**ELECTRONIC COMMERCE SYMPOSIUM**

**THE SPEED GAP: BROADBAND INFRASTRUCTURE AND ELECTRONIC COMMERCE**

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**ABSTRACT**

Although high-speed, broadband telecommunications services are not yet widespread outside of urban and commercial areas, they are starting to reach an increasing range of residential customers. Greater availability of high-speed communications links is likely to increase the growth of electronic commerce and other Internet applications, to the benefit of consumers and online businesses alike. Regulation of advanced services may, however, affect the speed of residential broadband deployment and the prices for such services in the short run. This essay discusses some important legal constraints underlying current regulatory proceedings and the impact those constraints may have on the spread of affordable broadband services.

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Telecommunications infrastructure is critical to the growth of electronic commerce. Telephone networks, cable systems, and other providers of facilities are essential intermediaries that can shape the volume and nature of transactions between online buyers and sellers. The faster and less expensive the links are between users and the Internet, the more quickly electronic commerce is likely to grow. Competition, innovation and regulatory changes have all contributed to the development of a more efficient, higher capacity telecommunications network that is increasingly well suited to moving large amounts of data quickly. There is, however, a point at which broadband transmission stops: the local, residential network. The extension of broadband capability beyond its current scope to a majority of small businesses and households is an important challenge for the communications industry.

Part I of this essay will discuss the current state of broadband capability in U.S. telecommunications networks. Part II will then discuss the importance for electronic commerce of increasing residential access to advanced, high-speed telecommunications services. Finally, Part III will examine how statutory constraints and tradeoffs underlying current regulatory proposals might affect the availability and affordability of residential broadband services. It suggests that the 1996 Act may constrain the Federal Communications Commission ("FCC") to favor rules that maximize the number of competitors in the broadband market at the expense of rules that maximize the spread of low-priced, advanced service offerings to residential customers.

I. AN OVERVIEW OF BROADBAND AVAILABILITY TO CONSUMERS

This section will begin by discussing changes in the telecommunications system's ability to provide high-capacity lines to customers and to process information in digital format, both of which are essential for broadband services. It will then discuss how, because of the high costs of deploying fiber lines to most individual customers, several technologies have been developed to increase capacity of the communications plant that telephone and cable carriers have already constructed. It will argue that deployment of those technologies—namely integrated services digital network ("ISDN"), digital subscriber line ("DSL"), and cable modem
service—has helped to make broadband service cheaper and more widely available, but not yet on a ubiquitous scale to residential consumers.

A. Current Deployment of Advanced Network Capability

Substantial progress has been made in upgrading telecommunications infrastructure to meet the needs of the information sector of the economy. When AT&T was broken up in 1984, not one “central office”—the offices where the switches that route telephone calls are located—contained advanced, digital signaling technology. By 1997, over 97 percent of central offices deployed such technology, and over 99 percent of customer lines were routed through such switches. Similarly, in 1984 only a very small number of links used to transport telephone traffic between central offices were made of fiber optic cable; the vast bulk were low-capacity copper lines. By 1990, 60 percent of interoffice transmission links were fiber, and by 1997 the proportion of fiber transport plant had reached nearly 96 percent.

FCC figures show that from 1993 through 1997, overall deployment of high-capacity, fiber optic cable in the U.S. telephone system increased from 2.3 million to 3.4 million miles in long-distance networks, from 6.6 million to 12.2 million miles in incumbent local telephone networks, and from 0.2 million to 1.8 million miles in competitive local exchange networks. Total fiber mileage increased an estimated 16 percent in 1997 alone, and actual fiber capacity by the end of 1998 was almost certainly much higher.

While the paving of the “Infobahn” has reached the freeways and main roads, it has not yet reached the neighborhood streets. For the most part, the high-capacity fiber infrastructure stops well short of individual customer lines—often called “loops,” or the “last mile”—that connect individual customers to the network. Of the 150 million customer lines oper-

1. See INDUSTRY ANALYSIS DIV., FEDERAL COMMUNICATIONS COMM’N, TRENDS IN TELEPHONE SERVICE 90 tbl.17.2 (July 1998).
2. See id.
3. Indeed, in 1986, total fiber deployment by AT&T was less than 30 percent of its total network, including long distance lines where the bulk of fiber was used. See John Haring & Ewan Kwerel, Competition Policy in the Post-Equal Access Market, 62 Rad. Reg. 2d (P & F) 587, n.18 (OPP Working Paper, Feb. 1987).
4. See INDUSTRY ANALYSIS DIV., supra note 1, at 91 tbl.17.3.
6. See id. at 24 tbl.6.
7. See id. at 36 tbl.14.
ated by the Bell operating companies (the major incumbent carriers), 86 percent were copper and only 14 percent were fiber at the end of 1997. Because some competitive local exchange carriers have been building all-fiber networks, the percentage of fiber loops for the overall market may be slightly higher than the percentage for the incumbents’ networks alone. But the competitive carriers have only about 3 percent of the local market by lines, so the total percentage of customer lines served by fiber loops is still almost certainly under 20 percent.

Not only is the proportion of fiber loops small, but the distribution of those links is heavily skewed toward businesses and urban customers. Once fiber “backbones” are put in place in dense areas, as they have been in many cities, it can be economical to build a fiber link from the backbone to an office or apartment building. The distances are short—often a matter of yards—and a single building will either have multiple customers or a very high-revenue customer. The economics of building fiber links to customers in less dense areas are much less promising. Loops are much longer—a matter of miles rather than yards—and at the end of that loop generally lies one, relatively low-revenue customer. As a result, no carriers are currently building fiber lines to individual customers outside of the densest urban areas.

B. Broadband Options in the “Last Mile”

The absence of fiber deployment to individual customers means that the speed of data transport drops precipitously at the point where information is handed off from the network’s transport lines to the customer’s loop. Given the time and cost required to build out fiber networks, the solution for bringing broadband service to residential customers must, in the foreseeable future at least, work over existing residential infrastructure: either the copper phone loops or the coaxial links of the cable television network. In addition to solutions based on landline telephone and cable systems, wireless technologies may also become important in the residential broadband market. Today, three technologies that meet the constraints of existing facilities are beginning to enter the market for residential

8. INDUSTRY ANALYSIS DIV., supra note 2, at 91 tbl.17.3.
10. See KRAUSHAAR, supra note 5, at 21 n.18.
broadband: ISDN line service and DSL service over the telephone network,11 and cable modem service.

1. Telephone Network Solutions: ISDN and DSL

Two ways of providing broadband transmission over copper telephone lines at modest cost are now in use. These technologies, ISDN and DSL, differ in their capabilities and in how they make use of existing infrastructure. ISDN allows transmission rates up to 128 kilobytes per second (kbps) over the circuit-switched voice network, about twice the best rate achievable by conventional modems.12 Using an ISDN modem is just like using a regular computer modem in that each use requires dial-up to the telephone network. According to FCC data, by 1997 about 40 percent of local telephone company central offices, where the main switches that serve customer lines are located, were capable of providing ISDN service.13 Those central offices together serve about 93 million customer lines, roughly 70 percent of the total in the United States.14 Residential ISDN prices have recently fallen to as low as $25 per month (not including Internet access), with initial set-up charges of $125 plus the cost of an ISDN modem.15 ISDN’s drawbacks include potentially high usage payments, frequent difficulty in achieving maximum bit rates, and the lack of an “always-on” connection that can be used without the delay of a dial-up process.16

DSL service overcomes some of the drawbacks of ISDN because it bypasses the circuit-switched voice network by routing data traffic to a packet-switched network. This allows more economical always-on connections and much faster speeds. By using modems that divide copper phone lines into separate bands for data traffic, DSL achieves download

11. At the high end of the telecommunications market are high-capacity data links called T1 (or T3) lines. Prices vary by distance, contract length, and share of line capacity, with the minimum monthly charge being around $300. See Telco Express (visited Mar. 2, 1999) <http://digiquote.telcoexpress.com> (providing an online pricing tool for digital line rates around the country based on location and distance). Because T1 lines tend to be affordable only for large businesses and institutions, they are not considered part of the solution for real consumer-level broadband service—i.e., service affordable by households and small businesses.

13. See INDUSTRY ANALYSIS Div., supra note 1, at 90 tbl.17.2.
14. See id.
15. See Digital Starter, supra note 12, at 300. Usage charges are 1 to 2 cents per minute in addition to the monthly fee.
speeds from 128 kbps to 7 Mbps.\textsuperscript{17} DSL service is not yet widely available, but that is changing. By the middle of 1998, DSL service was available to at least some consumers in about 30 states,\textsuperscript{18} and various providers have announced aggressive plans to expand the reach of their DSL offerings. For example, incumbent local exchange companies are pursuing different strategies, but are aiming to serve between 24 and 70 percent of their customers by 2000.\textsuperscript{19} In addition, competitive local exchange companies focusing on data services have entered a number of markets. Altogether, independent analysts predict that by 2000, over 40 million U.S. households will have access to DSL service.\textsuperscript{20}

Prices for DSL have started to fall accordingly. Bell Atlantic offers DSL service with Internet access at prices starting as low as $40 per month, plus an installation charge recently listed at over $400.\textsuperscript{21} Pacific Bell now offers DSL service, including Internet access, for as low as $39 per month for 384 kbps speeds; installation and necessary equipment require an additional one-time fee of just under $200.\textsuperscript{22}

Although DSL is promising and becoming more widely available, several technical issues limit the number of customers with access to the


\textsuperscript{18} See Memorandum from Carol W. Wilner, Director, Federal Government Relations, AT&T, to author, (Feb 5, 1999) (on file with \textit{Berkeley Technology Law Journal}) (providing maps depicting states with DSL and cable modem service).


\textsuperscript{20} See Wilner, supra note 18.


service: transmission over DSL lines is generally effective only for customers located a short distance, generally within about three miles, from a central switching office. Performance of DSL transmission declines with loop length, but also varies with condition of the loop and quality of equipment attached to the loop; older copper loops that have been patched and repaired over the decades will often have to be reconditioned before they are suitable for DSL transmission. Technological advances are starting to provide improvements, but for now DSL remains an option primarily in areas where loops are short and in good condition.

2. **Cable Network Solution: Cable Modems**

The hybrid fiber-coaxial plant of cable systems also has broadband capacity and can be configured for two-way, high-speed data service through the use of cable modems. As originally built, however, that pipe runs one-way, toward the consumer; to provide broadband service over the cable network, the plant must be upgraded to two-way capability for the more interactive applications of the Internet or for voice services. The investment for such upgrades is substantial, and by one estimate only about 15 percent of systems have been converted. But the natural high-speed capacity of cable systems, and the fact that cable is readily available to 98 percent of American households, make it a natural and, for residences, the leading broadband competitor.

Cable systems currently provide high-speed data services to about 300,000 customers, but are expanding aggressively. By the middle of 1998, cable modem service was available to some households in 44 states. Since 1995, $18 billion have been invested in cable upgrades, and it is predicted that cable modem service will be available to over 40 million households by 2000. AT&T's merger with Tele-Communications, Inc. ("TCI") is premised on upgrading TCI's cable sys-

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24. *See id.*
26. To be sure, the “upstream” channel away from the consumer need not be as big as the downstream channel, but some upstream capacity is necessary.
30. *See id.* (citing various analyst reports from the Yankee Group).
tems to serve up to 18 million customers with high-speed Internet access within the next few years. Recently, prices for cable modem service have fallen to about $40 per month excluding Internet access.

3. Wireless and Satellite Solutions

Finally, wireless solutions may also be just over the horizon. The wireless services that are likely to provide broadband data capability are not, however, the cellular telephone and personal communications service ("PCS") technologies with which most consumers are familiar. Even with digital conversion of the wireless telephone networks in the U.S. over the past several years, the data rates those systems support are less than the copper, landline network.

More promising for broadband purposes are land-based (as opposed to satellite), fixed wireless systems like multichannel multipoint distribution service ("MMDS") and local multipoint distribution service ("LMDS"). These systems use microwave transmission technology to send signals over a 30-70 kilometer radius. They have the advantage of low start-up costs and by 1997 there were 73 MMDS operators serving 1 million video customers in the United States. MMDS and LMDS systems have some drawbacks: they require line-of-sight transmission paths and are subject to interference—even from bad weather. MMDS is the more established of the two systems, and is estimated to pass over 30 million homes, although only about 1 million subscribe to MMDS video serv-

34. See ABE, supra note 25, at 343.
35. See id. at 347 (noting that in Los Angeles, a single MMDS antenna can reach upward of 4 million households, making the infrastructure investment less than $20 per residence in the coverage area).
36. See id. at 344.
Its ubiquity is promising, however, and could make MMDS an important broadband entrant if digital compression allows its capacity to increase and if interference and other technical issues can be resolved. LMDS is of much more recent vintage and, although capable of very high-bandwidth transmission, is not considered a near-term entrant into the residential broadband market.\footnote{39}

Finally, satellite services have entered the market and may, as they have in the video market,\footnote{40} prove a powerful competitor for broadband services. Few subscribers to date take advantage of the limited satellite offerings, like DirecPC, now available.\footnote{41} But given that satellite broadcasting, or “DBS” service, is moving towards having 15 million subscribers,\footnote{42} and that additional satellite systems have been licensed and are coming online, further offerings are likely in coming years.

Although wireless technologies will likely become more important players in broadband transmission, at present they lag behind other technologies. The most likely near-term solutions to the slow access speeds available to residential customers are those that make use of the landline telephone and cable networks. ISDN, DSL and cable modem services will thus likely see the fastest growth in the near future.


Right now, residential broadband is more promise than reality. Although broadband access is now available in most states, coverage within those states is limited. A recent study found high-speed services offered to selected customers in only 10 percent of counties, although those counties together contain 45 percent of the American population.\footnote{43} This suggests that advanced services are starting to spread to residents of densely populated areas, but rural customers will have a longer wait. Even if the promises of telephone carriers and cable systems are met, fewer than half of American households will have broadband access in the next couple of

\footnotesize{38.} See Annual Assessment of the Status of Competition, supra note 37, para. 83.
\footnotesize{41.} See Les Freed & Frank J. Derfler, Jr., Hughes Network Systems’ Direct PC Internet access via satellite, PC MAGAZINE, Apr. 20, 1999, at 160.
\footnotesize{42.} See Annual Assessment of the Status of Competition, supra note 37, para. 62.
years. But substantial investment is being made in expanding such offerings, and greater availability is inevitable. The two unknown variables are price and speed of deployment.

The best current prices for residential customers are, as indicated above, about $50 per month for a package of DSL or cable modem service and Internet access. Whether this will be considered affordable by the majority of Internet users is unclear. While the price seems high for those living on the median U.S. family income of about $30,000, other communications services such as cable television subscription have proven to be fairly insensitive to income. Broadband access for Internet service might follow a similar pattern, especially if economically bundled with video and voice telephone service. But the economic structure of broadband demand is as yet unknown.

It is very likely, however, that lower prices will substantially increase the spread of broadband subscribership. Indeed, future new purchasers of Internet access may be increasingly cost conscious. The available data indicate that average income of Internet users is declining. In 1995, the average household income of an Internet user was over $50,000. The latest Pew Center survey shows that the fastest growing groups of new Internet users are those with much lower income and educational levels than in the past. The survey finds that 23 percent of new users have annual household incomes below $30,000 and that 39 percent of new users never attended college. This is a healthy development, but it also suggests that, over time, customers will be increasingly hard to attract at a given access price. So, for purposes of the growth of e-commerce, the price premium for speed will have to be low enough to reach customers farther down the demand curve for Internet access.

47. See id.
From the perspective of electronic commerce, the challenge for the broadband market is to meet the growth targets announced by carriers, and to do so at prices that not only allow the carriers to make the required return on investment, but also make broadband subscription attractive to a large number of households. As discussed below, the benefits to electronic commerce from such deployment are likely to be substantial for both buyers and sellers.

II. THE IMPORTANCE OF BROADBAND CONNECTIONS FOR E-COMMERCE

The convenience and novelty of online shopping has sparked rapid growth in the volume of electronic commerce. Recent estimates of retail sales over the Internet in the United States range from $8 billion to $13 billion for 1998, up from $3 billion in 1997, and there seems little reason to believe the market will develop at a slower rate in the near future. Eight million Americans are estimated to have made online purchases this past holiday season. Established Internet businesses are becoming more user-friendly and sophisticated, while new entrants are coming (and going) at a rapid pace. “Infomediaries” that help consumers to search and sort online businesses have entered the market. And existing infrastructure is, for the moment, supporting substantial growth in the online marketplace. The real question is not whether there will be growth, but what trajectory it will follow. The ability of the telecommunications industry to provide fast and inexpensive pipes between online shoppers and Internet sites is an important factor in the answer.

A. The Consumers’ Perspective: Lowering Search Costs

Many factors other than the cost and capacity of telecommunications connections limit consumers’ demand for online transactions. Preferences for face-to-face interactions, privacy concerns about transmitting certain information electronically, and the inability to touch, try on, or tangibly compare certain products online constrain participation in electronic commerce—even among people who already use the Internet. Telecommunications technology can contribute to easing those constraints, but is only one of several relevant factors. Network infrastructure is more cen-

48. See, e.g., Sharon Linstedt, Santa Shops on the Web: $3.5 Billion in Online Sales Set This Season, THE BUFFALO NEWS, Dec. 20, 1998, at 14C.
trally relevant to the transaction costs of exchanges consumers do undertake electronically, as well as to the ability of online merchants to expand the range of transactions consumers are willing to engage in on the Internet.

Basic, copper telephone links generally allow data to be retrieved at a rate of about 56 kbps (at best). At that speed, still images download slowly and video displays can take prohibitive amounts of time. For example, to download a 3.5 minute video clip through a standard 56 kbps modem takes more than 20 minutes.\(^5\) Even with a fast ISDN line, which transmits at about 128 kbps, that clip takes 10 minutes to retrieve.\(^5\) Such time requirements restrict the ability and incentive of potential customers to retrieve useful or necessary product information and reduce the number of transactions for which they are willing to spend the necessary time on the Internet. Even if they are willing to retrieve slow-loading visual images from one or two sites, their ability to browse new sites and compare price and product offerings among online merchants is limited. Frustrated with the effort, some users will either buy from an established online seller, or buy the item at issue on their next trip to the (real) mall, as the world will not soon dispense with the necessity of some conventional shopping no matter how fast e-commerce expands.

At faster speeds, consumers will obviously be able to explore more sites and, perhaps more importantly, to obtain higher quality information about products—such as video and voice descriptions, and interactive responses—without prohibitive delay. A customer connected to the Internet through a 4 Mbps cable modem can download the above-mentioned 3.5 minute video in mere 20 seconds, making shorter product videos almost instantaneously viewable.\(^5\) And even the more modest 384 kbps DSL service becoming available in some areas would speed the download time to under 4 minutes.\(^5\) With such connections, which allow access to more enhanced, interactive information, Internet users will likely engage not just in more transactions, but in more kinds of transactions as well.

**B. The Sellers' Perspective: Reducing Barriers to Entry**

Slow infrastructure speeds are also an impediment to sellers, particularly to new entrants into established lines of electronic commerce. A


\(^5\) See id.

\(^5\) See id.

\(^5\) See id.
customer with limited time can browse a certain number of sites turned up by a search. If speeds now available to most households stay the same, the fact that more relevant sites come online will not proportionally increase the number the customer can visit, but instead shift and divide customers among sites.

To illustrate the dimensions of the problem, consider the explosive growth of Internet resources. Five years ago there were a couple million Internet “hosts”—computers that store sources of information on the Internet—in the United States.\(^\text{54}\) By 1998, more than 35 million Internet hosts were active world-wide, up from 20 million only six months earlier, and from fewer than 3 million in 1993.\(^\text{55}\) In 1993, there was roughly one Internet host in the United States for every 200 Americans.\(^\text{56}\) By 1997, the ratio had changed ten-fold, to 1 host for every 20 people—about one Internet host for every four American adults who use the Internet.\(^\text{57}\) Assuming that access speeds and time spent online by individuals has grown less quickly than the number of sources available on the Internet—which is certainly the case—the increase in hosts means a user will search a decreasing proportion of sites relevant for a particular transaction.

Competition among sites will bring consumers some benefits even if they cannot browse more sites per online session than they do now. The market does most of the work for them; prices will decline at the store one does go to because of competition from the store one has never shopped, but which other consumers patronize. New online marketplaces and sophisticated search tools that help consumers comparison shop make the market more effective at communicating prices. But a proliferation of new sites, without a significant increase in access speed, still means that a decreasing proportion of potential consumers may ever connect to any individual site, never mind choose to purchase from it.

The problem for the e-commerce market overall is that, at some point, the customer base divides sufficiently that retail entry becomes a poor prospect. In an environment where few purely online businesses are yet turning a profit, impediments to entry may have a non-trivial effect on the growth rate of electronic commerce. Several commentators suggest that it may already be too late for new entrants into the online market to succeed,

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54. See PROGRESSIVE POL’Y INST., supra note 45, at 30.
55. See id.
56. See id.
57. See id.
and that at very least there will be a very high failure rate for new ven-
tures. 58

Faster, cheaper Internet access will do three things to make entry into
the electronic marketplace more attractive for online businesses. First, it
will allow consumers to compare more sites in the time they allocate to
online shopping, thus expanding the addressable market for competing
businesses. Second, it will likely increase the number of transactions con-
sumers choose to complete electronically by making them easier and more
convenient when compared to alternative, non-electronic means. And
third, broadband connections will help Internet businesses to expand the
types of transactions consumers are willing to make online by supporting
real-time interactive capabilities as well as voice, video, and other displays
that increase the tangibility of products and services being examined elec-
tronically.

There are certainly ways to improve Internet applications, and e-
commerce in particular, without changing telecommunications infrastruc-
ture. "Accelerator" programs are now available that will, while down-
loading information from a site, simultaneously load all sites linked to that
site and speed return trips to sites already
visited. 59 Shopping portals, sites
that act as digital malls by organizing products or merchants into easily
searched categories and allowing transactions to be paid for together at the
portal's own "cash register," are convenient for buyers and provide sellers
with a ready-made market. 60 These sites potentially cut search and trans-
action times. But in the end, infrastructure will still limit the speed with
which sellers can be reached by potential customers.

Speed is particularly important to new entrants or to established sites
that wish to launch new product offerings. Observers have already noted
the phenomenon—called by one commentator the "killer click"—by
which consumers' simple, initial choices have a long-term effect on com-
petition in the online marketplace. 61 This form of inertia, or perhaps path
dependency, through which a bookmarked site becomes the default for the

58. See Bob Tedeschi, Can Shopping Networks Survive a Crowded Market?, N.Y.
commerce/19commerce.html> (citing various analyst comments and predictions).
(evaluating the performance of one accelerator program).
60. Examples are Yahoo's shopping area, 911gifts.com, and CyberShop. See, e.g.,
Tedeschi, supra note 58.
61. See George F. Colony, My View: Killer Clicks (visited Mar. 2, 1999)
<http://www.forrester.com/ER/Marketing/0,1053,61,01.html>.
product or service at issue, is reinforced to the extent consumers find the potential benefits of competitors not worth the inconvenience of additional search time. To overcome the advantages that established online merchants have by virtue of their installed presence on consumer screens, new entrants into electronic commerce must first attract, and then hold, the attention of potential buyers.

The first can be accomplished through advertising, both on the web and in other media. Web advertising expenditures totaled about $2 billion in 1998, more than double the level of 1997. The second—holding the customer—can be more difficult, especially if bandwidth is a constraint. A buyer might log onto a new, online bookseller out of curiosity. But if exploring the site is slow, although no slower than the customer’s bookmarked site, the customer is more likely to lose interest and revert to her familiar default site. If access is fast, however, the new entrant is more likely to be able to communicate the potential advantages of its site to the passing shopper and more likely to capture market share.

C. The Advantages of Broadband and the Challenge for Telecommunications

The commercial advantages of access speed make clear that the broadband deployment discussed in Part I will help the growth and competitiveness of electronic commerce. The fast growth of Internet usage will, of course, help e-commerce and other applications to grow regardless of data transmission rates. Between 1995 and 1997, the number of adults in the United States who used the Internet grew from about 14.3 million to over 41 million, or about one in five adults. The latest Pew Center survey finds that the total number of American Internet users today is about 74 million. But the growth from this increased usage will be all the greater with more widespread broadband deployment.

Given the importance for buyers and sellers of making advanced services rapidly and affordably available, regulatory and policy initiatives that can affect the path of such deployment are important for electronic commerce. The Federal Communications Commission (“FCC”) is currently holding proceedings, pursuant to petitions filed under the Telecommuni-

62. See THE YANKEE GROUP, TVs, PCs, AND BEYOND: CONVERGENCE OR CONFUSION? (Dec. 1998).
63. See PROGRESSIVE POL’Y INST., supra note 45, at 31.
64. See Pew Research Center, supra note 47.
cations Act of 1996 ("the Act"), that could potentially affect both the price and availability of residential broadband services in the coming years. The next section describes the proceedings and some potential concerns that those proceedings raise for electronic commerce.

III. REGULATION OF BROADBAND SERVICES AND IMPLICATIONS FOR E-COMMERCE

The above discussion of the broadband market shows that an enormous consumer market is yet to be served, several competitors are moving to serve it, and substantial benefits for e-commerce will result from such service. The questions that remain are the time frame, price and market conditions on which households will be able to purchase high-speed Internet access. The answers probably depend in large part on technological innovation, evolution of consumer demand, and the expanding range of services obtainable through broadband connections. But the answers will also be affected by regulation. The FCC is currently deciding how it will regulate broadband service offerings by telephone companies, with the stated goals of "encouraging the rapid deployment of new telecommunications technologies" and "facilitat[ing] the ability of competing carriers to offer advanced services on equal footing with incumbent carriers and their affiliates."  

This section will examine why the FCC's advanced services proceedings, despite having goals consonant with those of the electronic commerce industry, may lead to less rapid roll out than the unregulated market would provide. The explanations lie partly in the Act itself, and partly in the choice between preserving competition and allowing carriers to take full advantage of economies of scope that could potentially speed deployment through lower prices for consumers.

A. Background of the Advanced Services Proceedings

After the 1984 divestiture of AT&T, which broke up the integrated Bell System monopoly into a long distance company and seven separate,
local telephone companies,\textsuperscript{68} local telephone service remained a franchise monopoly throughout the United States. The regional "baby bells" and GTE were, and remain, the largest local service providers, while over one thousand independent companies serve small, primarily rural, territories.\textsuperscript{69} The regulatory barriers to entry into the local market were substantial and, for the most part, within the jurisdiction of state utilities commissions. Regulators have advanced a variety of justifications for exclusive local franchises: the economics of "natural monopoly," preserving cross-subsidies that support universal service goals, and ensuring timely network upgrades and extensions. Competition was eventually allowed in the provision of "enhanced services," like voice mail, but not generally in switched, local voice service.

The Telecommunications Act of 1996 radically changed that regulatory environment by preempting and prohibiting regulations that protect monopoly franchises for local telephone service.\textsuperscript{70} The Act thus dismantled a legal and administrative structure that had evolved over decades and replaced it with the rule that local competition must be permitted. Moreover, the Act pushed this principle beyond the regulatory agencies to the incumbent local service monopolies themselves: it requires them to allow new competitors to interconnect\textsuperscript{71} to their networks and to lease elements of those networks necessary for the competitor to provide competing service, and to allow them to do so at cost.\textsuperscript{72} High-speed data service competitors have invested heavily in facilities, and several competitive DSL providers have entered multiple markets in which they compete against each other, the incumbent carriers, and cable modem providers. New DSL entrants in particular have taken advantage of the 1996 Act to lease customer loops\textsuperscript{73} and rent space in the incumbent's central office

\begin{footnotesize}
\begin{itemize}
\item \textsuperscript{69} See U. S. Telephone Ass'n, USTA Fact Sheet (visited Apr. 5, 1999) \url{http://www.usta.org/ustafact.html}.
\item \textsuperscript{70} See 47 U.S.C. § 253 (Supp. II 1994).
\item \textsuperscript{71} Interconnection means exchange of traffic between networks. If a new company entered the market, but its customers could not call, or be called by, customers of the established local company (e.g., Pacific Bell), then no one would subscribe to the new company. Interconnection allows the new entrant to provide the same network benefit as the incumbent.
\item \textsuperscript{72} See 47 U.S.C. § 251 (Supp. II 1994).
\item \textsuperscript{73} The customer loop is the most important network element, and the one that is most difficult for a new entrant to construct for itself.
\end{itemize}
\end{footnotesize}
(often referred to as “collocation”) in order to offer their service to customers.\footnote{74}

B. The FCC’s Advanced Services Proceedings

The advanced services proceedings came about after several incumbent local carriers petitioned the FCC, pursuant to Section 706 of the 1996 Act, to allow them an exemption from the Act’s local competition requirements for the provision of advanced services like DSL.\footnote{75} In other words, they want to provide high-speed services without having to allow competitors access to the unbundled elements used for those services or to sell those services at wholesale to new entrants that want to resell them. The FCC has declined to extend the complete forbearance sought by the incumbents.\footnote{76} But the Commission is considering allowing the incumbents to choose between two alternatives. The first would allow incumbents to provide advanced services free of the resale and unbundling requirements of the 1996 Act, but only if they did so through separate subsidiaries that dealt at arms length, and on the identical terms as outsiders, with the parent company (a safeguard often called “structural separation”).\footnote{77} The second alternative would allow incumbents to provide advanced services directly, rather than through a subsidiary, but those advanced services and the facilities used to provide them would then be subject to the 1996 Act’s resale and unbundling provisions—which means competitors would have access to these services and facilities at wholesale rates on an equal and non-discriminatory basis.\footnote{78}

The rationale for the Commission’s proposals is to preserve access to the local advanced services market for new competitors. Competitive local exchange carriers already may have difficulty getting the facilities they need from the incumbents, and therefore in gaining access to some customers lines. The problem is exacerbated by the fact that incumbent local service providers offer DSL service themselves at the same time that they control inputs—notably loops and collocation space—needed by their DSL competitors. The FCC’s advanced services proceedings are designed

\footnote{74}{As discussed above, DSL technology uses special modems to transmit digital information over existing copper lines. “Collocation” allows competitors to place switching or other electronic equipment used to provide service over that loop in the Incumbent’s central office.}

\footnote{75}{See Advanced Services Notice, supra note 66, at para. 11.}

\footnote{76}{See id.}

\footnote{77}{See id.}

\footnote{78}{See id.}
to ensure that the incumbents do not discriminate against competitors in order to keep the broadband market for themselves.

C. The Regulatory Outlook: Increased Competition at the Cost of Cheaper Speed?

The FCC’s market-opening goals may bring about a variety of competitive benefits over time. But in the specific context of advanced services, there may be a tradeoff between those competitive benefits and economies of scale and scope that could help consumers in the near term. Incumbent firms might, in their own words, be “uniquely well positioned among common carriers to bring advanced services to the mass market.” 79 Indeed, under decades of operation as monopoly franchises, incumbent local carriers were able to construct extensive distribution networks serving the entire market, enabling them to realize scale economies and other advantages of incumbency that no other provider can yet match. Furthermore, the incumbents’ ubiquitous local networks give them a platform from which other services (such as DSL) can be offered at only incremental cost, allowing incumbents to exploit economies of scope in the provision of multiple services. 80

Such economies of scope and scale create the potential for consumers to be served quickly and at lower cost by incumbents than by new entrants. It may be true that the incumbents’ advantages stem from a history of regulatory protection and monopoly status, but that doesn’t mean that these advantages are any less beneficial for consumers or desirable from the standpoint of electronic commerce. Yet two underlying constraints in the Commission’s consideration of advanced services might prevent such efficiencies, assuming they exist, from being exploited by the incumbents, even if the incumbents face substantial competition in the advanced services market from cable or wireless companies.

The first constraint is rooted in the fact that under the Act, the FCC’s primary mandate is to open markets to competition. The purpose of the advanced services proceedings is accordingly to “propose measures to promote the deployment of advanced services in a competitive manner by both local exchange carriers and new entrants.” 81 Competing carriers must


80. See, e.g., id. at 16 (“The existence of extensive circuit-switched facilities will permit economies of scope in the roll-out of packet-switched technologies…”).

81. Advanced Services Notice, supra note 66, para. 4.
be able to provide advanced services on "equal footing" with incumbents. Any exploitation of economies of scale or scope by the incumbents, regardless of the potential benefits for consumers, may therefore be blocked to the extent those economies give the incumbent an advantage over new competitors. This might not be the wrong decision over time. The benefits of competition are well established: it provides incentives to reduce prices, develop innovations, and improve quality. Without competition, efficiency gains could be kept by carriers as profits instead of being passed through to consumers. And one could perhaps argue that the long-term benefits of opening the market will exceed the near-term benefits of existing economies of scope and scale.

But there is a second constraint underlying the current proceedings that might cause efficiencies to be traded away even where competition exists. In its Memorandum Order, the Commission limits its competitive analysis to "wireline, broadband telecommunications services." This limitation precludes the FCC from considering competition in the local market from non-telecommunications firms—namely cable providers.

Under the 1996 Act's definitions, cable is not a "telecommunications" service, and therefore does not factor into the FCC's analysis of whether the advanced services market is open to competition. The Act defines "telecommunications" as "transmission, between or among points specified by the user, of information of the user's choosing, without change in the form or content of the information as sent and received." This definition fits neatly with voice or data transmission between parties, for which "common carriers" like phone companies provide mere conduit. "Telecommunications" carriers neither choose nor alter content. Cable companies, by contrast, for the most part decide what will be transmitted over their networks. They choose and sell programming, not mere conduit, to customers. The 1984 Cable Act accordingly defines cable service as "one-way transmission to subscribers of (i) video programming, or (ii) other programming service," and establishes that cable providers are not

82. Id. para. 14.
83. Id. para. 3.
86. Id. § 522(6).
to be regulated as common carriers.  

The statutory definition of cable service now includes "subscriber interaction, if any, which is required for the selection of such video programming or other programming service." This definition has been interpreted to include Internet access.

As a result of the statutory definition of "telecommunications" services, the substantial rivalry that incumbent telephone companies might face from cable systems in providing residential broadband services will not be considered in the Commission's competitive assessment of the market for high-speed telecommunications. While such a constrained process might ensure there are more competitors in the broadband market, it does not ensure that there will be lower prices or even more vigorous competition. On one hand, the incumbents might be prevented from exploiting efficiencies that benefit consumers even though there is broadband competition from cable. On the other hand, cable providers will not face as strong competitive pressure from the incumbent phone companies if structural separation and non-discrimination obligations limit the incumbents' ability to reduce prices. This outcome, whereby consumer benefits are lost unnecessarily, is one that regulators and Congress should strive to avoid.

The FCC's discretion to consider the regulatory tradeoffs and to include cable or other non-"telecommunications" carriers in its analysis is limited by the Act. The Act's provisions on advanced services do include regulatory forbearance as a method the FCC can consider to promote broadband deployment, and moreover define advanced services "without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability."

Even if the Commission could read that definition to include cable or new wireless technologies, and to decide that forbearance would best achieve fast deployment of broadband capability, it is unlikely that section 706 ultimately supplies independent authority for it to suspend regulation. Forbearance is defined and specifically governed by section 401. And while section 401 gives the Commission some statutory discretion to forbear from regulating incumbent telecommunications carriers, it does so...
only where regulation is unnecessary to ensure nondiscriminatory behavior towards competing carriers.93 A finding that forbearance would serve the public interest and benefit consumers is necessary, but not sufficient under section 401, for the Commission to free incumbents from regulatory obligations.94 Structural separation or other regulation may thus be driven solely by the Act's antidiscrimination mandate, even if such discrimination would be irrelevant—or even beneficial to consumers.95

Although a full exploration of the possible statutory interpretations is beyond the scope of this essay, the foregoing analysis shows that using competition from cable or other non-"telecommunications" carriers as the basis for regulatory forbearance faces legal difficulties under the statute. Any remedy, if necessary, may in the end rest with Congress.

To make the case more concrete, consider the following example involving the joint provision of voice and high-speed data services over the same subscriber loop. Some DSL technologies can operate simultaneously with voice over the same line. Once a carrier is recovering its costs of operating that line from one service, the second service can be provided at incremental cost. As a general matter, however, most competitive data carriers entering the DSL market do not offer voice service, in part because the economics of voice delivery (which is subsidized for most residential customers) are very different from the economics of high speed data service. This puts new entrants at a potential disadvantage because a customer buying data service from the competitor must still, for the most part, buy voice service from the incumbent. Each charges a price that captures the line cost, so consumers pay for two lines. The incumbent, on the other hand, might be able to offer a lower total price when it provides both services itself: it can capture the line cost through one service and therefore be able to charge less for the second than if that service were purchased from a competitor on a stand-alone basis. Allowing firms to capture those economies, assuming they exist, could speed the deployment of advanced data services to residential customers.

To be sure, there may be debate over the existence and magnitude of scale and scope efficiencies. There may also be debate over whether those efficiencies need be lost as a result of regulation. But if economies of scope like the above do exist, then the FCC's two proposals for provision

93. See id. § 401(a)(1).
94. See id.
95. An additional hurdle is section 401(d), which prevents the Commission from forbearing until a carrier has "fully implemented" the Act's unbundling and interconnection requirements. See id. § 401(d).
of advanced services—either structural separation without unbundling obligations or no separation with unbundling obligations—may prevent economies of scope from being used by incumbents to underprice market entrants. This may be good for competitors, but not necessarily for consumers, at least in the short run. There may also be ways to overcome the competitive disadvantages that come from the incumbents’ network efficiencies without sacrificing the consumer benefits. Better collocation or joint marketing arrangements might be worked out that preserve scope and scale economies. But in the event they cannot be, regulators should be wary of sacrificing potential consumer benefits in the interests of preserving market entry. And policy makers should be especially hesitant to do so where, as in the broadband market, there is no natural monopoly and where a strong competitor exists that is not being factored into the regulatory analysis.

With cable, and perhaps eventually fixed wireless, in the market, incumbent telephone companies may be subject to competitive pressure to pass on efficiencies to consumers and invest in network innovation, regardless of whether there is competition on the residential telephone networks themselves. Of course, duopoly (or triopoly) may not be ideal for purposes of either allocative efficiency or innovation incentives when compared to more competitive market structures. But if the alternative to duopoly is regulation that encourages competitive entry by preventing exploitation of network efficiencies, then duopoly may be preferable. It may be best for consumers to let cable and telephone systems compete head-to-head, unregulated, in the broadband market. Whether such a policy

96. SBC contends that more than half the costs of structural separation (amounting to some $200 million) is attributable to the affiliate’s “[p]urchasing separate loops for data use only without the proper authorization (certification) . . . that would allow the affiliate to provide voice service as well as data service.” Ex Parte Presentation of SBC Communications Inc., in CC Docket No. 98-147, at 1 (Nov. 20, 1998) (on file with author). In other words, the principal cost of separation, in SBC’s view, stems from the fact that the affiliate cannot immediately offer voice and data services on an integrated basis.

97. It is also far from clear that competitors would be unable to survive in the event the incumbents exploited scale economies. This is especially so in the business services market, where product differentiation, an increased range of consumer options, and a different demand structure are likely to keep the market competitive.


99. Broadband regulation is at present asymmetric. Unlike incumbent telephone companies, cable companies do not have market-opening obligations under the 1996 Act, and the FCC has so far declined to consider separate “open access” requirements for ca-
would be wise depends on the substitutability of cable modem and DSL services and the relative cost structures for providing them. It also depends on an assessment of whether there are long-run benefits to competition within the DSL market itself that outweigh any scale and scope efficiencies from which consumers might benefit in the short run. The risk to consumers, and to electronic commerce, is that under the current statute it is difficult for policy makers to consider the foregoing questions in their regulatory analysis.

IV. CONCLUSION

Broadband deployment is increasing in the United States, and advanced telecommunications infrastructure is starting to become available to residential customers. Given the advantages of high-speed Internet access for electronic commerce, this is good news for online shoppers and merchants alike. Regulation of advanced services may, however, affect the speed of residential broadband deployment and the prices for such services in the short run. This essay does not try to resolve current regulatory questions about the proper competitive rules for the advanced services market. But it has tried to identify some important constraints underlying current proceedings, and to suggest that policy makers should be cautious not to let those constraints harm consumers, slow the expansion of affordable broadband services, or keep electronic commerce from reaching its potential rate of growth.

ble companies that enter the broadband services market. See Federal Communications Commission, Citing Pro-Competitive Benefits to Consumers, Commission Approves AT&T-TCI Merger, CS 99-2 (Feb. 17, 1999). There is intuitive appeal to the argument that if providers of one major broadband technology (cable modem) are not regulated, nor should the providers of the competing (DSL) technology be. For an argument supporting disparate regulation of cable and telephone systems in the broadband market, see Speta, supra note 23, at 58-80. Whether asymmetric regulation is warranted depends on a variety of factors, including the costs of regulation and the extent to which the disparately regulated carriers compete with each other.