) reveal this fact.¹²⁴

89. Regression (5) in Table 1 estimates the Eisner-Lehman Model 2 with the December-2000 edition of the dependent variable data. Eisner-Lehman used the June-2000 version of the data in their study. Importantly, using the same specification as Eisner-Lehman, no variable other than market size is statistically significant with the updated data – data only six-months different than that used by Drs. Eisner and Lehman.¹²⁵ (The same is true using the June 2001 data for the dependent variable). The t-statistic on the loop rate (“average UNE”) is 0.59, which is well below standard levels of statistical significance.¹²⁶ In this case, even if we ignore the influence of New York on the results, there is no relationship between the loop rate and the amount of distribution plant provided by CLECs. This finding suggests that the Eisner-Lehman results on loop price may be the result of spurious correlation, even ignoring the effect of outliers.

90. A fundamental tenet of economic science is that demand curves slope downward. Despite this fact, Drs. Eisner and Lehman reach the peculiar conclusion that the demand curve for unbundled loops slopes upward (“higher UNE rates tend to be positively associated with greater use of UNEs (p. B17)”), a conclusion that in itself requires all the results to be viewed with a dollop of skepticism.¹²⁷ Fortunately, as with the CLEC facilities regressions, this particularly absurd result can be shown to be a statistical illusion. For this analysis, Model 20 from the Eisner-Lehman study is reproduced, and my replication of the results (due to data limitations) is presented as Regression (6). The results are similar, but not exact, and it appears that the authors must have scaled the “employment change” variable (which is not material to the analysis).

¹²⁴ Ohio has a very low loop rate, but virtually no facilities-based entry by CLECs.

¹²⁵ Observe that the more recent data has five more observations, so the degrees of freedom of the estimates have increased.

¹²⁶ Significance levels of the t-statistics are about 1.7 at the 10% level and 2.00 at the 5% level.

¹²⁷ The authors do recognize this result as perverse, and expend some effort to describe to the reader the many potential mis-specifications that may contribute to it (pp. B21-B22).

91. Adding the New York dummy variable to Model 20, the results summarized as Regression (7) are produced. The coefficient on the New York dummy variable indicates UNE demand is much higher in New York, and note the size of the t-statistic (13.86). When the New York dummy is included as a regressor, the sign on the loop rate flips, becoming negative (demand now slopes downward), though the coefficient is not statistically different from zero. The signs on the “HCPM Loop” and “employment change” variable are reversed, with the latter variable now being statistically significant at the 10% level. The R-Square of the regression, a measure of how well the regression explains the dependent variable, has increased from 0.47 to 0.95 (*i.e.*, the model’s explanatory power increased from explaining about half of the variation of the dependent variable (47%) to almost all of the variation in the dependent variable (95%)). Obviously, the New York dummy variable is an important omitted variable in the Eisner-Lehman analysis, and ignoring this fact seriously biases the estimated coefficients of that study.

92. The problem of omitted variables bias (even with respect to New York) is apparently detected by Eisner and Lehman, but not fully appreciated. The authors state, “the statistical significance of the UNE rates appears to depend critically on whether or not 271 entry is included as an independent variable (p. B16).” Their regressions show that when 271 is included as an explanatory variable, the UNE loop rate is not statistically significant (and vice versa). The 271 variable, however, *is* statistically significant. Because the exclusion of relevant factors leads to biased estimates, it is no surprise that the exclusion of the 271 variable (which is mis-specified itself, but still statistically significant) affects the other estimates of the regression (which is typical of omitted variable bias).¹²⁸

93. In addition to omitted variables bias, the Eisner-Lehman study, by the authors own admission, suffers from simultaneity bias – a serious econometric problem. In footnote 13 of the study, the authors assert, “... 271 approval and entry are

¹²⁸ Drs. Eisner and Lehman include in their 271 dummy variable states that had not received 271 authority as of the date of their dependent variable data. As a consequence, the estimated coefficient has no meaningful interpretation (the variable is “mis-measured,” which is another severe econometric problem).

simultaneously determined (p. B16).” Yet, the authors make no attempt to correct for simultaneity, thereby risking biased estimates.¹²⁹ As with omitted variables bias, simultaneity bias leads to biased and inconsistent coefficient estimates. In defense of ignoring this severe econometric error, the authors contend, “there are too many unobservable variables ... to estimate such a model satisfactorily (p. B16).”

Unfortunately, the problems with simultaneity cannot be ignored just because the authors’ dataset is somehow incomplete. Nor is it the case that more variables are needed to account for simultaneity; there are a number of techniques that could potentially address that issue and require no more data than that possessed by the authors. But, if these “unobservable variables” are required to determine the true relationships, and the authors apparently believe they are, then they have concluded that all their models are mis-specified.

94. With econometric analysis, it is possible for a few observations to exert a powerful influence on the estimated coefficients, and care must be taken by the researcher to evaluate the presence and influence of outliers. An outlier (New York, and to some extent Ohio), and not genuine economic phenomena, drives the results of the Eisner-Lehman study. This observation, however, does not suppose that the Eisner-Lehman study is otherwise valid. Indeed, there are many other problems with the Eisner-Lehman study, and I will summarize a few of these problems below.

95. With respect to lines served by CLEC facilities, it is difficult to imagine conceptually why the price for an analog, two-wire loop would influence the decision of CLECs deploying, for the most part, high capacity loops, unless that price is a proxy for some truly relevant factor (perhaps the reciprocal compensation). In addition, it is unclear why interim rates would influence decisions regarding long-term, sunk investments (in unlike facilities) by CLECs. Indeed, the authors state, “facilities based

¹²⁹ Oddly, while only one state had received 271 authority by June 2000, the authors give four states a value of 1.00 for the 271 dummy variable. This invalid specification of the 271 variable was necessary, according to the authors, to “protect the confidentiality of the UNE line counts (ft. 9, p. B8).” Unfortunately, the rules of econometric analysis do not bend to confidentiality issues. Perhaps a better way to protect the confidentiality of the data is not to share it with BOC economic advocates in the first place (only to then deny such access to the CLECs).

entry takes time (p. B16),” and short-term, interim rates may not be a reliable indicator of long-term prices for UNEs. Nor is it clear how to interpret the coefficient on the loop rate, which is one measure of loop cost, when another measure of loop cost (the HCPM estimate of loop cost) is included in the regression. The authors provide no assistance in answering these important questions.

96. Additionally, there appear to be some data problems with the study. For example, the authors include as regressors the average UNE price (“average UNE”) and the “lowest UNE price available” (low UNE). However, for 23% of the states, the “low UNE” variable exceeds the “average UNE.” Clearly, there is something wrong with the data on rates.

97. One interesting finding of the study (to which I give no credence, given the problems discussed above) is the negative relationship found between the ILEC’s embedded cost and CLEC entry. Why would the ILEC’s embedded cost affect CLEC entry? The authors provide no explanation, but I can think of at least one. While the entrant may not be interested in the incumbent’s embedded costs, the incumbent most likely is. As Bell advocate Dr. Shelanski observes, “[n]o firm wants to strand costs (p. 12).” Entry, and the competition that inevitably follows, puts the recovery of embedded costs at risk, thereby reducing the profits of the incumbent. In markets where embedded costs are high (the incumbent is inefficient), therefore, the incumbent may have an increased incentive to deter competitive entry. The negative relationship between embedded cost and CLEC entry suggests that such entry deterrence is effective.

98. Finally, consider, just for the sake of argument, the Bell advocacy position supported by the Eisner-Lehman study. This ILEC position, based on the alleged positive relationship between CLEC facilities and the loop price, is that in order to promote facilities-based competition, the unbundled loop rate should be increased. However, this advocacy position does not make sense. From the estimated relationships of the Eisner-Lehman study, a \$1.00 increase in the loop rate will increase CLEC facility lines by about 4,000 units. That same increase, however, raises the number

of unbundled loops by about 10,000 lines.¹³⁰ Thus, increases in the loop rate will actually promote more element entry than facilities entry, shifting the competitive mix toward unbundled elements. This result is both counter-intuitive and contrary to the other empirical evidence in the record, and again indicates that this study provides little if any useful empirical evidence on competition in local exchange markets.¹³¹

Table 2. An Analysis of the Eisner-Lehman Study

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
		E-L Mod el 2	E-L Model 2 (Adj)	E-L Model 2 (Adj)	E-L Model 2 (Adj)	E-L Model 20	E-L Model 20 (Adj)
Constant	-359 51.2 (-2.6 6)a	-979 84.7 (-2.5 5)a	-69154.1 (-1.80)b	-58397 .3 (-1.71) b	-60197 .3 (-1.29)	6288.9 1 (0.02)	-13758 9.0 (-1.36)
employment	0.04 2 (14. 68)a	0.043 (15.1 5)a	0.040 (14.39)a	0.041 (16.41) a	0.052 (14.10) a	0.042 (3.10)a	0.028 (6.37)a
Pricecap	...	6027. 34 (0.30)	-1773.82 (-0.09)	411.97 (0.02)	2454.2 9 (0.10)	...	...
average UNE	...	3614. 39 (1.95)b	2371.35 (1.30)	1650.4 1 (1.00)	1254.0 1 (0.59)	15858. 2 (1.97)b	-2130. 49 (-0.74)
DNY	...	...	97586.8 (2.15)a	94259. 5 (2.34)a	...	...	981812 .4 (13.86) a
DOHIO	...	...	...	-10452 5.4 (2.81)a	...	...	...
HCPM Loop	...	...	...	...	...	-9021. 39 (-0.76)	3901.3 5 (0.99)
employ ment change	...	...	...	...	...	-50898 5.1 (-1.57)	213905 .8 (1.83) ^b
R2	0.89	0.90	0.92	0.94	0.87	0.47	
Obs.	30	30	30	30	35	27	

^a Statistically Significant at the 5% level.

^b Statistically Significant at the 10% level.

¹³⁰ These marginal effects are based on the estimated coefficients found in the Eisner-Lehman study.

¹³¹ For more sensible estimates of demand curves for unbundled elements, see Beard & Ford (2002); Robert B. Ekelund Jr. & George S. Ford, *Some Preliminary Evidence on the Demand for Unbundled Elements*, available at www.telepolicy.com.

VII. Credibility and the Promotion of Competition

99. One policy proposal of the Bell Companies is that to promote “real” competition, regulatory agencies should eliminate the availability of UNE-P and entrants should be required to replicate substantial portions of the incumbent’s network -- primarily digital switching equipment – to provide service. If switch deployment by entrants does, in fact, promote some more real form of competition, then presumably such entry would reduce the profits of the incumbent monopolists and *leave potentially billions of dollars of their own local exchange network stranded*. As Bell advocate Dr. Shelanski observes, “[n]o firm wants to strand costs (p. 12).” Are then the Bell Companies acting contrary to the interests of their shareholders? Or, is the competition promoted by the Bell Companies a sham? The answer, quite fortunately, is found in a straightforward algebraic analysis.

100. Common sense dictates that the Bell Company efforts to eliminate UNE-P are actually an effort to shield existing Bell Company businesses from profit-reducing competition by shifting entry to slower, less ubiquitous entry modes such as UNE-L.¹³² Thus, eliminating UNE-P will result in *less* competition.¹³³ Just as with any for-profit enterprise, increasing and protecting profits is the goal of the Bell Companies, not the altruistic promotion of consumer benefits realized from the rapid introduction of competition into the local exchange market. Policymakers should not ignore this fact.

1. A SIMPLE ECONOMIC ANALYSIS

101. In order to find an answer to the question of whether the Bell Companies are legitimately trying to promote “real” competition, thereby acting in conflict with the interest of their shareholders, a very simple economic analysis is used. As always, a few simplifications will make the analysis more tractable and accessible. While the following analysis is mathematical, it is relatively easy to follow. For those who prefer,

¹³² By no means is this observation meant to imply that UNE-L entrants should be impeded in any way by regulatory policy. All modes of entry should be encouraged by federal and state policy.

¹³³ See T. Randolph Beard, George S. Ford, & Thomas W. Koutsky, *Facilities-Based Entry in Local Telecommunications: An Empirical Investigation*, available at www.telepolicy.com (June 2002).

numerical examples are provided in Section VII.2 that illustrate plainly the symbolic computations of this section.

102. To begin, first assume that a Bell Company has one retail service it sells at a regulated price P .¹³⁴ This service is comprised of two inputs, namely input L and input S (e.g., loop and switching/transport).¹³⁵ The production of these inputs requires fixed (and probably sunk) cost F , and additional units of the input are supplied at marginal costs C_L and C_S , respectively. The per-unit price-marginal cost margin, therefore, is $(P - C_L - C_S)$, which is positive. Observe that this margin is computed as price over marginal cost, not average cost (either embedded or forward-looking). Marginal cost for embedded loop and switching plant should be very low, and well below average cost. Profit maximizing decisions are based on marginal cost, not average cost; so, our focus is on marginal cost.

103. In addition to its retail offering, the Bell Company also sells to other telecommunications carriers the inputs L and S at wholesale prices R_L and R_S , where the sum of the wholesale prices is less than the retail price ($P > R_L + R_S$).¹³⁶ The wholesale prices (R_L, R_S) are set equal to average cost (i.e., TELRIC), and therefore exceed marginal cost ($R_L > C_L, R_S > C_S$).

104. The (annual) profit function of the Bell Company is

$$\pi = (P - C_L - C_S)n_B + (R_L + R_S - C_L - C_S)n_P + (R_L - C_L)n_U - kF, \quad (9)$$

where k is factor that converts the fixed cost into depreciation and an annual “payment” to the capital (i.e. because profits are measured in annual terms), and n_i is the number of units sold by the Bell Company to either its own retail customer (subscript B), a wholesale-customer buying both L and S (subscript P , for “UNE-P”), or a wholesale

¹³⁴ Price includes all forms of revenue from the customer, including universal service receipts.

¹³⁵ The production technology is fixed proportions; each unit of output requires one L and one S .

¹³⁶ In practice, this condition may not hold, which really makes the Bells’ reluctance to sell unbundled elements puzzling.

customer buying just L (subscript U , for “UNE-L”). It should not be a surprise to anyone that the Bell Companies do not wish to wholesale inputs to their competitors; they have made their preference clear.

105. The question of interest is what “type” of entrant the Bell Company seeks to promote, and whether or not its decision is compatible with profit maximization and, thus, shareholder interests. In order to evaluate this issue, the total differential of Equation (9) is required:

$$\Delta\pi = (P - C_L - C_S)\Delta n_B + (R_L + R_S - C_L - C_S)\Delta n_P + (R_L - C_L)\Delta n_U, \quad (10)$$

where the Δ symbol indicates “the change in.” Equation (10) can be used to compute the change in profit for changes in the number of customers of each type, including the movement of a customer from, say, a retail product to a wholesale product. To illustrate, a one-unit increase in n_B increases profit by $[\Delta\pi/\Delta n_B = (P - C_L - C_S)]$.

106. The Bell Companies’ distaste for the Telecommunications Act’s unbundling mandates (i.e., forcing the Bells to offer wholesale products L and S) is revealed by Equation (10). If the Bell Company loses a retail customer ($\Delta n_B = -1$) to a UNE-P provider ($\Delta n_P = +1$), its profits change by

$$\Delta\pi/\Delta n_P - \Delta\pi/\Delta n_B = (R_L + R_S - C_L - C_S) - (P - C_L - C_S) = R_L + R_S - P, \quad (11)$$

which is clearly negative because the retail price exceeds the sum of the wholesale prices ($P > R_L + R_S$). Equation (11) shows that the Bell Company continues to incur the marginal cost of both L and S , but loses retail revenue P that is replaced by wholesale revenue R_L and R_S .

107. Similarly, if the Bell Company loses a retail customer ($\Delta n_B = -1$) to a UNE-L competitor ($\Delta n_L = +1$), then its profits decline by

$$(R_L - C_L) - (P - C_L - C_S) = R_L - P + C_S, \quad (12)$$

which again is plainly negative because the retail price exceeds the wholesale price of both L and S and the wholesale prices exceed marginal cost ($R_L + C_S < P$).

108. Finally, if the Bell Company loses a retail customer to a full facilities-based competitor, the change in Bell profits is

$$-(P - C_L - C_S), \quad (13)$$

which is the largest loss of profit of any of the alternatives. So, full facilities-based competition is the worst outcome of all for the Bell Companies.

109. A more interesting scenario for the issue at hand is what happens to profits when a UNE-P customer ($\Delta n_P = -1$) migrates to UNE-L ($n_U = +1$). In this scenario, Bell Company profits change by

$$(R_L - C_L) - (R_L + R_S - C_L - C_S) = -R_S + C_S, \quad (12)$$

which again is negative because wholesale prices exceed marginal cost ($R_S > C_S$). Thus, promoting switch-based entry and the elimination of UNE-P entry *reduces* Bell Company profits. Bell Company advocacy of switch-based entry, consequently, is contrary to the interest of Bell Company shareholders! Or is it?

110. This simple analysis of one-customer migrations from UNE-P to UNE-L is a bit misleading, or even counterfactual. History shows that in New York State, about six times as many UNE-P lines as UNE-L lines are installed each month (about 30,000 to 5,000 per month), on average. (Generally, the manual hot-cut process will always limit UNE-L relative to UNE-P growth). This evidence suggests that for every one-customer migrating from the retail arm of the Bell Company to a competitor, there is a 15% chance that customer migrates to UNE-L and an 85% chance that customer migrates to UNE-P. For every successful acquisition by a competitor, therefore, the expected reduction in profits is

$$\begin{aligned} \Delta\pi &= 0.15(R_L - C_L) + 0.85(R_L + R_S - C_L - C_S) - (P - C_L - C_S) \\ &= R_L + 0.85R_S + 0.15C_S - P, \end{aligned} \quad (13)$$

which again is negative ($P > R_L + R_S$ and $R_S > C_S$). As a general matter, any migration of a retail customer to a wholesale customer reduces profits. Now, if the UNE-P is eliminated as an entry option, the expected reduction in profits is

$$\begin{aligned}\Delta\pi &= 0.15(R_L - C_L) - (P - C_L - C_S) + 0.85(P - C_L - C_S) \\ &= 0.15R_L + 0.15C_S - 0.15P,\end{aligned}\tag{14}$$

which is negative ($P > R_L + R_S$ and $R_S > C_S$). Note that we treat the expected migration to the UNE-P (0.85 customers) as a migration to the Bell Company (i.e., the customer is retained).

111. What remains to be determined is whether the expected change in profits after eliminating UNE-P as an entry option is less than the expected change in profits with UNE-P. Subtracting Equation (7) from Equation (8), we have

$$(0.15R_L + 0.15C_S - 0.15P) - (R_L + 0.85R_S + 0.15C_S - P) = 0.85(P - R_L - R_S),\tag{15}$$

which is clearly positive ($P > R_L + R_S$). Because the growth rate of UNE-L is considerably less than that of the UNE-P, eliminating UNE-P increases profits, despite the fact that a UNE-P wholesale account has a higher margin than a UNE-L wholesale account. In essence, the Bell Company loses more per lost customer, but they make it up in reduced volume.

112. If UNE-P and UNE-L are substitutes, an issue addressed and rejected by Beard and Ford (2002), then eliminating UNE-P may simply increase the number of UNE-L customers.¹³⁷ Assuming perfect substitution between UNE-L and UNE-P, and ignoring the capacity constraint on UNE-L caused by the hot-cut bottleneck, then the promotion of UNE-L competition by eliminating the UNE-P is plainly unprofitable for the Bell Company and contrary to the interest of Bell Company shareholders. If the Bell Companies are profit-maximizing firms, therefore, then the inevitable conclusion is that the Bells do not believe that UNE-P and UNE-L are highly substitutable.

¹³⁷ See Beard & Ford, *supra* n.14.

2. NUMERICAL EXAMPLES

113. The symbolic analysis of the previous section can be presented as a numerical example, without loss of force. In order to do so, assume the following: the retail price for the Bell Company's service is \$40 ($P = 40$); the wholesale price for input L (i.e., the loop) is \$16 ($R_L = 16$), the wholesale price for input S (i.e., switching) is \$10 ($R_S = 10$), and the marginal cost for input L and S are \$2 and \$1, respectively ($C_L = 2$, $C_S = 1$). Specifying a value for fixed cost (F) is not required, since it does not affect the analysis of profit changes. The change in Bell Company profit from various migration scenarios is summarized in Table 3.

Table 3.		
Scenario	Change in Bell Company Profit	Equation from Text
Retail to UNE-P	$(16+10-2-1) - (40 - 2 - 1) = -14$	Equation (11)
Retail to UNE-L	$(16-2)+(40-2-1) = -23$	Equation (12)
Retail to Facilities-Based	$(40 - 2 - 1) = -37$	Equation (13)
UNE-P to UNE-L	$(16-2) - (16+10-2-1) = -9$	Equation (14)
Avg Retail to Wholesale	$0.15*(16-2)+0.85*(16+10-2-1) - (40-2-1) = -15.35$	Equation (15)
Avg Retail to Wholesale w/o UNE-P	$0.15*(16-2)+0.85*(40-2-1) - (40-2-1) = -3.45$	Equation (16)
Per-customer Profit Change from Eliminating UNE-P	$0.85(P - R_L - R_S) = 11.90$	Equation (17)

114. From Table 3, it is plain to see that losing a customer to a UNE-L provider (-\$23) has a larger effect on profits than losing a customer to the UNE-P provider (-\$14). Most harmful to Bell Company profits is a loss to facilities-based provider (-\$37). Migration from a UNE-P competitor to a UNE-L competitor reduces profits by \$9 per month.

115. The expected loss in margin from a lost retail customer is \$15.35, but that expected loss is reduced to \$3.45 per lost customer by eliminating UNE-P as a viable entry strategy. Thus, eliminating the UNE-P increases Bell Company profits.

VIII. Conclusion

116. In an effort to promote competition and deregulation in the monopolistic local exchange markets, Congress constructed an economically rational framework in the 1996 Act to encourage entry into the local exchange market. The unbundling obligations of the Act are an essential component of the framework as they create the wholesale markets for local network capacity that are essential to competitive industry. These unbundled capacity markets break the vertically integrated local exchange market into retail and wholesale segments, thereby freeing the retail entrants from making the entry-detering sunk cost network investments prior to entry, which is the primary source of the existing monopoly. Retail competition is supported by lease arrangements between the entrants and the incumbent monopolist, where the wholesale prices equal cost and the elements are provided on non-discriminatory terms. Over time, the development of a competitive retail market would reduce the inherent risk of entry in the wholesale market by generating an effective, non-incumbent demand for wholesale local exchange facilities. If sunk entry costs are reduced sufficiently through unbundling, then it may be possible to realize, in the future, a quasi-competitive wholesale market for network capacity.

117. Implementation of this competitive plan has proven difficult. Litigation tactics by the incumbents, inadequate enforcement authority and vigor, and the complexity of estimating market prices based on cost all slowed the progress of true implementation. Only recently have all the relevant participants begun to grasp the meaning of the Act, and what genuinely is required to make the competitive plan a success. Unfortunately, the sluggish implementation and litigation delays, coupled with aggressive facilities deployment, led to widespread failure among the competitive entrants, and the flow of capital resources has dried up. The incumbent monopolists further increase the risk of investing in competitive ventures with their persistent efforts to sabotage the more viable business plans available to entrants.

118. The Bell Companies' attack on the unbundling obligations of the Act as detrimental to competition is supported by little more than rhetoric. The allegedly harmful relationships between unbundling, investment, and competition are

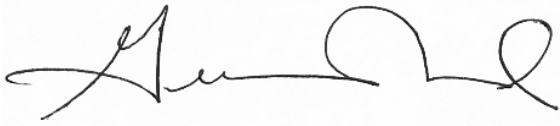
unsupported entirely by the facts. As Congress envisioned, unbundling facilitates entry at both the wholesale and retail segments of the local exchange market. According to the recent decision by the Supreme Court, the Bell attacks on the pricing standard developed by the Commission (TELRIC) are unsubstantiated and downright wrongheaded.

119. The pricing standard for unbundled elements has been affirmed, and state regulatory commissions are becoming masters of its implementation. All the empirical evidence shows that as implementation becomes more accurate and widespread, the full benefits of competitive entry in the local exchange markets, both at the retail and wholesale level, are now emerging. At the brink of success, the Commission must not set aside the competitive plan set forth by Congress. If the Commission does restrict unbundling further than it already has, the local exchange market will slouch back towards monopoly, probably dragging the competitive long distance market with it.

Accordingly, the Commission is at a crossroads – maintain full unbundling, or spite Congress and embrace monopoly.

I declare under penalty of perjury that the foregoing is true and correct.

Executed on July 16, 2002 by:

A handwritten signature in black ink, appearing to read "George S. Ford", written in a cursive style. The signature is positioned above a horizontal line.

George S. Ford