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Regulated Unbundling of Telecommunications Networks:
A Stepping Stone to Facilities-Based Competition?

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The 1996 Telecommunications Act created mandatory network sharing regimes where incumbents were required to give competitors access to their networks at regulated prices. The end point of competition policy for telecommunications networks is facilities-based competition. The mandatory network sharing policy, then, is only intended as a “stepping stone” to the world of competing physical networks.

How well did this “stepping stone” policy work? We look at two markets: local telephony and broadband. We examine trends in subscribership for incumbents, various types of resellers, and facilities-based competitors. We conclude that marketplace evidence strongly rejects the hypothesis that regulated unbundling of telecommunications networks provided a stepping stone to facilities-based competition in the US.

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I. Introduction

The argument for wholesale access rules in telecommunications networks is based not on the premise that government regulators can manufacture market competition via network sharing mandates, but on the “stepping stone” theory.¹ This theory posits that allowing entrants to rent some pieces of the network that are particularly difficult to replicate at an initial stage of competition provides an impetus to those entrants investing in their own facilities over time. Before long, rival networks are created and regulation of wholesale terms can be removed. In short, mandatory network sharing is a means to an end, not the end itself.²

While low prices are good for consumers, all else equal, all else will not be equal if wholesale price regulation undermines investment incentives or otherwise leads network owners to reduce service quality.³ It is not an efficient outcome when consumers’ bills for service decline but these declines are offset by lower service quality or capital depreciation (which implies lower quality and/or higher prices in future periods). In fact, policies that favor short-term price discounts at the expense of long-term capital investment inefficiently distort the balance between the quality/price bundle available to consumers today and choices available in the future. And, in disrupting investment in new networks, they undermine the emergence of competitive market forces that promise to bring much greater consumer benefits than are available in today’s regulated marketplace.

There has been considerable debate over how to establish a wholesale pricing structure that strikes the proper balance between competitive entry, on the one hand, and anti-consumer reductions in network infrastructure, on the other. Until recently, the method for calculating the regulated wholesale prices has been Total Element Long-Run Incremental Cost (TELRIC).⁴ Based on our examination of the available evidence, we conclude that the net effect of TELRIC pricing has been to discourage investment in network infrastructure by both Incumbent Local Exchange Carriers (ILECs) and

¹ Gregory L. Rosston and Roger G. Noll, *The Economics of the Supreme Court’s Decision on Forward Looking Costs*, 1 REVIEW OF NETWORK ECONOMICS (September 2002): 81-89, p. 88.

² After discussing two avenues for facilities-based competition, Gregory Rosston and Roger Noll note: “A third possible outcome is that when the dust settles, most local access competition will take the form resale (sic) of the incumbent’s facilities. In this case, consumers are not likely to benefit, and regulation will, if anything, grow as regulators are called upon to resolve disputes between incumbents and resellers.” Gregory L. Rosston and Roger G. Noll, *The Economics of the Supreme Court’s Decision on Forward Looking Costs*, 1 REVIEW OF NETWORK ECONOMICS (September 2002): 81-89, p. 89.

³ This is the well-known result that has made retail price regulation in cable television anti-consumer. See Thomas W. Hazlett and Matthew L. Spitzer, PUBLIC POLICY TOWARD CABLE TELEVISION (1997).

⁴ Federal Communications Commission, In the Matter of Review of the Commission’s Ruling Regarding the Pricing of Unbundled Network Elements and the Resale of Service by Incumbent Local Exchange Carriers, WC Docket No. 03-173.

Competitive Local Exchange Carriers (CLECs), and that such regulated rates have failed to bolster incentives to create new competitive networks.

This paper tests the stepping stone hypothesis using two natural experiments. The first is the experience with UNE-P. In the context of UNE-P, we test the stepping stone hypothesis in two ways. The first test based on the UNE-P experience looks at wireline telecommunications investment. Marketplace evidence strongly suggests that the decline in wireline investment from 2000 to 2004 is due in substantial part to the rise of UNE-P. This causality is supported by basic economic reasoning, the pattern of investment taking place in the sector as compared with other sectors, the reaction of facilities-based competitors to UNE-P, the wide consensus among investment analysts and telecommunications technology suppliers that the expanding use of UNE-P threatened capital expenditures on network assets, and disinvestment decisions being made by telecommunications carriers (including CLECs). Second, we directly test for the effect of UNE-P on facilities-based subscribers among CLECs. Contrary to the stepping stone hypothesis, we find that there is no statistical support for the proposition that UNE-P leads to facilities-based competition.

The second natural experiment we look at is the experience with network sharing rules surrounding DSL. Another aspect of the UNE policy was that incumbent telephone companies had to make access to their copper wires available at below cost tariffs to competitors offering DSL service. In February, 2003, the FCC announced an end to the line-sharing rules, providing a natural break in the regulatory structure of DSL deployment. The stepping stone hypothesis would suggest a slow down in DSL growth with the elimination of mandatory sharing rules. Instead, the regulatory change caused the growth rate of DSL to accelerate and for DSL to gain market share in the residential broadband market.

II. Network Sharing Mandates

A. Local Competition and the Telecommunications Act of 1996

One clear goal of the Telecommunications Act of 1996 was to introduce competition in the provision of local phone service. Consequently, the Act abolished local franchise monopolies in the provision of telephone service. To provide real benefits to consumers, the competition envisioned by the Act was to be based on competing facilities. Although all competition ultimately would be facilities-based, the Act had three provisions intended to jump-start competition in the short-term. First, it required interconnection between rival networks, so that customers of a new facilities-based carrier could connect to customers of other phone networks.

Second, the Act included a “resale” provision, whereby incumbent network operators make available their services at a wholesale price, calculated as a discount from

their resale prices. The “resale” program discount is based on the costs the incumbent operator avoids—such as billing and marketing—when a rival resells its services.

Third, the Act mandated network sharing rules that give rivals access to the incumbent’s network. The FCC’s implementation of this provision of the Act was to create Unbundled Network Elements (UNEs). This determines which parts of the incumbent’s network rivals may rent separately at regulated wholesale rates. Each part is called an unbundled network element. The local loop connecting a home user to the local phone company’s central office would be an example of a UNE, as would the telephone switch redirecting the user’s voice traffic in the central office. The FCC has identified about nine such elements, depending on circumstances.⁵ Under the 1996 act, CLECs should have access to a UNE whenever lack of access would “impair” competitive entry.⁶ Under FCC rules, CLECs could use all parts of the ILEC’s network and resell them as a package, an outcome called UNE-platform.

UNEs prices are calculated using the forward looking TELRIC approach which does not compensate for actual costs. When a rival purchases a subset of UNEs that typically will include the local loop it is called UNE-L. When a rival purchases the entire set of UNEs so that the rival can provide telephone service entirely with the incumbent’s facilities, it is called the Unbundled Network Element-Platform (UNE-P). It is important to emphasize that UNE-P and the “resale” program are essentially indistinguishable in the services provided by the incumbent to the entrant, but the basis for pricing the service is very different. UNE-P has become the leading resale mode, exceeding TSR lines since 2001, because UNE prices typically fall far below TSR rates. In short, the “resale” discount offered wholesalers of generally 15%-25% is being abandoned by CLECs—the buyers—in favor of UNE-P, where wholesale discounts from retail price levels are generally 40%-60%.⁷

Under FCC network-sharing rules, instead of being motivated by contract terms that encourage mutually reinforcing behavior, both the host network and the reseller have strong incentives to increase their profits at the expense of their “partners.” That happens because outside parties, rather than the firms themselves, arrange the transaction. Theoretically, the regulator could devise rules initially pleasing both the incumbent and the entrant, but the parties would still have strong incentives to lobby for more favorable terms, to be awarded at the expense of the losing party. The normal market incentives for cooperation disappear because “contract” terms between incumbent and the reseller are involuntary.

⁵ Unbundled network elements include local loops, subloops, network interface devices, circuit switching, packet switching, dedicated transport, shared transport, signaling networks and call-related databases, and operations support systems. *U.S. Telecom Ass’n v. FCC*, 290 F.3d 415 (D.C. Cir. 2002), at 4–5.

⁶ Telecommunications Act of 1996 § 251(d)(2)(b) (Jan. 3, 1996). Jerry Hausman and J. Gregory Sidak, *A Consumer-Welfare Approach to the Mandatory Unbundling of Telecommunications Networks*, 109 *YALE L.J.* (Nov. 24, 1999).

⁷ UBS Warburg, *How Much Pain from UNE-P?* (August 20, 2002), p. 6 and p. 14.

B. An Eight-Year Battle over Network-Sharing Rules

The wars over network-sharing rules required by the Telecommunications Act of 1996 have produced no clear answers to myriad questions about the use of incumbents' networks. Market rivalry has given way to a telecommunications sector "war of the roses." As University of Chicago law professor Richard Epstein concludes, "forced marriages based on accidental happenstance have little chance of success."⁸ Epstein emphasizes the degree of difficulty by reference to common-law rules that try to avoid the complexity that mandatory network sharing creates:

As is well understood by the drafters of the 1996 Act, telecommunications is the quintessential network industry so that competition between firms cannot take place without some measure of cooperation, which in turn requires some measure of government regulation. The only question worth asking is which form of regulation minimizes distortions attributable to private opportunism and government overreaching. Here the nub of the difficulty rests in the decision to require the forced sale of UNEs and, by administrative interpretation, UNE-Platforms.⁹

The current status of the law is that, in rough terms, CLECs arguing for favorable wholesale terms have won on the issue of pricing (the key decision rendered in May 2002, when the U.S. Supreme Court refused to overturn the use of TELRIC rates),¹⁰ while ILECs have emerged victorious on UNEs. The latter became apparent after a March 2004 decision by the U.S. Court of Appeals for the D.C. Circuit, characterized by the *Wall Street Journal* as "strike three at the FCC,"¹¹ that found the FCC's unbundling rules illegal because they make network-sharing rules excessively expansive. By overextending sharing opportunities, regulators promoted resale competition at the expense of facilities-based entry. Because the Telecommunications Act explicitly aimed to create new networks, the court held that policies undercutting this goal violate the law:

After all, the purpose of the Act is not to provide the widest possible unbundling, or to guarantee competitors access to ILEC network elements at the lowest price that government may lawfully mandate. Rather, its purpose is to stimulate competition—preferably genuine, facilities-based competition.¹²

⁸ Richard A. Epstein, *Takings, Commons, and Associations: Why the Telecommunications Act of 1996 Misfired*, Manhattan Institute for Policy Research conference, Tragedy of the Telecommons (May 17, 2004), at 24; http://www.manhattan-institute.org/pdf/cde5-17-04_epstein.pdf.

⁹ *Id.* at 11.

¹⁰ *Verizon Communications v. FCC*, 122 S.Ct. 1646 (2002).

¹¹ *Strike Three at the FCC*, WALL ST. J. (Mar. 4, 2004), at 1.

¹² *U.S. Telecom Ass'n v. FCC*, 359 F.3d 554 (D.C. Cir. 2004).

The ruling, uncontested by the FCC or the Department of Justice,¹³ effectively eliminated UNE rules as of June 15, 2004.

By promoting rules that were seen as favorable to one side and onerous to the other, the network sharing mandates encouraged litigation over cooperation. Moreover, the litigation challenging the rules was ultimately victorious, meaning that the FCC's regulations violated the expressed purpose of the Telecommunications Act under which they were crafted. Of key significance was the March 2, 2004 opinion rendered in the case of *United States Telephone Ass'n. v. Federal Communications Commission*¹⁴ (USTA II), which overturned essentially the entire regime for "unbundled network elements" (UNEs), and the June 9, 2004 decision of the FCC not to appeal that opinion to the U.S. Supreme Court.¹⁵

C. Competitive Trends in Local Telephony

The overall effect of UNE-P has been dismal. Between year-end 2000 and December 2004, UNE-P lines grew approximately 400%, while CLEC-owned lines grew just over 60%.¹⁶ When the subset of competitive lines provided via cable telephony is excluded, CLEC-owned lines actually declined through June 2003 and is up only 17% from December 2000, growth that occurred entirely in 2004.. *See* Figure 1. During this period, UNE rates (and, therefore, UNE-P prices) have been dramatically lowered in many states, and it appears clear that this reduction in price has helped drive the increase in UNE-P lines.¹⁷ During this same period, both ILEC and CLEC investments have plummeted. For instance, from 2001 to 2004, the total net capital stock of the four Bell operating companies fell by 32%, indicating a remarkably high level of disinvestment.¹⁸ CLEC capital spending declined from 49% of revenues in 2000 to 14% of revenues in

¹³ Stephen Labaton, *In Pivotal Case, Bush Backs Off Rule That Eased Phone Line Fees*, N.Y. TIMES (June 10, 2004).

¹⁴ The ruling making sequence is as follows: *Local Competition Order*, 11 FCC Rcd 15499 (1996), rev'd in part, aff'd in part, *Iowa Utilities Board v. FCC*, 120 F.3d 753 (8th Cir. 1997), rev'd in part, aff'd in part, *AT&T Corp. v. Iowa Utilities Board*, 525 U.S. 366 (1999); *UNE Remand Order*, 15 FCC Rcd 3696 (1999); *Local Competition Order (Supplemental Order)*, 15 FCC Rcd 1760 (1999); *Line Sharing Order*, 14 FCC Rcd 20912 (1999); *Iowa Utilities Board v. FCC*, 219 F.3d 744 (8th Cir. 2000) (remand decision); *Local Competition Order (Supplemental Order Clarification)*, 15 FCC Rcd 9587 (2000), aff'd sub nom. *Competitive Telecommunications Ass'n v. FCC*, 309 F.3d 8 (D.C. Cir. 2002); *Triennial Review NPRM*, 16 FCC Rcd 22781 (2001); *Verizon Communications, Inc. v. FCC*, 535 U.S. 467 (2002); *United States Telecom Ass'n v. FCC*, 290 F.3d 415 (D.C. Cir. 2002) ("*USTA I*"); *Triennial Review Order*, 18 FCC Rcd 19020 (2003); *United States Telecom Ass'n v. FCC*, 359 F.3d 554 (2004) ("*USTA II*").

¹⁵ [Ben Charny](#), *Bush administration won't appeal phone decision*, CNET NEWS.COM (June 9, 2004).

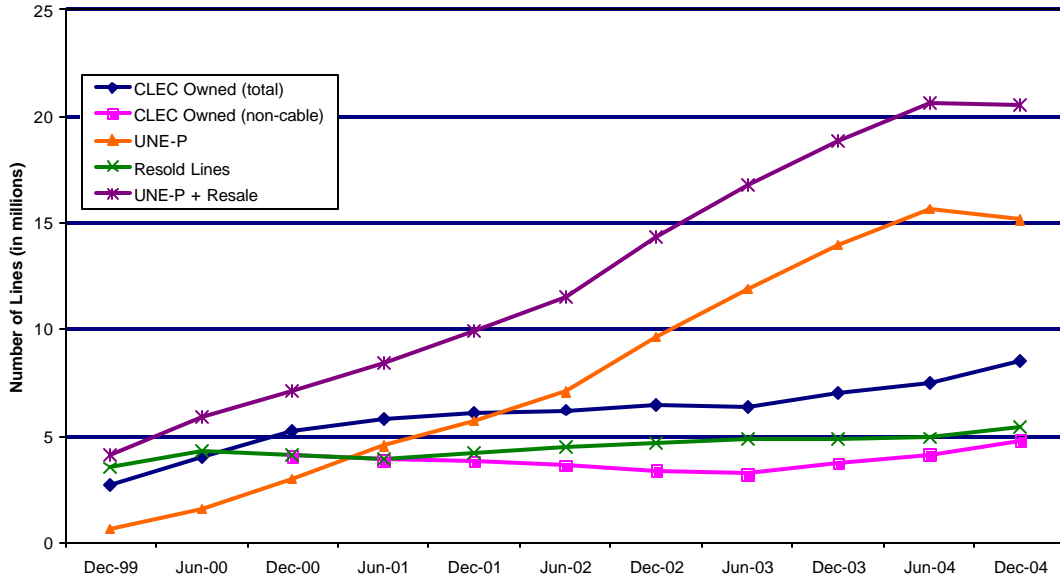
¹⁶ A CLEC-owned line involves local phone services delivered entirely over a competitive, non-ILEC network.

¹⁷ *Local Telephone Competition: Status as of June 30, 2003*, Federal Communications Commission, Wireline Competition Bureau (December 2003).

¹⁸ *See* Figure 4.

2002.¹⁹ These reductions contrast with the experience in other communications sectors not subject to similar network sharing rules. For instance, although investment by wireless carriers and cable operators decreased in 2002 compared to 2001, investment in those sectors remains well above the pre-bubble levels of the late 1990s. Local phone networks, in contrast, are investing less in 2002 (even without adjusting for inflation or population increases) than in 1996.²⁰

Figure 1
CLEC Lines by Type



Source: Data from *Local Telephone Competition: Status as of December 31, 2004*, Industry Analysis and Technology Division, Wireline Competition Bureau, July 2005.

III. Telecommunications Investment Trends

The rise of UNE-P was associated with disinvestment in the telecom sector. This disinvestment occurred at a time of collapsing equity values—the well known bursting of the telecom bubble. Nevertheless, telecommunications firms subject to mandatory unbundling invested comparatively less than their peers not subject to such mandates.

A. The Decline of Wireline Telecommunications Investment

Investment by wireline local exchange carriers is down sharply not only from the highs of 2000 and 2001 but also from historic averages. According to a report by Skyline Marketing Group, the amount of annual gross investment by wireline

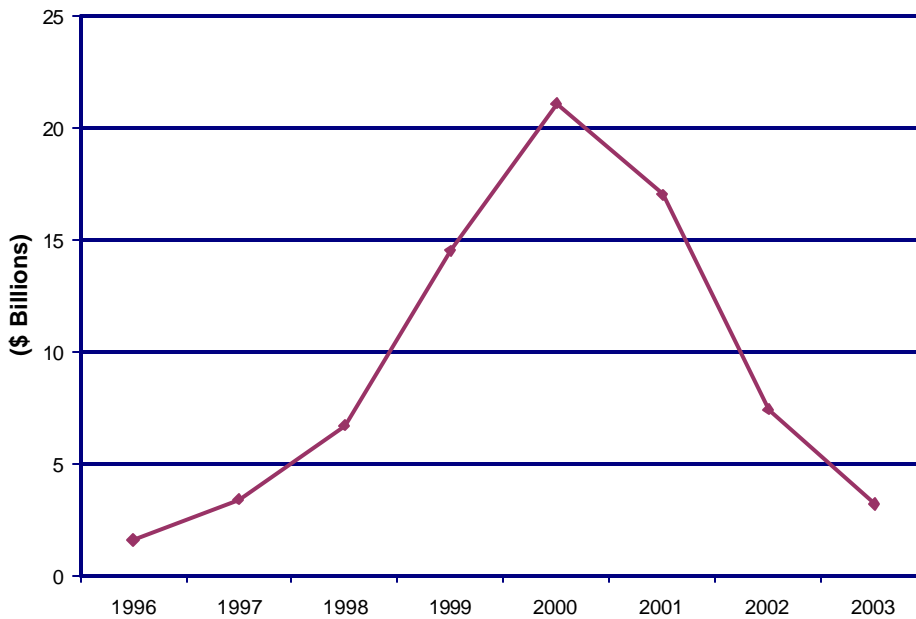
¹⁹ Thomas W. Hazlett, Arthur M. Havenner, and Coleman Bazelon, *Declaration Submitted to the Federal Communications Commission by Verizon Communications*, WC Docket No. 03-157 (September 2, 2003) [“HHB-I 2003”], Figure 2.

²⁰ HHB-I 2003, pp. 4-8. See Figure 8.

telecommunications carriers (both local and long distance) declined from \$104.8 billion in 2000 to \$42.8 billion in 2002—a reduction of over \$60 billion in just two years.²¹ According to the Telecommunications Industry Association, spending by carriers on telecommunications equipment (one crucial component of network capital) decreased from \$58 billion in 2000 to \$22 billion in 2002.²²

The decline in overall telecom investment reflects a decrease in spending by competitors, the CLECs, and incumbent carriers, the ILECs. In both cases, current levels of gross investment are below not only the peak-years of 1999- 2001 (*see* Figures 2 and 4), but also below previous levels when measured in the standard way, which is cap ex as a percent of revenues (*see* figures 3 and 5).

Figure 2
CLEC Gross Investment



Source: ALTS, *The State of Local Competition 2004*, p. 10 (July 2004).

Gross investment by both private and public CLECs fell by 39 percent from 2000 to 2001, and by an additional 81 percent from 2001 to 2002.²³ According to ALTS, a CLEC trade association, capital expenditures by the subset of publicly traded, facilities-based CLECs decreased by 19 percent from 2000 to 2001, by 56 percent from 2001 to

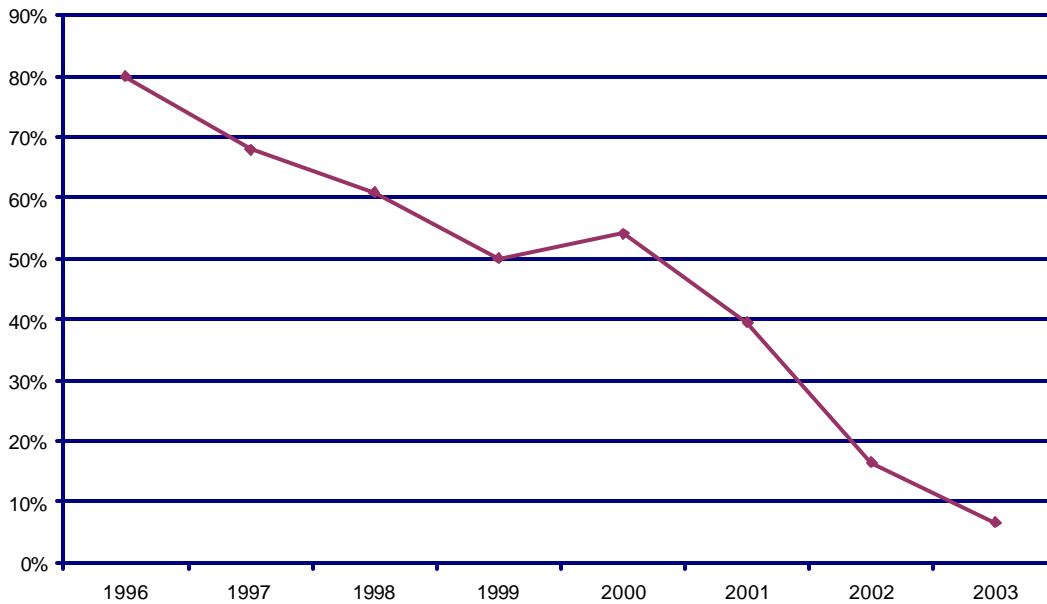
²¹ See Skyline Marketing Group, *CapEx Report: 2002 Annual Report*, Carrier Data Sheet 1, June, 2003. Unlike other data sources cited in this paper, this report breaks out estimates of wireline voice (i.e., without DSL) capital investments.

²² TIA, *2003 Telecommunications Market Review and Forecast* at 56 – Tables II-4.1 & II-4.2 (2003). Spending by carriers on telecommunications equipment decreased by 26.2 percent in 2001 (from \$58B to \$43B) and by 49.1 percent in 2002 (from \$43B to \$22B).

²³ See Skyline Marketing Group, *CapEx Report: 2002 Annual Report*, Carrier Data Sheet 1, June, 2003.

2002, and 57 percent from 2002 to 2003. *See* Figure 2. As a percentage of revenues, the decline for these CLECs was even greater—87 percent from 2000 to 2003. *See* Figure 3. Under this measure, CLEC investment in 2002 had plummeted to about one-quarter its level in 1999-2000.

Figure 3
CLEC Gross Investment as a Percentage of Revenue

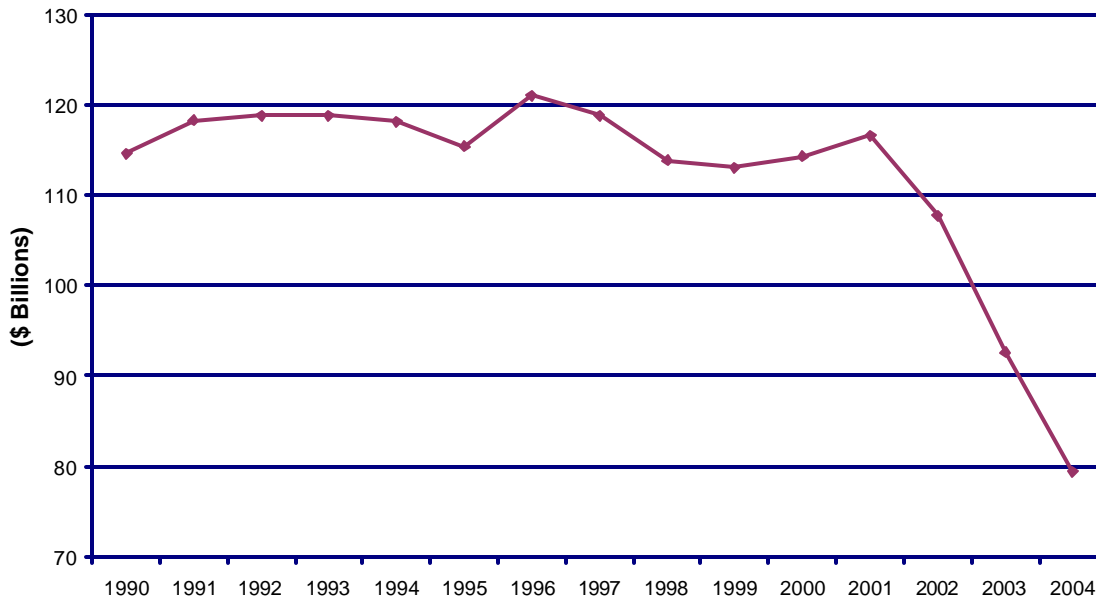


Source: ALTS, *The State of Local Competition 2004*, pp. 8, 10 (July 2004).

There has also been a significant decline in investment by incumbent local exchange carriers. Figure 4 shows the net capital stock of BellSouth, Qwest, SBC, and Verizon from 1990 through 2004. While net capital stock appeared to rise during the last of the Internet boom, it was a relatively minor uptick, and substantial disinvestment appears to be taking place since. Net capital stock of the Bell companies is down approximately 34 percent—\$41.5 billion—since enactment of the 1996 Telecommunications Act.²⁴

²⁴ Combined net capital stock of Verizon, SBC, BellSouth and Qwest is down from \$121.0 billion in 1996 to \$79.5 billion in 2004. FCC Report 43-01 (ARMIS). *See* Figure 4.

Figure 4
Net Capital Stock
Verizon, Bell South, SBC, Qwest



Source: FCC Report 43-01 (ARMIS); "Average Net Investment, Subject to Separations."

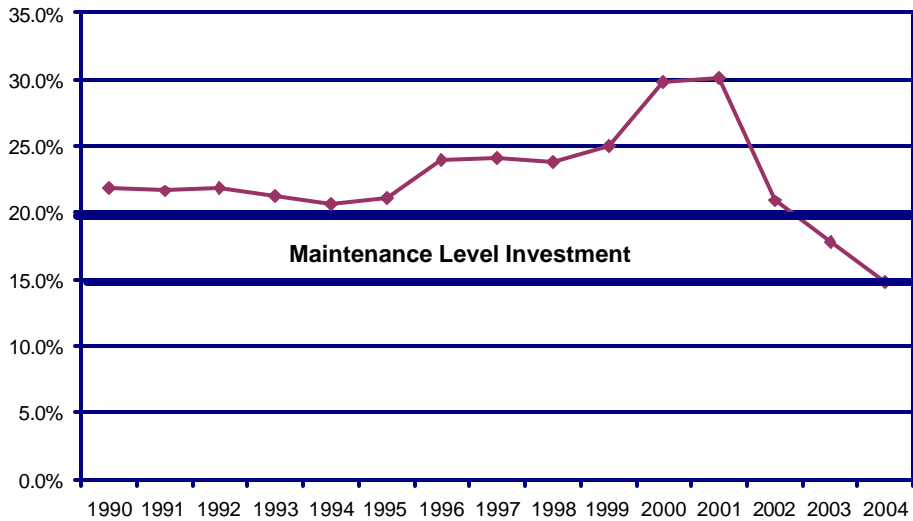
Not surprisingly, the period has seen a marked reduction in annual capital expenditures. As demonstrated in Figure 5, for example, annual gross investment by the Bell companies has declined significantly as a percentage of BOC revenues. By that measure, gross investment has declined not only below the years of peak investment in 2000 and 2001, but is also below any level seen in a decade.

Figure 5 shows that, in 2002, BOC capital spending was just at maintenance level²⁵, and that it fell below it in 2004. This implies that the networks owned by these companies will not be enhanced to provide for greater productive activity. Indeed, it suggests that the leading local exchange networks could stagnate or decline in functionality. As investment analysts have recognized, there are potentially serious consequences for consumers when cap ex spending goes below maintenance levels. Morgan Stanley cites the experience of Ameritech, which reduced its cap ex to sales ratio to 13.7% in 1994 and 1995. "Service quality complaints filed with state regulatory authorities ramped significantly from 15 per 1 million access lines in 1994 to 1,044 per million in 2000 by the time the [acquisition by SBC] was closed."²⁶

²⁵ We use 15% to 20% as the range for the maintenance level of capex. See, Thomas W. Hazlett, Coleman Bazelon, John Rutledge, and Deborah Allen Hewitt, *SENDING THE RIGHT SIGNALS: PROMOTING COMPETITION THROUGH TELECOMMUNICATIONS REFORM, A REPORT TO THE U.S. CHAMBER OF COMMERCE*, September 22, 2004, p. 91, footnote 225.

²⁶ Morgan Stanley, "Wireline Telecom Services Trend Tracker: Nowhere to Hide," March 3, 2003, p. 52.

Figure 5
RBOC Wireline Investment Spending As A Percentage of Revenue



Source: Data represent "Telecommunications Plant in Service Additions" as a percent of "Total Operating Revenues, Subject to Separations". FCC Report 43-01 and 43-02 (ARMIS).

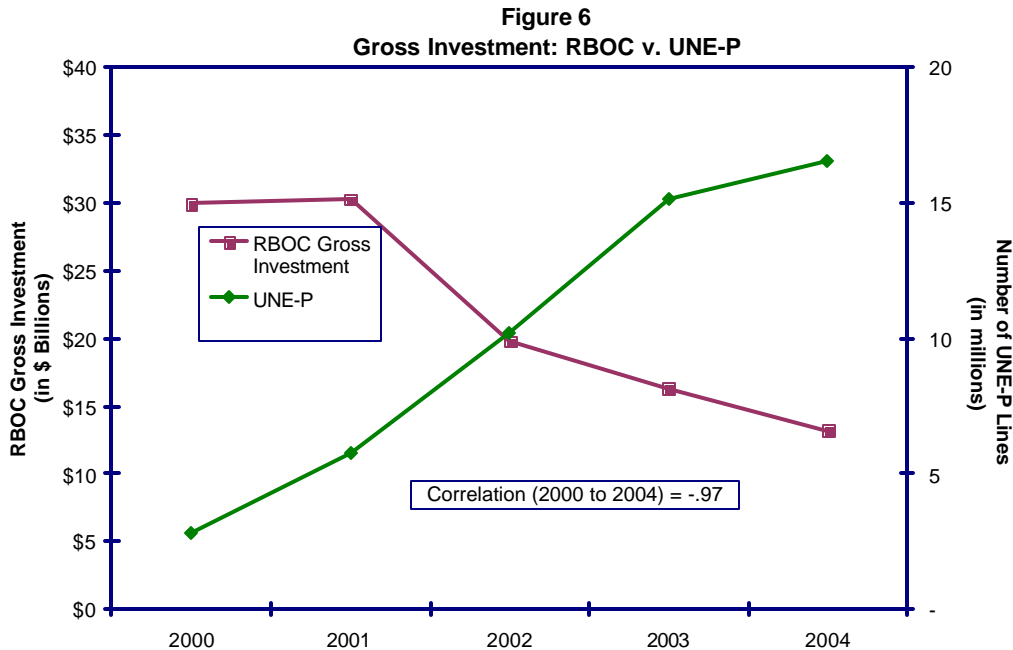
B. Telecom Regulation and the Investment Decline

There is one area of clear consensus: financial analysts widely believe that the rational strategy under the current regulatory regime is for local phone companies to slash capital expenditures. As financial analysts have repeatedly found, one important factor making telecommunications investments uneconomic (for both incumbent and competing carriers) is the prospect that UNE-P line growth will ramp up. The available evidence supports this conclusion.

Data from the FCC show that UNE-P growth is coming at the expense of facilities-based competition. As UNE-P lines grew over 245% from year-end 2000 to year-end 2004 period, facilities-based competitive lines grew just sixty percent—a substantial slowing from their previous trend. The number of facilities-based non-cable lines *decreased* from 4.1 million at the end of 2000 to 3.2 million by mid 2003 before recovering to 4.8 million at the end of 2004.²⁷ For the period year-end 2000 through mid 2003, the correlation between UNE-P lines and non-cable facilities-based lines is almost a perfect -1 (-0.99685), meaning that UNE-P line growth has been accompanied by a simultaneous reduction in facilities-based competitive lines period by period.

²⁷ Federal Communications Commission, "Local Telephone Competition: Status as of December 31, 2004" (July 2005).

Second, the evidence demonstrates that the decline in investment by incumbent local exchange carriers has been caused to some substantial degree by current regulatory policies. Since the emergence of substantial UNE-P line growth in 2000, the simple correlation between UNE-P lines and Bell Operating Company (BOC) investment is -0.97 , indicating a strongly negative relationship.²⁸



Source: UNE-P reflect December data from *Local Telephone Competition: Status as of December 31, 2004*, FCC Industry Analysis and Technology Division, Wireline Competition Bureau, July 2005, Table 4 (ILEC reporting). RBOC Gross Investment from FCC ARMIS Report 43-02, "Plant Added to Telecommunications Plant in Service," Table B-1.B.ac, accessed 9/12/2005.

Financial analysts also view the regulatory structure in 2003 (prior to the 2004 end of below cost UNE-P) as strongly anti-investment. This is an important source of information, in that analysts evaluate financial opportunities for investors. Analysts are typically objective in the sense that they have no preference for one industry over another, but seek to understand how economic and regulatory factors affect future returns. They view UNE-P as a negative for both RBOC investors and the entire telecommunications industry.²⁹ The continuation of UNE-P at current TELRIC pricing

²⁸ The correlation coefficient measures the degree to which two variables move together. A correlation coefficient of -0.97 implies that when one of the variables, say UNE-P lines, increases, the other variable, in this case gross BOC investment, decreases. The coefficients can vary between -1 and 1 ; positive means they move in the same direction; negative means they move in opposite directions; the closer to either 1 or -1 , the stronger the relation.

²⁹ "How the FCC Decision Depresses Overall Equipment Demand. Precursor believes the FCC's decision to invigorate/extend UNE-P resale competition will likely pressure core telecom equipment spending. . . . (1) Increasing profit pressure forces Bell capex cuts. . . . (2) Enables AT&T and WorldCom to cut current capex to fund UNE-P marketing. Preserving UNE-P for at least four years and making it available to more of the small business market encourages AT&T and WorldCom to swap capex for more

was seen as detrimental to telecommunications investment.³⁰ Telecommunications networks were seen to be decreasing investment in direct response to wholesale price regulation. As Merrill Lynch reported, “SBC continues to be the RBOC with the worst retail to UNE-P line migration.”³¹ At the same time, SBC is cutting gross investment most aggressively.³²

Under the regulatory structure in 2003, analysts noted that decreasing investment was not just correlated with UNE-P, but the smart thing for BOCs to do. One “bright spot” for the investment analyst community following the first quarter of 2003 was that “practically every telco reported capex well below our expectations.”³³ One firm notes that with SBC’s cap ex to revenue ratio at 9%, there is little room for further cuts, while Bell South and Qwest “still have some room to cut” at 11% and 12%, respectively, and Verizon at 15% “is likely best positioned to cut.”³⁴ As RBOC capital spending falls below maintenance levels, financial analysts are hoping to see *deeper cuts*.³⁵ Morgan Stanley adds that “[a]s the Bells approach spending of at historical [low] mid-teens percentage of sales levels, we do not believe that we have yet witnessed a bottoming of capex. If conditions worsen and UNE-P persists, we would expect more capex cuts across the board.”³⁶

UNE-P marketing in order to improve cash flow and profitability short-term. (3) Increases capital investment risk and uncertainty. . . . (4) Increases necessity of Bell-LD consolidation, reducing capex spending. Given that the government is artificially forcing down local profits, consolidation to achieve cost savings may be the only way to preserve some Bell shareholder value.” Precursor Group, *FCC Decision Accelerates Dis-investment and Shifts Equipment Demand*, March 4, 2003 (emphasis omitted).

³⁰ “The FCC... increased its anti-investment bias by favoring resellers over infrastructure owners and equipment suppliers.” Scott Cleland, Precursor Group, *Precursor Returning to Negative Telecom Outlook As FCC Invigorates UNE-P*, February 24, 2003 (emphasis omitted).

³¹ Merrill Lynch, *SBC Communications*, Comment, April 29, 2003, p. 2. See, also, UBS Warburg, “How much Pain from UNE-P?” August 20, 2002: “SBC has lost more retail lines to UNE-P than any other Bell...” and “SBC takes the hardest hit for retail lines lost to UNE-P...”, p. 27.

³² Precursor Group, “Telecom Disconnect: Quality of Bell Free Cash Flow Worsening”, July 21, 2003: “Among the Bells, SBC has been most aggressive in propping up FCF [free cash flow] with CapEx cuts, followed by BLS and VZ, respectively.”

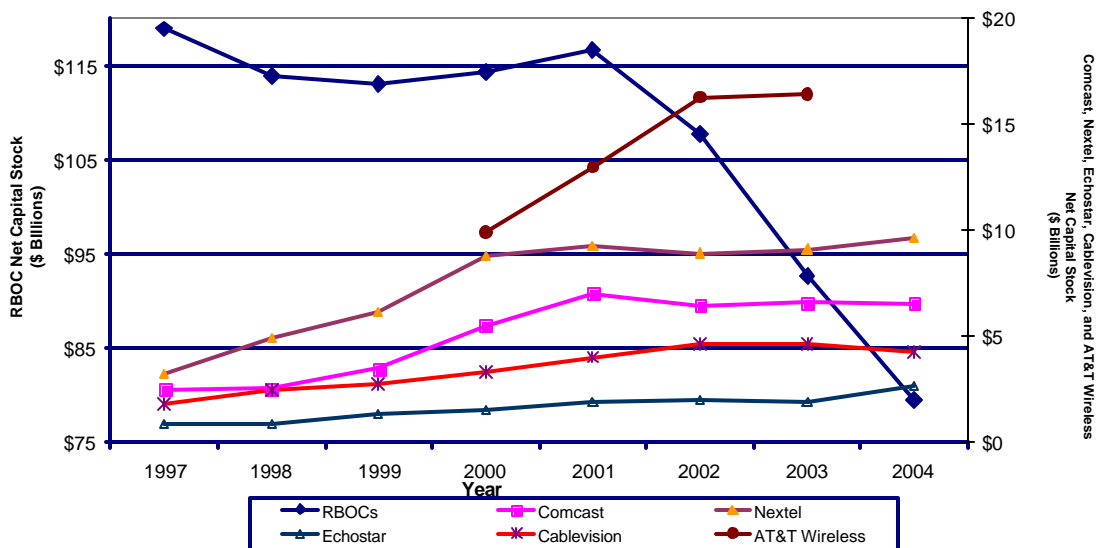
³³ Merrill Lynch, *ILEC Scorecard*, May 15, 2003, p. 2.

³⁴ Precursor Group, “Telecom Disconnect’: Quality of Bell Free Cash Flow Worsening,” July 21, 2003.

³⁵ “[W]e would not be terribly surprised to see additional cuts from our nation’s largest carriers, as they react to this current FCC order. If these companies are charged with the fiduciary responsibility of the underlying shareholders, at some point it will be more responsible for the companies to begin returning cash flows to shareholders in the form of large dividends or share buy backs, rather than deploying capital into the network to generate negative returns for equity and debt holders.” Fulcrum Global Partners, *Wireline Communications: Thoughts on FCC Order*, February 25, 2003.

³⁶ Morgan Stanley, Wireline Telecom Services, *Trend Tracker: Nowhere to Hide*, March 3, 2003, p. 7.

Figure 7
Net Capital Stock



Source: RBOC Net Capital Stock data are from FCC Wireline Bureau's ARMIS Report 43-01 under the heading "Average Net Investment, Subject to Separations." The RBOC entry is the sum of data for all companies listed on the report. Comcast, Nextel, EchoStar, and AT&T Wireless data are from Comcast Holdings Corporation (Comcast Corporation for 1997-2001), Nextel Communications, Inc., EchoStar Communications Corporation, and AT&T Wireless, Inc. 10-Ks, entries "Property, plant and equipment, net." AT&T Broadband capital stock is not included in the Comcast figures for 2002-2004.

Some argue that the pattern of telecom investment reflects only the standard leveling off experienced after a period of rapid expansion.³⁷ While it is true that the opportunities created in the Internet boom, including heightened demand for high-speed data services by both consumers and businesses, attracted investors to provide capital for telephone network infrastructure, this does not explain current trends. The net capital stock owned by RBOCs did not rapidly expand in the boom period, and it is not now leveling off but *declining*. In contrast, other U.S. communications sectors—such as wireless and cable—expanded their net capital stock at a high rate, and have responded to post-boom conditions by reducing growth but maintaining capital infrastructure.

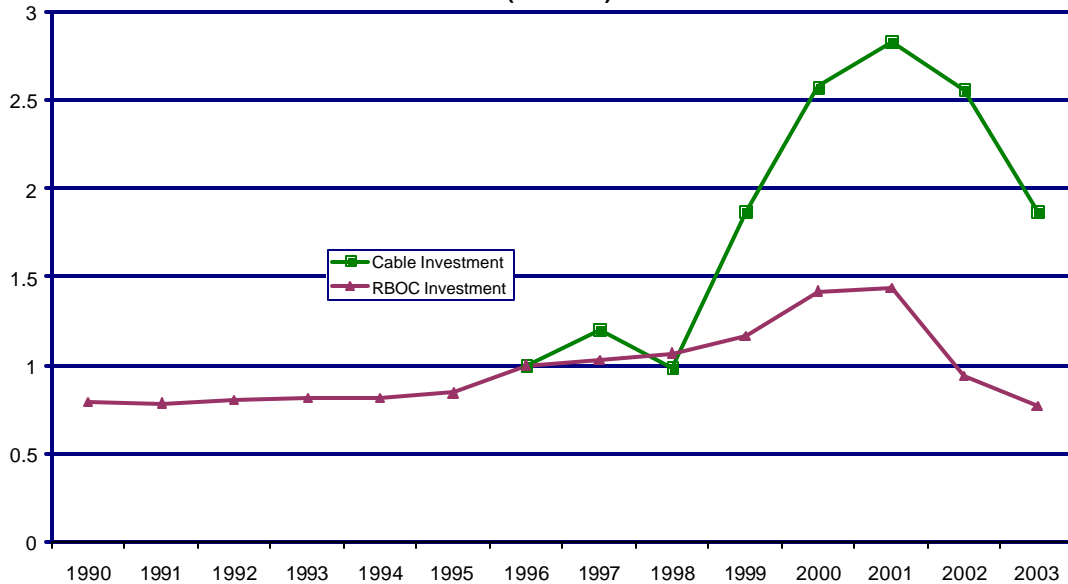
Figure 7 shows the net capital stock for leading “pure play” firms in wireless telephony, cable TV, and satellite TV, along with the RBOCs.³⁸ Although the growth of capital stock in these other sectors has flattened, in contrast to the wireline sector capital stock is not declining. This is true despite the fact that these sectors all experienced rapid expansion in the boom phase of the current cycle, while the BOCs did not.

³⁷ See Phoenix Center Policy Bulletin No. 5, “Competition and Bell Company Investment in Telecommunications Plant: The Effects of UNE-P,” July 9, 2003.

³⁸ These firms are AT&T Wireless and Nextel (wireless telephony); Comcast and Cablevision (cable TV), and EchoStar (satellite TV). By focusing on pure plays, it is possible to see the financial picture across different industries. Firms investing in multiple markets typically do not break out capital assets, and so company data offer an unclear picture of the trends in any one industry.

Similarly, the cable industry has not reduced its capital stock despite the fact that it, too, has now largely completed a major upgrade of its facilities nationwide. Even after building out two-way digital infrastructure for the delivery of digital video and cable modem service, investment remains at historically high levels. As Figure 8 shows, cable cap ex is much higher than that for the RBOCs, adjusting for their level of investment in 1996.³⁹ Similarly, satellite television companies spent substantial sums to create distribution platforms in recent years, and continue to increase net capital stock now.

Figure 8
Normalized RBOC and Cable Capital Investment
(1996 = 1)



Source: Cable Investment represents "Cable Industry Infrastructure Expenditures," from Kagan Research, LLC (available at <http://www.ncta.com/Docs/PageContent.cfm?pageID=314>, accessed September 9, 2005). RBOC Investment represents "Plant Added" to "Telecommunications Plant in Service" for Verizon, SBC, BellSouth and Qwest, from FCC Report 43-02 (ARMIS).

IV. An Empirical Test of the Stepping Stone Theory

The regulatory justification of low wholesale prices in the UNE-P program is to encourage firms to enter the market and to then convert UNE-P lines into new networks. If the stepping stones were working, one should be able to use the number of UNE-P lines in a state in one period to help predict the number of facilities-based CLEC lines in that state in future periods.

The results below demonstrate that the levels of UNE-P lines (and other measures of non-CLEC owned competitive lines) have no statistically significant relationship with facilities-based CLEC lines (CLEC-owned or UNE-L) in future periods. This empirically

³⁹ While widespread growth of UNE-P has discouraged cable telephony upgrades, the cable industry has been successful in opposing "open access" mandates for video and cable modem service, the two markets in which local cable operators are dominant, and which provide the vast majority of industry revenues.

contradicts the stepping-stone theory, the economic justification offered for TELRIC-priced UNE-P.

The rationale underlying unbundling rules is that entrants enjoy economies of scale and scope if they can access the existing network (owned by an incumbent telecommunications carrier) at cost-based prices; and that such regulatory assistance for entrants will soon result in new physical networks as entrants transition from the shared use of network elements to building and utilizing their own facilities. “Competitors argue that they are making substantial investments in their own facilities and are using UNEs as a stepping stone to their own facilities.”⁴⁰ The implication is that, where regulated access to networks is relatively widespread, the emergence of facilities-based competition will follow.

We tested this theory in a multivariate regression equation estimated on semi-annual state-level data from the FCC’s Local Competition Report, December 1999 through December 2004,⁴¹ and from the U.S. Department of Labor, Bureau of Labor Statistics.⁴² The estimated model was:

$$COL_{i,t} = C + \beta_1 Z_{i,t} + \beta_2 UL_{i,t-1} + \beta_3 UL_{i,t-2} + \beta_4 UL_{i,t-3} + e_{i,t} \quad (\text{Eq. 1})$$

where,

$COL_{i,t}$ = CLEC-owned lines in state i during semi-annual period t , divided by BOC lines in state i during period t ;

C = constant term, divided by BOC lines;

$Z_{i,t}$ = unemployment rate in state i during semi-annual period t , divided by BOC lines in state i during period t ;

$UL_{i,t-1}$ = UNE-P lines in state i during semi-annual period $t-1$, divided by BOC lines in state i during period t ;

$UL_{i,t-2}$ = UNE-P lines in state i during semi-annual period $t-2$, divided by BOC lines in state i during period t ;

$UL_{i,t-3}$ = UNE-P lines in state i during semi-annual period $t-3$, divided by BOC lines in state i during period t ;

$e_{i,t}$ = error for estimate of state i during period t .

The “stepping stone” theory suggests that the number of UNE-P lines in a state in one period should help to predict the number of CLEC-owned competitive lines in future periods. Hence, lagged values of UNE-P lines are included as regressors. We also

⁴⁰ Gregory L. Rosston and Roger G. Noll, *The Economics of the Supreme Court’s Decision on Forward Looking Costs*, 1 REVIEW OF NETWORK ECONOMICS (September 2002): 81-89, p. 88.

⁴¹ Available at: <http://www.fcc.gov/wcb/iatd/comp.html>.

⁴² Available at: <http://data.bls.gov/labjava/outside.jsp?survey=la>. The unemployment rate was included to control for differences in the economic climate between states and over time.

include the state unemployment rate as an independent variable to incorporate financial conditions in the respective states, and these financial conditions help explain CLEC entry decisions. The coefficients of interest are associated with the lagged terms (the number of UNE-P lines in a state one, two, or three periods previous) which, under the stepping stone theory, should help to predict CLEC-owned lines. This would be evidenced by a positive effect as estimated by the coefficients, b_2 , b_3 , and b_4 .

We estimated the model using an autoregression correction.⁴³ We found that the second and third lags of UNE-P lines had a statistically significant relationship—but collectively the effect was negative. See Table 1. This indicates that increases in UNE-P lines lead to decreases in CLEC owned lines two or three periods later. The stepping stone theory is strongly rejected by the evidence.

Table 1: Test of the Stepping-Stone Theory

| Dependent Variable: CLEC-owned Lines | | |
|--|-------------|---------|
| | Coefficient | P-Value |
| Constant | -53601 | 0.14 |
| β_1 (unemployment) | -4070 | 0.24 |
| β_2 (UNE-P lines lagged one period) | -0.012276 | 0.77 |
| β_3 (UNE-P lines lagged two periods) | -0.134201 | 0.00 |
| β_4 (UNE-P lines lagged three periods) | 0.095407 | 0.01 |
| AR(1) | 1.267037 | 0.00 |
| AR(2) | -0.185655 | 0.02 |
| Adjusted R-squared | .94 | |
| F-statistic | 499.5 | |

V. The Broadband Race

The competition between cable modem and digital subscriber line service is an important part of the regulation story, both because this rivalry serves as a test bed for unbundling rules and because broadband services directly compete with telephone service via emerging voice over Internet protocol applications. High-speed Internet connections now provide subscribers with basic phone service and do so at reasonably competitive prices.

⁴³ Autoregressive error corrections are standard procedures in econometrics for correcting persistence in the regression equation disturbances. Although the equation misses are zero on average, there can be some carryover in the equation disturbance from one period to the next, here from one half year to the next. In this case, the second order autoregressive process uses information from the previous two periods—up to a year prior—to improve the accuracy of the regression coefficients and associated statistical tests.

The two principal forms of residential broadband access were subject to two distinct regulatory regimes. Cable modem service uses the cable TV system platform, and the system owner is under no legal obligation to open that facility for use by others. Despite considerable political pressure to impose “open access” rules allowing rival Internet service providers (ISPs) wholesale use of the high-speed last-mile links, cable modems remain unregulated.⁴⁴ As proprietary, vertically integrated networks, cable operators determine how to serve customers and can package access to their networks that is based solely on profit considerations.

Digital subscriber line service, on the other hand, is delivered over telephone lines—specifically, the twisted copper pairs of the local loop. These connections are UNEs and must be rented to others at prices set by state regulators using FCC guidelines. Until recently, the states were free to set DSL local access rental fees based on the cost of using only part of the local loop, the high-frequency portion that is best used for data. Because this portion can be used when the low-frequency portion is simultaneously delivering telephone calls, incremental costs are very low. But the FCC’s February 2003 decision to end “line sharing” eliminated the option to lease only part of a loop. This decision carried important implications.

The disparate regulatory treatment of broadband platforms is striking: cable is a “closed” platform, while DSL’s telephone company platform is “open.” Rivals have a right to rent incumbent telephone carrier loops at regulated wholesale rates to provide DSL and compete with the telephone company head-to-head for retail customers; those wishing to use cable facilities must negotiate an agreement with the cable operator. The upshot is that mandatory network-sharing rules apply in large part for DSL and not at all for cable modem service.

This suggests an empirical test. Since the rival regimes are in sharp contrast, which one best encourages new investment and product improvements? If mandatory sharing rules achieve their objective of encouraging efficient new entrants, then the “open” platform should outperform the “closed” one. This performance could be measured in price and quality, but quality measurement is difficult, and data are elusive. An alternative test, for which data do exist, uses output as measured by subscribership. Conveniently, this incorporates supplier incentives to deploy service and to offer preferred quality-of-service levels. It assumes that cable modem service and DSL are good substitutes for each other, which seems reasonable.

In the early days of the broadband race, many credible sources predicted DSL as the ultimate winner. These included expert prognosticators who saw the burden of cable modem deployment as the greater handicap, as noted in the following 1997 report from ZDnet:

⁴⁴ *National Cable & Telecommunications Association, et al. v. Brand X Internet Services, et al.*, 545 US ____ (2005) (released June 27, 2005; complete cite not yet available)

Cable modems: May want to write the obit on this one. *PC Week* reports vendors are backing away from cable, given competition from digital subscriber line technology and cable's massive implementation headaches. Hewlett-Packard, IBM and Intel among those reportedly throwing in the towel.⁴⁵

But cable operators soon began investing aggressively to upgrade existing infrastructure and became far more successful in making broadband service available. By the end of 2003, cable modem service was offered to 90 percent of households passed by cable TV lines, while DSL service was available to only 66 percent of households passed by telephone networks.⁴⁶ Cable companies maintain an even healthier advantage in subscribers. As of December 2003, FCC data show 21,357,400 cable modem subscribers, compared with 13,817,280 for DSL.⁴⁷ Thus far, the less-regulated "closed" platform has been far more popular than the more-regulated alternative.⁴⁸

The trend may be changing, however. A major shift in regulation came in the February 20, 2003, FCC order that altered a network-sharing rule key to DSL provision by entrants. The order stated that "the Commission will no longer require that line-sharing be available as an unbundled element"⁴⁹ and narrowed "open access" requirements to incumbents' facilities used for DSL. Effectively, the ruling substantially raised access rates for competitors.⁵⁰ After a phase-in period, CLECs seeking to use ILEC loops to deliver DSL would have to pay for the entire circuit as if they were reselling telephone service.

This prompted dire predictions. A *New York Times* headline on February 21, 2003, announced, "High-Speed Service May Cost More."⁵¹ Other newspapers reported similar forecasts.⁵² Several scholars agreed. New York University economist Nicholas Economides wrote:

⁴⁵ Jon C. A. DeKeles, *Don't Get Robbed on the Road to Faster Access*, ZDNET (May 29, 1997); http://www.zdnet.com/chkpt/adem2fpf/www.anchordesk.com/story/story_931.html.

⁴⁶ Congressional Budget Office, *Does the Residential Broadband Market Need Fixing?* (Dec. 2003), at 21.

⁴⁷ Federal Communications Commission, Industry Analysis and Technology Division, Wireline Competition Bureau, *High-Speed Services for Internet Access: Status as of December 31, 2004* (July 2005), at Table 1.

⁴⁸ See Thomas W. Hazlett and George Bittlingmayer, *The Political Economy of Cable "Open Access,"* 4 STAN. TECH. L. REV. (2003); http://stlr.stanford.edu/STLR/Articles/03_STLR_4.

⁴⁹ Federal Communications Commission, *FCC Adopts New Rules for Network Unbundling Obligations of Incumbent Local Phone Carriers* (Feb. 20, 2003).

⁵⁰ ALFRED E. KAHN, *LESSONS FROM DEREGULATION: TELECOMMUNICATIONS AND AIRLINES AFTER THE CRUNCH* (AEI-Brookings Joint Center for Regulatory Studies, 2004), at 43.

⁵¹ Saul Hansell, *Communications Compromise: Internet Access; High-Speed Service May Cost More*, N.Y. TIMES (Feb. 21, 2003), at C4.

⁵² Jane Black, *A Not-So-Ringing Defeat for the Bells: While the FCC's Proposed Rules Don't Give Them Relief on Local Service, They Scored Big-Time on Broadband Deregulation*, BUS. WK. ONLINE (Feb. 21, 2003); Ben Charny, *DSL Customers Brace for Higher Prices*, CNET NEWS.COM (Feb. 21, 2003).

In February 2003, the FCC decided to allow incumbent monopolists of local telecommunications networks to charge any price they want for the portion of the network used to provide DSL service. The immediate consequence will be higher Internet connectivity prices and slower growth of the Internet in the U.S. This is possibly the most damaging decision for the Internet that the FCC could take short of formally imposing regulation on the Internet.⁵³

The logic of mandatory network sharing rules implies that short-run prices will rise and penetration growth will fall in the wake of the rule change.⁵⁴ In fact, broadband access prices have *fallen* since the FCC decision to end line sharing.⁵⁵ Moreover, retail discounting has occurred simultaneously with acceleration in DSL growth. Telephone companies have cut prices, and this appears to have driven an increase in DSL market share.

Figure 9 displays broadband subscriber data from Legg Mason. After the FCC decision ending line sharing, both cable modem and DSL growth continued. But while DSL growth accelerates above trend (extrapolated via the dashed line), no positive growth “bump” occurs for cable during this period.

Figure 10 displays the ratio of cable modem subscribers to DSL subscribers (also using Legg Mason data). The end of line sharing occurs just as the cable modem-to-DSL ratio reaches a local maximum. This indicates that the trend in the ratio of cable modem to DSL subscribers significantly changed after the Triennial Review Order—in favor of DSL. In fact, it has. An analysis of quarterly data from Legg Mason covering the third quarter of 2000 through the fourth quarter of 2005 finds that the apparent structural breaks seen in Figure 9 and Figure 10 are statistically significant.⁵⁶

Although other factors may account for observed patterns, the conjecture that access provisions drive broadband competition appears to lack support.

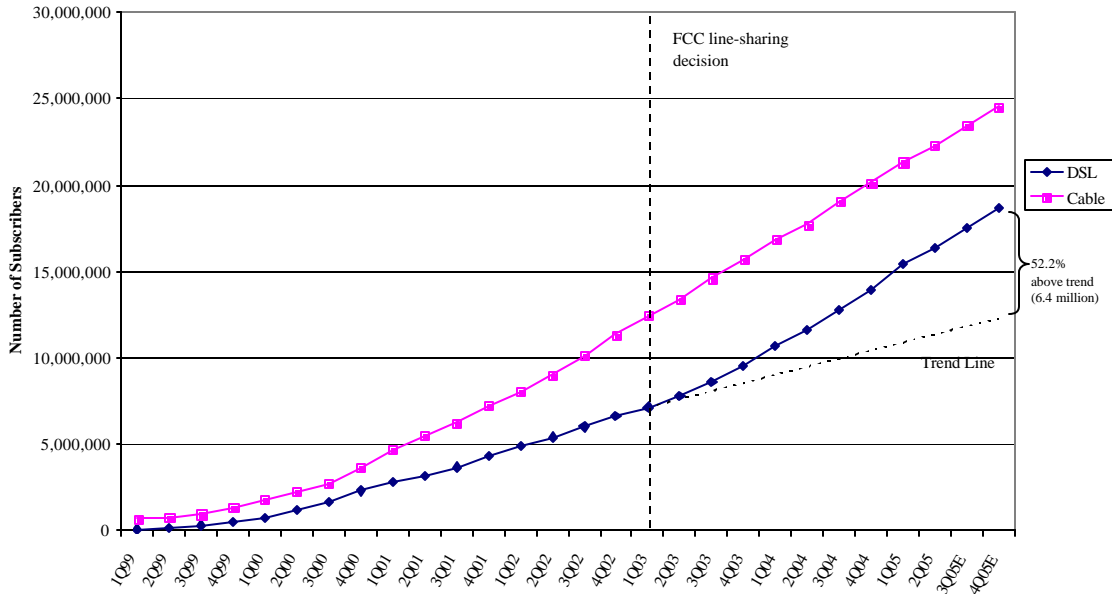
⁵³ Nicholas Economides, *Dial “C” for Competition*, STERN BUS. 40 (Fall/Winter 2003), at 43.

⁵⁴ For access regulation to be efficient in this circumstance, it is necessary that it lower prices and increase near-term penetration, even as these outcomes are insufficient to demonstrate a proconsumer result, which additionally requires that long-term price-quality choices by consumers (which encompass short-run effects) are superior to what they would be in the absence of such rules. Investment choices and other market dynamics enter in the long run.

⁵⁵ *Falling DSL Prices May Herald a Broadband Sea Change*, 13 BROADBAND BUS. REP. (Nov. 4, 2003); Jon Van, *SBC Gains Strong Lead in DSL Race, Aggressive Price-Cutting and Dealmaking Help Telecom Giant Surge Past Other Phone Companies for Broadband Market Share. Still, Cable TV Operators Add Two Customers for Each DSL User*, CHI. TRIB. (Nov. 14, 2003), at 1; Anick Jesdanun, *High-Speed Internet Soaring as Prices Decrease*, ALB. TIMES UNION (Apr. 19, 2004), at A3.

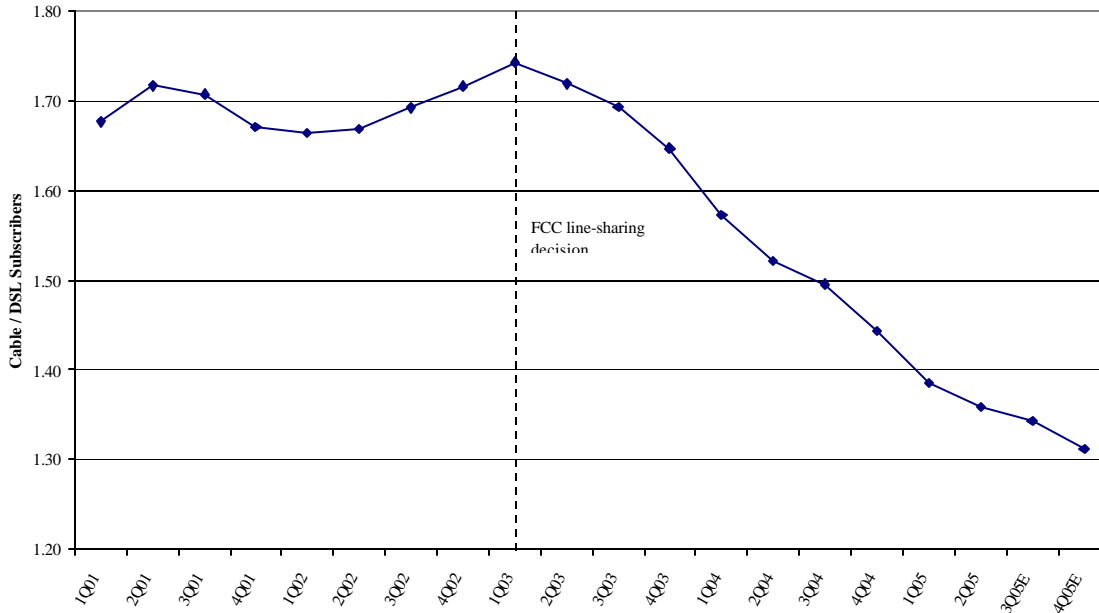
⁵⁶ We performed a Chow test on the series reported in Figure 9 and Figure 10 and found that the 2003 Q1 represented a significant break in the series.

Figure 9
Quarterly DSL and Cable Subscribers: 1999 to 2005



Notes & Sources: Data from Legg Mason Equity Research. Q3 and Q4 2005 data are estimated.

Figure 10
Ratio of Cable to DSL Subscribers: 2001 to 2005



Notes & Sources: Data from Legg Mason Equity Research. Q3 and Q4 2005 data are estimated.

VI. Conclusion

The complexity of devising ambitious network-sharing rules to promote last-mile telephone competition has proven more than regulators can handle. It is clearly not as simple as providing a ‘stepping stone’ facilities-based competition. The policy failures stand in stark contrast to examples of markets that work. As demonstrated in broadband, head-to-head rivalry outperforms regulation, even with just two principal competitors. Fortunately, superior procompetition rules are available.

Network-sharing policy should be reformed in two basic ways. First, policymakers should weight the administrative processes, transaction costs, and ripple effects caused by government interventions *ex ante*. Rules that invite contentiousness constitute “attractive nuisances”; litigants cannot be blamed for jamming the system when policies invite arch rivals to try to twist the rules to extract financial benefits. In a study of determinants of regulated telecommunications prices, University of California at Berkeley scholars Rui J. P. de Figueiredo, Jr., and Geoff Edwards find:

[R]egulated prices for access to the local loops of incumbent telephone networks varied from \$2.79 per month in downtown Chicago, IL to \$7.70 in Manhattan, NY to \$12.14 in Houston, TX [W]e find a significant effect of private money on regulatory decisions. A one standard deviation increase in the percentage of contributions in an electoral cycle by entrants to the industry is associated with a fall of around three-tenths of a standard deviation in the regulated local loop price (around \$1.36 per month).⁵⁷

Policymakers should alter the structure of telecommunications regulation to reduce such influence. This implies lessening the scope, frequency, and economic significance of arbitrary judgments that policymakers render. Ending theoretical pricing rules constituted on the basis of an “ideally efficient competitor,” a standard that may itself serve as a powerful deterrent to new investment by entrants,⁵⁸ should be an essential part of any reform.

Alternative policies are available to stimulate the creation of rival networks without incurring the collateral damage that today thwarts progress. Competitive networks exist, and additional entrants are on the horizon. The highest priority of regulators should be to create policies to encourage investors to take the risks to develop vigorous competition

⁵⁷ Rui J.P. de Figueiredo, Jr., and Geoff Edwards, *Why Do Regulatory Outcomes Vary So Much? Economic, Political, and Institutional Determinants of Regulated Prices in the U.S. Telecommunications Industry*, Haas School of Business, University of California (May 2004).

⁵⁸ “The FCC has decreed that the charges for [unbundled network] elements and the resale discounts must emulate the costs of an ideally efficient firm. This standard is in fact not efficient, and the FCC’s attempt to jump-start the entry of competitors in this way has short-circuited the competitive process itself.” Alfred E. Kahn, Timothy J. Tardiff, and Dennis L. Weisman, *The Telecommunications Act at Three Years: An Economic Evaluation of Its Implementation by the Federal Communications Commission*, 7 INFO. ECON. & POL’Y 319 (1999), at 365.

Draft of September 20, 2005

between communications networks. The success of such a reform effort will redirect market forces. Instead of lobbying for more favorable government rules, rivals will compete to offer customers better prices and improved service.