PUTTING BROADBAND ON HIGH SPEED

New public policies to encourage rapid deployment

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Executive Summary

Many industry experts agree that investments in high-speed Internet services are not taking place as fast as they should be and that public policy needs to create incentives for speeding investment in this area.[1] The lack of high-speed Internet service deployment is an issue that is receiving considerable attention at the Federal Communications Commission (FCC) and in Congress.[2]

In order to evaluate public policies that would speed deployment of broadband services, it is important to analyze the market convergence that is under way, the extent of high-speed service regulations and how they affect deployment, and concerns with market structure for these services.[3] Based on this analysis, we propose public policy changes and evaluate how these changes would speed deployment while protecting consumers. The major findings in this report are as follows:

- Cable television, wired telecommunications, and wireless telecommunications – once distinct industries – have converged into an information sector that now provides high-speed Internet services to consumers. However, regulations have not kept pace with this industry convergence, leading to *asymmetric regulation*, a situation where similar high-speed services are subject to dissimilar regulations. For example, cable modem services are generally free of regulations, while digital subscriber line (DSL) services face intrusive regulations, but only if these services are provided by incumbent local exchange carriers (ILECs).
- ILECs are discouraged from investing in high-speed services because of asymmetric regulations that require them to lease their network facilities to competitors at prices that do not fully recover costs. When businesses cannot recoup the costs of their investments, they are discouraged from investing, and consumers lose.
- Because of slow investment, DSL market penetration has fallen significantly behind that of cable modem services. In effect, asymmetric regulation has led to cable modem dominance and increased market concentration, which has reduced intermodal competition and increased anticompetitive risks to consumers.

Based on these findings, we propose a model of *symmetrical regulation*, one in which regulatory rules are reduced and equalized between the various broadband services. Symmetrical regulations would produce less risk to consumers and create substantial incentives for speeding broadband investments.

Some regulatory oversight, however, is needed in order to provide a minimum standard for open networks for Internet Services Providers (ISPs). In addition, because asymmetric regulation has promoted cable modem market concentration, mergers among these providers should be discouraged until regulatory symmetry has resulted in increased investment and intermodal competition.

The benefit of symmetric regulation is that it would encourage intermodal competition of broadband providers. This intermodal competition would speed benefits to consumers who would use these services to access bandwidth-intensive content and applications. One study predicts nearly $500 billion in benefits to consumers, including the creation of new services, such as telemedicine, worker training,

public services, services to the disabled, and public safety. Another study estimates that 1.2 million new jobs would be created if broadband services were fully deployed. Because information technology (IT) jobs pay, on average, 85% more than other jobs, building a nationwide broadband network could provide an important source of high-wage jobs for working families.

In summary, there does not appear to be any benefit for continuing asymmetric regulations on broadband services. These regulations have prevented intermodal competition, discouraged DSL investment, and led to cable modem dominance. Conversely, symmetrical regulation would heighten intermodal competition, increase investment, lower consumer prices, and provide safeguards to consumers.

Introduction

Over 80% of Americans have access to the Internet in some manner.[4] For consumers, most still use their telephone lines for dialup Internet access to news, electronic mail, entertainment, instant messaging, software downloads, shopping, and other online activities. As the Internet grows, however, so have consumer appetites for more bandwidth-intensive content, such as music, quick time video, software, and pictures. As **Figure A** demonstrates, the increase in bandwidth-intensive content has resulted in a 50% to 60% increase in downloading times for those consumers using dial-up Internet access. Waiting for computer screens to fill has resulted in $25 billion a year in lost e-commerce[5] and countless billions of dollars in lost time for consumers.

Broadband services would provide much needed relief to this congestion, if they were widely available. However, broadband services have not been ubiquitously deployed in the United States, and 45 million households have no selection among broadband providers.[6] Furthermore, only about 4% of consumers subscribe to broadband services, much of it at speeds well below what the technology is capable of delivering.[7]

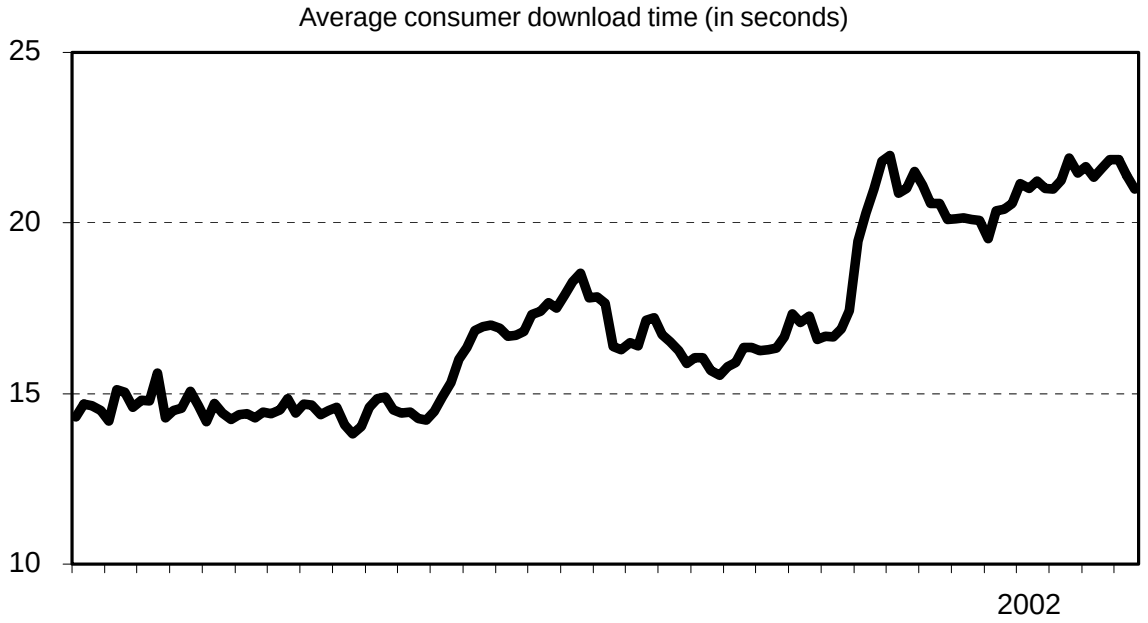
Coincident with the slow deployment of broadband services has been the financial turmoil affecting the IT sector over the last year. IT investment declined last year for the first time in decades, according to Department of Commerce data. In terms of job losses, half of layoffs announced last year were from corporations in the IT sector.[8] Despite talk of an economic recovery, the IT slowdown continues. The Internet-related economy has lost much of its luster, and IT stock prices, investment, and new orders for equipment have not rebounded.

Can speeding broadband investment provide a boost to the IT economy and stimulate economic growth? Can speeding broadband services eliminate Internet delays and congestion? If broadband is so promising, why then is broadband deployment in the U.S. falling behind that of South Korea, Canada, Hong Kong, and Germany?

To better understand why consumer broadband services are not being deployed as fast as they should be, this report will provide an empirical review of the broadband market, its structure, and regulations. We will provide a basis for determining how public policies can be changed to promote broadband deployment and improve consumer welfare. Before exploring the public policy considerations for promoting high-speed services, it is important to understand why services such as these are so important to consumers and the general health of the economy.

FIGURE A

Dial-up Internet services are getting slower



Source: Keynote Consumer 40, Internet Performance Index, as of April 6, 2002.

Importance of Broadband Deployment

Investment in the information technology sector has been inextricably linked to the overall health of the U.S. economy. According to a number of studies, IT investment is a significant factor in explaining increases in national productivity.[9] According to one study, IT accounted for nearly all of the productivity gains experienced in the economy since 1995, as well as a slowdown in inflation.[10] Another study estimated that IT capital investment accounted for 22% of the growth in gross domestic product.[11] Yet another study estimated that IT investment was responsible for two-fifths of the growth in total factor productivity and 68% of the accelerated growth in labor productivity.[12] Because the IT sector is so important to business productivity, consumer prosperity, and economic growth, the IT sector is becoming a linchpin to sustaining an increasingly service-oriented economy.

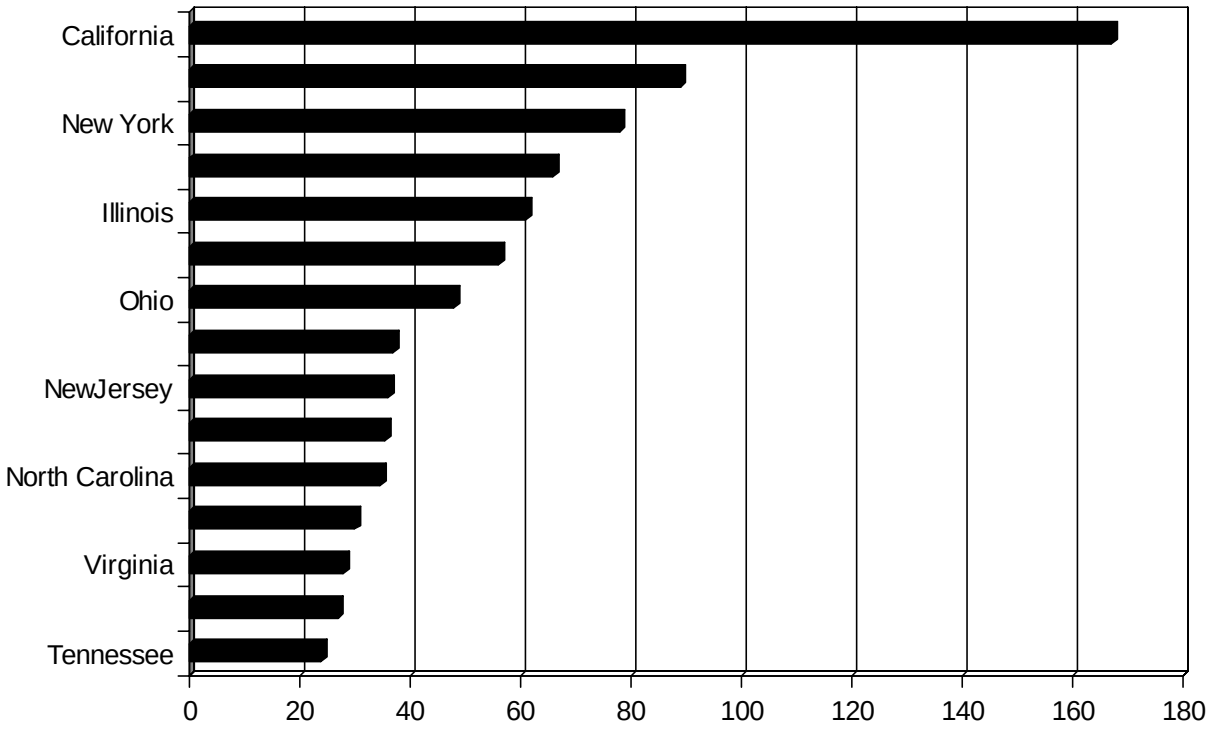
Increased broadband investments would be an effective boost to the economy. These investments would provide a platform for creating communications services, applications, software, entertainment, and other content too bandwidth consuming for most current users. The potential benefits to consumers would be significant. By one estimate, the benefits to the economy would be $500 billion if broadband services were universally available. These consumer benefits would come from broadband services and related household equipment, as well as benefits derived from entertainment, telemedicine, shopping, telecommuting, and telecommunications services.[13] A study by the Yankee Group predicted a $233 billion cost saving from high-speed services, assuming widespread broadband deployment.[14] Another study estimated that the Internet has led to improved efficiency and saved business and government operating expenses of $155 billion.[15]

Another recent study predicted that building a nationwide broadband network would create 1.2 million new and permanent jobs.[16] Because IT jobs pay on average 85% more than other jobs, the boost to working families would be considerable. The study predicted that nearly one-quarter million workers would be needed to build the network. In addition, the study estimated that nearly one million other jobs would result from the creation of services, applications, and content, in addition to many new jobs that would spillover into other industries. **Figure B** shows newly released data from that study and indicates that large job benefits would result once a nationwide broadband network was built. However, all of these studies assumed the widespread and ubiquitous deployment of broadband – a goal that remains well out of reach.

While not easy to quantify, the widespread deployment of broadband services would create many social benefits for consumers, including benefits from telemedicine, services for the disabled, rural economic development, public safety, job training, and distance learning.[17] In short, failure to encourage broadband investment is creating huge welfare losses for consumers. Indeed, if IT and broadband investments are inextricably linked to the health of the economy, then conversely one could reasonably conclude that slow broadband deployment would have a negative impact on economic growth. For this reason, it is important that public policies create incentives for speeding broadband investment into next generation infrastructure in order to increase benefits to consumers and stimulate economic growth.

FIGURE B

Potential job benefits from broadband deployment (in thousands of permanent jobs)



Source: "Building a Nationwide Broadband Network: Speeding Job Growth," *TeleNomic Research*, Feb. 25, 2002.

How to Assess Broadband — Markets and Public Policies

The urgency to speed broadband deployment has led to a number of important regulatory and legislative initiatives. Recently, the FCC completed a Cable Modem Notice Inquiry and issued a declaratory ruling. That ruling concluded that cable modem services are an interstate service and thus fall under the regulatory jurisdiction of the FCC. The FCC also concluded that cable modem services should be classified as an information service, and not as a telecommunications service. That conclusion spares cable modems from onerous telephone-like regulations, sometimes referred to as *common carrier regulations*.
In addition to this ruling, the FCC opened a number of other proceedings that question the degree of and need for broadband regulations. One is the Triennial Review that will revisit the extent to which ILECs must make their broadband investments available to competitors. Another proceeding will investigate whether ILECs are non-dominant providers in the broadband market, a finding that would justify ending DSL regulations. Still another proceeding will decide whether DSL services are an information service, which would subject the ILECs' DSL services to fewer regulations, much in the same way the cable modem declaratory ruling did.

In addition to these and other regulatory initiatives, the U.S. House of Representatives has passed and referred to the Senate legislation called the Internet Freedom and Broadband Deployment Act (H.R. 1542), which, if passed, would reduce regulations on ILECs and encourage DSL deployment. The Senate has its own initiative called the Broadband Regulatory Parity Act of 2002 (S. 2430), which calls for applying similar regulations on all high-speed services. All of these legislative and regulatory initiatives are focused on the goal of stimulating broadband deployment by improving outdated regulatory rules. Clearly, this is an important issue among policy makers.

In order to evaluate public policies that would speed deployment of broadband services, this report will analyze the market convergence that is under way, the extent of broadband regulations and how they effect deployment, and concerns with market structure. Based on this analysis, this report will propose public policy changes and evaluate how these changes would speed deployment, while protecting consumers.

Market Convergence

Cable television, wired telecommunications, radio telecommunications, Internet data services, and related communications industries have converged into a new "information sector."[18] These once distinct industries now are capable of transporting voice, data, and video information to consumers, albeit using dissimilar technologies. This market convergence brings with it an intermodal rivalry that has become an important aspect of competition.[19]

Today, high-speed data services are available to consumers from satellite networks, fixed wireless providers, telephone companies, and cable companies – all separate industries providing similar services. In short, the relevant market for high-speed Internet services has broadened,[20] and public policies need to be reevaluated based on this new definition of the market.

Cable companies provide cable modem services, ILECs provide most of the DSL services, and a variety of new wireless services on the way use satellite, fixed wireless, and third-generation mobile technologies.[21] These services provide speeds usually of several hundred kilobits per second, but the various technologies are capable of transporting data at several megabits per second. Residential customers are usually offered services that allow them to receive data at rates much faster than they can send data. The prices for these services range from about $35 to $100 per month plus installation and equipment. Cable modems tend to be the least expensive option for consumers.

In summary, once-distinct industries have now converged and are providing similar high-speed access to residential consumers.

Regulatory Divergence

Another question that needs to be addressed is whether regulatory changes have kept pace with developments in intermodal competition. While consumers buy services and not industries, regulations tend to be organized by industry and not service. For example, the FCC's Common Carrier Bureau (now called the Wireline Competition Bureau) regulates the wired telecommunications industry, the Wireless Communications Bureau regulates the radiotelephony industry, the Media Bureau regulates cable and satellite television, and the International Bureau regulates the remaining satellite industry. Because different bureaus tend to promulgate different regulatory rules, regulators have fallen into a trap. They regulate based on who provides the service and not whether the service needs regulation. FCC Chairman Michael K. Powell concedes this point:

> The convergence of industries, where advanced networks allow entities in traditionally distinct market segments to enter into each other's markets and into new similar markets, demands that we rationalize our regulatory regime to address these changes.[22]

As a result, regulations are not keeping pace with changes in the market, and similar services are subject to different regulations.[23] In order to evaluate the rationale behind these asymmetric regulations, an understanding of policies is needed.

Unbundling regulations

In order to spur competitive entry into the local telephone market, the Telecommunications Act of 1996 required that ILECs make their network facilities available to competitive local exchange carriers (CLECs) at wholesale prices. In setting these wholesale prices, state commissions required that the incumbent telephone company unbundle its network into various network elements – loop, port, transport, and switching elements – and offer these unbundled network elements (UNEs) at total element long-run incremental costs (TELRIC). In setting UNE prices, many state commissions relied on hypothetical bottoms-up cost models that assumed the deployment of the lowest-cost technology. These models typically excluded some overhead costs, ignored regulatory costs, overlooked actual and prudent investments, missed the recovery of embedded costs, and undervalued the risk of plant obsolescence. As a result, TELRIC prices have been systematically understated, which means that, in many cases, CLECs have been able to lease the ILECs' facilities cheaper than they could have been built.

There is strong empirical evidence that setting low UNE prices is affecting ILEC's recovery of network investment. One study looked at the effects on technical change and found that low TELRIC prices discouraged investment.[24] Another study calculated that TELRIC costs would need to be marked up 3.3 times in order to recover the ILECs' sunk costs and risks.[25] Yet another study showed that UNE prices were so low that ILECs could not survive solely as wholesale companies.[26] This finding was validated in subsequent studies, which concluded that UNE prices needed to be as much as doubled in order to encourage investment and innovation.[27] Another analysis compared UNE revenues to retail end-user revenues and concluded that UNEs give the ILECs only 42% of the revenue they would have

received from their retail operations.[28] In effect, it would take 20 years of productivity-based price reductions to reach the one-time effect of an immediate shift to TELRIC prices.[29]

By setting UNE prices so low, FCC and state regulators have attempted to encourage local telephone competition. However, while the telephone infrastructure has been built, a nationwide DSL network has not been built. As will be shown in the next section, applying the same financially punitive rules to DSL services as were applied to local telephone services discourages ILECs and CLECs from investing in broadband services.

Applying unbundling to DSL

Asymmetric regulation is a potential public policy problem for the high-speed services market. When the Internet was commercialized in 1995, cable television and ILECs raced to develop and test new high-speed data services for the mass market. At the time, cable modem and DSL were new services. However, regulators chose to apply onerous regulations on the ILECs' new data services, while cable modem services remained unregulated. **Figure C** illustrates the extent to which asymmetric regulation exists between the ILECs and cable operators.

One of those onerous rules was the requirement that ILECs make available unbundled DSL facilities to competitors at TELRIC prices. As previously explained, because these UNE prices were being set at very low levels, ILECs have been unable to recover their actual costs. As a result, unlike the telephone infrastructure, a nationwide broadband network has not been built. ILECs have been reluctant to deploy broadband networks because of this financial disincentive. However, infrastructure investments are necessary if customers are to have DSL services. This is particularly true given that achieving widespread coverage of DSL services requires pushing fiber cables and equipment as close to customers as possible. Without financial incentives to recoup these investments, the ILEC's DSL network would remain largely incomplete.

The extent to which the ILECs' network can be unbundled becomes another factor inhibiting investment. If an ILEC develops a differentiated service, it can, with regulatory concurrence, be unbundled and given away at TELRIC-based prices. Thus, ILECs have little incentive to extend, differentiate, and innovate their services. Instead of providing a means to vertically integrate and reduce production costs, open network regulations have inhibited these efficiencies and adversely affected rollout of services.[30] Thus, applying local telephone regulations to high-speed Internet services has had a detrimental effect on the deployment of DSL services.

The result of applying onerous regulations on broadband services is that UNE prices are being set too low.[31] Because of this financial penalty, ILECs see no financial reward for making risky investments into broadband services. As for entrants, they are being encouraged to avoid the risk of investment and, instead, use the ILECs' facilities.[32]

In summary, applying burdensome regulations to the ILECs' DSL services has made DSL an unattractive financial investment. This has lowered DSL supply, raised prices, and reduced output. Ironically, this is exactly what these regulations were designed to prevent.

FIGURE C

Regulations for cable operators vs. local exchange carriers

	Local exchange carriers	**Cable TV operators**
Number portability	Required	Not required
Unbundled access	Required	Not required
Interconnection	Required	Not required
Dialing parity	Required	Not required
Collocation	Required	Not required
Regulated depreciation	Prescribed	Not required
InterLATA services	Approval required	No required
Separate subsidiary requirement	Required for InterLATA, information, electronic publishing services	Not required

Source: This is a portion of a chart prepared by Roy Neel in his testimony before the House Telecommunications Subcommittee, May 25, 2000.

Line sharing

The failure of DSL services to take off has resulted in more regulations instead of fewer. Two years ago the FCC ordered line sharing, a practice that gives a competitor the right to offer high-speed services to the ILECs' telephone customer and pay the ILEC next to nothing for use of its facilities.[33] Considering that telephone investment costs average $2,311 per line,[34] it is easy to conclude that line sharing is a subsidy for competitors at the expense of the telephone network. For example, California's permanent line sharing rate of $2.92 per month is insufficient to cover the monthly interest payment for the incumbent's facility. Therefore, CLECs can use the ILECs' facilities contributing toward the investment. In other words, this subsidy undermines the basic infrastructure that consumers depend upon for universal service, because it encourages ILECs to disinvest. Alfred Kahn puts the effect on innovation and investment in this way:

> If rivals can share whatever ILEC facilities they ask for that can feasibly be provided, at TSLRIC-BS prices – with their mere asking satisfying the conditions for mandatory sharing set forth in the Telecommunications Act – it cannot but have a discouraging effect on their own initiative and innovation.[35]

Line sharing and unbundling have been referred to as a *reverse patent*.[36] Whereas a patent gives a creator exclusive ownership rights as a reward for innovations, unbundling requires the creator to give its

investments away at a loss. In this way, line sharing and unbundling encourages freeloading of private investment.

A similar problem of asymmetric regulation occurred when the ILECs wanted to enter the video market. Common carrier rules were applied to ILEC video services, including a sharing of video channels. These rules were applied despite the fact that ILECs were clearly a new entrant into the video market. Today, ILEC investments into video networks are trivial.[37] It is difficult to see how consumers benefited from limiting competition and discouraging the deployment of a video network. Interestingly, because the ILECs were using DSL technologies to carry video content, had the ILECs been more encouraged to enter the video market, a DSL network might exist today.

Symmetrical regulation spurs broadband investment

Because broadband investments are risky and involve substantial sunk costs, undermining the return on investment would reduce investment. As the previous section showed, unbundling and line sharing create financial disincentives to invest. Conversely, if unbundling and sharing were not required, investments would increase. That appears to be the case for cable modem services, where unbundling and sharing requirements are nonexistent. As **Figure D** indicates, by the end of last year there were twice as many cable modem subscribers as DSL subscribers, accounting for nearly 4 million more subscribers. Mounting empirical evidence supports the position that asymmetric regulations are not spurring DSL deployment.[38]

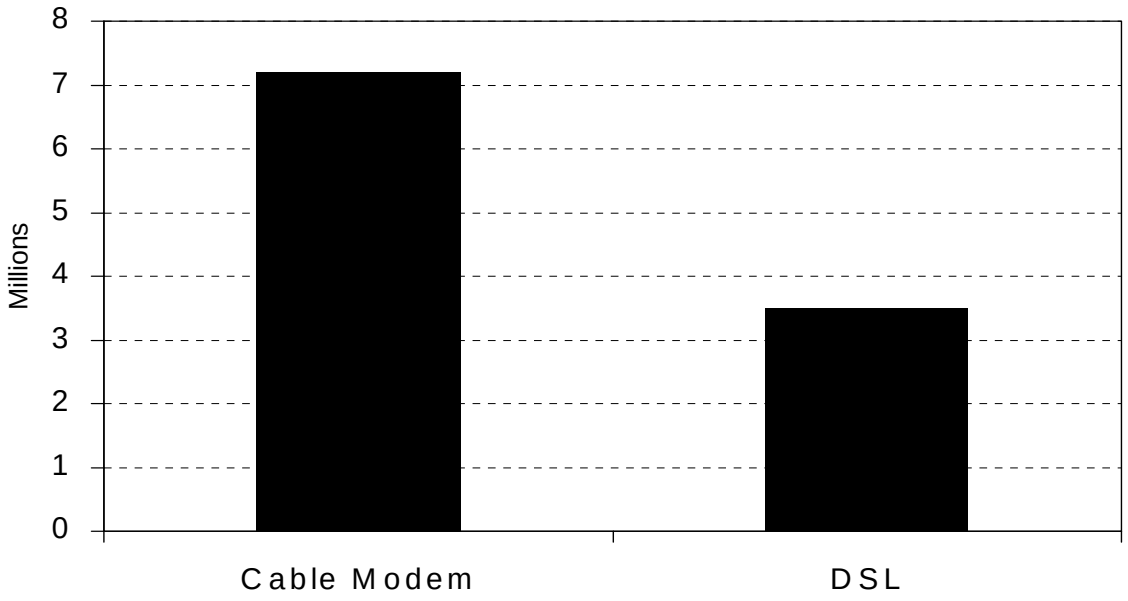
Wireless high-speed services may provide some relief in the race against cable modems and DSL for broadband deployment.[39] But penetration rates for these services have been slow, in part because wireless services were late in entering the market, and also because low UNE rates have attracted investment away from building wireless networks and into renting ILEC facilities. This trend has resulted in slow growth, which prevented customer equipment prices from falling sufficiently to improve the financial position of the wireless competitors. While cable companies appear to have benefited from asymmetric regulations, consumers have not.

Another way to see the effect of removing asymmetric regulations on broadband services is to look at South Korea, the country that leads the world in broadband deployment. South Korea does not use unbundling or line sharing to regulate broadband deployment and, as **Figure E** shows, it boasts six times more DSL subscribers than the U.S.[40] Furthermore, as the chart indicates, the surge in South Korea's DSL deployment did not come at the expense of cable modem sales, which are also more widely deployed than in the U.S..[41] This is an important point, and suggests that intermodal competition would lead to higher market penetration, and presumably with lower prices.

In summary, regulations on the ILECs have inhibited broadband investment and increased regulatory costs. Those factors have resulted in a decrease in supply, increase in prices, and a corresponding reduction in broadband subscribers.

FIGURE D

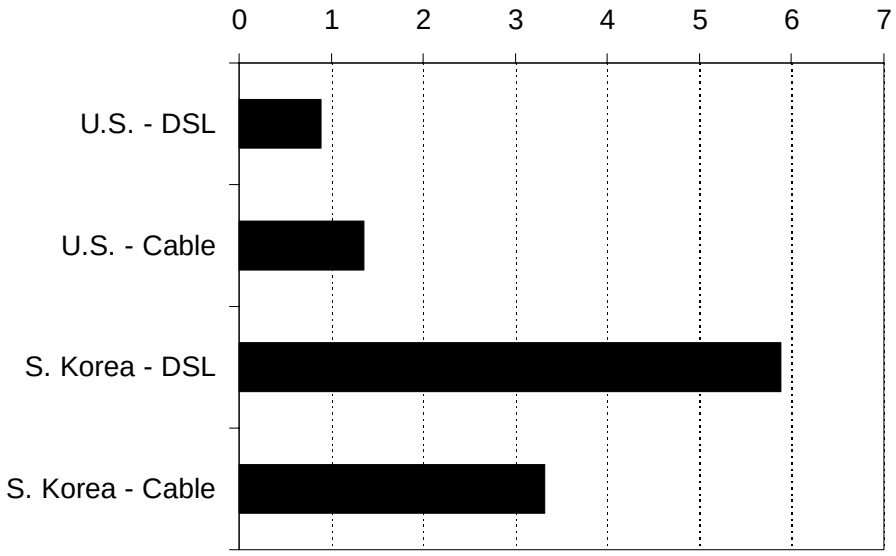
U.S. residential broadband Internet subscribers (as of 2001)



Source: Cable Datacom News, Kinetic Strategies, March 2002.

FIGURE E

South Korea deploys DSL without unbundling (broadband subscribers per 100 inhabitants)



Source: Cable Datacom News, Kinetic Strategies, March 2002.

Are Regulations Affecting Market Dominance in the High-Speed Services Market?

Regulations have reduced high-speed investments, particularly for DSL services, and the result is that incumbent local telephone companies are far from being the dominant force in high-speed services. As **Figure F** indicates, cable modem services are, by far, the dominant provider of high-speed Internet services, accounting for 64% to 75% of the market share for high-speed services to residential consumers.

FIGURE F

U.S. cable modem market share of high-speed lines

	Source	Publication Date	Market Share	HHI Index**
FCC -- Res. >200 kbps*	FCC.gov	2/2002	64%	4,094
Kinetic Strategies	KineticStrategies.com	3/2002	66%	4,377
FCC -- Res. >200 kbps*	FCC.gov	2/2002	74%	5,444
Eastern management	John Malone, EMG, ZDNet Commentary	6/2001	75%	5,625

* Denotes minimum speed in one and both directions, respectively.
Res. denotes residential market.

** Reflects the Herfindahl-Hirschman Index (HHI), a standard economic measure of industry concentration, of cable modem providers relative to the total market for high-speed lines. The table shows that, in every case, the HHI index exceeds a level of 1,800, which, according to the Horizontal Merger Guidelines of the Department of Justice and the Federal Trade Commission, represents a highly concentrated industry. Therefore, regulations are inhibiting DSL growth and unintentionally leading to cable dominance. The HHI is calculated by summing the squares of the percent market shares of each firm in the industry and multiplying the result by 10,000. If one hundred firms have a 1% percent market share, the resulting HHI would be one. If one firm has 100% market share (a monopoly), the resulting HHI would be 10,000.

The Case of Regulatory Symmetry

Although the empirical and anecdotal evidence concludes that asymmetric regulations are inhibiting broadband deployment, in order to evaluate the risks and benefits of ending asymmetric regulation, a model of symmetric regulations needs to be proposed and tested. To this end, the following public policies would help achieve regulatory symmetry:

- *End mandatory unbundling and sharing of high-speed facilities.* Broadband providers should not be required to unbundle their broadband investments, unless they voluntarily choose to do so. This should include ending unbundling of DSL investments (such as facilities at the remote terminal), fiber facilities, other high-speed technologies (such as passive optical networks, wireless facilities, or high-capacity circuits), or other new investments. This recommendation would create regulatory parity among broadband facility providers and encourage broadband investments.
- *Limit loop unbundling*. Because competitors are currently using ILEC facilities to provide DSL services, discontinuing immediate access to these leased facilities would cause a disruption of services to customers. Therefore, the ILECs should continue to lease these loop facilities to competitors on a sunset basis, which gives time for these competitors to build or move to alternative networks. However, during this sunset period, prices for these unbundled loops must fully contribute to the basic telephone network that consumers depend upon for universal service.
- *Provide a minimum standard for open networks*. Larger facility-based broadband (cable, DSL, and wireless) providers should have some minimal requirement of wholesaling broadband services to ISPs and nonfacility-based competitors. These agreements should be freely negotiated, as long as the terms and conditions are applied on a nondiscriminatory basis to all ISPs. This would prevent a price squeeze on ISPs, develop intermodal competition for ISP traffic, and reduce risks from market concentration. The presence of an ISP aggregator may be a useful way for smaller ISPs to participate in the broadband market.

Could symmetrical regulation speed broadband deployment? That was the conclusion of 43 economists in a recent statement to the FCC.[42] Moreover, as previously mentioned, legislative and regulatory initiatives revisiting broadband regulations are needed. In fact, legislation was recently passed in Oklahoma that prevents the state commission from regulating DSL services. Is it more than coincidence that just days after the bill passed, one ILEC announced it was increasing DSL investment into 62 towns in Oklahoma?[43]

This section has recommended a regulatory alternative, which would mitigate many of the problems that asymmetric regulations create. Increased deployment of high-speed services would be a great benefit to consumers. But does this model of regulatory symmetry pose any risks for consumers? That concern will be discussed in the next section.

Regulatory Symmetry: What Are the Risks?

Policy makers need to make sure that symmetrical regulations would not lead to higher broadband prices or concentrate the industry in a manner that would lead to market failure. As previously mentioned, because the ILECs are not dominant providers of DSL services, it is likely that making DSL services more competitive with cable modem services would benefit consumers. However, the concern that symmetrical regulation may create anti-competitive risks is a legitimate concern and should be analyzed in more detail.

Does symmetry hamper local telephone competition?

One concern is that moving to symmetrical regulation would jeopardize unbundling, which has become regulators' preferred tool for jumpstarting local telephone competition. While this report recommends that symmetrical regulations apply to broadband services, it makes no recommendation concerning local telephone services. Making broadband regulations uniform would not affect the rules governing local competition, and therefore would not affect local telephone prices. As this report has shown, the ILEC regulation of broadband services cannot be justified based on market dominance. The recommendation for regulatory parity is based on encouraging competition rather than protecting competitors.

Does symmetry increase price risks?

The major risk to consumers from instituting symmetrical regulations is that it may lead to increases in industry concentration, which would result in a dampening of competition or price collusion and higher consumer prices.

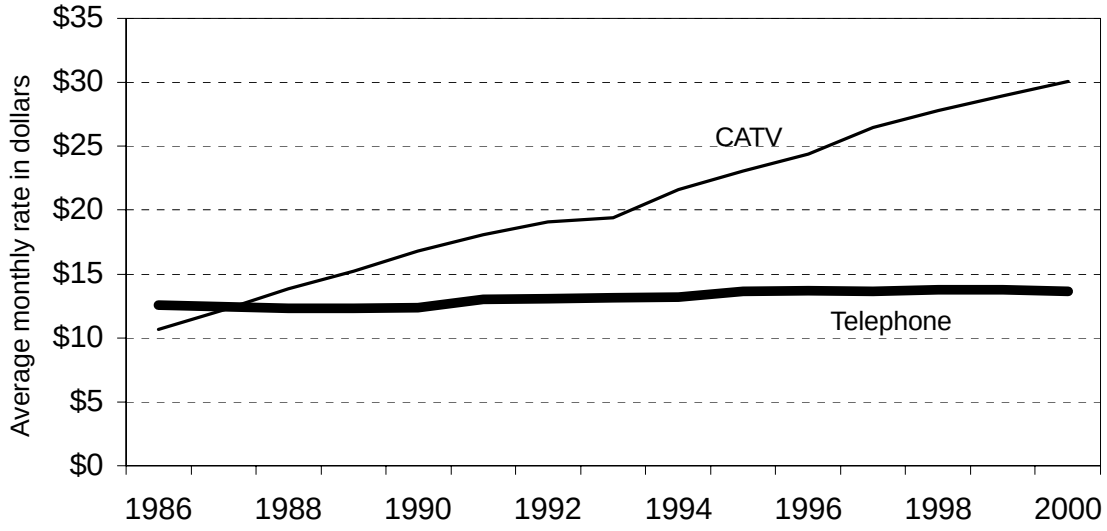
The risk that consumer DSL prices would increase appears remote when considering that the demand for broadband services is such that an increase in price would lead to a fall in subscribers and a decrease in total revenue. This is because the demand for broadband services is very price elastic. When demand is price elastic, the quantity demanded is very sensitive to changes in price, meaning that if prices go up by 1%, then subscriptions would drop by more than 1%. More generally, if a seller increases the price of an elastic service, the quantity demanded decreases and total revenue falls, and vise versa. In the end, there does not appear to be any risk of price increases.

Empirical evidence suggests that high-speed services are indeed price elastic. One study estimated that a 30% reduction in price would yield a 130% increase in subscribers.[44] This study agrees closely with the observations of noted futurist George Gilder, who predicted that a one-unit decrease in bandwidth price would produce a five-unit increase in demand.[45] Kridel, Rappoport, and Taylor, who estimated a demand equation using a large data set, also concluded that cable modem demand was price elastic.[46]

One interesting observation is that telephone services, unlike broadband services, tend to be very price inelastic – meaning that if prices increase, revenues would increase. This inelasticity is, in part, the historical justification for regulation. But that justification is absent in the case of broadband services. Broadband service is not a good candidate for regulation, since small increases in cost would have a more sizable affect on subscribership. Public policy needs to recognize this very important distinction. For this reason alone, high-speed services should not be treated as a telecommunications service.

FIGURE G

Basic cable TV rates have increased faster than basic residential local telephone rates



Source: *Statistical Abstract of United States: 2001*, Table 1144, and *Trends in Telephone Service*, FCC, August 2001, Table 14.1.

If regulatory relief leads to an increased supply of broadband services, broadband service prices would fall. Because broadband consumers are price sensitive, as previously explained, small decreases in price would lead to large increases in the quantity demanded. In other words, regulatory barriers may be restricting supply and keeping broadband prices too high for mass consumption. High prices may be one explanation for why broadband penetration has remained low even where broadband services have been offered.

In summary, there appears to be no risk that symmetrical regulation would lead to increased prices. In fact, if symmetrical regulation increases investment, then intermodal competition would increase and lead to lower DSL prices. The fact is that cable modems and DSL services are competitive substitutes for one another, and regulations need to encourage competition and investment. Ultimately, symmetric regulations would not pose additional price risks to consumers and may lead to more competition and lower consumers prices.

Are there risks from mergers?

Another risk that may be problematic is that asymmetric regulations have benefited cable modem operators and, as a result, promoted market concentration for those services. Concentration is not necessarily a problem if it leads to efficiencies and lower consumer prices, but the evidence suggests that, as the industry has concentrated, cable prices have increased. As **Figure G** shows, basic cable rates have increased much faster than basic local telephone services. According to data from the Bureau of Labor Statistics, consumer prices for cable television increased 80% since 1986, adjusted for inflation.[47] Therefore, the consumer benefits of the recent cable mergers have not been apparent.

In fact, increased concentration and higher prices have resulted in monopoly profits. Hazlett and Bittlingmayer compare the market value of cable networks to the cost of these networks and find that market values have increased to six times the level of costs.[48] They conclude that cable providers are earning monopoly profits and leveraging their dominance into the broadband services. The continuation of asymmetric regulation promotes this concentration and increases anticompetitive risks to consumers.

The recently proposed $72 billion merger of AT&T Broadband and Comcast Corporation highlights the concentration in the industry. If approved, this merger would place 61% of residential cable market in the control of just two companies – Comcast/AT&T and AOL Time Warner.[49] These companies already control considerable investments in cable, program content, and Internet services.

Symmetric regulation may help reduce these consumer risks by heightening intermodal competition. Until asymmetric regulations are completely removed and competitors have had an opportunity to increase investment, regulators should resist cable mergers of this magnitude. Only then would regulators be in a better position to assess the risks of these mergers for consumers. In summary, putting high-speed services on an equal competitive footing with cable modem services appears to reduce anti-competitive risks to consumers.

Are there risks to ISPs?

ISPs can be an attractive marketing channel for selling broadband services. For this reason, some ILECs have freely partnered with ISPs who sell their broadband services to consumers. However, some cable operators have been reluctant to open their cable modem networks to ISPs. Thus, as dial-up customers migrate to cable modem services, ISPs face reductions in online subscribers. For this reason, regulatory symmetry should include some minimal standard for open markets. This would help create intermodal competition for ISP traffic and create a natural market for wholesale services to develop.

Summary of Findings and Recommendations

Many experts agree that broadband deployment is developing too slowly. Policy makers recognize the importance of encouraging broadband investment and are exploring legislative and regulatory initiatives toward that end. An analysis of the current market conditions and regulations surrounding high-speed data services shows the following:

- Market convergence has led to intermodal competition. Cable companies, wireline telephone companies, and wireless companies all sell high-speed services to consumers.
- However, regulations are not keeping pace with market convergence. The result is that DSL deployment is being treated as any other regulated telephone service, despite the fact that DSL is not a dominant service.
- The application of telephone regulations, specifically unbundling and line sharing, has raised the cost of providing DSL services and has inhibited deployment by ILECs. Low UNE prices may be undercutting interest in wireless alternatives and driving competitors to renting, instead of building networks.
- Because cable modem services are not regulated, asymmetric regulations on DSL have caused it to fall four million subscribers behind cable modems. In South Korea, where there is no sharing and unbundling requirements, broadband service penetration, particularly for DSL service, far exceeds that in the U.S.

These findings clearly argue for a model of symmetrical regulation that limits intrusive unbundling requirements, while providing incentives for investment into high-speed services. Such a model would have to provide for some open market benefits to protect ISPs. The intent of symmetrical regulation is to heighten intermodal competition, speed broadband investment, and consequently drive consumer prices down. Because of the price elasticity of demand for broadband services, price competition would lead to sharp increases in broadband penetration rates. These higher penetration rates would create, in turn, huge consumer welfare benefits, high-paying technology jobs, improvements in the quality of life, and increases in business productivity. In short, speeding broadband deployment would provide an important stimulus to economic growth.

Appendix A:
Major types of broadband services

There are three types of high-speed Internet services being offered to residential consumers today: cable modem, digital subscriber line (DSL), and wireless advanced services, which include fixed wireless, satellite, and mobile services. To use the FCC definition, these services provide consumers with the ability to download information, such as data, pictures, and music, at speeds exceeding 200 kilobits per second (kbps), a substantial improvement over dial-up 56 kbps telephone modems.

Many of these services have speeds that are fast in only one direction, allowing consumers to receive information faster than they can send it. In general, residential services cost consumers between $40 and $100 per month, and usually require installation fees and customer equipment. **Table A-1** compares the three principle types of high-speed services in terms of speed and price.[50]

Cable modems are the most popular consumer high-speed service, accounting for about three of every four broadband subscribers. Cable modem service uses the existing cable television network and is a shared network, much like local area networks (LANs). While the service is capable of downloading information at speeds between 10 to 36 megabits per second (mbps), speeds seldom exceed one to two mbps. In fact, because it is a shared network, cable modem performance would slow when more customers send and receive information online. The main advantage of cable modem services is that, at about $40 per month, they can be cheaper than the total cost of dial-up Internet services and the cost of a second telephone line.

Unlike cable modem services, DSL service uses dedicated facilities and is not slowed by local congestion. But even so, speeds seldom reach the six mbps services offered by some carriers, for various reasons. DSL service works by boosting the speed of copper transmission in the telephone network's last mile. One major drawback is that DSL speeds decrease significantly as the distance between the customer and central office increase. In order for DSL speeds to improve, telephone companies need to extend fiber closer to customers, thereby reducing the length of the copper loop. However, these investments are proving elusive for reasons that are explained in this report. The price of DSL is typically $10 more than cable modem services, and most DSL services are provided by incumbent local telephone companies.

Wireless broadband offers yet another option for consumer high-speed services. One wireless broadband service uses satellites to transmit data. These services can be two-way or use a telephone line for uploading information. Either way, satellite is more expensive than cable modems and DSL services, but these services have easy reach to the more remote areas not yet reached by cable modems and DSL. The merger of Echostar and DirecTV would combine two high-speed data competitors.

Fixed wireless services such as LMDS (local multipoint distribution services) and MMDS (multichannel multipoint distribution services) have prices similar to DSL services and plenty of bandwidth. However, the prices of the customer equipment have remained too high and hurt the rollout of the service. In addition, because these are line-of-sight technologies, buildings and trees can limit market coverage and rain-fade can create outages. Recently approved by the FCC, multichannel video distribution and data services (MVDDS) may offer a low-cost terrestrial wireless multi-channel video and broadband Internet services, when deployed. Mobile wireless broadband services may be on the horizon using third-generation networks.

Appendix B:
How meaningful are high-speed service measurements?

Before assessing what public policies can encourage the deployment of broadband services, it is necessary to point out that there is some ambiguity concerning how to define broadband services. By one estimate, high-speed Internet services have penetrated 10% of the residential consumer market.[51] However, the actual penetration rate depends on how you define the market for broadband services. The FCC reports 9.6 million high-speed lines, defined as lines with speeds exceeding 200 kbps in at least one direction.[52] However, 38% of these lines could not reach 200 kbps in both directions. This example illustrates that the term "high-speed services" may include some services that are inadequate for both sending and receiving bandwidth-rich multimedia, and can include services that send (upload) files no faster than today's dial-up services.

If the definition of the high-speed service market included only services provided to residential consumers

FIGURE A-1

Common broadband services

Service	Typical speeds Sending / Receiving	Typical price*
Cable modem	+128 kbps / +700 kbps	$35-$45
DSL	+128 kpbs / 768 kbps	$40-$50
Satellite	+128 kbps / +400 kbps	$70
Fixed wireless	+256 kbps / 1-2 mbps	$50

* Actual figures vary by provider and service plan. Monthly prices do not include additional expenses for installation and equipment.

Sources: CNET.com and various service providers.

and small businesses, there would be only 4.3 million bi-directional high-speed lines in the market, or 44% of all high-speed lines, according to FCC data.[53] Given the fact that there are millions of small business customers and about 110 million households in the U.S., it can be argued that high-speed Internet services penetrate less than 4% of the market.

The fact is that consumers require much more than 200 kbps in order to transport bandwidth-intensive applications and content. Receiving broadcast quality video-on-demand can require speeds up to six mbps of bandwidth. If six megabits were the minimal criteria for broadband, high-speed Internet service penetration would be close to zero percent for consumers. That may seem high by today's standards unless one considers that passive fiber networks could let consumers receive traffic at rates of 622 mbps.

In summary, the standard by which high-speed services are measured is too low and tends to exaggerate the deployment of advanced services. From a public policy perspective, it may be just as important to encourage bandwidth competition as it is to encourage broadband penetration.

Appendix C: Asymmetric regulation's effects on video competition

The first DSL service did not begin with the commercialization of the Internet, but began earlier as a potential competitor to cable television services. However, ILECs never became a meaningful provider of video services because telephone regulations were applied to these new video services in much the same way they are now being applied to DSL services. Just as with DSL services, ILECs were required to share their video network with competitors. The result, not unlike what has happened in the DSL market, has had a chilling effect on the investment into bandwidth-rich video services.

In 1970, the FCC banned telephone companies from using their facilities to provide cable television-like services, called video dialtone (VDT), to consumers. The outright ban created a barrier to entry that protected existing cable television and broadcast television operators. The 1984 Cable Act codified the FCC's ban.

However, in 1992, the FCC reconsidered its ban, permitting telephone companies to transport video pro-

gramming, but prohibited them from providing the content or video programming themselves. Interestingly, the telephone companies dabbled with a new technology that sent bandwidth intensive video over existing copper lines. That service represented the first use of DSL technology. Because telephone companies did not have control over the selection of video content on their network and were subject to traditional common carrier regulation, they found themselves unable to compete head-to-head with cable companies that offered a full line of programming. As a result, VDT was never a viable commercial service. Indeed, for telephone companies seeking to provide video services, the regulatory approval process was daunting. According to former FCC Chief Economist Thomas Hazlett, "[t]he story of VDT is summarized by one statistic: 1.47. That is the ratio of VDT filings to VDT subscribers."[54]

For years, the telephone companies argued unsuccessfully that video transport alone was not a financially viable service, and that video services should not be subject to regulation because the market had changed and because telephone companies were not in a dominant position with respect to cable television competitors. In 1992, the Chesapeake and Potomac Telephone Company of Virginia challenged the constitutionality of the cable act's ban on video programming, when the city of Alexandria denied the company's request for a cable franchise. The company argued that the VDT rules banning local video programming were an unconstitutional denial of free speech. The Supreme Court agreed.[55]

Eliminating the programming ban, the Telecommunications Act of 1996 called for open video systems (OVS), where the carrier could control up to one-third of its channels while giving up at least two-thirds of its channels to other programmers. The idea was to require telephone companies to share their facilities with multiple video programmers and their video affiliates on a nondiscriminatory basis. However, this sharing model produced little success. Today, OVS is nowhere to be seen. By 1999, Bell Atlantic closed its only video franchise, ending a three-year experiment in Dover Township, N.J. Another telephone company, USWest, purchased cable properties instead of building a regulated video network. Several telephone companies sought joint marketing agreements with a satellite TV provider. In another instance, a telephone company, Ameritech, found it cheaper to over-build entirely new cable networks, rather than use its own telephone facilities to provide OVS. In other words, OVS became so costly, because of onerous regulations, that it never became a viable service for telephone companies wanting to offer video services to consumers.

Requiring telephone companies to provide at least two-thirds of their channels to independent video operators meant that, instead of adding one additional video provider to compete with the dominant cable television provider, each market had to sustain at least three new video operators. Without these new competitors, an OVS network could not operate at capacity and would never become financially viable. Where OVS would be deployed, telephone companies would bear the full risk of that investment, while competitive video programmers could pick and choose where it was most profitable to ride the network. Thus, competitors were advantaged and, because of sharing, ILECs were discouraged from investing in OVS.

The result was that investments into OVS did not happen, jobs were not created, and consumers did not benefit from competition and choice. If there is any lesson to be learned from these experiences, it is that heavy regulations should not be placed on non-dominant firms seeking to enter a new market. Cable companies, the dominant provider of video programming, were not required to open up their facilities to competitors. Regulation on the ILECs' DSL services appears to be having similar results, leading to a reduction in broadband investment and cable dominance.

Glossary

Asymmetric regulation – The application of different regulations to similar services.

Cable modem service – A high-speed Internet service usually offered by cable television operators using their cable television network.

Competitive local exchange carrier (CLEC) – The new competitors in the local telephone services markets. These new rivals are now challenging the incumbent local exchange carriers (ILECs)

Digital subscriber line (DSL) service – A high-speed service usually offered by CLECs, ILECs, and some ISPs. The residential consumer version of DSL is usually referred to as ADSL, a service that allows customers to receive data at a much higher rate than they can send it.

Herfindahl-Hirschman Index (HHI) – A standard economic measure of industrial concentration, calculated as the sum of the squared market shares for each firm in the industry. An HHI approaching zero suggests perfect competition, while an HHI of 10,000 signifies a pure monopoly. According to the Department of Justice and Federal Trade Commission merger guidelines, an HHI above 1,800 suggests a highly concentrated industry or market.

Incumbent local exchange carrier (ILEC) – These are the initial providers of local telephone services in a given market area. These providers are now being challenged by CLECs.

Internet service providers (ISPs) – Firms that provide businesses and consumers access to the Internet. Most ISPs offer dial-up access to the Internet and some offer high-speed services.

Price elastic – A condition where changes in a price of a good or service produce larger changes in the quantity demanded of that good or service. Quantity demanded is sensitive to price.

Price inelastic – A condition where changes in a price of a good or service produce smaller changes in the quantity demanded for the good or service. Quantity demanded is relatively insensitive to price.

Symmetric regulation – The application of similar regulations on similar services, without respect to how those services are delivered.

Total element long-run incremental cost (TELRIC) – The method used to calculate the network costs for unbundled network elements (UNEs). In theory, these costs are used to set the competitive wholesale prices that the ILEC charges CLECs for UNEs.

Unbundled network elements (UNEs) – The various network components used to provide a telecommunications service. These may include copper last mile (loop), central office call switching centers, and transport between switching centers and other components.

Endnotes

1. These views were expressed in "Building the Networked World," the Computer Systems Policy Project, Washington, D.C., 2002 (available at www.cspp.org) and "A National Imperative: Universal Availability of Broadband by 2010," The TechNet CEO Broadband Task Force, January 15, 2002 (available at www.technet.org).

2. In recent months, the FCC has opened five proceedings that deal with broadband, including the Triennial UNE Review Notice, Cable Modem NOI, the National Performance Measures NPRM, Broadband Notice, and the Incumbent LEC Broadband Notice. The U.S. House of Representatives passed legislation called *The Internet Freedom and Broadband Deployment Act* (H.R. 1542), and the U.S. Senate has its own initiative called *Broadband Regulatory Parity Act of 2002* (S. 2430).

3. The terms *broadband* and *high-speed data services* are used interchangeably in this study. A description of these services is available in Appendix A.

4. The figure includes Internet access from any location, according to *A Nation Online: How Americans Are Expanding Their Use of the Internet*, National Telecommunications and Information Administration (NTIA), Washington, D.C., Feb. 2002, p. 11, fig. 2.2.

5. "The Need for Speed II," Zona Market Bulletin, Issue 05, April 2001 (available at www.keynote.com).

6. This figure is probably much higher. A recent FCC report indicates that 42.5% of U.S. ZIP codes have either no broadband providers or only one broadband provider serving any portion of a ZIP code area. Because the report includes services to business, such as T1 and T3 services, this statistic overstates the availability to residential consumers. The report includes services that are modestly high-speed in only one direction, and does not require that an area have full coverage. *High-Speed Services for Internet Access: Subscribership as of June 30, 2001*, FCC, Feb. 2002.

7. There are varying estimates of broadband penetration. A discussion of broadband penetration measurement can be found in Appendix B.

8. This is based on the author's analysis of data from the Forbes Layoff Tracker at www.forbes.com.

9. Kevin J. Stiroh, "Investing in Information Technology: Productivity Payoffs for U.S. Industries," *Current Issues in Economics and Finance*, Federal Reserve Bank of New York, Vol. 7, No. 6, June 2001.

10. *Digital Economy 2002*, U.S. Department of Commerce, Economics, and Statistics Administration, Washington, D.C., pp. 38-40.

11. Dale W. Jorgenson, "Information Technology and the U.S. Economy, *American Economic Review*, Vol. 91, No. 1, March 2001, pp. 1-32.

12. Stephen D. Oliner and Daniel E. Sichel, "The resurgence of Growth in the Late 1990s: Is Information Technology the Story?" *Journal of Economic Perspectives*, Vol. 14, No. 4, Fall 2000, pp. 3-22.

13. Robert W. Crandall and Charles L. Jackson, "The $500 Billion Opportunity: The Potential Economic Benefit of Widespread Diffusion of Broadband Internet Access," Criterion Economics, L.L.C., Washington D.C., July 2001 (available at www.criterioneconomics.com).

14. "The Collaborative Commerce Value Statement: A $223 Billion Cost Savings Opportunity Over Six Years," *Module B-to-B Commerce & Applications*, Vol. 6, No. 6, Yankee Group, Boston Mass., June 14, 2001.

15. Based on a report conducted by Momentum Research Group, the University of California at Berkeley, and the Brookings Institution (see www.netimpactstudy.com).

16. Steve Pociask, "Building a Nationwide Broadband Network: Speeding Job Growth," TeleNomic Research, Sponsored by the New Millennium Research Council, Washington, D.C., Feb. 25, 2002. Available at www.technet.org.

17. Case studies can be found in *Advanced Services, Enhanced Lives*, Alliance for Public Technology (APT), Washington, D.C., www.apt.org. For other examples on benefits of broadband services to the disabled, see http://people.hofstra.edu/faculty/frank_g_bowe/bb/usedata.html.

18. The U.S. Office of Management and Budget U.S, in its 1997 revision of the 1987 Standard Industrial Classification, combined portions of what were once different industries into a new designation called the Information Sector.

19. This concept of redefining the industry was explored in a number of studies and articles, including Steve Pociask and Jack Rutner, "FCC's Antiquated Approach to Regulation Harms Consumers," *Legal Backgrounder*, Washington Legal Foundation, Washington D.C., Feb. 18, 2000, Vol. 15, No. 12; and *Deregulation and Consolidation of the Information Transport Sector: A Quantification of Economic Benefits to Consumers*, Joel Popkin and Co., Washington D.C., Sept. 29, 1999. This study draws on many of the themes from these and other earlier works.

20. Inter-industry competition (also referred to as intermodal competition) can provide the basis for expanding the definition of a relevant market, e.g., U.S. v. Continental Can Co., 378 U. S. 441 (1964).

21. A complete description of these services is provided in Appendix A.

22. Speech by Michael K. Powell, Broadband Technology Summit, U.S. Chamber of Commerce, Washington, D.C., April 30, 2002 (available at www.fcc.gov).

23. This is referred to as asymmetric regulations.

24. David M. Mandy, "TELRIC Pricing With Vintage Capital," Department of Economics, University of Missouri, Columbia, Mo., Dec. 16, 2001.

25. Jerry Hausman, "Valuing the Effect of Regulation on New Services in Telecommunications, " *Brookings Papers on Economic Activity: Microeconomics*, Brookings Institute, Washington, D.C., 1997, pp. 1-54.

26. Stephen Pociask, "Competition at Bargain Prices," published as "Two Degrees of Structural Separation," *America's Network*, Vol. 102, No. 24, Dec. 15, 1998, pp. 38-42.

27. Stephen Pociask "Structural Separation: Consequences for Michigan Consumers," TeleNomic Research, May 9, 2001; Stephen Pociask, "Structural Separation of BellSouth Telecommunications and Its Effects on Florida Consumers," TeleNomic Research, July 31, 2001; and Stephen Pociask, "Addition by Division: How Dividing-up Ameritech Indiana Would Add Costs and Harm Consumers," TeleNomic Research, May 14, 2001 (available at www.connectindiana.org/Telenomic%20Report2.pdf).

28. Randolph J. May and Larry F. Darby, FCC Comments of the Progress and Freedom Foundation, CC Docket No. 01-338, No. 96-98 and No. 98-147, p. 24.

29. Alfred Kahn, Timothy Tardiff, and Dennis Weisman, "The Telecommunications Act at Three Years: An Economic Evaluation of Its Implementation by the Federal Communications Commission," *Information Economics and Policy*, Vol. 11, 1999, pp. 330-32.

30. Thomas W. Hazlett, "Regulation and Vertical Integration in Broadband Access Supply," American Enterprise Institute-Brookings Joint Center for Regulatory Studies, forthcoming in Robert Crandall and James Alleman, eds. *Broadband Communications: Overcoming the Barriers.* Also presented at the American Enterprise Institute-Brookings Joint Center's Conference on Oct. 4-5, 2001, p. 12 and endnote 21 (available at www.manhattan-institute.org).

31. Bittlingmayer and Hazlett provide a survey of empirical literature that shows that these regulations have resulted in reductions in investment, delays in service, and consumer welfare losses. George Bittlingmayer and Thomas W. Hazlett, "Financial Effects of Broadband Regulation," forthcoming in Robert Crandall and James Alleman, eds. *Broadband Communications: Overcoming the Barriers*, AEI-Brookings Joint Center for Regulatory Studies, Washington, D.C., 2002 (also available at www.manhattan-institute.org).

32. New entrants are receiving what some economists refer to as *free options*, because they can lease facilities at prices below actual costs and avoid the risk of investing. This disincentive for investment is explained by Robert Crandall and Jerry Hausman in "Competition in the U.S., Telecommunications Services Four Years After the 1996 Act," Draft, March 30, 1999, p. 22 (available at www.criterioneconomics.com).

33. Some commissions have ruled that ILECs should not be compensated at all for line sharing.

34. Thomas W. Hazlett, *Regulation and Vertical Integration in Broadband Access Supply*. AEI-Brookings Join Center for Regulatory Studies Conference, "Broadband Communications: Overcoming the Barriers," Oct. 4-5, 2001, p.12.

35. Alfred E. Kahn, "Whom the Gods Would Destroy, or How Not to Regulate," AEI-Brookings Center for Regulatory Studies, Washington, D.C., May 2001, p. 22 (available at www.aei.brookings.org).

36. The term was used by Scott Cleland of the Precursor Group at "Broadband and the Markets: Perspective From the Investment Community," Cato Institute Policy Forum, Washington, D.C., July 24, 2001. The transcript for this forum is available at www.cato.org.

37. A discussion of this can be found in Appendix C.

38. J. Gregory Sidak, Robert W. Crandall, and Hal J. Singer "The Empirical Case Against Asymmetric Regulation of Broadband Internet Access," *Berkeley Technology Law Journal*, forthcoming 2002.

39. Appendix A briefly describes these wireless broadband services.

40. These figures are adjusted for the number of inhabitants and are for the year 2001. See "U.S. Falling Behind in DSL-Broadband Race," www.Point-topic.com, 2002. Similar data for the year 2000 is available from the ITU/OECD (see endnote 41). It should be noted that other factors explain some of the differences in DSL deployment between countries, such as demographic and housing characteristics.

41. This information was taken from an article on an ITU workshop called "Regulatory Implications of Broadband" at www.itu.int/journal/200106/e/html/broadband.htm. It should be noted that, while South Korea is an impressive case for broadband investment, it has not been a model for local telephone competition.

42. "Statement of 43 Economists on the Proper Regulatory Treatment of Broadband Internet Access Services," CC Docket No. 01-339, No. 01-337 and No. 02-33, May 3, 2002.

43. "Oklahoma: SW Bell to Expand DSL Coverage; Credits Broadband-Parity Law," *TR State News Wire*, Telecommunications Reports International, April 30, 2002.

44. "What Drives High-Speed Internet Services Home?" Parks Associates, News Release, Dallas, Texas, December 4, 1998 (www.parksassociates.com).

45. This is one of his "Twenty Laws of the Telecomm," see George Gilder, *Telecosm: How Infinite Bandwidth Will Revolutionize Our World*, Free Press, New York, N.Y., 2000.

46. Don Kridel, Paul Rappoport, and Lester Taylor, "The Demand for High-Speed Access to the Internet: The Case of Cable Modems," presented at the Thirteenth Biennial Conference of the International Telecommunications Society, Buenos Aires, Argentina, July 1-5, 2000.

47. After adjusting for inflation, consumer prices for cable television have increased 81% since 1986, while consumer prices for local telephone services have fallen by 22%, according to the U.S. Consumer Price Index for Urban Consumers, Bureau of Labor Statistics.

48. Thomas W. Hazlett and George Bittlingmayer, "The Political Economy of Cable Open Access," AEI-Brookings Joint Center for Regulatory Studies Working Paper 01-06, May 2001, pp. 4-6 (also available at www.manhattan-institute.org).

49. Based on calculations using data from Kinetic Strategies (www.cabledatacomnews.com).

50. Business high-speed services have been available for decades and include T-1 services that transport data at 1.4 mbps and T-3 services that transport data at 45 mbps. Because these services are only available to businesses and are not necessarily used for Internet access, they will not be discussed further in this report.

51. Based on estimates from Kinetic Strategies (www.cabledatacomnews.com).

52. *High-Speed Services for Internet Access: Subscribership as of June 30, 2001*, FCC, Feb. 2002, table 1.

53. The FCC's latest report includes T1 and T3 circuits, a dedicated service that has been around for decades and its use is not restricted to Internet access. Because it costs businesses thousands of dollars per month, it is not a viable option for consumers and is not addressed in this report.

54. Thomas W. Hazlett, "Economic and Political Consequences of the 1996 Telecommunications Act," AEI-Brookings Joint Center for Regulatory Studies, Working Paper 99-8, September 1999 (available at www.aei.brookings.org).

55. United States v. Chesapeake & Potomac Telephone Co., 116 S. Ct. 1036 (1996).