Before the
Federal Communications Commission
Washington, D. C. 20554

In the Matter of	**)**	
	)	**WC Docket No. 07-52**
Broadband Industry Practices	**)**	
	)	

COMMENTS OF THE CONSUMER FEDERATION OF AMERICA,

CONSUMERS UNION AND FREE PRESS

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SUMMARY

These comments by the Consumer Federation of America, Consumers Union, Free Press, the Media Access Project and U.S.Pirg focus on the overarching, fundamental principles that the Commission must apply to broadband communications in America. Those principles, not current business practices of broadband network owners, will decide whether we reclaim leadership in broadband communications, or continue to lag behind.

These comments demonstrate that the decision to abandon the principle of open communications networks after the Telecommunications Act of 1996 (the 1996 Act) resulted in a cozy duopoly of the telephone and cable companies that has failed to accomplish the most fundamental goals of the Telecommunications Act of 1996. In comparison to at least a dozen other nations, the closed proprietary networks of the cozy duopoly

- have failed "to make available to all people of the United States... adequate facilities at reasonable charges,"
- failed to “encourage the deployment on a reasonable and timely basis” of a two-way communications network, with advanced telecommunications capabilities, defined in § 706 as a “high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, graphics, and video telecommunication,” and.
- threatens the vibrant and competitive Internet that Congress sought to preserve in § 230 of the 1996 Act.

When congress passed the Telecommunication Act of 1996, virtually all Internet traffic originated by or delivered to the public traveled on telecommunications networks that were obligated to provide nondiscriminatory interconnection and carriage under Title II of the Communications Act. The U.S. was the global Internet leader by far. But the FCC abandoned the principles of nondiscrimination, first for broadband provided by cable companies, then for telephone companies.

In a little more than a decade later we have fallen far behind many other nations, when it comes to truly broadband communications that Congress envisioned in the 1996 Act. Compared to many other nations, most of which strengthened their commitment to open communications networks,

- Americans pay 10 to 20 times as much for far less service and
- the communications networks being deployed in American relegate the public to the role of passive listeners and restrict their opportunity as producers of content and speakers to fully utilize the immense functionality of broadband technologies in civic discourse.

The root cause of this failure is the abandonment of the commitment to open communications networks and the reliance on feeble competition between, at best, two closed

proprietary networks that possess and abuse market power. With inadequate competition and little public obligation, the cozy duopoly dribbles out capacity at high prices and restricts the uses of the network, chilling innovation in applications and services and causing a much lower rate of penetration of broadband in the U.S. than abroad.

The demonstrated failure of the cozy duopoly model to achieve the goals of the 1996 Act, the flawed theory of the benefits of discrimination, the clear initial signs of anti-competitive and anti-consumer practices, as well as the extremely dim prospects for vigorous competition in facilities, combine to create a very dismal future for broadband consumers in America. The only way to break out of this quagmire is to return to the success policies of open communications that made the Internet possible and allowed the U.S. to be the world leader in the first generation of the digital age.

The Comments begin in Part I, with a discussion of the broad impact of the communications revolution in the last quarter of the twentieth century and its relationship to the goals of the Telecommunications Act of 1996. Section I explores § 230 and § 706 of the 1996 Act. The Notice of Inquiry cites these two Sections of the 1996 Act as the authority on which the Notice rests, but fails to recognize the broad fundamental issues that should be addressed in this proceeding. Section II examines the issue of two-way communications, which is completely ignored in the Notice.

Part II presents a discussion of the historical roots and importance of open communications networks and the role that the principle of open communications played in the successful development of Internet access and its deployment in America. The crux of the discussion in Section III outlines how and why the nondiscrimination principle operating on open networks has been the cornerstone of the Internet's free market for speech and commerce. Section IV and Appendix A demonstrate that the obligation of non discrimination throughout U.S. history has been essential to the flow of commerce and ideas.

- The combination of open communications and the end-to-end principle of the Internet not only revolutionized communications, but also had a uniquely powerful impact on innovation across broad range of economic sectors.
- The very process of innovation was transformed by the decentralization of invention.

The harm of abandoning that principle is demonstrated in Part III (and Appendix B). . Three specific cases of failure are discussed – the decline of Internet services providers as a result of their foreclosure from the broadband Internet Access market (Section V), the decline of the U.S. in global broadband adoption (Section VI and Appendix C) and the failure of the U.S. to achieve the goals of making available ubiquitous broadband service at reasonable prices (Section VII).

The failure of the closed, proprietary, and cozy duopoly is evident in a multidimensional context as demonstrated in Sections VI and VII, as well as Appendix. This model has

- Failed to deliver *any* broadband services to substantial numbers of American households (around 9%, according to the GAO);
- Failed to deliver bandwidth with data transfer rates comparable to the broadband networks which are deployed in other industrialized nations.
- Failed across the board to deliver facilities that afford two-way communications at full broadband functionality and at reasonable prices.
- Where last-mile broadband networks are available, the prices charged for broadband are excessive, when compared with the price per megabit available in other industrialized nations;
- The target recipients of advanced broadband facilities, which are capable of providing bandwidth on par with the higher speeds available in other industrialized nations are households with high incomes, reflecting pricing practices which demand extremely high charges for access;

Part IV rebuts the theoretical arguments offered by network operators to divert attention from the negative impact of abandoning open communications as the foundation of communications policy. Sections VIII and IX, as well as Appendix D, show that the economic theory of "benign market power" used to justify discrimination is based on unreasonable assumptions that are contradicted by reality. Although the manifestations of discriminatory behavior in the marketplace remain constrained today because of regulatory uncertainty, merger requirements, and the threat of impending legislation to establish nondiscrimination, Section IX also shows that current business practices are already discriminatory, anti-competitive and anti-consumer.

- Packet management or traffic shaping practices that target specific applications, like video that competes with the incumbent network operator's TV and pay-per-view video products.

- Through their customer agreements, the network operators not only place severe restrictions on customer usage, but assert a disconcerting level of control over their customer's online service. These agreements assert the right to monitor all traffic and block or remove any traffic for a wide range of reasons, many of which have nothing to do with lawful content or network management.

- They also impose terms and conditions intended to lock consumers in with long periods, severe early termination fees, and penalties to switching services.

These are just the tip of the iceberg, in terms of discrimination and exclusion and will become much worse, if the FCC fails to enforce broad anti-discrimination principles.

It is time we made policy based on the facts on the ground, not the hype and promises of entrenched incumbents. Our fact-based discussion demonstrates that it is vitally important

to restore the principle of nondiscrimination on open communications networks. The Commission must recognize that a mere statement of policy is not enough to make the principles enforceable. The Comments recommend that the process of repairing the damage to our nation's communications network begin with a restatement of the four principles to include consumers and citizens as users and speakers on the broadband Internet.

> *To encourage broadband deployment and preserve and promote the open and interconnected nature of the Internet, the ability of Internet users to produce, distribute, and access the lawful Internet content of their choice and use applications and services of their choice shall not be impeded.*

The FCC should declare that these principles enforceable under Title II of the Act. The Supreme Court deferred to the FCC's expertise and authority in allowing it to abandon the obligation of nondiscrimination. If the agency has the discretion and authority to such a historic mistake, it certainly has the same discretion and authority to correct its error, when presented with such clear evidence of its failure.

It should further declare that exclusion and discrimination violate the principles by denying the user the ability "run applications and use services of their choice" and undermining "competition among network providers, applications and service providers, and content providers".

PART I:
BACKGROUND

The Consumer Federation of America,[1] Consumers Union,[2] Free Press,[3] the Media Access Project[4] and U. S. Public Interest Research Group[5] respectfully summit these comments in the above captioned Notice of Inquiry. These groups have been active participants in the policy process concerning telecommunications for over thirty years. Since the earliest days of the widespread commercial availability of the Internet, these groups have been vigorous proponents of open communications networks.[6] We deem this issue to be one of the most vital to our nation because it deeply affects a wide range of activities in society:

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[1] The Consumer Federation of America is an advocacy, research, education and service organization established in 1968. CFA has as its members some 300 nonprofit organizations from throughout the nation with a combined membership exceeding 50 million people. As an advocacy group, CFA works to advance pro-consumer policy on a variety of issues before Congress, the White House, federal and state regulatory agencies, state legislatures, and the courts.

[2] Consumers Union, the publisher of Consumer Reports®, is an independent, nonprofit testing and information organization serving only consumers. CU does advocacy work from four offices in New York, Washington, San Francisco, and Austin. CU's public policy staff addresses a broad range of telecommunications, media and other policy issues affecting consumers at the regional, national and international level. CU staff members frequently testify before Federal and state legislative and regulatory bodies and participate in rulemaking activities at the Commission and elsewhere.

[3] Free Press is a national nonpartisan organization working to increase informed public participation in crucial media policy debates, and to generate policies that will produce a more competitive and public interest-oriented media system with a strong nonprofit and non-commercial sector.

[4] Media Access Project (MAP), a non-profit, tax exempt, public interest telecommunications law firm, works to ensure that the electronic media and emerging technologies promote the first amendment goals of open civic discourse and a marketplace of ideas in order to safeguard democracy now and in the future. While technologies change, the importance of a well informed public and electorate does not.

[5] U.S. PIRG, the federation of state Public Interest Research Groups (PIRGs), takes on powerful interests on behalf of the American public, working to win concrete results for our health and our well-being. With a strong network of researchers, advocates, organizers and students in state capitols and population centers across the country, we stand up to powerful special interests on issues to promote clean air and water, protect open space, stop identity theft, fight political corruption, provide safe and affordable prescription drugs, and strengthen voting rights.

[6] Support for open communications networks in the Internet age has been a pillar of consumer group policy. See Cooper, Mark, *Expanding the Information Age for the 1990s: A Pragmatic Consumer View* (Washington: American Association of Retired Persons and Consumer Federation of America, January 11, 1990). This was the first in a series of reports that analyzed the effects of decentralized, open networks, prior to the dramatic commercial success of the Internet (see Cooper, Mark, *Developing the Information Age in the 1990s: A Pragmatic Consumer View* (Washington: Consumer Federation of America, June 8, 1992), "Delivering the Information Age Now," *Telecom Infrastructure: 1993*, Telecommunications Reports, 1993; *The Meaning of the Word Infrastructure* (Washington: Consumer Federation of America, June 30, 1994); Public Interest groups activity at the Commission has also been extensive, including the first petition to apply the principles of non-discrimination to cable modem service [Reply Comments of Center for Media Education, et al., Inquiry Concerning the Deployment of Advanced Telecommunications Capability to America Americans in a Reasonable and Timely Fashion,

- The quality of our democracy because of its impact on the ability of people to speak and participate in civic discourse,
- The national economy because of its impact on innovation, and
- The consumer because of its impact on commerce.

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and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, Federal Communications Commission, CC Docket No. 98-146, October 10, 1998; Petition to Deny Consumers Union, et al., Joint Application of AT&T Corporation and Tele-Communications Inc. for Approval of Transfer of Control of Commission Licenses and Authorizations, Federal Communications Commission, CS Docket No. 98-178, October 28, 199], as well as most subsequent proceedings as court cases [Consumer Federation of America, Texas Office of People's Counsel, and Consumers Union, "Reply Comments," before the Federal Communications Commission, *In The Matter of Deployment of Wireline Services Offering Advanced Telecommunications Capability, Etc.*, CC Docket Nos. 98-147, 98-11, 98-26, 98-32, 98-78, 98-91, CCB/CPD Docket No. 98-15, RM 9244, October 18, 1998. Comments of CU, *et al.*, *Inquiry Concerning High-Speed Access to the Internet over Cable and Other Facilities*, GEN Docket No. 00-185 (filed December 1, 2001); "Comments of Arizona Consumer Council, Center For Digital Democracy, Citizen Action of Illinois, Citizens Utility Board of Oregon, Consumer Action, The Consumer Federation of America, Consumers Union, Democratic Processes Center, Florida Consumer Action Network, Illinois PIRG, Massachusetts Consumer Coalition, Media Access Project, New Jersey Citizen Action, Texas Consumer Association, Texas Office of Public Utility Counsel, USAction," *In the Matter of Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, Universal Service Obligations of Broadband Providers, Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review – Review of Computer III and ONA Safeguards and Requirements*, Federal Communications Commission, CC Dockets Nos. 95-20, 98-10 (hereafter Wireline Proceeding), May 3, 2002; Reply Comments, July 1, 2002; "Comments of Texas Office of Public Utility Counsel, Consumer Federation of America, Consumers Union," *In the Matter of Inquiry Concerning High Speed Access to the Internet over Cable and Other Facilities*, Federal Communications Commission, GN Docket No. 96-262, December 12, 1999, January 12, 2000; "Comments of Texas Office of Consumer Counsel, Consumer Federation of America," *In the Matter of Inquiry Concerning High-Speed Access to the Internet over Cable and Other Facilities; Declaratory Ruling; Appropriate Regulatory Treatment for Broadband Access to the Internet over Cable Facilities*, Federal Communications Commission**,** GN Dockets Nos. 00-185, CS Dockets No. 02-52, March 15, 2002; "Comments and Reply Comments of The Consumer Federation of America, Texas Office of Public Utility Counsel, Consumers Union, and Center For Digital Democracy," *In the Matter of Review of the Section 251 Unbundling, Obligations of Incumbent Local Exchange Carriers, Implementation of the Local Competition Provisions of the Telecommunications Act of 1996, Deployment of Wireline Services Offering Advanced Telecommunications Capability*, Federal Communications Commission, CC Dockets Nos. 01-338, 96-98, 98-147, April 5, 2002; Reply Comments, July 1, 2002; "Brief For Respondents, States and Consumer Groups, California, Vermont, Consumer Federation of America and Consumers Union," *National Cable & Telecommunications Association, Et Al., Petitioner v. Brand X Internet Services, et al. Respondent, Federal Communications Commission and the United States of America v. Brand X Internet Services Et Al, Respondents*, February 22, 2005; "Amicus Curiae Brief of Citizens' Utility Board of Oregon, Consumer Action, Consumer Federation of America, The Utility Reform Network (TURN) and Utility Consumer Action Network," *AT&T v. Portland*, 216 F.3d 871 (9th Cir. 2000); "Opening Brief of Consumer Federation of America, Consumers Union and Center for Digital Democracy," *Brand X Internet Service, et al., v. Federal Communications Commission*, October 10, 2001].

I. VIBRANT COMPETITION AND UBIQUITOUS COMMUNICATIONS AT REASONABLE CHARGES

Open broadband communication platforms hold a special role in the "new" economy, as demonstrated in Section II and Appendix A. An open and accessible physical layer is critical to the value creation in the platform because it promotes a dynamic space for economic innovation, as discussed in Section III. However, the open architecture of the broadband communication platforms, while powerful, is fragile, as demonstrated in Section IV and Appendix B. Market power in the physical layer, especially in broadband access networks, can disrupt and undermine competition and innovation at higher levels of the platform. In the absence of competition to discipline market behavior, incumbent network owners will install themselves as gatekeepers to consumer access to content, applications, and services.

Arguments against the obligation of nondiscriminatory interconnection and carriage misread the history and incentives of owners of the physical facilities and they misunderstand the value and role of the broadband communications platform. This platform has the unique economic characteristic of being: 1) a bearer service that affects the ability of many industries to function, as all transportation and communications technologies do; and 2) a general purpose, cumulative, systemic, enabling technology that alters the fundamental way in which numerous industries conduct their business and create technological progress.

From the point of view of communications, the broadband network is also an essential vehicle for speech in the twenty-first century. With its new functionality, it carries the revolutionary, many-to-many characteristic of the Internet to new levels. It affords a much

more powerful means of expression for all who have access to it.[7] It is the post-office, the railroads, electricity, and the telephone rolled into one.

The empirical record shows that even oligopolistic competition for a critical infrastructure industry will leave far too much rent and control in the hands of the network owners. After repeated efforts by telecommunications facility owners to assert control over access to the Internet, it is hard to imagine they will adopt an open architecture of their own volition. The leverage they enjoy in a blocking technology and the interest they have in related product markets disposes them to maximize profits by maximizing proprietary control over the network. In so doing, they can reduce the competitive threat to their core services and gain advantages in new product markets. Facility owners demand a level of vertical control that creates uncertainty about future discrimination, the mere existence of which is sufficient to chill innovation.

We are all too familiar with the results of the gatekeeper model of mass communications. We have lived with it in broadcasting and cable for generations. In each case—radio, broadcast television, and cable television—it appeared that a disruptive technology of mass media had arrived to break the top-down control of the incumbent communications system. In each successive case, the new mass media form failed to decentralize control over the platform, permitting powerful gatekeepers to control access to content and services. The Internet must not duplicate this mistake. Its potential to revolutionize commerce and communications has already been glimpsed. Its remarkable success thus far has been built upon an open architecture, and only in recent years have we

[7] Yochai Benkler, *The Wealth of Networks* (2006), specifies the role of technology as creating possibilities – affordances.

considered reverting back to the gatekeeper model of operator control. This would be a tragic error that would cripple the most democratic means of mass media since the printing press.

What is clear, then, is that maintaining an open broadband communications platform for advanced services is in the public interest because only such an obligation can ensure a vibrant, high-speed, next generation of the Internet that will drive innovation, provide a greater flow of information, and have a positive impact on the economy and society. Given the nature and role of networks, policymakers should reconsider and reverse the decision to allow proprietary discrimination to undermine the open architecture of the digital communications platform. The role of regulation should be to ensure that strategically placed actors with market power cannot undermine innovation at any layer of the platform. This is best achieved by mandating that the core infrastructure of the broadband communications platform remain open and accessible to all. This is the essence of the aspiration expressed for the 21st century communications network in the Telecommunications Act of 1996 (hereafter the 1996 Act).

A. PRESERVING COMPETITION ON THE INTERNET

The first sentence of the 1996 Act expands the original commitment of the Communications Act of 1934, declaring the purpose to "make available, so far as possible, to all people of the Unites States, without discrimination on the basis of race, color, religion, national origin, or sex, a rapid, efficient nationwide and world-wide wire and radio communications service with adequate facilities at reasonable charges."[8] The 1996 Act added

[8] 47 U.S.C. § 151. See § 1 of the Telecommunications Act of 1996, 104 P.L. 104; 110 Stat. 56; 1996 Enacted S. 652; February 8, 1996.

two sections to operationalize these goals, which the Federal Communications Commission (FCC) cites as the authority for this proceeding. [9]

In the *Notice of Inquiry* in this Proceeding, the FCC first cites Section 230 of the 1996 Act for its authority. That section states the charge to the FCC as follows:

> It is the policy of the United States – (1) to promote the continued development of the Internet and other interactive computer services and interactive media; (2) to preserve the vibrant and competitive free market that presently exists for the Internet and other interactive computer services, unfettered by Federal or State regulation; (3) to encourage the development of technologies which maximize user control over what information is received by individuals, families, and schools who use the Internet and other interactive computer services…[10]

In 1996, when those words became the law of the land, virtually all Internet data delivered to, or originated by, the public was carried on a telecommunications network that was subject to the obligation of nondiscriminatory interconnection and carriage under Title II of the Communications Act. That was the environment Congress wanted to preserve in the 1996 Act, and for good reason. As shown in Section III and Appendix A, open communications networks are and have been the cornerstone of democracy and a dynamic economy since the birth of capitalism, half a millennium ago. The FCC's adaptation of the principle of open communications networks to the information age in the Computer Inquiries provided a thirty year record of success on which the Congress relied in updating the Communications Act.[11] The Congress essentially adopted the concepts and principles of the Computer Inquiries which had been a vital ingredient in the success of the Internet.

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[9] *In the Matter of Broadband Industry Practices*, Notice of Inquiry, WC Docket No. 07-52, April 16, 2007.
[10] Id, at 1.
[11] On the historical significance of policy in creating the environment for success of the Internet see Mark A. Lemley and Lawrence Lessig, "The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era," in Mark Cooper (Ed.), *Open Architecture as Communications Policy* (2004). On the codification of the Computer Inquiries in the 1996 Act, see Earl W. Comstock and John W. Butler,

Unfortunately, almost immediately on passage of the 1996 Act, the FCC began to abandon this vital principle of communications policy. When cable operators began providing telecommunications facilities for Internet traffic, the FCC hesitated in applying the principle of nondiscrimination to them and seven year legal struggle ensued, in which the FCC was reversed twice by Appellate courts,[12] but ultimately prevailed on a narrow, procedural, not policy, argument at the Supreme Court. The Court essentially deferred to the Commission's expertise, mistaken or otherwise.[13] The abandonment of the core policy of open communications networks was quickly extended from cable broadband facilities to telephone company broadband facilities. This proceeding enquires as to whether the FCC should restore the policy of open communications as an enforceable principle under the Communications Act.[14]

B. AVAILABLE TO ALL AMERICANS AT REASONABLE CHARGES

That the decision to abandon the policy of open communications networks was a mistake became immediately apparent. First, as demonstrated in Section V, a sector that was vital to innovation, adaptation and adoption in the digital information age, Internet Service Providers, was devastated by the decision to allow cable operators to discriminate and exclude. Second, as demonstrated in Section VI and Appendix D, without regulation or competition to push the cozy duopoly of network owners, they chose to exploit scarcity rather than create abundance. They have dribbled out capacity in small increments at high prices, to such an extent that where truly broadband networks are concerned, Americans pay 10 to 20

"Access Denied: The FCC's Failure to Implement Open Access to Cable as Required by the Communications Act," in Mark Cooper (Ed.), *Open Architecture as Communications Policy* (2004).

[12] Comstock and Butler, Access Denied.

[13] In his dissent Justice Scalia wrote, "After all is said and done, after all the regulatory cant has been translated, and the smoke of agency expertise blown away, it remains perfectly clear that someone who sells cable-modem service is "offering" telecommunications."

[14] *In the Matter of Broadband Industry Practices,* Notice of Inquiry, WC Docket No. 07-52, April 16, 2007.

times as much as the Japanese, Koreans, and many Europeans. With innovation slowed and prices high, America has fallen far behind in the penetration of broadband service. Ironically, many of the nations that have shot ahead of the U.S. have done so by embracing the policy of open communications networks that the U.S. abandoned. [15]

Three decades of global leadership have been transformed into a decade of decline by the abandonment of the commitment to open communications networks. In the face of the clear empirical evidence that abandoning the principle of open communications networks has led to this failure, the proponents of discrimination and exclusion resort to unsubstantiated theories about why discrimination could be a superior approach. As shown in Section VIII and Appendices B and C, the theory of "benevolent market power," is based on assumptions that simply do not fit reality and contradicted by numerous examples from telecommunications history. Unfortunately, as shown in Sections IX and X, the prospects for relief from this grim situation within the confines of the current market model are not encouraging.

Over that past decade, the Commission has simply claimed that the marketplace would take care of deployment and that lifting the obligation of nondiscrimination would provide the necessary incentive to "make available… a rapid, efficient… communications service with adequate facilities at reasonable charges."[16] The results of the Commission's "free market" policy have been disastrous. America has fallen steadily from global leadership in Internet connections and communications to a place well back in the pack. More than a dozen nations,

[15] Ben Scott, Policy Director, Free Press, Before the US Senate Committee on Commerce, Science and Transportation, Communications, Broadband and Competitiveness: How Does the U.S. Measure Up?, April 24, 2007.

[16] 47 U.S.C. § 151. See § 1 of the Telecommunications Act of 1996, 104 P.L. 104; 110 Stat. 56; 1996 Enacted S. 652; February 8, 1996.

who trailed behind the U.S. in the dial-up era, have shot passed us. By some measures almost two dozen have.[17]

Thus, not only has the policy of abandoning open communications networks failed to accomplish the goals of § 230, the failure of the U.S. to keep up in the adoption of broadband represents a second failure of the FCC to accomplish the goals Congress laid out in the 1996 Act. § 706, which the FCC cites as the second source of authority for this proceeding, charges the Commission to "encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans."[18] Falling behind the other advanced industrial nations because broadband access costs ten to twenty times as much in America as it does in many other nations constitutes an utter failure to accomplish the primary goals of the Communications Act.

To the extent that US broadband policy has been guided by any logic, it is the argument that intermodal or cross-platform competition will be the savior of national broadband performance in the marketplace. While much of the rest of the world has opened up vigorous competition *within* platforms, we have staked our broadband future on competition *between* platforms. So far, it has not worked out—the US broadband market has long been a rigid duopoly that shows few signs of weakening. We rely on the market forces of a duopoly to produce robust cross-platform competition at our peril. When the chief supporters of the status-quo, wait-and-see approach to the arrival of a third competitor to DSL and cable are the incumbents themselves, we should understand that they do not expect it will happen. "Intramodal" competition is the key to regaining our once-lofty stature as the world's

[17] The International Telecommunication Union (ITU) places the U.S. 21st in the Digital Opportunity Index, which measures a variety of factors. World Information Society Report, August 2006, Available at http://www.itu.int/osg/spu/publications/worldinformationsociety/2006/wisr-web.pdf

[18] See § 706(a) of the 1996 Act.

technology leader. We must not sacrifice the long term economic and social interests of the country for the short term interests of a duopoly marketplace that has long shielded itself from free market competition.

II. THE PROMISE OF TWO-WAY COMMUNICATIONS

There is an even more profound sense in which the course chosen by the FCC has failed to accomplish the fundamental objectives of the Communications Act. The network architecture that the cozy duopoly has chosen to deploy is not adequate as a communications network. It is a stunted communications network that dramatically over-emphasizes the downloading of content, while it sharply restricts the ability of consumers to upload content that they create (see Section VII). It treats them as consumers, not users; as listeners, not speakers.

A. FULL PARTICIPATION IN BROADBAND COMMUNICATIONS

The promise of the Internet to affect social and economic change is based upon its fundamental nature as a *two-way* communications medium. The 1996 Act makes this clear in § 706 where it defines the goal as follows:

> The Commission and each state commission with regulatory jurisdiction over telecommunications services shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans…
>
> The term "advanced telecommunications capability" is defined without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receive high-quality voice, data graphics, and video telecommunications using any technology.

The legislative history strongly reinforces the emphasis on two-way communications. In the years and months leading up to the enactment of the 1996 Act, Congress clearly articulated its intent to use the legislation as a means of fostering universal deployment and adoption of a *communications* technology, and not another one-way, one-to-many broadcast medium.

For example, the accompanying Committee language to S.1822 (a predecessor bill to the 1996 Act) clearly states the importance of developing ***two-way*** broadband service, and the belief that carriers would likely, without appropriate FCC action, continue to deploy high-speed services that did not live up to the standard of "true" broadband[19]:

> Section 901 grants the necessary authority to the FCC to achieve in a timely fashion the national policy goal of making available, so far as possible to all the people of the United States***, high-capacity two-way communications*** networks capable of enabling users to ***originate*** and receive ***affordable*** and accessible ***high-quality, voice, data, graphics, video***, and other types of telecommunications services... This goal will not be achieved if carriers only deploy more of the same service that subscribers already receive today... The Committee is concerned that such capability will not be deployed in a timely fashion. According to Dr. Robert Cohen, a Senior Fellow at the Economic Strategy Institute, ***less than 1 percent of the subscribers*** who will receive the broadband service under the proposals pending before the FCC ***will be served by systems that are capable of both sending and receiving information in all its forms.*** Most of the systems are only capable of delivering more two-way phone and data service and more one-way cable service. One goal of S. 1822 is to provide new, advanced services to Americans. ***This section authorizes the FCC to initiate an inquiry to determine if the current trend in deployment of systems incapable of sending and receiving information in all its forms (e.g. images, graphics, and video) continues.*** Such an inquiry should determine if users will gain "reasonable and timely" access to switched broadband telecommunications network capabilities. If the FCC finds that reasonable and timely access will not be achieved, it shall initiate a rulemaking... [emphasis added]

Thus we see a clear emphasis on *two-way, true next-generation broadband* in the debates leading up to the final legislation that contained the Section 706 mandate. The accompanying report on the Senate bill that became the 1996 Act (S.652) also contained a similar emphasis on two-way next generation technology[20]:

> The goal is to accelerate deployment of an ***advanced capability*** that will enable subscribers in all parts of the United States to ***send and receive*** information in all its forms voice, data, graphics, and ***video*** over a high-speed switched,

[19] Communications Act of 1994, S. 1822, Senate Report 103-367, 103d Congress, 2nd Session (1994).
[20] Telecommunications Competition and Deregulation Act of 1995, S. 652, Senate Report 104-23, 104th Congress, 1st Session (1995).

> interactive, broadband, transmission capability... Section 304 of the bill is intended to ensure that ***one of the primary objectives of the bill to accelerate deployment of advanced telecommunications capability is achieved***. Section 4 of the bill states clearly that this bill is intended to establish a national policy framework designed to accelerate rapidly the private sector deployment of advanced telecommunications. More specifically***, the bill's goal is*** "***to promote*** and encourage advanced telecommunications ***networks, capable of enabling users to originate and receive affordable, high-quality*** voice, data, image, graphics, and ***video telecommunications services***." [emphasis added]

The Congressional emphasis on video and on two-way telecommunications is a key aspect of Section 706 of the 1996 Act. Clearly Congress intended for the FCC to focus *both* on download speeds (for users to receive high-speed data, including high-quality video) and upload speeds (for users to originate high-speed data, including high-quality video). Indeed, Congress likely intended to foster deployment of technologies that were much higher bandwidth versions of the technologies that were commonly used at the time of the crafting of the legislation -- dial-up and Integrated Services Digital Networks (ISDN) -- both of which are *symmetrical* bandwidth technologies.

But in the years since the 1996 Act's passage, the Commission has largely abandoned its duty to focus on the upload aspect of advanced telecommunications deployment. The FCC only gathers information on connections that have upload speeds less or greater than 200 kbps, barely above what is possible with dial-up and ISDN connections. The Commission does not gather the appropriate data that would enable it to assess if services that are capable of originating high-quality voice, data, graphics, and video are being deployed to all Americans in a reasonable and timely fashion.

The *Notice of Inquiry* states that the Commission is seeking a "fuller understanding of the behavior of broadband market participants today, including network platform providers, broadband Internet access providers, other broadband transmission providers, Internet service

providers, Internet backbone providers, content and application service providers, and others."[21] It is notable that the Commission's perception of the issues associated with the future of broadband does not acknowledge a fundamental characteristic, which distinguishes the broadband Internet from all other previous communications mediums—the fact that consumers and producers of content have the potential to be the same individuals. Broadband Internet has the ability to fundamentally change, for the better, access to the facilities, which enable the production, distribution, and consumption of information. The capabilities of the broadband platform have the potential to erase the line between "consumer" and "producer" of information. Unfortunately, to date, the Commission does not appear to grasp the fundamental change which broadband Internet technology is bringing to the American economy and society. Rather, the Commission appears to be attached to an "old economy" view of the broadband future, one where consumers are passive recipients of information, content, and services which are produced and distributed by a relative few for the "many" to consume. This limitation of the Commission's view is clearly apparent in the Commission's Policy Statement, which does not acknowledge the unique nature of the broadband Internet, but instead frames the issue from the standpoint of what "consumers" may expect:

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* consumers are entitled to access the lawful Internet content of their choice.

The Commission must also consider whether citizens who use the Internet are entitled to *produce and distribute* lawful Internet content of their choice, and whether the practices of network providers interfere with the ability of citizens to produce and distribute Internet content.

[21] *In the Matter of Broadband Industry Practices,* Notice of Inquiry, WC Docket No. 07-52, April 16, 2007, ¶8.

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* consumers are entitled to run applications and use services of their choice, subject to the needs of law enforcement.

The Commission must also consider whether citizens who use the Internet are entitled to *produce and distribute* applications and services of their choice.

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* consumers are entitled to connect their choice of legal devices that do not harm the network.

The Commission must also consider whether the providers of the broadband Internet, especially the broadband access network, are designing a network which arbitrarily defines network harm and thus limits the ability of citizens who use the Internet to innovate and utilize network resources.

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* consumers are entitled to competition among network providers, application and service providers, and content providers. [22]

The Commission must also consider whether the providers of broadband Internet, especially the broadband access network, are designing a network, which structurally inhibits competition and innovation.

Thus, the Commission's starting point in this *Inquiry*, as to whether the observed practices of network providers are consistent with the Policy Statement[23], begins from the wrong point. Further, the responses to the Commission's questions which are framed with reference to the Commission's Policy Statement may not provide sufficient insight into the

[22] *Policy Statement*, 20 FCC Rcd at 14988, para. 4; see also Statement of Administration Policy, H.R. 5252 – Communications Opportunity, Promotion, and Enhancement Act of 2006, Executive Office of the President, Office of Management and Budget (June 8, 2006) ("The Administration supports the broadband policy statement of the Federal Communications Commission (FCC) and . . . believes the FCC currently has sufficient authority to address potential abuses in the marketplace.").

[23] *In the Matter of Broadband Industry Practices*, Notice of Inquiry, WC Docket No. 07-52, April 16, 2007, ¶8.

industry practices which are already having a profound impact on the potential of broadband Internet to encourage innovation, communication, and competition.

For example, the *Notice of Inquiry* raises the issue of "packet management practices":

> Are there specific examples of packet management practices that commenters consider reasonable or unreasonable? More specifically, are providers engaging in packet management that is helpful or harmful to consumers? For example, during times of congestion, do providers prioritize packets for latency-sensitive applications such as voice calls, video conferencing, live video, or gaming?. . . . Do providers deprioritize or block packets for certain content when the providers or their affiliates offer similar content, or do providers prioritize packets containing their own content over packets containing similar content from unaffiliated providers? Do providers deprioritize or block packets containing material that is harmful to their commercial interests, or prioritize packets relating to applications or services in which they have a commercial interest? Are any of these packet management practices in place to implement other legal requirements? Are there other packet management practices of which the Commission should be aware?[24]

These questions are primarily directed at finding the "smoking gun" of a network provider's targeted blocking of packets. As the Commission elsewhere notes:

> In several proceedings evaluating wireline mergers, the Commission found that no commenter had alleged that the entities engage in packet discrimination or degradation, and that, given conflicting incentives, it was unlikely that the merged companies would do so.[25]

While there is no question that the Commission should maintain continued vigilance regarding the potential for network providers to block or otherwise discriminate against packets, the Commission must also expand its view of the nature of discrimination to examine whether structural impediments associated with the design of last-mile broadband networks, and the practices of last-mile broadband network providers, discriminate and degrade the treatment of entire classes of packets across the board.

[24] *Notice of Inquiry*, ¶8.
[25] *Notice of Inquiry*, ¶3.

For example, the availability of inexpensive digital video equipment has fueled production of video content. Consumer demand for upload speed, to process or share these files has followed, and grown rapidly.[26] However, broadband provider practices continue to crimp bandwidth available for uploads, virtually across the board. This structural discrimination limits the ability of individuals to participate in the production and distribution of video information. Thus, broadband network provider practices, with regard to the availability of upload bandwidth, should be closely examined by the Commission.

Network providers may argue that most consumers demand fast download speeds, and the capacity limitations of their last-mile broadband networks limit their ability to provide additional bandwidth for uploads. This argument is not persuasive and only points to the other major policy problem facing this Commission with regard to the broadband Internet, i.e. *market forces are simply not delivering sufficient bandwidth to consumers.* These comments discuss in detail the market failure which is clearly associated with the monopoly and duopoly provision of broadband access facilities. The failure of the cozy duopoly model is evident in a multidimensional context:

- market forces have failed to deliver *any* broadband services to substantial numbers of American households (around 9% according to the GAO)[27];
- market forces have failed to deliver bandwidth with data transfer rates comparable to the broadband networks which are deployed in other industrialized nations;
- where last-mile broadband networks are available, the prices charged for broadband are excessive, when compared with the price per megabit of transfer speed which is available in other industrialized nations; and

[26] See, for example, "Ups and downs of consumer broadband," *CNET News.com*, August 1, 2005. Available at: http://news.com.com/Ups+and+downs+of+consumer+broadband/2100-1034_3-5810534.html

[27] Broadband Deployment is Extensive throughout the United Sates, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas", United States Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006

- where advanced broadband facilities are being deployed which are capable of providing bandwidth on par with the higher speeds available in other industrialized nations, the target recipients of this technology are households with high incomes, reflecting pricing practices which demand extremely high charges for access to advanced broadband technology.[28]

B. ASSESSING CURRENT MARKET PRACTICES

The narrow focus of the Notice misses more than the big fundamental principles. It misstates the narrow question of anti-competitive and anti-consumer practices. While the *Notice* cites the broad authority and goals of the 1996 Act, the *Notice* focuses narrowly on current business practices. By focusing on the very narrow issue of the current business practices of communications networks, the Commission starts from the wrong place and misses two other extremely important facts about the environment in which the broadband network functions.

Focusing narrowly on current business practices fails to recognize that for almost a decade, high speed broadband has been under the cloud of discrimination. Network operators have asserted and occasionally exercised the right to discriminate against Internet service providers and applications, but the exact nature and extent of their ability to discriminate has been unclear. The mere threat of such discrimination has a chilling effect on innovation in the Internet space.

Further, in the narrow focus of the *Notice of Inquiry* on current business practices the FCC seems to assume that current business practices reflect the long term incentives that would operate in a broadband communications market that is without an obligation of nondiscrimination. The four principles that the FCC asserts govern the market, are not

[28] Ben Scott, Policy Director, Free Press, Before the US Senate Committee on Commerce, Science and Transportation, Communications, Broadband and Competitiveness: How Does the U.S. Measure Up?, April 24, 2007

enforceable. The Commission made that clear when they were adopted. Subsequently, conditions were placed on network operators that made them enforceable, but those conditions are temporary. A neutrality condition was placed on the merger of AT&T and BellSouth, but that is a temporary condition which will expire at the end of 2008. Finally, and perhaps most importantly, Congress has been considering network neutrality legislation for over a year. The scrutiny of market behavior that accompanies legislative deliberations exerts considerable pressure on network operators to check any discriminatory behavior which they feel might draw legislative action against them. Consequently, current behavior does not in any way reflect the environment that will exist over time if the Commission fails to enact enforceable network neutrality or open access conditions. We would not expect to see rampant violations of neutral network practices at this time, but we would certainly predict that they will occur in the future and become the norm in the longer term. That is the entire purpose of the network neutrality debate for the incumbent network operators—to rid themselves of the nondiscrimination obligations of the past.

The stated intensions and clear incentives of network operators, should enforceability expire, are quite different that the current actions of the network operators.[29] They have steadfastly defined their right to discriminate and refused to accept even minimal conditions of non-exclusion.[30] They insist that discrimination and exclusion are the proper subjects of commercial negotiations, not public policy. That is precisely the uncertainty that destroys the essential innovation-friendly, consumer-friendly character of the Internet.

[29] "At SBC, It's All About 'Scale and Scope'," Business Week Online, November 7, 2005; Jonathan Krim, "Executive Wants to Charge for Web Speed," Washington Post, December 1, 2005; Dionne Searcey and Amy Schatz, "Phone Companies Set Off a Battle Over Internet Fees," January 6, 2006.

[30] Id.

We would also like to draw the attention of the Commission to the terms of service forced on consumers by the duopoly of DSL and cable modem providers. Restrictions on use, blocking rights, and early termination fees are the common themes. These agreements, known to consumers only as the fine print in the first bill, represent the true intentionality of the network operators regarding network access and user freedom of operation. These practices are a shadow of what they would do if permitted the full right to discriminate and gate keep; but it is instructive. A full discussion of terms of service is included in Appendix E.

We would also be remiss if we did not point out the outrageous hypocrisy of the network operators in their disposition toward the various policies of nondiscrimination that abound in communications law. As we have pointed out in these comments, the nondiscrimination principle has been the cornerstone of communications policy for a century. It remains so today, and it is supported whole-heartedly in other areas of the law by the very same network owners that oppose it in the context of network neutrality when it suits their interests. The cable companies are strong backers of nondiscriminatory interconnection of data networks to ensure that their local systems are protected from anticompetitive practices by the owners of backhaul networks. Wireless companies that are unaffiliated with the RBOCs as well as RLECs of all kinds around the country also favor this policy of nondiscriminatory interconnection. The RBOCs, for their part, favor nondiscrimination when it comes to access to cable networks in the MVPD marketplace. The DBS providers back the same principle. In fact, they have made a business because of it. The nondiscrimination principle is all over communications law—from the USF programs to the cable franchising process. In each case, one of the incumbent interests depends upon the very same concept

that they so vigorously oppose here. The public interest is consistent throughout—and the policy should remain consistent throughout. A careful review of the telecommunications bill moving in the Senate Commerce Committee last year (S 2686) shows the hypocrisy of the incumbents in full view.[31]

If the Commission seeks to understand what the wireline broadband market will look like if discrimination is permitted—the wireless market provides a clear demonstration of private, closed networks operating with overt discrimination. The wireless carriers developed their data network capabilities in an environment free of nondiscrimination requirements. As a result, we can observe market behaviors that are antithetical to the open architecture of the Internet. All of the networks owned by the major carriers are proprietary and do not interoperate. They all require their own equipment and actively block the use of unapproved equipment. Each carrier dictates precisely which applications will and will not be permitted on the handset platform. Innovation in this space is stagnant as developers face gatekeepers and barriers to entry. Bandwidth is strictly limited, even in services marketed as "unlimited access." Certain applications and services are prohibited (e.g. VoIP); and certain types of content are blocked (e.g. unauthorized audio and video).[32] Speeds are low and prices are very high for data services. Each network operators is seeking to turn its "broadband" service into a proprietary network of "walled garden" content and services. This balkanized network environment is precisely what the Internet was designed to explode. Permitting these kinds of

[31] Ben Scott, Policy Director, Free Press, Before the U.S. Senate Committee on Commerce, Science and Transportation, Communications, S. 2686, Communications Reform Bill (as revised) Hearing III, June, 13, 2006

[32] Wu, Tim, "Wireless Net Neutrality: Cellular Carterfone and Consumer Choice in Mobile Broadband," Working Paper, February 15, 2007, Available at http://www.newamerica.net/files/WorkingPaper17_WirelessNetNeutrality_Wu.pdf

market practices in the wireline world (which would inevitably occur without network neutrality) would be a disaster for consumers and innovators alike.

C. RECOMMENDATIONS

It is time for the FCC to admit the failure of the past decade and enforce the principle of nondiscrimination to ensure open communications networks. Abandonment of the principle of nondiscrimination in interconnection and carriage under Title II of the 1996 Act has undermined the vibrant, competitive environment that Congress wanted the FCC to preserve and prevented the U.S. from achieving the goal of ubiquitous broadband, available at reasonable prices. The *Notice of Inquiry* seeks comment on whether the Commission's Policy Statement should be amended. There is no question that it should be amended, and these comments will offer suggestions for beginning the process of developing a meaningful policy statement with enforceable rules. The Commission should set its sights on broadband policy that is capable of restoring the United States to the leadership position in broadband deployment it once held relative to the rest of the world.

1. Two-Way Communications

The Commission must begin by replacing its antiquated definition of "high speed" and "advanced" services and redefining broadband to reflect 21st century technological capabilities. Those definitions should be redeveloped in light of the critical importance of two-way broadband communications.

An appropriate definition should continue to identify threshold upload and download speeds. However, standards should reflect the technological state, as reflected by the technology deployments that are already in place in many nations with which the United States competes in the global economy. A reasonable definition of "high-speed" services

would include those which provide upload and download speeds of at least 1 Mbps downstream, and at least 256 kbps upstream. A reasonable definition of "advanced" services would include services which provide at least 3 Mbps in each direction. These should be seen as minimum baselines that evolve over time. Considering that our global competitors make available 50 and 100 Mbps symmetrical connections across their national markets, we have a long way to go. If we don't begin setting more appropriate incremental goals, we will linger in our state of underperformance. In addition, the Commission should develop a third category of broadband connectivity pegged to a dynamic metric which reflects the average upload and download speeds of a set of competing nations, for example, the top ten nations identified by the OECD with the highest rates of broadband subscription. To the extent possible, all of these definitions should reflect *actual* throughput to a consumer household, as opposed to the theoretical maximum available on a line. Americans will be well served if the Commission begins to measure progress based on what is possible, rather than what monopolies are willing to deploy.

2. Open Communications Networks

With regard to the revision of the Policy Statement, as the discussion above clearly illustrates, the Commission must expand its policy "vision" associated with the broadband Internet to include the promotion of the "two-way" broadband Internet. Furthermore, as will be discussed in detail in the balance of these comments, the Commission must rely on more than policy statements to correct the emerging broadband crisis facing America. However, to the extent that the Commission wants to employ a policy statement, it must be refocused to acknowledge that the broadband Internet is not a one-way mechanism for the "few" to distribute content, services, and applications to the "many." Rather, the Policy Statement

should enable and promote communication which is more dynamic and fluid than the "broadcast" model inherent in the current Policy Statement. A revised Policy Statement is provided below:

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* the ability of Internet users to produce, distribute, and access the lawful Internet content of their choice shall not be impeded.

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* the ability of Internet users to produce, distribute, and use applications and services of their choice shall not be impeded, subject to the legitimate needs of law enforcement.

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* the ability of Internet users to connect their choice of legal devices to the network should not be impeded. If a device is alleged to harm the network, the basis for the harm should be fully explored prior to restrictive action being taken against such device.

- *To encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet,* users of the Internet are entitled to competition among network providers, application and service providers, and content providers. Internet users are also entitled to regulatory protection where competition fails to provide the resources and protections necessary to promote the vitality of the public Internet.

That the Commission take timely action on these changes is imperative. In the age of the broadband communications platform, harm from inaction mounts quickly. The growing restrictions placed on the broadband platform by the monopoly/duopoly firms associated with the provision of broadband access networks will have a profound effect on the economy and society which will lead to significant and negative consequences.

3. Enforceability of Nondiscrimination

The FCC also should declare that the four principles, as revised above, are enforceable under Title II. If it had the discretion to abandon the principle of non-discrimination, without substantial evidence to support that conclusion, it certainly has the discretion to restore it,

based on the clear evidence of failure in the past decade. It should further declare that discrimination of any kind violates the fourth principle since discrimination undermines "competition among network providers, applications and service providers, and content providers."[33] It should declare that exclusion violates the second principle, since it denies the consumer the ability "run applications and use services of their choice."

The companies who have been constrained by the consent decrees and claim that they have been complying with the principles will have nothing to complain about, since making the principles enforceable will not require any change in current business practices.

To properly address the enforcement of these principles, the Commission will need to undertake a rule making on the matter of open communications networks. The organizing principle should be nondiscriminatory access to the bandwidth on an open platform by consumers and producers of Internet content, applications, services, and devices. Through a combination of simple, targeted policies, the Commission can develop the rules of the road for an open Internet that apply across technologies to all providers of broadband access. This will create competition in the access market and protect the free market of ideas and commerce on the Internet that has been the hallmark of its social and economic success.

[33] Policy Statement, FCC Docket No. 05-151, p. 3

PART II.
THE IMPORTANCE OF OPEN COMMUNICATIONS NETWORKS

III. COMMUNICATIONS AT THE HEART OF A TECHNOLOGY REVOLUTION

The technological revolution of the late twentieth century is frequently referred to as an information and communication technology (ICT) revolution.[34] Open communications networks are the essential infrastructure of the deep technological revolution that has transformed the economy and stimulated mass participation in the production of culture, and widened the scope of democratic discourse.[35]

For almost two decades, consumer advocates have been among the leading proponents of open communications networks. Unlike many consumer issues, where price is the advocates' central concern, in the matter of communications and the Internet, the primary focus has been on other aspects of market performance: innovation and consumer sovereignty. We view open communications networks as an environment friendly to innovation driven by consumer choice and decentralized decision-making. These analyses have demonstrated the benefits of open communications networks in terms of core Internet services, computer development, and broad spillovers into the economy.

The convergence of computers, communications, and the Internet, all deployed under design principles of open architecture, created a unique, digital communications platform or "bearer service". It supports a broad range of economic activities in the 21st century digital economy and it has revolutionized the environment for innovation. Nations, regions,

[34] See, for example, David B. Audreretsh and Paul J. J. Welfens (Eds.) *The New Economy and Economic Growth in Europe and the U.S.* (2002; Daniel Cohen, Pietro Garibaldi, Stefano Scarpetta, *The ICT Revolution Productivity Differences and the Digital Divide*

[35] Benkler, 2006.

industries, and firms that seized the opportunity presented by the open digital communications platform have enjoyed much more vigorous economic growth than those that did not.

Policy choices that required open architecture and nondiscrimination in access to communications networks played a key role in creating the open communications environment. For three decades the Computer Inquiries of the FCC required open architecture and nondiscrimination in access to communications networks and kept the underlying telecommunications facilities open and available, ensuring that information services could grow without the threat of foreclosure or manipulation by network operators. This constrained the ability of telephone companies to leverage control over the communications infrastructure and ensured a network that was interconnected and accessible to producers and consumers, free from the domination of centralized network operators and not Balkanized by proprietary standards. Open communications networks mirrored and supported the open architecture of the Internet.

The Courts, in the first of the many challenges to the FCC decision to abandon open communications networks, could not have been clearer on this point.

> Among its broad reforms, the Telecommunications Act of 1996 enacted a competitive principle embodied by the dual duties of nondiscrimination and interconnection. See 47 U.S.C. s. 201 (a) …s. 251 (A) (1)… Together, these provisions mandate a network architecture that prioritizes consumer choice, demonstrated by vigorous competition among telecommunications carriers. As applied to the Internet, Portland calls it "open access," while AT&T dysphemizes it as "forced access." Under the Communications Act, this principle of telecommunications common carriage governs cable broadband as it does other means of Internet transmission such as telephone service and DSL, "regardless of the facilities used." The Internet's protocols themselves manifest a related principle called "end-to-end": control lies at the ends of the network where the users are, leaving a simple network that is neutral with

> respect to the data it transmits, like any common carrier. On this role of the Internet, the codes of the legislator and the programmer agree. [36]

After decades of success, the FCC seems to have lost its appreciation for the fundamental importance of the principle of open architecture. The FCC abandoned the Title II commitment to nondiscrimination in the broadband communications network, and the U.S. leadership in communications infrastructure has slipped away.

Contrary to the claims of network owners, the decision to abandon network neutrality represents a dramatic change that would render the ICT environment much less conducive to innovation. The mere threat of discrimination dramatically affects incentives and *imposes a burden on innovation today.*

This section makes the case for open communications networks by combining two analytic frameworks. The first perspective is provided by the new field of network theory, which pinpoints the source of the benefits of open communications. The second perspective is provided by analysis of network economics. It highlights the positive aspects of network effects and feedback loops.

A. Open Communications and the Digital Information Revolution

The consumer analysis of the importance of open communications networks identified key characteristics that are essential to a dynamic, consumer friendly, information environment. Communications networks are a uniquely important platform or "bearer service" that supports and plays a critical role in a broad range of economic activities in the 21st century digital economy. The extreme importance of this platform stems from the varied

[36] *AT&T Corp. v. City of Portland*, 43 F. Supp 2d 1146, 1154 (D. Ore 1999).

and diffuse positive externalities to which it gives rise.[37] The private network owners on whom the FCC would rely to build, maintain, and expand the platform simply do not see and cannot internalize the massive positive externalities of open communications networks. That is why public policy has been deployed to enforce the principle of nondiscrimination on the communications network. What is in the short term financial interests of the network operator is a disaster for the long term interests of the consumer, the citizen, the innovator, and the information economy as a whole.

For purposes of this analysis, it is useful to think of the digital communications platform as consisting of four layers: the physical layer, the code layer, the applications layer, and the content layer.[38] At the physical layer, cheap, powerful computers, routers, switches, and high-capacity fiber optic cable are the rapidly proliferating physical infrastructure of the digital economy that allows communications at rising speeds with falling costs. In the code and applications layer, a software revolution is the nervous system that enables messages to be routed, translated, and coordinated. Open protocols facilitate communications. Standardized and pre-installed bundles of software applications have allowed the rapidly expanding capabilities of computer hardware to become accessible and useful to consumers with little expertise in computing.[39] At the content layer, every sound, symbol, and image now can be digitized. As computing speeds, storage capacity, and transmission rates become

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[37] Brett Frischmann, "An Economic Theory of Infrastructure and Commons Management," *Minnesota Law Review*, April 2005, discusses the special nature of infrastructural and social externalities associated with the Internet.

[38] Lawrence Lessig, THE FUTURE OF IDEAS (2001) , at 23 notes that Tim Berners-Lee, WEAVING THE WEB: THE ORIGINAL DESIGN AND ULTIMATE DESTINY OF THE WORLD WIDE WEB BY ITS INVENTOR (1999), at 129-30, identified four layers: transmission, computer, software and content.

[39] Shane Greenstein, *The Evolving Structure of the Internet Market*, in UNDERSTANDING THE DIGITAL ECONOMY (Erik Brynjolfsson and Brian Kahin, eds., 2000), at 155.

big enough, fast enough, and cheap enough, it becomes feasible to move huge quantities of voice, data, and video over vast distances.

The technological changes had dramatic economic effects.[40] Supply-side and economies of scale and scope drove production costs down. By increasing the number of units and types of services sold, the cost per unit falls dramatically. Demand side economies of scale also emerged. As more consumers use a particular technology, each individual consumer can derive greater benefit from it. In addition to the direct network effects (direct communications between end-users on the network), larger numbers of users seeking specialized applications create a larger library of applications that become available to other users. As the installed base of hardware and software deployed grows, learning and training can be applied by more users and to more uses. Thus, demand-side economies also drive down social costs, as the network effect eliminates the need for duplication of effort across multiple standards or platforms.

The nature of information reinforces the technological and economic changes. Information production exhibits unique characteristics. It is significantly non-excludable. Once information is distributed, it is difficult to prevent it from being shared by users. It is non-rivalrous. The consumption of information (reading or viewing) by one person does not detract from the ability of others to derive value from consuming it. It exhibits positive externalities. Information is a major input to its own output, which creates a feedback effect. Putting information into the world enables subsequent production at a lower cost by its original producers or others. Where network effects and feedbacks are direct and strong, they create positive feedback loops.

[40] Benkler, 2006, Chapter 2.

The effect of the digital platform was driven by the fact that the three major components of the digital platform – the personal computer, the Internet, and telecommunications networks – had open architectures for key interfaces. The architectural interfaces to access the components were available to all potential users and producers on identical terms and conditions. Users did not have to negotiate rates, terms, and conditions or request permission to deploy or interconnect new components or services. Individuals seeking to plug into or develop a component or application for the platform could not be discriminated against. They simply had to conform to an open standard.

Decentralized experimentation by users turned them into producers whose command over increasing computing power created the conditions for a dramatic increase in innovation.[41] The Internet unleashed competitive processes and innovation exhibiting the fundamental characteristics of audacious or atomistic competition. Open communications networks played a key role by allowing experimentation, innovation and commercial activity to flourish rapidly on a national and international scope.

A strong commitment to open architecture was critical to ensuring the platform was open. A longer historical perspective on the role of open communications networks in the development of capitalist economies suggests that increasingly interconnected and open communications networks have played an important part in furthering economic growth.

The legal obligations of common carriage and nondiscrimination, ensuring open access to the highways of commerce and means of communications, dates back to the end of

[41] Erik Brynjolfsson and Brian Kahin, *Introduction*, in UNDERSTANDING THE DIGITAL ECONOMY (Erik Brynjolfsson and Brian Kahin, eds., 2000), at 1; François Bar, et al., *Defending the Internet Revolution in the Broadband Era: When Doing Nothing is Doing Harm* (1999), *at* http://e-conomy.berkeley.edu/publications/ wp/ewp12.pdf.

feudalism and emergence of capitalism. They have been applied in increasingly sophisticated forms of commerce and communications, from early inns to roads and highways, canals, railroads, the mail, telegraph, and telephone. The FCC's Computer Inquiries were the information age embodiment of these principles.

The commitment to open architecture in public policy went farther. The Internet protocols themselves were the result of a search for a more robust architecture for communications. Having initiated the Internet project based on principles of open architecture, the government's insistence that open protocols be supported as the Internet moved toward widespread availability.

B. COMMUNICATIONS AND INNOVATION

The digital communications platform has transformed the very fabric of the innovation process (see Appendix A). The open digital communications platform facilitates and accelerates technological innovation by altering the information environment to make distributed solutions more feasible. The digital communications platform became a critical enabling technology, in which interconnection, interoperability, and maximization of available functionality to end-users are essential ingredients for the continued flow of dynamic innovation. The digital revolution allows technical knowledge to be embodied in software and hardware and to be implemented and coordinated with rapid communications over great distances.

Technological innovation has moved outside the firm. As hierarchical modularity in the network replaces vertically integrated hierarchy in the firm, complex digital platform industries have benefited from open network approaches. Smaller innovative firms, each pursuing a particular challenge, result in greater innovation and technological change.

Vertical integration and extreme hierarchical structure lose their comparative advantage; modular flexibility and connectivity gain significant advantage. The foundation of this transformation is the open nature of the Internet platform. The reduction in entry barriers in a variety of information-related industries, which emerged due to the open platform, can easily be threatened by the lack of competition in last-mile access facilities and the negative impact that the monopoly/duopoly environment in the last mile can have on higher levels of the Internet.

The revolution in communications and computing technology combines with the institutional innovation of the Internet to create not only a potentially profound change in the environment in which information is produced and distributed, but it opens the door to greater competition amongst a much wider set of producers and a more diverse set of institutions.

Given the characteristics of the digital communication platform, public policy should favor open interfaces in the platform because of the strong complementarities across a large number of components. Coordination and collective action problems make it difficult to coordinate progress through private transactions. Private interests with strategic assets can "hold up" the advancement of the platform. Open interfaces overcome these problems. In each of the components of the platform, repeated efforts to impose proprietary closure were challenged and rejected. In the telecommunications network and the Internet, public policy successfully resisted impediments to technological advances associated with the platform. However, unless adequate safeguards are adopted, the past success will be undermined as the narrow perspective of profit maximization on the part of last-mile broadband providers will channel technological change to the benefit of the few, and undermine innovation and competition.

C. POLITICAL SUPERIORITY OF OPEN COMMUNICATIONS NETWORKS

Because of the age in which we live, most of the dispute over open access has been about economic value and values, but this disagreement should begin with and highlight the political aspects. Leading analysts of industrial organization have long recognized the convergence between truly competitive markets and democratic values. They "begin with the political arguments, not merely because they are sufficiently transparent to be treated briefly, but also because when all is said and done, they, and not the economists' abstruse models, have tipped the balance of social consensus toward competition."[42]

Thus, atomistic competition is seen to promote individualistic, impersonal decisions with freedom of opportunity and relatively low resource requirements for entry. The dispersion of power that typifies atomistically competitive markets is extremely attractive as a base for democracy:

> One of the most important arguments is that the atomistic structure of buyers and sellers required for competition decentralizes and disperses power. The resource allocation and income distribution problem is solved through the almost mechanical interaction of supply and demand forces on the market, and not through the conscious exercise of power held in private hands (for example, under monopoly) or government hands (that is, under state enterprise or government regulation). Limiting the power of both government bodies and private individuals to make decisions that shape people's lives and fortunes was a fundamental goal of the men who wrote the U.S. Constitution… A closely related benefit is the fact that competitive market processes solve the economic problem *impersonally*, and not through the personal control of entrepreneurs and bureaucrats…[43]

[42] Scherer, F.M. and David Ross, *Industrial Market Structure and Economic Performance* (Boston: Houghton Mifflin, 3d ed. 1990), p. 18.
[43] Id., p. 19.

An obvious benefit of competitive markets for democratic process is its freedom of opportunity.[44] The underlying dynamic of success in competitive economies, which promote fluidity because of a lack of barriers to entry, is another key characteristic:

> When the no-barriers-to-entry condition of perfect competition is satisfied, individuals are free to choose whatever trade or profession they prefer, limited only by their own talent and skill and by their ability to raise the (presumably modest) amount of capital required.[45]

The Internet principle of end-to-end converges with the strong commitment in our society to democratic values. The transparency of the network and its reliance on distributed intelligence foster innovation and empowers speakers at the ends of the network. These are ideal for populist forms of democracy. The Internet captures these qualities to an extreme degree:

> Relative anonymity, decentralized distribution, multiple points of access, no necessary tie to geography, no simple system to identify content, tools of encryption – all these features and consequences of the Internet protocol make it difficult to control speech in cyberspace. The architecture of cyberspace is the real protector of speech there; it is the real "First Amendment in cyberspace," and this First Amendment is no local ordinance…
>
> The architecture of the Internet, as it is right now, is perhaps the most important model of free speech since the founding.[46]

The preference for atomistic competition in the economy applies with special force to communications media, particularly in the information age.[47] They are not only a means of commerce; they are also the primary means of communications. The Communications Act embraces competition as a goal, but it has always demanded more.

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[44] Id.
[45] Id.
[46] Lessig, Lawrence, *Code and Other Laws of Cyberspace* (New York: Basic Books, 1999), pp. 166-167.
[47] See Benkler, Yochai, "From Consumers to Users: Shifting the Deeper Structures of Regulation Toward Sustainable Commons and User Access," *Federal Communications Law Journal*, 52, 2000, p. 561; Benkler, Yochai, "Intellectual Property and the Organization of Information Production," *International Review of Law and Economics*, 22, 2002, p. 81, *available at* http://www.law.nyu.edu/benklery/IP&Organization.pdf.

When economists tell us that digital networks industries exhibit extreme economies of scale and scope that drive them toward a very small number of very large entities, we must redouble our efforts to prevent the negative effects that centralized economic power can have on democracy.

IV. THE ROLE OF NONDISCRIMINATION IN COMMUNICATIONS NETWORKS

A. OPEN ARCHITECTURE: THE INTERNET AND COMMUNICATIONS

Although an obligation to provide nondiscriminatory access to communications networks has been a long-standing principle in the U.S., the most recent iteration of this policy had a particularly powerful effect because it interacted with the spreading technology (computer) and architectural principle of the Internet (end-to-end) to create a uniquely dynamic environment. The digital communications platform "links the logic of numbers to the expressive power and authority of words and images. Internet technology offers new forms for social and economic enterprise, new versatility for business relationships and partnerships, and new scope and efficiency for markets."[48]

The Internet unleashed competitive processes and innovation exhibiting the fundamental characteristics of audacious or atomistic competition.[49] Decentralized experimentation by users who had command over increasing computing power created the conditions for a dramatic increase in innovation.[50] Openness of the communications network was central to this newly dynamic environment.

Because computing intelligence can be distributed widely, and the activities of the end-points communicated so quickly, interactivity is transformed. "As rapid advances in computation lower the physical capital cost of information production, and as the cost of communications decline, human capital becomes the salient economic good involved in

[48] Brynjolfsson and Kahin, 2000), at 1.
[49] Richard N. Langlois, *Technology Standards, Innovation, and Essential Facilities: Toward a Schumpeterian Post-Chicago Approach*, in DYNAMIC COMPETITION & PUBLIC POLICY: TECHNOLOGY, INNOVATIONS, AND ANTITRUST ISSUES (Jerry Ellig, ed., 2001), at 207.
[50] François Bar, et al.

information production."[51] Users become producers as their feedback rapidly influences the evolution of information products.

> It is a proven lesson from the history of technology that users are key producers of the technology, by adapting it to their uses and values, and ultimately transforming the technology itself, as Claude Fischer. . . demonstrated in his history of the telephone. But there is something special in the case of the Internet. New uses of the technology, as well as the actual modifications introduced in the technology, are communicated back to the whole world, in real time. Thus, the timespan between the process of learning by using and producing by using is extraordinarily shortened, with the result that we engage in a process of learning by producing, in a virtuous feedback between the diffusion of technology and its enhancement.[52]

The institutional forms that will expand are those that economize on the most valuable factor of production (now human capital) by facilitating communications to reduce cost or maximizing output.[53] Alternatively, the scarcest or most critical input to production becomes the focal point of attention in economic activity.[54] This makes it possible for a wholly new form of information production – based on peer-to-peer relationships – to exist on a sustainable basis.[55] By drawing on a broad and diverse supply of human capital, a loose, collaborative approach can provide a potent mechanism for innovation and production.

The impact of this shift in information production is not limited to new organizational forms. Those who have studied corporate changes in the last quarter of the twentieth century have found similar patterns. The new thrust of corporate organization, based on distributed intelligence and a flat structure, reflects these forces.[56] Hierarchy is out; horizontal is in.[57]

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[51] *See* Yochai Benkler, *Coase's Penguin, or Linux and the Nature of the Firm* (paper presented at the CONFERENCE ON THE PUBLIC DOMAIN, DUKE UNIVERSITY LAW SCHOOL, Nov. 9-11, 2001), at 2.
[52] Manuel Castells, THE INTERNET GALAXY – REFLECTIONS ON THE INTERNET, BUSINESS, AND SOCIETY (2001), at 28.
[53] Yochai Benkler, *Property Commons and the First Amendment: Toward a Core Common Infrastructure,* BRENNAN CENTER FOR JUSTICE, NEW YORK UNIVERSITY LAW SCHOOL, March 2000.
[54] Langlois, *Technology Standards.*.
[55] Benkler, *Coase's Penguin*, at 22-23.
[56] Marina N. Whitman, NEW WORLD, NEW RULES (1999), at 17, 32-37, 55-62.

The ability to coordinate at a distance dramatically alters the nature of centralized control, transferring much decision-making to dispersed management. A Harvard Business School Press publication, graphically titled *Blown to Bits*, summarized the dramatic change compelling corporate adjustment as follows: "Digital networks finally make it possible to blow up the link between rich information and its physical carrier. The Internet stands in the same relation to television as television did to books, and books to stained glass windows. The traditional link. . . between the economics of information and the economics of things – is broken."[58]

Thus, the revolution in communications and computing technology combined with the institutional innovation of the Internet to create not only a potentially profound change in the environment in which information is produced and distributed, but it opened the door to greater competition among a much wider set of producers and a more diverse set of institutions. We find that the deeper and more pervasively the principle of openness is embedded in the communications network, the greater the ability of information production to stimulate innovation.

In 1994, just as the commercial Internet was taking off, a National Research Council publication referred to the Internet as a "bearer" service. It underscored the concept of open access: "An open network is one that is capable of carrying information service of all kinds from suppliers of all kinds to customers of all kinds, across network service providers of all kinds, in a seamless accessible fashion."[59]

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[57] Manuel Castells, THE RISE OF NETWORK SOCIETY (1996); Richard C. Longworth, GLOBAL SQUEEZE (1998).
[58] Philip Evans & Thomas S. Wurster, Blown to Bits: How the New Economics of Information Transforms Strategy (2000), at 17 (footnote omitted).
[59] National Research Council, REALIZING THE INFORMATION FUTURE, (1994), at 43.

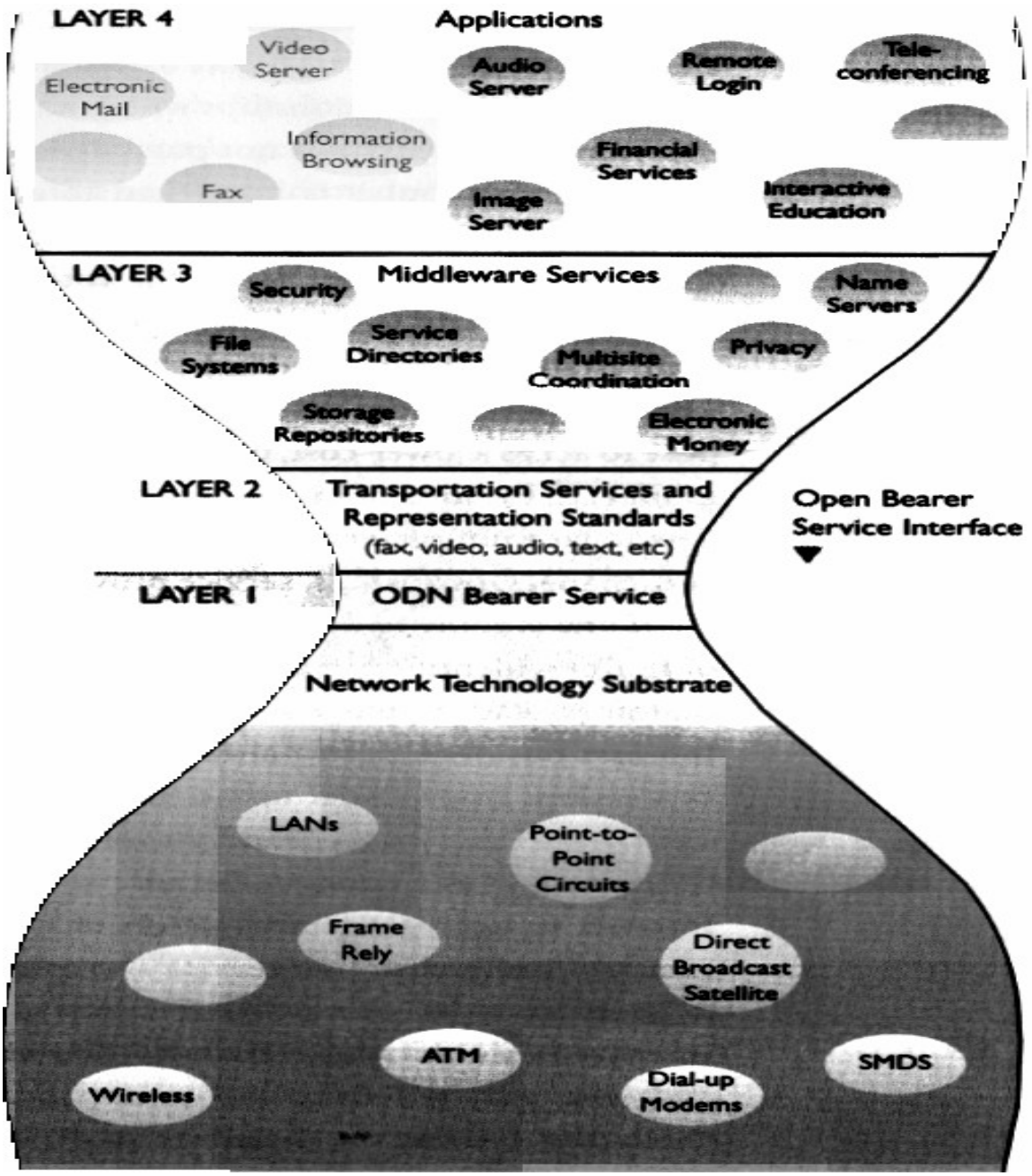
Figure IV-1 presents the graphic the NRC used to convey the importance of the bearer service. It draws attention to the fact that the open data network (ODN) and protocols at the neck of the hourglass are the link between diverse networks and a broad range of applications. Not surprisingly, the NRC chose the then current example to make its point: "The telephone system is an example of an open network, and it is clear to most people that this kind of system is vastly more useful than a system in which the users are partitioned into closed groups based, for example, on the service provider or the user's employer."[60] The principles of openness it identified bear repeating:

> *Open to users.* It does not force users into closed groups or deny access to any sectors of society, but permits universal connectivity, as does the telephone network.
>
> *Open to providers.* It provides an open and accessible environment for competing commercial and intellectual interests. It does not preclude competitive access for information providers.
>
> *Open to network providers.* It makes it possible for any network provider to meet the necessary requirements to attach and become a part of the aggregate of interconnected networks.
>
> *Open to change.* It permits the introduction of new applications and services over time. It is not limited to only one application, such as TV distribution. It also permits new transmission, switching, and control technologies to become available in the future.[61]

The Internet distribution technology or bearer service transforms economic activity, opens new markets, and supports even faster development than previous transportation and communications revolutions have typically done. As a business text observed:

[60] Id., p. 43.
[61] Id., p. 44.

FIGURE IV-1:
THE INTERNET AS A BEARER SERVICE



Source: Computer Science and Telecommunications Board, National Research Council, *Realizing the Information Future* (Washington, D.C. National Academy Press, 1994), p. 53.

> Taken together these critical features of the Internet are understood by economics by generalizing the concept of the Internet's bearer service through the idea that the Internet acts as a general-purpose technology or platform technology. The reduced transaction costs and positive network externalities often found on the Internet enable new products to be brought to market more easily and quickly than in the past.[62]

Critical communications technologies have the most dramatic impact on society and there is a tendency to link them together as analogies when describing the impact of the Internet. For example, Mark Buchanan observes that "[t]he Internet has doubled in size yearly for ten straight years, which amounts to an explosive thousand-fold increase in the number of computers connected to it. In fact, it has grown in influence even more rapidly than did the telephone early in the twentieth century."[63] The implication is that the telephone had a major impact, but the impact of the Internet is even greater. Buchanan goes on to cite an observation by Peter Drucker from 1998 that compared the Internet and the railroad in a way that emphasizes the melding of technologies into communications platforms that transform society:

> As [Drucker] sees it, the computer is akin to the steam engine, and the Information Revolution is now at the point at which the Industrial Revolution was in the 1820s. Drucker points out that the most far reaching changes of the Industrial Revolution came not from the steam engine itself, but as a consequence of another unprecedented invention the engine made possible – the railroad. Similarly, he suspects, it is not computers or the Internet that will be world-changing, but rather one of their recent spin-offs: "e-Commerce is to the Information Revolution what the railroad was 170 years ago, e-commerce is creating a new and distinct boom, rapidly changing the economy, society and politics."[64]

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[62] Lee W. McKnight, *Internet Business Models: Creative Destruction as Usual*, in CREATIVE DESTRUCTION: BUSINESS SURVIVAL STRATEGIES IN THE GLOBAL INTERNET ECONOMY (Lee W. McKnight, Paul M. Vaaler, & Raul L. Katz, eds., 2001), at 45.

[63] Mark Buchanan, NEXUS: SMALL WORLDS AND THE GROUNDBREAKING THEORY OF NETWORKS (2002), at 76.

[64] *Id.*, at 76-77.

Joel Mokyr points to electricity as a better referent.[65] Describing the semiconductor's "unusual properties" as "its ability to recombine with other techniques, its complementarity with downstream innovations, and its consequent pervasiveness in many applications,"[66] Mokyr concludes that it "merits the term general purpose technology."[67] Picking up a theme mentioned earlier, he argues:

> there have been few comparable macroinventions since the emergence of electricity in the late nineteenth century…What has happened is the emergence of a large cluster of separate innovations with an unusual propensity to recombine with one another and to create synergistic innovations which vastly exceeded the capabilities of the individual component… The significance of ICT, then, is not just in its direct impact on productivity but that it is a *knowledge technology* and thus affects every other technique in use.[68]

B. OPEN COMMERCE AND COMMUNICATIONS NETWORKS: A CORNERSTONE OF CAPITALISM

In the half decade after Drucker's observation, e-commerce has lived up to its advanced billing. Interestingly, the railroads created both boom and bust cycles, but drove an industrial spiral upward, just as the Internet has. Moreover, dramatic transformations go hand-in-hand with major institutional transformations in the economy. The railroad age saw the growth of the corporation, as the digital communications platform is now transforming business organizations.[69] In this section, it is argued that critical decisions to ensure non-discriminatory access to the emerging dominant means of communications at the end of the 19th century – the railroad and telecommunications network – played a critical role in the

[65] Joel Mokyr, *Innovation in an Historical Perspective: Tales of Technology and Evolution*, in TECHNOLOGICAL INNOVATION AND ECONOMIC PERFORMANCE (Benn Steil, David G. Victor & Richard R. Nelson, eds., 2002).
[66] *Id.*, at 42.
[67] *Id.*, p. 141.
[68] *Id.*, at 42.
[69] Harold Evans, THE AMERICAN CENTURY (1998).

subsequent success, just as the decision to keep the telecommunications network open for enhanced and information services at the end of the 20th century.

The dynamic effect of open communications networks in the digital age is only the most recent iteration of a broader process that has been unfolding over half a millennium. The "Computer Inquiries" were an evolution of the common carrier principles to preserve open communications in the Information Age. Another perspective on the importance of open communications networks is gained by placing recent developments in the longer sweep of history. By doing so, we find that open communications and transportation networks are deeply embedded in the very DNA of capitalism.

As capitalism was dissolving feudalism, the emerging social order discovered an important new social, political and economic function – mobility. Physical and social mobility were anathema to feudalism, but essential to capitalism and democracy. Providing for open and adequate highways of commerce and means of communications were critical to allow commerce to flow, to support a more complex division of labor and to weave small distant places into a national and later global economy.

Legal obligations of common carriage and nondiscrimination were the solutions.[70] For example, under common law, innkeepers were obligated to serve all travelers, thereby

[70] This understanding of common carriage is quite prevalent, as an analysis prepared by Morgan Stanley Dean Witter, THE DIGITAL DECADE, April 6, 1999, at 177-178, noted in describing common carriers:" Generally, they are involved in the sale of infrastructure services in transportation and communications. The legal principle of common carriage is used to ensure that no customer seeking service upon reasonable demand, willing and able to pay the established prices, however, set, would be denied lawful use of the service or would otherwise be discriminated against…Significantly, a carrier does not have to claim to be a common carrier to be treated as such under the law: a designation of common carriage depends upon a carriers actual business practices, not its charter...Common carriage is also thought to be an economically efficient response to reduce the market power of carriers through government regulation, preventing discrimination and/or censorship and promoting competition. It is also said to promote the basic infrastructure, reduce transaction costs from carrier to carrier, and extend some protections for First Amendment rights from the public to the private sector."

supporting the movement of people, goods and services. Not only were all to be served on a nondiscriminatory basis, but when the innkeeper hung out his sign he brought upon himself the obligation to protect the property of the traveler.[71]

Inns were critical to commerce since, given the technology of the time, only short distances could be covered before rest and sustenance were needed. As critical as inns were to the flow of commerce, obviously roads and waterways were more important. Navigation projects, canals and turnpike trusts chartered under obligations of providing service to the public were the early vehicles of the capitalist political economy to provide for transportation projects.[72] Created in the 15th through 18th centuries and building on principles of common law, these were private undertakings with a public franchise to collect tolls on the section of a road or waterway whose upkeep was the responsibility of the trustee. Fees were assessed and access provided on a nondiscriminatory basis. While different rates could be charged to different types of traffic, discrimination within categories was forbidden.

By the 19th century, however, direct public responsibility for roads became the norm and provided nondiscriminatory access. Maintaining a network of transcontinental roads became a governmental responsibility, first city, then state, then national. Later, the principles of nondiscriminatory access were carried through to all national communications and transportation networks. Roads and highways, canals, railroads, the mail, telegraph, and telephone, some owned by public entities, most owned by private corporations, have always been operated as common carriers that are required to interconnect and serve the public on a

[71] James B. Speta, A Common Carrier Approach to Internet Interconnection, 54 FED. COMM. L.J., 254 (2002).

[72] Andrew Odlyzko, PRICING AND ARCHITECTURE OF THE INTERNET: HISTORICAL PERSPECTIVES FROM TELECOMMUNICATIONS AND TRANSPORTATION (2003), notes price discrimination between classes of goods but not in access to the network. He also notes the central role of government policy in establishing rights of access and setting rates (*see* also Hal Varian, MARKETS FOR PUBLIC GOODS [January 2003]; D. Davis, SHINE YOUR LIGHT ON ME, December 23, 2002 (http://D-squareddiest.blogpost.org/2002_12_22_d-squareddigest_archives.html#86435321)).

non-discriminatory basis. An early court decision regarding telecommunications provides an interesting historical perspective:

> The telephone has become as much a matter of public convenience and of public necessity as were the stagecoach and sailing vessel a hundred years ago, or as the steamboat, the railroad, and the telegraph have become in later years. It has already become an important instrument of commerce. No other known device can supply the extraordinary facilities which it affords. It may therefore be regarded, when relatively considered, as an indispensable instrument of commerce. The relations which it has assumed towards the public make it a common carrier of news – a common carrier in the sense in which the telegraph is a common carrier – and impose upon it certain well defined obligations of a public character. All the instruments and appliances used by the telephone company in the prosecution of its business are consequently, in legal contemplation, devoted to a public use.[73]

The early date of this observation, 1886, is notable, since the telephone had just begun to penetrate, but so too is the comprehensive sweep of history. The telephone network was in its infancy but its vital nature brought the obligation of a common carrier upon it. Telephones would soon become a dominant means of business communication. Traditional practice did not excuse it from public interest obligations because it was new. Moreover, this citation also suggests the dual nature of communications networks as both a means of commerce and a means of democratic expression.

Interestingly, the railroads, whose transcontinental network was completed only two decades before the decision cited above, had already brought upon themselves specific legislation to impose regulation beyond simple common carriage because of anticompetitive and discriminatory business practices. Because they practiced price gouging and discrimination against shippers and localities, direct regulation was imposed on them, first at the city level, but later at the state level and ultimately the national level.

[73] Hockett v. State Indiana, 1886, cited Speta, *Common Carrier*, at 262.

These large corporate entities had failed to be restrained by the common law principles of common carriage or the common law principles were inadequate to the more complex reality of industrial society. As the Collum Committee found, "the paramount evil chargeable against the operation of the transportation system of the United States as now conducted is unjust discrimination between persons, places, commodities, or particular descriptions of traffic."[74] More discipline was needed to protect the public interest; society responded with specific obligations of nondiscrimination and interconnection and the provision of service at just and reasonable rates.

It is an important historical theme that the transformation of the economy in the second industrial revolution gave rise to new forms of economic organization that seemed unwilling to be bound by principles of commerce that were critical to the maintenance of a dynamic capitalist economy. Private contract and common law had failed to promote the public interest and were replaced by more direct public obligations. Moreover, as the nature of the economy and economic organization change, the nature of conduct that is considered anti-social changes as well. The American century was built, in part, on a repeated reaffirmation of the commitment to open communications and transportation networks (e.g. the Interstate Commerce Act (1887), the Mann Elkins Act (1910) and the Communications Acts (1934)) and to competitive principles (the Sherman Act (1880), the Clayton Act (1914) and the Federal Trade Commission Act (1914)).

Telecommunications has followed a path similar to the railroads with respect to regulation. The dominant telecommunications entity also failed to provide nondiscriminatory interconnection at the end of the 19th century. Common law could not effectively force access

[74] Cited in Alfred Kahn, The Economics of Regulation: Principles and Institutions (1988), at 55.

and private entities could not negotiate it. By the early 20th century, states entered, imposing regulation that embodied common carrier principles and more. Eventually the federal government followed the same course. While advocates of proprietary carriage complain that the decision to impose public obligations cut off the public policy debate and short-circuited the private process, several decades of failure with an increasingly ubiquitous bearer service imposed substantial harm on localities and users of the network.

Almost a decade after the introduction of high-speed Internet into the mass market, the pattern is being repeated. A federal district court has twice ruled that advanced telecommunications should be subject to the obligation of non-discrimination, but the network owners are resisting.

As happened a century earlier, states and cities have entered the fray. Events may move a little faster because, in the age of the digital communications platform, harm mounts more quickly. Time speeds up and the platform has a more profound effect on the remainder of society, but the fundamental issue is the same.

Current arguments against obligations to provide nondiscriminatory access are based on the claim that competition exists between two networks and that that is all the American economy needs. That claim is wrong as a matter of historical fact and practical experience. Opponents of an obligation for nondiscrimination have mistakenly set up a mutually exclusive choice between competition and public obligations.[74]

The notion that two competitors are enough to ensure a vigorously competitive market is inconsistent with economic theory and decades of empirical evidence. Monopoly is not now and has never been a necessary legal condition for common carrier status. The existence of intermodal competition in other industries did not eliminate the obligation for

nondiscrimination. The paramount concern is the nature of the service, not the conditions of supply. Public convenience and necessity is required of a service because it is a critically important, indispensable input into other economic activity. The function provided by and the network characteristics of transportation and communications industries are conducive to creating the conditions for "affecting the public interest".

Starting from the demand side to arrive at common carrier obligations does not mean that the conditions of supply do not matter. On the supply-side, a key characteristic of common carriers is the reliance on some public resource for the deployment of the network. Transportation and communications networks are typically the beneficiaries of public largesse or special considerations. The public support may take one of many forms, such as public funds, use of public property, the right to condemn private property, or the grant of a franchise.

The manner in which the service is offered to the public is also important. Service that is made widely available to the public becomes "affected with the public interest." The presence of market power over a vital service is another factor that leans in favor of common carriage status. However, viewed in this way, the presence of market power on the supply side is only one of several considerations in determining whether an obligation for nondiscrimination should be applied to a particular service, and by no means the most important.

Public roads competed against privately owned canals, but they were both subject to common carrier obligations. Private railroads were added to compete with canals and roads, and they were all subject to common carrier obligations. Telegraph, wireline telephone and wireless are all common carriers. In other words, we have layered alternative modes of

communications one atop another, each using a different technology, each optimized for a somewhat different form of communications, and still we imposed the common carrier obligations to ensure access. Access to the means of communications was too important to allow discrimination. That access should play a critical role in the digital revolution is not surprising.

> Access in the form of search engines that allow an individual to find some known piece of useful knowledge at low cost becomes critical. Indeed, it must be true that had useful knowledge grown at the rate it did without changes in the technology of access, diminishing returns might have set in just due to the gigantic scale… It may be that the Internet 2 will be the culmination of this process, but in fact access has been improving for decades in the form of computer-based information databases such as computerized library catalogs, databases, and online access channels such as Medline. As people who carry out technological instructions – let alone those who write new ones – have access to more and more useful knowledge, the means by which they can access, sort, evaluate, and filter this knowledge is crucial.[75]

For the first three centuries of the non-discrimination principle, transportation and communications were essentially intertwined, as the physical movement of printed word or speakers was the primary means of communications at long distance. Thus, the obvious and most direct frame for the ongoing debate over nondiscrimination is in the non-discrimination principles that were ultimately expressed in common carriage. Even though the link between the physical carriage of written words or live speakers was broken with the advent of electronic communications, the common carrier paradigm was transferred from the rails to the wires.

Some scholars argue that another frame can be usefully applied to the contemporary debate of open communications networks – the postal frame – in so far as the U.S. Postal system was a critical institutional mechanism for ensuring the flow of information in the

[75] Mokyr, *Innovation*, at 42-43.

physical age. In fact, the physical medium that carried the information was of less importance that the social institution and policies that ensured open communications.

> The Royal Post was the British system characterized by its refusal to carry packets for society's elite. The U.S. Postal system was formed in response to this discriminatory system. Alexis de Tocqueville, who credited the newspapers and other information delivered via the post as greatly responsible for the America's thriving democratic culture, praised the U.S. system. The opportunity for anyone to send anything anywhere without constraint or discrimination was a fundamental assumption of the early U.S. communications system.[76]

The postal principle – the right of anyone to send anything anywhere – so deeply embedded in our national pamphleteer history, helps to overcome the tendency to view this as a pure issue of electronic commerce and reminds us that, at root, this issue is about speech and communications.

> While yesteryear's newspapers and today's Internet are quite different media, their social functionality in civil society is remarkably similar. Whereas the unrestricted transport of newspapers via the Postal Service has long been protected and subsidized, today, ISPs are proposing to have discriminatory power over social networking applications that utilize their networks… [N]etwork neutrality incorporates strong civil rights protection simply by mandating neutral and non-reactive transport medium. Recent endeavors to surveil network traffic encroach upon users' rights to privacy, creating a panoptic environment that undermines civil society, creativity, and public dialogue.[77]

[76] Victor Pickard and Sascha D. Meinrath, "Beyond Network Neutrality: Criteria for a Democratic Internet," paper presented at the Annual Meeting of the International Communications Association, May 25, 2007, p. 8

[77] Id, p. 12.

PART III.
THE HARM CAUSED BY ABANDONING OPEN COMMUNICATIONS NETWORKS

V. ELIMINATING SERVICE AND APPLICATION COMPETITION

One would expect that abandoning such a fundamental principle of such an important economic infrastructure would have an impact. Our research shows that it did negatively affect two important components of the digital information environment. On the supply side, the ranks of the Internet service providers—which played a key role in innovation, adaptation and adoption of digital technologies—were decimated. On the demand side, penetration lagged as prices remain high and speeds low compared to other nations. We see a direct link between the policy changes and these two outcomes. Cutting out a key sector that provided a vital function to promote adoption and allowing network owners to price consumers out of the market slowed adoption.

A. Threats to Open Communications Networks

A framework for economic analysis of the digital communications platform must recognize the potential for new and more harmful types of anticompetitive behavior in platform industries. The anti-consumer and anti-competitive behavior of the incumbent duopoly, freed of the public interest obligation of nondiscrimination, is deeply engrained in the economic structure and incentives of the facilities market.

Platforms heighten the potential for negative, anticompetitive actions by private parties who have a dominant position at key locations of the platform.[78] This also provides

[78] Beard, T. Randolph, George S. Ford, and Lawrence J. Spiwak, Why ADCo? Why Now: An Economic Exploration into the Future of Industry Structure for the "Last Mile" in Local Telecommunications Markets (Phoenix Center, November 2001); Computer Science and Telecommunications Board, National Research Council, Broadband, Bringing Home the Bits (Washington: National Academy Press, 2002) (hereafter Bits), pp. 23; 152-154; Banerjee, Anupam and Marvin Sirvu, "Towards

the basis for policies to defend the open architecture of the platform. Dominant firms that own and control key layers of the platform may have the incentive and ability to protect and promote their interests, distorting the architecture of the platform at the expense of competition and slowing innovation.

In old economy industries, vertical leverage is exploited by business practices. By integrating across stages of production, incumbents can gain control over critical inputs, which can be withdrawn from the open market, driving up competitors' costs. This vertical integration creates barriers to entry by forcing potential competitors to enter at more than one stage, making competition much less likely. Exclusive and preferential deals for the use of facilities and products compound the problem. Vertical integration facilitates price squeezes and enhances price discrimination.

In a platform industry, vertical leverage can take an additional and more insidious form, technological manipulation.[79] Introduction of incompatibilities can impair or undermine the function of disfavored complements. The refusal to interoperate, the withholding of functionalities, is an extremely powerful tool for excluding or undermining rivals and thereby short circuiting competition.

The growing concern about digital information platform industries derives from the fact that the physical and code layers do not appear to be very competitive.[80] There are not

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Technologically and Competitively Neutral Fiber to the Home (FTTH) Infrastructure," Telecommunications Policy Research Conference, 2003; Newman, Stagg, "Broadband Access Platforms for the Mass Market," Telecommunications Policy Research Conference, 2003.

[79] See Langlois, p. 52, "The owner of a dominant standard may thus want to manipulate the standard in ways that close off the possibilities for a competitor to achieve compatibility. This has a tendency to retard the generational advance of the system." Ferguson, Charles H., *High Stakes, No Prisoners: A Winner's Tale of Greed and Glory in the Internet Wars* (New York: Three Rivers Press, 1999), p. 307.

[80] Rubinfeld, Daniel L. and John Hoven, "Innovation and Antitrust Enforcement," in Jerry Ellig (ed.*), Dynamic Competition and Public Policy: Technology, Innovation, and Antitrust Issues* (Cambridge: Cambridge University Press, 2001), pp. 65, 75-76.

now, nor are there likely to be, a sufficient number of networks deployed in any given area to sustain vigorous competition. Vigorous and balanced competition between operating systems has not been sustained for long periods of time.

Dominant firms at the physical and code layers have a variety of tools to create economic and entry barriers such as exclusive deals, retaliation, manipulation of standards, and strategies that lock in customers. They can leverage their access to customers to reinforce their market dominance by creating ever-larger bundles of complementary assets. Firms whose market power is neither total nor permanent can use bundling to defend or extend their market power. Under a wide range of assumptions, the dynamic[81] ability of bundling to undermine competition has been demonstrated through a number of mechanisms including inducing exit,[82] restricting entry by raising barriers,[83] relaxing price competition,[84] distorting investment,[85] retarding innovation,[86] and extending market power into new markets.[87]

Control over the product cycle can impose immense costs by creating incompatibilities,[88] forcing upgrades, [89] and by spreading the cost increases across layers of

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[81] Kaplow, J. "Extension of Monopoly Through Bundling," *Columbia Law Review*, 85:1985; J. A. Sykes, Ordover, A. Sykes and R.D. Willig, "Nonprice Anticompetitive Behavior by Dominant Firms Toward the Producers of Complementary Products," in F.M. Fisher (Ed.), *Antitrust and Regulation: Essays in Memory of John J. McGowen* (1985).

[82] M. Whinston, "Tying Foreclosure and Exclusion," *American Economic Review*, 80 (1990).

[83] O.E. Williamson, "Assessing Vertical Market Restriction: Antitrust Ramifications of the Transaction Cost Approach," *University of Pennsylvania Law Review*, 127 (1979); B. Nalebuff, "Bundling as an Entry Barrier," *Quarterly Journal of Economics* (2004), "Bundling," Manuscript, School of Management, Yale University (1999); Y. Bakos and Eric Brynjolfsson, "Bundling and Competition on the Internet: Aggregation Strategies for Information Goods," *Marketing Science*, 19 (2000).

[84] J. Carbajo, D. de Meza and D. Seidman, "A Strategic Motivation for Commodity Bundling," *Journal of Industrial Economics*, 38 (1990); Y. Chen, "Equilibrium Product Bundling," *Journal of Business*, 70 (1997).

[85] J. P. Choi and C. Stefanadis, "Tying, Investment, and the Dynamic Leverage Theory," *Rand Journal of Economics*, 32 (2001).

[86] J. P. Choi, "Tying and Innovation: A Dynamic Analysis of Tying Arrangements," *The Economic Journal* 114 (2004); J. P. Choi, "Preemptive R&D, Rent Dissipation, and the 'Leverage Theory'," *Quarterly Journal of Economics*, 110 (1996).

[87] Carlton, "The Strategic Use of Tying.

[88] See Choi, pp. 167, 171-73.

the platform to extract consumer surplus.[90] If a firm is a large buyer of content or applications or can dictate which content reaches the public through control of a physical or code interface, it can determine the fate of content and applications developers.

These anti-competitive behaviors are attractive to dominant firms in the physical and code layers for static and dynamic reasons:[91] preserving market power in the core market, preventing rivals from achieving economies of scale,[92] enhancing the ability to price discriminate, driving competitors out of neighboring markets to create new market power, and diminishing the pool of potential competitors. The observable behavior of the incumbent wire owners gives immediacy to the concerns that the physical layer of the communications platform will not perform efficiently or in a competitive manner without a check on market power. Public policy should resist efforts to impose proprietary closure, which would undermine the open architecture of the platform.

B. The Importance of ISPs in the Commercial Success of the Internet

ISPs were the first children of the commercialization of the open network of the Internet and later the first victims of the network foreclosure strategy. ISPs were generally

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[89] Ellison, Glenn and Drew Fudenberg, "The Neo-Luddite's Lament: Excessive Upgrades in the Software Industry," *Rand Journal of Economics*, 2000; Fudenberg, Drew and Jean Tirole, "Upgrades, Trade-ins, and Buybacks," *Rand Journal of Economics*, 29, 1998, pp. 235, 235-36.

[90] Moorthy, K. Sridhar, "Market Segmentation, Self Selection, and Product Lines Design," *Marketing Science*, 3, 1985, p. 256; Thum, Marcel, "Network Externalities, Technological Progress, and the Competition of Market Contract," *International Journal of Industrial Organization*, 12, 1994, p. 269.

[91] Katz and Shapiro, Antitrust and Software, pp. 70-80; Ordover, Lansuz A. and Robert D. Willig, "Access and Bundling in High Technology Markets," in Jeffrey A. Eisenach and Thomas M. Lenard (eds.), *Competition, Innovation and The Microsoft Monopoly: Antitrust and The Digital Marketplace* (Boston: Kluwer Academic, 1999); Rubinfeld, pp. 877-81; Salop, Steven C., "Using Leverage to Preserve Monopoly," in Jeffrey A. Eisenach and Thomas M. Lenard (eds.), *Competition, Innovation and The Microsoft Monopoly: Antitrust and The Digital Marketplace* (Boston: Kluwer Academic, 1999). Fisher, Franklin M., "Innovation and Monopoly Leveraging," in Jerry Ellig (ed.), *Dynamic Competition and Public Policy: Technology, Innovation, and Antitrust Issues* (Cambridge: Cambridge University Press, 2001), p. 138.

[92] Carlton, D.W. "The Strategic Use of Tying to Preserve and Create Market Power in Evolving Industries," *Rand Journal of Economics*, 33 (2002).

small operators who tied together the broader population of users. Getting 50 million households to use a new, technologically sophisticated device (the PC) to interconnect on a regular basis with a network of millions of other devices was no easy feat.[93] Domestic online service providers numbered about 400 to 500 in the late 1980s when Internet commercialization began.[94] That number grew to 7,000 to 8,000 ISPs in the late 1990s.[95] It has plummeted since the FCC abandoned its commitment to open communications networks.

Buying wholesale telecommunications service from telephone companies and selling basic Internet access combined with a variety of additional applications and services to the public, they translated the complex technologies that had to be combined to use the Internet into a mass market service.[96] Once the Internet was commercialized, ISPs rapidly covered the country with dial-up access and translated a series of innovations into products and services that were accessible and useful to the public. Berners-Lee noted the critical linking role played by ISPs:

> It was already possible for anyone to download, free, all the browsers, TCP/IP, and software needed to get on the Internet and Web, but a user had to know a

[93] Abbate, INVENTING THE INTERNET (1999); Lessig, FUTURE OF IDEAS (2001), Chapters 3 and 4; Shane Greenstein, Commercialization of the Internet: The Interaction of Public Policy and Private Choices, or Why Introducing the Market Worked so Well (NBER, N.D.), Building and Delivering the Virtual World: Commercializing Services for Internet Access (March 31, 2000); The Evolving Structure of Commercial Internet Markets, in UNDERSTANDING THE DIGITAL ECONOMY (Erik Brynjolfsson & Brian Kahin, eds., 2000).

[94] Frank Matos, INFORMATION SERVICE REPORT (1988); Abbate.

[95] Recent ISPS counts are from BOARDWATCH MAGAZINE, North American ISPS. There are differences of opinion about the precise numbers. We use this source as an internally consistent set of numbers. While there are differences in details, the trends seem clear – rapid growth in the late 1990s and declines in the past few years.

[96] Greenstein, Commercialization of the Internet, emphasizes the range of services offered; "Comments of Earthlink, Inc," In the matter of Appropriate Framework for Broadband Access to the Internet Over Wireline Facilities, Universal Service Obligations of Broadband Providers, Computer III Remand Proceedings: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review – Review of Computer II and ONA Safeguards and Requirements, Federal Communications Commission, CC Docket NO. 02-33, 95-20, 98-10, May 3, 2002, at 6, offers the following list: "ISPs offer a host of information functionalities under the rubric "Internet access" that includes, but is not limited to, email, web access, instant messaging ("IM"), chat rooms, content-based services (such as news, weather, music, stock quotes, etc.) web-hosting, access to software or games, and more."

> lot about how to configure them and make them work together, which was complicated. Neither the Internet nor the Web had initially been set up for home or individual business use; they were meant for universities, researchers and large organizations…
>
> Soon thereafter, however, many Internet service providers started to spring up – local companies that would give access to the Internet via a local telephone call. They provided all the software a subscriber required.[97]

Greenstein analyzes the activities of ISPs as "coinvention, the complementary invention that makes advances in general purpose technology valuable in particular places at particular points in time."[98] Some of the underlying innovations that the ISPs adapted and popularized had been around for a while, like the Internet protocol itself, e-mail, file transfer and sharing, and bulletin boards. Some of the innovations were very recent, like the web, the browser, instant messaging and streaming.

Greenstein argues that "[a] significant set of activities of many providers in the commercial Internet market involved 'adaptation…Adaptation does not happen on its own."[99] The process involves "one of several activities: Monitoring technical developments, distilling new information into components that are meaningful to unfamiliar users, and matching unique user needs to one of the many possible solutions."[100]

Local specificity and the importance of the linking and communications function of ISPs is strong because adaptation "depends on the users, their circumstances, their background, their capital investments, the costs of adjusting to new services, and other factors that influence the match between user needs and technological possibilities."[101] Consequently, there were few plain vanilla ISPs, offering only basic access to the Internet.

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[97] Berners-Lee, at 80-81.
[98] Shane Greenstein, *Building and Delivering the Virtual World: Commercializing Service for Internet Access* (March, 31, 2000), at 2.
[99] Greenstein, *Building and Delivering*, at 168.
[100] Id.
[101] Id.

Thousands of ISPs tailoring services to customer needs supported the rapid spread of Internet subscription and use. Greenstein finds that "by the summer of 1998… there were dozens of well-known national networks and scores of less-known national providers covering a wide variety of dial-up and direct access. There were also thousands of regional and local providers of Internet access that served as the link between end-users and the Internet backbone."[102]

In the view of some, the impact of "the army of ISPs" goes beyond merely spurring the adoption of Internet service on the demand side. They opened markets that were neglected by dominant ISPs and forced dominant firms to make services available that they might well have resisted had they not faced the competition. Competition at the level of service providers not only drove adoption but stimulated cross layer competition. David Mowery and Timothy Simcoe describe these impacts as follows[103]:

> These small ISPs benefited from the distance-sensitive pricing of long distance telecommunication services that created opportunities for entry by ISPs into local markets, the focus of larger ISPs on high-density urban locations and the fact that no more than a few hundred customers were needed to provide sufficient revenues to fund a modem pool and high-speed connection. At the same time, many of the larger online services hesitated to provide unrestricted Internet access, which they saw as diluting the value of their proprietary applications. In a classic illustration of the power of network externalities, the rising number of Internet hosts and users compelled the major online service providers to offer e-mail connectivity and later, browsing, in order to keep their customers…
>
> Increased demand and entry by new service providers led to rapid investment in new capacity, particularly in major metropolitan areas, and brought telecommunications service providers into direct competition with national and regional ISPs… The PC networks that evolved from bulletin boards into online service providers were a significant source of Internet growth and competition in the market for access.

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[102] Id., at 3.

[103] David C. Mowery & Timothy Simcoe, The Internet, in TECHNOLOGICAL INNOVATION AND ECONOMIC PERFORMANCE (Benn Steil, David G. Victor, & Richard R. Nelson, 2002), at 238.

Throughout the history of the commercial narrowband Internet, the number of service providers was never less than 10 per 100,000 customers. At present, and for most of the commercial history of the industry, there have been 15 or more ISPs per 100,000 subscribers on the open, dial-up Internet.

The competitive pressures that small ISPs brought to the Internet service market and the investment in complementary communications equipment stimulated by having nondiscriminatory access to the network represents a general pattern that can be expected to be repeated. In fact, a similar process can be seen in the development of competitive local exchange carriers (CLECs). In an effort to stimulate competition in telecommunications markets, Congress mandated that the CLECs be given access to the elements that constitute the telephone network in an unbundled fashion. These entities began by innovating in marketing and customer service as the ISPs had done, specializing in:

> the value added a competitor contributes through steps such as definition, marketing, sales, and support of commercialized services, all dimensions around which competitors seek to compete and innovate. . . .In the case of UNE-P, for example, competition is keen in pricing, brandings, markets, customer service, etc. . . . [T]hose activities constitute real competition that results in true economic efficiency.[104]

Although the marketing innovation of the new entrants is most obvious, they have also made substantial contributions to the production side of the industry. They have driven innovation in operating support and back office systems, rights of way and collocation, and the provisioning and use of fiber.

> Entrants innovated in almost every dimension of the business from use of rights-of-way, to becoming early adopters of new technology. Entrants innovated at the OSS/BSS level by working closely with new vendors that

[104] Allaine DeFontenay, Why Inefficient Incumbents Can Prevail in the Marketplace Over More Efficient Entrant: An Analysis of Economies of Scale and Scope, Transaction Costs and the Misuse of Data, (2003), at 27.

> were developing modular off-the-shelf elements that would support a plug-and-play strategy. While incumbents were selling their real estate because of the miniaturization of equipment and complaining that there was not enough space for collocation, entrepreneurs created the *telehouse*, where myriad service providers could collocate and interconnect efficiently. Fiber became commercialized under a growing diversity of formats – dark or lit, by strands or lambda. While ADSL had been developed by Bellcore in the late 1980's, the CLECs were the first to push for its large-scale deployment. In all, entrants brought a new standard of innovation and efficiency to the marketplace.[105]
>
> One of the lessons from the recent competitive era is that new entrants and competitors can be quite ingenious and innovative in tackling the challenges that they face. One of the most impressive innovations was the use of old pipelines to create a national backbone fiber network… More generally entrants have been very successful in addressing the right-of-way problem where they were at an enormous disadvantage.[154]

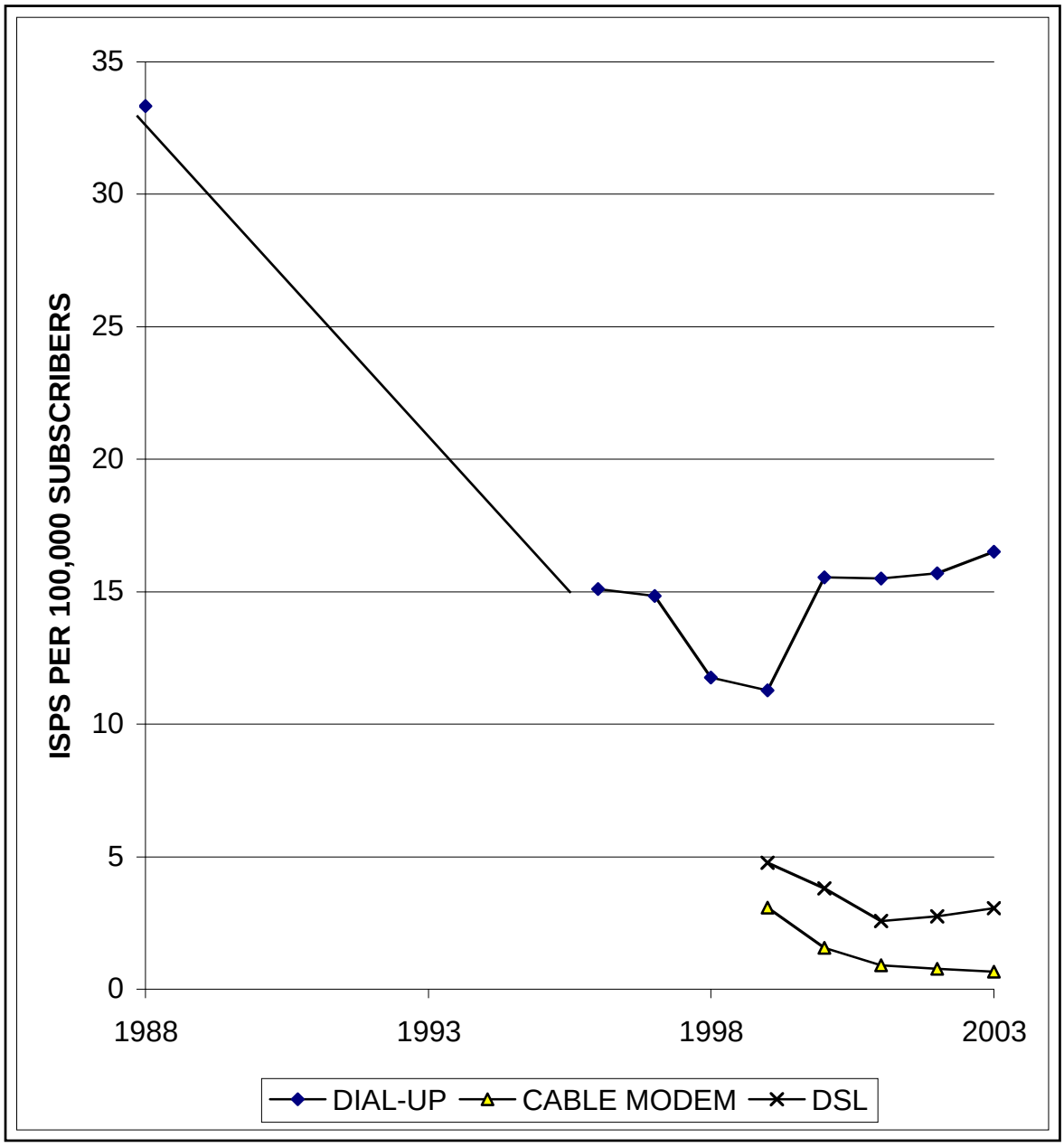
Thus, the introduction of competition in a middle or applications layer not only promotes efficiency in that layer, but it may provide the base for launching competition across layers, as well as stimulating investments in complementary assets.

C. SQUEEZING INTERNET SERVICE PROVIDERS OUT OF THE MARKET

ISPs were also the first victims of the network foreclosure strategy. The independent business of buying telecommunications services and selling Internet access service has been all but eliminated from the high-speed Internet market by the withholding of advanced telecommunications services. In contrast to the 15 ISPs per 100,000 customers on the dial-up Internet, on the high-speed Internet there are now less than 2 ISPs per 100,000 customers. For cable modem service there is less than 1 Internet service provider per 100,000 customers. For DSL service, there are fewer than 2.5 ISPs per 100,000 customers. Viewed on a market size basis, the impact is even more drastic (see Figure V-1).

[105] *Id.*, at 59.

FIGURE V-1:
DENSITY OF DIAL-UP AND HIGH-SPEED ISP



Source: Subscriber counts: Carey, John, "The First Hundred Feet for Households: Consumer Adoption Patterns," in Deborah Hurley and James H. Keller (Eds.), *The First Hundred Feet* (Cambridge: MIT Press, 1999); National Telecommunications Information Administration, *A Nation Online* (U.S. Department of Commerce, 2002). Early ISP counts are discussed in Cooper, Mark, *Expanding the Information Age for the 1990s: A Pragmatic Consumer View* (Washington, D.C.: Consumer Federation of America, American Association of Retired Persons, January 11, 1990). See also Abate, Janet, Inventing the Internet (Cambridge: MIT Press, 1999) and Matos, F., *Information Service Report* (Washington, D.C.: National Telecommunications Information Administration, August 1988), p. x. More recent numbers are from the Bureau of Labor Statistics; 2001b. Since the mid-1990s, annual counts of ISPs have been published in *Network World*.

The foreclosure of the market to independents is even more profound than these numbers indicate. Approximately 96 percent of households subscribing to high-speed Internet access are served by ISPs affiliated with either cable companies or telephone companies.[106] This dominance is not the result of winning in a competitive market; it is the result of leveraging control of physical facilities. The fact that control over the wires is the cornerstone of this market foreclosure is demonstrated by the failure of the cable and telephone affiliated ISPs to have any success in the truly competitive narrowband Internet market. Cable companies have not sold Internet service in any product and geographic market where they do not control a monopoly wire. Telephone companies have done very poorly as ISPs in the dial-up market. Consequently, 95 percent of the customers in the dial-up market take their service from independent ISPs – treating AOL as an independent in the dial-up market. In other words, incumbent monopolists have a 95 percent market share where they can leverage their market power over their wires and a 5 percent market share where they cannot.

It may well be that the Internet service market was due for some consolidation.[136] However, the staying power of ISPs is impressive and the closing of the Internet produces a very different picture of service development and innovation than we saw on the dial-up Internet. In contrast to the dial-up Internet, which witnessed a steady flow of innovations and the growth of a large customer service sector that stimulated the adoption of Internet service by a majority of households, the body of potential innovators and customer care providers in the broadband market has shrunk. At a minimum, ISPs provided customer care, extended service throughout the country and adapted applications to customer needs. They are like the

[106] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.

mechanics and gas stations in the automobile industry. There are now just too few ISPs on the broadband Internet. Broadband Internet service providers (who also control the broadband access facilities) have few incentives to innovate, due to their dominant position in the market. If "market forces" have failed, it is up to the Commission to establish a framework which encourages competition.

The Internet model has been turned on its head in the closed broadband space. Analysts proclaim critical mass of deployment and wait for the killer application, while they worry about how average users will be induced to adopt services.

> With close to 27 million US business and residential subscribers at the end of 2003, broadband is now clearly a mainstream service… However, the one major challenge that faces the future provisioning of broadband will come from a less tech-savvy subscriber. As broadband moves into mass adoption, newer subscribers will be less experienced with computers and the Internet. They will expect all of the benefits of the Internet, but will have less patience for dealing with its technical issues.[107]

Acting as a mediator with regard to technical complexity was exactly the function of the competitive ISP market—which has been decimated by the denial of access to customers. More importantly, Internet applications did not wait for a subscriber base, they drove demand for subscription. The potential applications that are expected to flourish have run into problems with the closed platform. "[T]he existence of a significant subscriber base opens up markets for other services that are looking to take advantage of the broadband connection, such as home entertainment/networking, Voice over IP (VoIP) and online gaming."[108] Home networking and entertainment, as well as online gaming have been possible for several years, but have been resisted by cable operators who want to control them.

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[107] Annalee Saxenian, *The Origins and Dynamics of Production Networks in Silicon Valley*, in UNDERSTANDING SILICON VALLEY (Martin Kenney, ed., 2000), at 148.

[108] Techweb News, *Broadband Boom*, INFORMATION WEEK, May 12, 2004, Id., see also Scott Pruitt, *ISPs Missing the Broadband Boom*, PC WORLD, November 14, 2003.

Thus, the hoped-for uplift in services and adoption is still hampered by the obstacles that the open Internet architecture/open communications platform had solved over a decade ago. The process we observe on the high-speed Internet is strangulation of technology adoption through the exercise of market power. By cutting off access to advanced telecommunications service – the oxygen of the Internet market – facility-owners have eliminated competition at the level of applications and services. The threat of withholding functionality or banning applications chills innovation.

VI. FALLING BEHIND ON BROADBAND

A. THE LOSS OF LEADERSHIP

With every passing month, the United States falls further behind the global leaders in broadband Internet access thanks to a combination of market and policy failures. Our markets lack the competition to bring lower prices and higher capacity, and market forces are unlikely to deliver universal access. Our policies lack the imagination and potency to create real change. Meanwhile, Americans pay more money for less service than a dozen other nations. Thirty percent of US households are still stuck with dial-up modems, and another quarter do not have Internet access of any kind. Our broadband problem is reaching crisis proportions.

Cable and telephone companies hold a cozy duopoly over broadband services with a 96% residential market share.[109] A recent Government Accountability Office (GAO) report on broadband availability shows that the average U.S. household has access to only two terrestrial broadband services providers.[110] Though its methodology overstates the level of competition, FCC data shows that over 35 percent of U.S. ZIP codes have one or zero DSL and/or cable modem provider reporting service.[111]

The FCC continues to overstate broadband deployment and adoption in the United States and mislead about the actual state of competition in the market. The FCC is mandated to ensure deployment of broadband "that enables users to originate and receive high-quality

[109] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.
[110] "Broadband Deployment is Extensive throughout the United Sates, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas", United States Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006.
[111] High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.

voice, data, graphics and video telecommunications."[112] However, the FCC standard for "high-speed" connections (200 Kbps) is barely fast enough for users to receive low-quality streaming video, much less originate high-quality video. The FCC also uses a meaningless measure of broadband coverage. The Commission counts a ZIP code as covered by broadband service if it contains at least one broadband subscriber. This flawed metric produces inflated estimates of the state of broadband availability and competition.

B. WHY INTERNATIONAL TECHNOLOGY RANKINGS MATTER FOR THE UNITED STATES

The latest broadband data from the Organization for Economic Cooperation and Development (OECD) shows that the United States ranks 15th out of the 30-member nations in per capita broadband use, down from 12th place just 6 months ago, and down from 4th place in 2001. In terms of growth in broadband penetration over the past year, the U.S. ranks 20th out of 30.[113] The International Telecommunications Union's (ITU) 2005 broadband penetration data had the U.S. at 16th overall in the world, a figure that will likely show a drop to 20th when updated data is released. ITU includes several countries in its study with high broadband performance that are not OECD members (which is why the numbers vary).[114]

The U.S. ranks 21st in another ITU metric -- the Digital Opportunity Index -- which measures eleven different variables of technology development, including an important factor not captured in the simple broadband rankings -- the cost of connectivity relative to per capita income. Notably, the US dropped from 8th place in the Digital Opportunity Index in 2000 to

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[112] See § 706(c) of the 1996 Act.

[113] Organization for Economic Cooperation and Development (OECD), "OECD Broadband Statistics to December 2006".

[114] In the 2005 ITU rankings (available at http://www.itu.int/ITUD/ict/statistics/at_glance/top20_broad_2005.html) four nations were ahead of the U.S. that are not included in the OECD rankings -- Liechtenstein, Hong Kong, Taiwan, and Israel.

21st place by 2005. We are ranked 36th relative to other nations in the increase in the absolute value of our Digital Opportunity Index score between 2000 and 2005.[115]

Apologists for the poor relative performance of the U.S. are eager to discredit these international rankings. They offer ways to explain away the declining status of the United States as a global technology pioneer and leader. But the excuses of entrenched incumbents bear a heavy burden of proof. Too often, these are simply diversions offered by companies that oppose the competition policies that would reverse market failures and ensure that America's digital future gets back on the right track.

Currently, 45% of U.S. households subscribe to broadband service. If the U.S.'s penetration level were as high as in Denmark or the Netherlands, this would translate into an additional 36 million total subscribers, or approximately 33 million additional residential subscribers. This would put the U.S. household penetration level at 67%. If the U.S.'s penetration level were as high as 9th-ranked Canada, this would translate into an additional 12.5 million total subscribers, or about 11.5 million additional residential subscribers. This would put the U.S. household penetration level at 50%.[116]

These differences have real world consequences. In 2003 when residential broadband penetration was at 20%, economists estimated the annual consumer surplus from broadband to be about $10 billion per year.[117] If broadband penetration were 50% of all U.S. homes, consumers would realize a $38 billion annual surplus. If household broadband

[115] International Telecommunications Union, "World Information Society Report 2006", available at http://www.itu.int/osg/spu/publications/worldinformationsociety/2006/report.html.

[116] These data are extrapolated from official FCC broadband data reported in "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission; calculated assuming one line per household, based on July 2006 Census household estimates.

[117] Crandall et. al., "The Effect of Ubiquitous Broadband Adoption on Investment, Jobs, and the U.S. Economy," Criterion Economics, L.L.C., September 2003.

penetration were at 95%, the consumer surplus would be $350 billion annually. Because of network effects, the *benefits of higher broadband penetration accumulate exponentially*, thus **even a minor increase in our international broadband ranking has tremendous positive impact on the American economy.**

Though our position in the international rankings is cause for concern, even more troubling is how we have progressed in recent years relative to other countries. From December 2001 to December 2006, the U.S. penetration in the OECD rankings increased by 15.1 subscribers per 100 inhabitants, below the OECD average of 15.9, and 14th overall in the amount of increase among the 30 nations. The average 5-year growth rate of the countries that outperformed the U.S. since 2001 is 40% higher, and the growth rate of the top performing country, The Netherlands, is over 85% higher than that of the U.S.

From December 2005 to December 2006, the U.S. penetration in the OECD rankings increased by 3.3 subscribers per 100 inhabitants, below the OECD average of 3.4, and 20th overall in the amount of increase among the 30 nations. The average 1-year growth rate of the countries that outperformed the U.S. in the past year is nearly 60% higher, and the growth rate of the top performing country, Denmark, is 114% higher than that of the U.S. Even South Korea, a very early broadband leader that in theory should be closer to market saturation, outperformed the U.S.'s growth over the past year.

Even if the U.S. were able to match the world leaders in penetration rates, American consumers cannot obtain the speed and value (cost per unit of speed) available in other nations. The value of U.S. connections is alarmingly below other countries. Where U.S. consumers routinely pay about $10 per month per Mbps (Megabit per second), citizens in countries like Japan, South Korea, Sweden and France pay less that $1 per month per Mbps.

For example, a 50 mbps connection in Japan costs $30 per month. Such speeds are not even available in the US. American customers can expect to pay $20-30 per month for (at best) 3 mbps of DSL connectivity or between $40-50 per month for 4-8 mbps of cable modem connectivity.[118] A French company offers the "triple play"—50 mbps of symmetrical broadband service, unlimited telephony and cable television—for 30 euros per months. Neither this level of service nor this price point is available in the US by a wide margin.[119] On the other hand, American consumers are charged, on a per megabit basis, substantially higher rates for DSL and cable modem offerings—which provide a fraction of the bandwidth associated with these alternatives.

C. CAUSES OF THE U.S. DECLINE

The most important factors for explaining the differences in various nations' broadband penetration rates are household income and poverty — not geographic factors like population density.

Much of the broadband successes of other countries are due to their successful implementation and use of non-discriminatory, open access policy — which has directly facilitated vigorous competition that has brought Europe and Asia fast, inexpensive broadband connections. The FCC and Congress — as a result of intense lobbying by powerful incumbent cable and telecom companies — have turned their backs on this important communications policy.

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[118] Grant Gross, "U.S. customers pay considerably more than the Japanese for bandwidth," IDG, 4 April 2007, http://www.infoworld.com/archives/emailPrint.jsp?R=printThis&A=/article/07/04/04/HNjapbroadband_1.html

[119] "Neuf Offers 50 Mbps in Paris for 30 EUR per month," *MuniWireless*, 7 March 2007, http://www.muniwireless.com/article/articleview/5771/1/2/

The digital divide — between rich and poor and urban and rural areas — shows no sign of narrowing. Those living in urban areas are nearly twice as likely to have home broadband access as their rural counterparts. The GAO found that nearly one in 10 households nationwide have no terrestrial broadband service available.[120] U.S. farm households have home broadband access at nearly half the level of all U.S. households nationwide.[121]

U.S. students have the fourth-lowest level in the OECD of exposure to computers in the home. Students without home computer exposure perform significantly lower on tests that measure mathematical aptitude.[122] Furthermore, approximately one out of 10 households with incomes below $30,000 reported having broadband access while broadband connections were in six out of every 10 households with incomes above $100,000.[123] The price of the connection is the most significant barrier to broadband adoption by low-income consumers.[124]

In short, American broadband connections are slow, expensive, and not universally available. Congress and the FCC have the power to reverse these disturbing trends, and to return the U.S. to a leadership position. To do this, however, they need to take an honest look at the lack of meaningful competition in the broadband services market. Faith-based policy and wishful thinking will not bring broadband to U.S. households, especially those in rural or low-income areas, and the repeated use of misleading data will not help American consumers afford broadband.

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[120] "Broadband Deployment is Extensive throughout the United Sates, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas", United States Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006 ("GAO Report").

[121] "Farm Computer Usage and Ownership", National Agricultural Statistics Service, Agricultural Statistics Board, U.S. Department of Agriculture, July 29 2005.

[122] "Are students ready for a technology-rich world?" OECD, January 2006.

[123] GAO Report.

[124] Yankee Group, February 2006, as published 2/17/2006 on emarketer.com. See http://www.emarketer.com/eStatDatabase/ArticlePreview.aspx?1003833

D. THE APOLOGISTS' EXCUSES FOR THE POOR U.S. PERFORMANCE DON'T HOLD UP

Several incumbent providers have published information that attempts to discredit the OECD international broadband rankings, and persuade policy makers that all is well.[125] Their arguments center around three key points, each of which is seriously lacking.

The first claim is that the OECD's methodology undercounts U.S. business connections.[126] But a simple look at the OECD data on U.S. connections in comparison to data from the FCC's census of broadband providers shows that this accusation has no basis in fact. After subtracting mobile wireless connections from the June 2006 FCC data (to account for the fact that the OECD does not include these connections in their tally) and comparing these to the June 2006 OECD totals for U.S. subscribers, we found that the FCC counted about 53.6 million lines, while the OECD counted 56.5 million lines.[127] Thus, it appears that the OECD's tally for the U.S. may be *too generous*, and not an underestimate.

Secondly, the incumbents point to geographic factors like population density to assign blame for the poor U.S. broadband performance.[128] However, this is simply not the case – **geographic factors play little if any role in explaining the U.S. broadband performance relative to other countries**. There is absolutely no correlation between international broadband penetration and population density.[129] Five of the 14 countries with higher

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[125] Comments of Verizon ("Verizon Comments"); Comments of AT&T ("AT&T Comments"); Comments of the National Cable and Telecommunications Association ("NCTA Comments"); Comments of CTIA ("CTIA Comments"). All comments submitted in GN Docket No. 07-45, May 16, 2007.

[126] NCTA Comments at 18; Verizon Comments at 28-29; AT&T Comments at 17.

[127] Organization for Economic Cooperation and Development (OECD), "OECD Broadband Statistics to June 2006" (The OECD numbers were taken from the June 2006 study, the same timeframe as the latest totals provided by the FCC); "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.

[128] NCTA Comments at 17-18; Verizon Comments at 29; AT&T Comments at 17.

[129] S. Derek Turner, "Broadband Reality Check II," Free Press, Consumers Union, and Consumer Federation of America, August 2006, Available at http://www.freepress.net/docs/bbrc2-final.pdf.

broadband penetration levels have lower population densities than the U.S. There is a very weak relationship between international broadband penetration and the percentage of a country's population living in urban areas. But the U.S. is a relatively urban nation, with 79% of the population living in urban areas, close to South Korea, which has an urban population of 80%. However, factors like median household income and poverty play a much larger role in explaining international broadband performance. **When income and poverty are controlled for in econometric models, population density and urban percentage have absolutely no explanatory effect on broadband penetration.**

Some apologists invoke comparisons of the EU 25 to the U.S. broadband performance. However, the EU 25 includes developing countries that should not be directly compared with the U.S.

Incumbent providers assert that the amount of platform competition (i.e. competition between technologies) is lacking among other nations, and thus the U.S. is poised for some sort of "just around the corner" broadband wonderland.[130] **However, several of the nations ahead of the U.S. in the OECD ranking do have appreciable levels of platform diversity *and* they also have significant amounts of competition within each platform -- something the U.S. lacks.** Countries like Denmark, The Netherlands, South Korea, Sweden, Belgium, Canada, and Japan all have significant amounts of second and third-platform broadband technologies. In fact, in 7 of the 14 countries ahead of the U.S. in the OECD rankings, the leading platform has a market share of 62% or less. This is very close to the share of the cable platform in the U.S., which is 52% in the latest OECD data.

[130] Verizon Comments at 24.

Verizon touts their deployment of fiber optic to the home technology. We applaud that unique effort, since other major carriers like AT&T have adamantly stated their opposition to upgrading infrastructure. But Verizon is shifting out of some traditional markets; they are very selective about what they deploy, and their service is slow and expensive by fiber standards. **According to Verizon's website, their fastest fiber offering is only 30Mbps download/5Mbps upload, for a whopping $199.95 per month**, plus fees and taxes. In contrast, fiber offerings from Japan are routinely 100Mbps *symmetrical*, and under $50 per month.

E. CONCLUSION

Reflecting the importance of the communications network at the core of the digital economy, the ultimate cost of falling behind reverberates through the economy. With lagging broadband penetration, innovation in the applications layer and the services that use the physical connection has gone abroad. Jobs follow the exit of innovation.[131] The precipitous decline in leadership has been widely noted in well-respected rankings, as recently reported in the Harvard Business Review. Harvard Business School's Michael Porter, for instance, ranked the United States as the world's most competitive nation in his initial 1995 Global Innovation Index. According to Porter's projections, by 2005, the U.S. will have tumbled to sixth among the 17 member countries of the Organization for Economic Co-operation and Development (OECD) trailing (in order) Japan, Finland, Switzerland, Denmark, and Sweden. The 2004 Globalization Index developed by A.T. Kearney and published in Foreign Policy ranks the United States seventh behind Ireland, Singapore, Switzerland, the Netherlands,

[131] Richard Florida, "America's Looming Creativity Crisis," Harvard Business Review, October 2004.

Finland, and Canada.[132] There are obviously many causes of this decline, but it is interesting to note that eight of the nine countries ranking ahead of the U.S. in this list have higher levels of broadband penetration than the U.S.

[132] Id., p. 3.

VII. FAILING TO ACCOMPLISH THE GOAL OF UBIQUITOUS BROADBAND AVAILABLE AT REASONABLE PRICES

Current FCC policy is failing to accomplish the most fundamental goal of the Communications Act as articulated in its first sentence and in Section 706. The U.S. broadband communications network is not available to "all Americans… at reasonable charges" by any stretch of the imagination. The network that is being deployed is not "adequate" in the most fundamental way a communications network should serve the public. The upload speeds necessary to make the public effective speakers in the digital information age are simply not available.

A. THE COMMISSION'S DATA ARE INADEQUATE, YET STILL SHOW LARGE GAPS IN BROADBAND COVERAGE

The Commission's ability to monitor the marketplace for the reasonable and timely universal deployment of advanced services is only as good as the data it collects. And it is in this effort that the Commission has failed.

To fulfill the monitoring requirements of the Act, the Commission implemented the Form 477 reporting requirements.[133] Initially, all providers of high-speed and advanced services with at least 250 customers in a given state were required to report twice a year about their broadband deployment activities. This information included the total number of subscribers in a state and type of technology to which they subscribed, as well as a listing of each 5-digit ZIP code where a provider had at least one subscriber residing. Providers were required to report connections based on the Commission's perplexing definitions of "high-speed" (200 kbps asymmetrical) and "advanced service" (200 kbps symmetrical) Internet connections.

[133] See "Local Competition and Broadband Reporting", *Report and Order*, CC Docket No. 99-301, 15 FCC Rcd 7717, (2000).

Four years after these reporting requirements were implemented, the FCC released an updated Order on Form 477.[134] All companies are now required to report regardless of how many subscribers they serve. Also, companies now must report some limited information on the speeds and types of the connections to which their customers subscribe. These are welcome changes, as they do provide the FCC and Congress with a more detailed understanding of the U.S. broadband market. However, the only information that Form 477 provides on *local* broadband activity is the absolutely meaningless metric of ZIP code coverage. The FCC reports the number of providers in a given ZIP code that report serving at least one subscriber in that ZIP code. Given the large geographic size of ZIP codes, especially in rural areas, this metric provides no realistic measure of actual broadband deployment and adoption at the local level.

The 1996 Act clearly requires the FCC to determine the pace and extent of the deployment of broadband to *all* Americans. Yet the Commission itself admits that its ZIP code methodology is not meant to be a measure of broadband deployment.[135] In the 2004 proceeding to revise Form 477 reporting requirements, the FCC was urged to make changes that would provide a better understanding of the true nature of broadband deployment. For instance, the FCC could ask providers to report the actual number of subscribers in a given ZIP code, which would allow for a more granular level of household penetration calculations (currently, state-level household penetration is the most granular level the Form 477 data enables calculation of). The Commission could have decided to use Form 477 to ask providers to list ZIP codes where their service is available at the more specific "ZIP plus 4"

[134] See "Local Telephone Competition and Broadband Reporting", *Report and Order*, WC Docket No. 04-141, 19 FCC Rcd 22340 (2004).

[135] See "Local Competition and Broadband Reporting", *Report and Order*, CC Docket No. 99-301, 15 FCC Rcd 7717, (2000).

geographic level, which approximates city blocks. Likewise, the FCC could have required the reporting of pricing data. The Commission declined to implement any of these improvements. Thus, the mandate of the 1996 Act goes unfulfilled, and policymakers are left in the dark about the true nature of broadband deployment in America.

In its May 2006 report on broadband deployment, the GAO chided the FCC on its use of the meaningless ZIP code metric. The GAO stated that "the use of subscriber indicators at the ZIP code level to imply availability, or deployment, may overstate terrestrially based deployment." The GAO added: "Based on our analysis it appears that these [ZIP code] data may not provide a highly accurate depiction of deployment of broadband infrastructures for residential service in some areas." **The GAO concluded, "the number of providers reported in the ZIP code *overstates the level of competition to individual households."*** [136]

For example, according to the FCC's data, 95 percent of Kentucky households live in ZIP codes where broadband service has been reported. However, the results from ConnectKentucky's massive statewide assessment showed that only 77 percent of Kentucky households live in areas where broadband service is available.[137] The GAO also compared FCC ZIP code data to survey data they obtained from Knowledge Networks. According the FCC's ZIP code data, the median number of providers offering broadband in the average ZIP code area is eight. However, after the GAO corrected for the shortcomings in the FCC's data,

[136] "Broadband Deployment is Extensive throughout the United Sates, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas", United States Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006.

[137] "Technology Adoption and Barriers by Metropolitan and Non-Metropolitan Areas: Results and Analysis from the ConnectKentucky Technology Assessment Study", ConnectKentucky, 2005.

it found that the median number of providers fell to just two, and that 9 percent of respondents had no service available whatsoever.[138]

The inadequacy of the FCC's data is no small matter. ***The FCC's methodology overstates the true level of broadband deployment and adoption***, and offers no information at all on the price to performance ratio of broadband connections. So what is the true state of broadband in America?

B. INDEPENDENT DATA SHOW A PERSISTING DIGITAL DIVIDE

To answer the above question, one must use other non-FCC survey data to construct a more accurate assessment of the fulfillment of the Section 706 mandate for universal broadband deployment. The Pew Internet and American Life Project conducts periodic surveys that provide a snapshot of the broadband marketplace. In their most recent report[139] (May 2006 based on 2005 survey data), Pew showed that urban adults were 1.76 times more likely to report a home broadband connection than their rural counter parts, increasing from 1.72 the previous year. Pew data also shows that adults living in homes with annual household incomes below $30,000 are more than three times less likely to report having a broadband connection as those with annual household incomes above $75,000.

Other sources confirm these findings. A 2006 GAO study revealed that approximately one out of 10 households with incomes below $30,000 reported having broadband access, while broadband connections were in six out of every 10 households with incomes above $100,000. This study also showed that urban households had broadband connections at nearly

[138] "Broadband Deployment is Extensive throughout the United Sates, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas", United States Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006.

[139] In 2005, 18 percent of rural adults reported a home broadband connection, compared to 31 percent of urban adults. In 2006, 25 percent of rural adults reported a home broadband connection compared to 44 percent of urban adults. See John B. Horrigan, "Home Broadband Adoption 2006", Pew Internet & American Life Project, May 28 2006.

twice the rate of rural households.[140] USDA data reveals that U.S. farms are half as likely to have broadband as the average American household.[141]

A recent survey by the Yankee Research group asked non-broadband users why they did not subscribe. Nearly half of the respondents indicated that broadband was just "too expensive," with nearly 10 percent reporting that broadband service was unavailable where they lived.[142] The latter result is consistent with the May 2006 GAO report, which showed that nearly 10 percent of adults live in areas where broadband service is unavailable.

The data make it quite clear that the key barriers to broadband adoption by low-income and rural consumers are price and availability. This is not surprising, as high prices and limited deployment is the exact expected outcome in a duopoly market.

ConnectKentucky, a public-private alliance in that state, has undertaken the largest and most comprehensive broadband availability and use assessment effort to date. The work demonstrates that in Kentucky, one of the lowest-ranking states in terms of broadband penetration, availability and price are the key barriers to adoption by non-broadband Internet users. Of all Kentucky dial-up users, 23 percent report that no high-speed service is available, and 26 percent report that broadband is too expensive. In non-metropolitan Kentucky counties, 30 percent of dial-up users report no broadband service is available, while just 18 percent of dial-up users in metropolitan Kentucky counties reported no service is available. In

[140] "Broadband Deployment is Extensive throughout the United Sates, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas", United States Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006.

[141] "Farm Computer Usage and Ownership", National Agricultural Statistics Service, Agricultural Statistics Board, U.S. Department of Agriculture, July 29 2005.

[142] Yankee Group, February 2006, as published 2/17/2006 on emarketer.com. See http://www.emarketer.com/eStatDatabase/ArticlePreview.aspx?1003833

metropolitan Kentucky counties, nearly one out of every three dialup users reported that broadband is too expensive.[143]

Response to questions about patterns and habits of all Kentucky Internet users clearly demonstrates that non-metropolitan subscribers use the Internet in almost identical ways as their metropolitan counterparts, with significantly more non-metropolitan users reporting using the Internet for instant messaging and taking online classes. The results from this survey seem to confirm that it is price and availability that is standing in the way of broadband adoption by rural users. If given the opportunity, rural users will use their broadband connection in ways that are identical to their urban counterparts.

Results from a recent survey of low-income families in California confirm that this segment of society uses information and communications technologies at a high rate but have not adopted broadband service due to its high price. Cell phone usage is prominent in these low-income households, with 88 percent of homes reporting cell phone adoption. More than 70 percent of low-income California families have a computer in their homes, and 76 percent of these homes (or 54 percent of all low-income California families) are connected to the Internet.[144] Contrast this with the GAO study, which found that 66 percent of all households nationwide have a home computer and that 59 percent of all households nationwide are connected to the Internet.

Of the families in the California survey who reported no home Internet access, 50 percent said that the monthly cost of Internet service was a barrier to adoption. When low-income respondents who reported no home Internet access were asked if they would subscribe

[143] Technology Adoption and Barriers by Metropolitan and Non-Metropolitan Areas: Results and Analysis from the ConnectKentucky Technology Assessment Study", ConnectKentucky, 2005.
[144] Results of Greenlinings "Low Income Twenty-first Century Technology Study" as filed with the California Public Utilities Commission, May 24 2006.

to broadband at a price level of $15 per month, a whopping 83 percent said that they would. The results from this survey indicate that the price of broadband service, and not necessarily the lack of a home computer, is the key barrier to broadband adoption by low-income households.

Bringing higher quality and more affordable broadband products to underserved low-income and rural markets is a policy goal that flows directly from the language contained in the 1996 Telecommunications Act. The Act also declares that "consumers in all regions of the nation, including low-income consumers and those in rural, insular, and high cost areas, should have access to telecommunications and information services, including interexchange services and advanced telecommunications and information services that are reasonably comparable to those services provided in urban areas and that are available at rates that are reasonably comparable to rates charged for similar services in urban areas."[145] But the Commissions data gathering doesn't enable it to determine if rural and low-income consumers in all regions of the nation have access to advanced services, and it doesn't even attempt to gather any information about the prices of these services.

C. LIMITED DATA ON DEPLOYMENT SHOWS LARGE GAPS

As the various data above indicates, urban users have home broadband connections at nearly twice the level of rural users, a gap that has held quite steady over the years. We know that at least 10 percent of Americans nationwide report having no broadband service available where they live, and that in certain less-populated areas a quarter of households have no broadband service.

[145] See § 254(b) of the 1996 Act.

Even the FCC's own ZIP code data, which overstates the level of deployment, shows that 12 percent of ZIP codes have no providers reporting cable modem and/or DSL service, and that nearly 40 percent of ZIP codes have one or less cable modem and/or DSL providers. This same data shows that nine out of every 10 ZIP codes have one or less providers of cable modem service, and six out of every ten ZIP codes have one or less providers of DSL service.[146]

Nationwide, the FCC reports that DSL service is not offered on 21 percent of incumbent telephone companies' lines, and that cable companies do not offer modem service on 7 percent of their lines. In some states, these numbers are very high. In South Dakota, 42 percent of the cable lines are not modem-capable, while over 40 percent of New Hampshire's incumbent telephone lines are not equipped with DSL.

Because of the lack of granularity of Form 477 data, conclusions based on this data about the differences in proliferation of advanced services can only be made at the state level. This is somewhat problematic because the variation in local deployment at such a large aggregate will be somewhat misleading and understated. However, even at the state level we see large gaps between the household penetrations of the top versus bottom states. Likewise, we see large gaps in the availability of cable and DSL between the best and worst performing states.

Together these data paint a very troubling picture. America appears to be a land of broadband haves and have-nots, where large and significant numbers of citizens in rural states are unable to purchase the same high-speed Internet services that are more common in other states. The data on the availability of cable modem and DSL suggests a very slow increase in

[146] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission;

the provision of service at the nationwide level. **But quite disconcertingly, from December 2005 to June 2006, 20 states saw a decrease in the availability of cable modem service and 5 states saw a decrease in the availability of DSL service.**

And none of this data tells the Commission anything about how low-income citizens are left behind in the information economy, a fact born out by the numerous national surveys. And it does not speak at all to the issue of a racial/ethnic digital divide. Recent data from Pew (2006) indicates that **while 43% of white American adults have a broadband connection in the home, only 29% of Latino and 31% of African American adults report access**.[147]

D. DISTORTED COMMUNICATIONS

The economic incentive for the cozy duopoly is to deploy a network that emphasizes one-way, download communications at the expense of two-way communications. Having built such a network their discrimination plans focus on charging applications and content providers to download content to consumers.

For example, depending upon the compression standard, a user would need approximately 2 to 4 Mbps of upload speed to originate a standard-definition quality television signal, and 30-40 Mbps of upload speed to originate a professional high-definition quality television signal over the Internet (see Figure VII-1).

[147] "Latinos Online: Hispanics with lower levels of education and English proficiency remain largely disconnected from the Internet", March 14, 2007, Pew Internet & American Life Project and the Pew Hispanic Center; Also, *Ibid.* at 20.

Figure VII-1: Speeds Required for Video Transfer[148]

Data Speed Required (Mbps)	Application	Compression Standard
0.384	Low Quality Video Conference	MPEG-4
1.5	Video in a Window (You Tube)	MPEG-1
1 to 2	VHS Quality Full Screen	MPEG-2
2 to 3	Broadcast NTSC	MPEG-2
4 to 6	Broadcast PAL	MPEG-2
8 to 10	Professional PAL	MPEG-2
12 to 20	Broadcast HDTV	MPEG-2
28 to 40	DVB Satellite Multiplex	MPEG-2 Transport
32 to 40	Professional HDTV	MPEG-2
34 to 50	Contribution TV	MPEG-2-I
140	Contribution HDTV	MPEG-2-I
168	Raw NTSC	Uncompressed
216	Raw PAL	Uncompressed
270	Raw Contribution PAL	Uncompressed
1000 to 1500	Raw HDTV	Uncompressed

But an examination of the offerings of the leading providers of broadband Internet service reveals that very few, if any U.S. consumers are able to purchase an advanced service product that allows them to originate high-quality video. Nearly all the products offered by the leading companies who provide the DSL and cable platforms (which have a combined share of 96% of the residential market[149]) have upload speeds below 1 Mbps (see Figure VII-2). The so-called "third-pipe" satellite and 3G mobile wireless products offer upload speed that are in some cases incapable of originating even low-quality VOIP data. At these levels of upload speed, users have no hope of originating high-quality video.

[148] See http://erg.abdn.ac.uk/research/future-net/digital-video/mpeg2.html

[149] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.

Figure VII-2: Offerings of Leading U.S. Internet Providers[150]

Service Type	Provider	Monthly Fee	Maximum Download Speed (Mbps)	Maximum Upload Speed (Mbps)	Must Bundle or Bundle for Rate?
Cable Modem	Comcast [1]	$42.95	6	0.768	Yes
	TimeWarner	$44.95	5	0.384	Yes
	Cox[2]	$41.95	7	0.512	Yes
	Charter	$42.99	3	0.256	Yes
	Cablevision	$44.95	10	1	Yes
DSL	AT&T	$49.95	3	0.512	Yes
	Verizon	$37.99	3	0.768	Yes
	Qwest	$31.95	1.5	0.896	Yes
3G Wireless	Verizon[4]	$79.99	0.4 to 1.4	0.05 to 0.5	No
	AT&T	$79.99	0.4 to 0.7	0.05 to 0.07	No
	Sprint[6]	$79.99	0.4 to 1.4	0.05 to 0.5	No
Fiber	Verizon	$199.95	30	5	No
Satellite	HughesNet [7]	$59.99	0.7	0.128	No
	WildBlue[8]	$49.95	0.5	0.128	No

[1] $59.95 without video bundle

[2] Services at this price vary by location

[3] Standard rate; must be voice customer; contract terms depend on location

[4] One-year contract; $175 early termination fee; usage restrictions; $25-$35 activation fee; faster (Rev-A) service availbility is limited

[5] One-year contract; $175 early termination fee; usage restrictions; $36 activation fee

[6] One-year contract; $200 early termination fee; usage restrictions; $36 activation fee; faster (Rev-A) service availbility is limited

[7] Require a minimum 2 year service agreement; $299.98 for equipment and standard installation; usage resrictions; $300 service termination fee

[8] $299 equipment fee; $179.95 installation fee; minimum service term is 12 months with early termination fee

The only major U.S. provider that is deploying advanced services with upload speeds that even come close to approaching the intent of Section 706 is Verizon with its FIOS fiber optic service. However, the 30Mbps download/5Mbps upload service is the very top tier FIOS offering, and is only available in a few limited areas. Moreover, the $200 price tag is clearly outside of the realm of "affordable" -- a term used many times in the legislative activities that produced the 1996 Act.

Congress articulated a clear vision of a two-way symmetrical broadband marketplace. But even setting aside for the moment the upload capabilities of U.S. broadband connections, it is clear from the Commission's own data that very few consumers are able to purchase a

[150] The information in this figure was gathered from each companies published offerings as of May 15 2007.

broadband connection that allows them to *receive* high-quality video data. Typical DSL offerings have download speeds that range from 768 kbps to 3 Mbps, with a few carriers now rolling out 6 Mbps service. Cable, the leading platform in the U.S., continues to outperform DSL in speed, but the typical cable offering is 6 Mbps, with a few limited areas seeing 10-15 Mbps service.

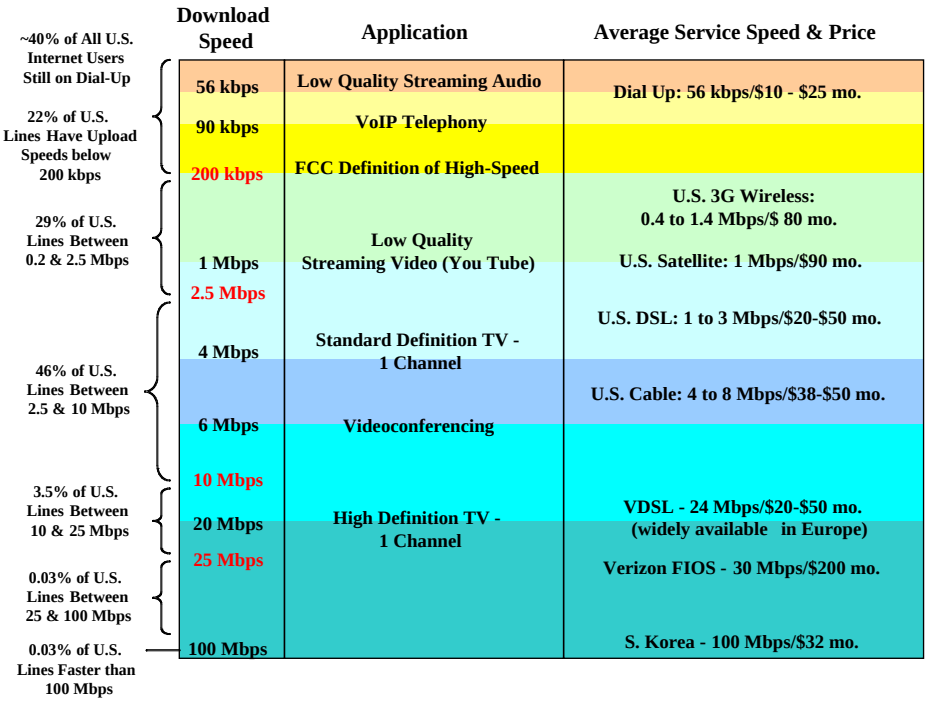
According to the most recent FCC data, more than half of all U.S. high-speed lines (residential and business) offer download speeds of 2.5 Mbps or less.[151] At this speed, using the standard video compression format (MPEG-2), none of these users could receive a standard-definition quality video service, which requires about 3 Mbps of bandwidth. Only 3.5% of all U.S. high-speed connections are between 10 and 25 Mbps, and thus capable of receiving a broadcast HDTV quality signal. In total less than 0.01% of U.S. lines can receive professional quality HDTV data, which requires speeds between 30 and 40Mbps using the MPEG-2 compression standard (see Figure VII-3).

Thus it is clear, if the Commission adopts an analytical framework based on the *actual* language of Section 706, it has no choice but to conclude that advanced telecommunications services are not being deployed to all Americans in a reasonable and timely fashion. Congress envisioned The 1996 Act as a way of facilitating the deployment of a *communications* technology, where every American could become a broadcaster by simply subscribing to a competitive and affordable advanced service offering. But the Commission's implementation of Section 706 and its definition of "advanced services" as at least 200 kbps

[151] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.

symmetrical falls far short of meeting its statutory obligation to monitor deployment of broadband technology.

Figure VIII-3: Speeds of U.S. High-Speed Lines[152]



The Commission's abandonment of the focus on upload speeds has fostered an industry that deploys extremely asymmetrical connections. FCC data reveals that the proportion of slow connections is on the rise.[153] In December 2005, 15% of broadband lines had upload speeds slower than 200kbps. By June 2006, this had increased to 22% of lines. The proportion of DSL lines that had upload speeds slower than 200kbps increased over the 12/06-6/06 time period from 18.4% to 18.9%.

[152] *Ibid.* at 8; Free Press Research.
[153] *Ibid.*

PART IV.
THE INCUMBENT FACILITY DUOPOLY UNDERMINES THE INTERNET ECONOMY

VIII. THE THEORY OF "BENEVOLENT MARKET POWER"

The macro level empirical evidence on the failure of the current policy forces the advocates of network discrimination into both the apologetics discussed in section III and an effort to present a theory of network development in which the enlightened self-interest of a small number of closed proprietary networks lead them to voluntarily eschew the abuse of market power. As the analysis in Appendices B and D shows, the theory of "benevolent market power" can only look good on paper by distorting the economic analysis and ignoring the real world behavior of the incumbent telco/cable duopoly.

A. THEORETICAL APOLOGISTS FOR CLOSED NETWORKS HAVE GOT IT WRONG

Those opposing open network principles have gone as far as to suggest that abandonment of protocol standardization, the foundation of the Internet, could be beneficial.[154] Others indicate that network neutrality principles may harm investment, if policymakers prevent last-mile broadband providers from "differentiating" their networks.[155] Unfortunately for consumers, network providers are differentiating their broadband products through excessive controls over usage, which will have the consequence of stifling the innovation which has made the Internet such a remarkable addition to the social and economic life in the United States. As has been discussed earlier, the current broadband duopoly is

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[154] Christopher Yoo, "Promoting Broadband Through Network Diversity," February 6, 2006, Available at http://law.vanderbilt.edu/faculty/Yoo%20-%20Network%20Diversity%202-6-06.pdf
Professor Yoo's study was funded by the National Cable and Telecommunications Association (the principal trade association of the cable television industry in the United States). See, "Law and Technology Professor Releases Study on Net Neutrality," TMCNet News, February 6, 2006. Available at http://www.tmcnet.com/usubmit/2006/02/06/1346622.htm

[155] George S. Ford, Thomas M. Koutsky and Lawrence J. Spiwak, "Network Neutrality and Industry Structure," Phoenix Center for Advanced Legal and Public Policy Studies, Policy White Paper No. 24, April 2006. Available at http://www.phoenix-center.org/ppapers.html

unresponsive to the demands of consumers. The evolution of Internet usage has made the ability to upload content an essential component of future progress of Internet technology. However, network providers continue to crimp the bandwidth available to virtually all residential consumers who desire to upload content. The broadband duopoly has not responded to consumer demand is a clear example of market failure. If competitive forces were functioning, consumers would quickly find reasonable (and numerous) options to take advantage of new Internet technologies which rely on the ability to upload content.

If deference to the network edge is abandoned due to the attack on network neutrality principles, then innovation will undoubtedly be affected. If innovation is slowed or prevented due to the abandonment of network neutrality principles, then significant harm to consumers and firms will result. Some providers of Internet access have begun to interfere with what happens at the network edge. Insights into the consequences of non-neutral network management policies are exemplified by the terms of service associated with a Verizon 3G wireless Internet access plan:

> **Data Plans and Features (such as NationalAccess, BroadbandAccess, GlobalAccess, and certain VZEmail services that do not include a specific monthly MB allowance or are not billed on a pay-as-you-go basis) may ONLY be used with wireless devices for the following purposes: (i) Internet browsing; (ii) email; and (iii) intranet access (including access to corporate intranets, email, and individual productivity applications like customer relationship management, sales force, and field service automation). These Data Plans and Features MAY NOT be used for any other purpose. Examples of prohibited uses include, without limitation, the following: (i) continuous uploading, downloading, or streaming of audio or video programming or games; (ii) server devices or host computer applications, including, but not limited to, Web camera posts or broadcasts, automatic data feeds, automated machine to-machine connections or peer-to-peer (P2P) file-sharing; or (iii) as a substitute or backup for private lines or dedicated data connections. This means, by way of example only, that checking email, surfing the Internet, downloading legally acquired songs, and/or visiting corporate intranets is permitted, but downloading movies using P2P file-**

> **sharing services and/or redirecting television programming content for viewing on laptops is prohibited**. A person engaged in prohibited uses continuously for one hour could typically use 100 to 200 MB, or, if engaged in prohibited uses for 10 hours a day, 7 days a week, could use more than 5 GB in a month.
>
> For individual use only and not for resale. We reserve the right to protect our network from harm, which may impact legitimate data flows. We reserve the right to limit throughput speeds or amount of data transferred, and to deny or terminate service, without notice, to anyone we believe is using one of these Data Plans or Features in any manner prohibited above or whose usage adversely impacts our network or service levels. Anyone using more than 5 GB per line in a given month is presumed to be using the service in a manner prohibited above, and we reserve the right to immediately terminate the service of any such person without notice. We also reserve the right to terminate service upon expiration of Customer Agreement term.[156]

The fact that Verizon's 3G wireless broadband service has usage restrictions associated with uploading, streaming, or peer-to-peer will hinder innovation in these areas. If these types of restrictions were placed more broadly on network users, due to the rise of "differentiated" last-mile networks, the impact on innovation would be pronounced. If, for example, end-users have limited upload capabilities or cannot use a service for streaming, then the incentive and ability to innovate in these areas is greatly reduced. Similar restrictions have been introduced on an intermittent basis whenever the principle of network neutrality has been relaxed.[157] The threat that network operators may introduce such restrictions on an intermittent basis also pollutes the open environment for innovation on the Internet.

Furthermore, while wireline broadband providers typically limit upload speeds through network design principles which crimp upstream bandwidth, there is evidence that download restrictions are emerging:

> Amanda Lee of Cambridge received a call from Comcast Corp. in December ordering her to curtail her Web use or lose her high-speed Internet connection for a year.

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[156] BroadbandAccess Terms & Conditions, boldface emphasis in the original, Available at http://b2b.vzw.com/broadband/bba_terms.html

[157] Tim Wu, "Network Neutrality, Broadband Discrimination," "Broadband Policy, A Users Guide," in Mark Cooper (Ed.), *Open Architecture as Communications Policy*.

> Lee, who said she had been using the same broadband connection for years without a problem, was taken aback. But when she asked what the download limit was, she was told there was no limit that she was just downloading too much.
>
> Then in mid-February, her Internet service was cut off without further warning.
> For Lee and an increasing number of people, a high-speed Internet connection is a lifeline to everyday entertainment and communication. Television networks are posting shows online; retailers are lining up to offer music and movie downloads; thousands of Internet radio stations stream music; more people are using WiFi phones; and "over the top TV," in which channels stream over the Internet, is predicted to grow.
>
> That means that more customers may become familiar with Comcast's little-known acceptable-use policy, which allows the company to cut off service to customers who use the Internet too much. Comcast says that only .01 percent of its 11.5 million residential high-speed Internet customers fall into this category.
> "Comcast has a responsibility to provide these customers with a superior experience and to address any excessive usage issues that may impact that experience," Comcast spokeswoman Shawn Feddeman said in a statement. "The few customers who are notified of excessive use typically consume exponentially more bandwidth than the average user."
>
> Feddeman declined to say where Comcast draws the line on too much Internet usage.[158]

While it may seem "reasonable" to restrict "high-volume" users, Comcast's practice is in reality targeting specific applications, namely video, which also competes with Comcast's cable TV and pay-per-view video products. These "packet management" practices unreasonably discriminate against consumers who adopt video technologies offered by the Internet, and point out that a broadband provider, like Comcast, which also provides pay-per-view and cable programming may have reduced incentives to upgrade its broadband network, if that broadband network offers video rivals the ability to compete with Comcast's core business.

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[158] "Not so fast, broadband providers tell big users, Firms impose limits even as demand rises," Carolyn Y. Johnson, *Boston Globe*, March 12, 2007. Available at http://www.boston.com/business/personaltech/articles/2007/03/12/not_so_fast_broadband_providers_tell_big_users?mode=PF

Furthermore, it is notable that a Comcast representative is quoted as follows:

> Downloading is “certainly going to increase dramatically over the next five years,” he said. "And even if it's double or triple or quadruple, it's going to place a lot of pressure on networks that are being pressured right now."[159]

Thus, the scope of these restrictive practices are likely to grow in the future, as the consumers adopt more over-the-top video technologies, and the broadband duopoly does not appear to be capable of meeting growing consumer demand, as is evident from current industry practices.

As shown in Appendix E, these packet management or traffic shaping practices are embodied in highly restrictive terms of service, subscriber agreements, and acceptable use policies for the high-speed Internet service offerings of the incumbent duopolists. The Internet providers studied not only place severe restrictions on customer usage, but assert a disconcerting level of control over their customer’s online service. These agreements assert the right to monitor all traffic and block or remove any traffic for a wide range of reasons, many of which have nothing to do with lawful content or network management. For example, Verizon asserts the right to deny or terminate service for “any reason or no reason,” if customers:

- Damage the name or reputation of Verizon or its affiliates
- Generate excessive amounts (as determined by Verizon) of Internet traffic
- Use the service in a way that is “objectionable for any reason”
- Interfere with another person’s usage or enjoyment
- Transmit information that is “defamatory”
- Use any name or mark of Verizon as a hypertext link to any Web site
- Use the service to “disrupt the normal flow of online dialogue”

AT&T has a similar set of policies: “AT&T does not pre-screen Content, but AT&T and its designees shall have the right (but not the obligation) to monitor any and all traffic

[159] Id.

routed though the Service, and in their sole discretion to refuse, block, move or remove any Content that is available via the Service".

The control over content that the broadband network providers exert is paralleled by their assertion of control over applications. They forbid the operation of servers or hosting, reserve the right to monitor and throttle transmission speeds, and restrict the access to permanent IP addresses, which are necessary to upload content.

One might take some solace in these restrictions if they were in some way limited to acts that are unlawful. That is obviously not the case, as is not so explicitly stated in the policies. Comcast goes a step further, asserting this control over content and use, where it is legal.

> "Comcast reserves the right, but not the obligation, to refuse to transmit or post and to remove or block any information or materials, in whole or in part, that it, in its sole discretion, deems to be offensive, indecent, or otherwise inappropriate, regardless of whether this material or its dissemination is unlawful.
>
> Although Comcast has no obligation to monitor the Service and/or the network, Comcast and its suppliers reserve the right at any time to monitor bandwidth, usage, transmissions, and content from time to time to operate the Service; to identify violations of this Policy; and/or to protect the network, the Service and Comcast users."[160]

The customer agreements also seek to lock consumers into their providers with long term contract, early termination charges, unbundling penalties and to drive them to more costly packages to obtain the elements necessary for fully functional communications on advanced telecommunications networks (e.g. static IP addresses and sufficient bandwidth to upload content). The lack of competition has allowed these practices to exist and persist and undermine the achievement of the telecommunications network that Congress envisioned in

[160] Comcast Acceptable Use Policy, emphasis added, more information available in Appendix E

Section 706 where it stated "*advanced telecommunications capability* is defined without regard to any transmission media or technology, as high-speed, switched, broadband telecommunications capability that enables users to originate and receive high quality voice, data, and video telecommunications using any technology."[161]

The *Notice* requests comments on whether providers treat different packets in different ways. Clearly they do, based on whether the packet is upstream or downstream, or whether the end-user has requested "too many" downstream packets. The discrimination that is observed to date is likely to expand in the future and the evolution of technology places more pressure on the providers of last-mile network infrastructure which, due to the lack of competition, have few incentives to upgrade their facilities to allow adoption of new bandwidth intensive applications, both on the upload and download side of the equation.

B. Sound Economic Analysis Is Needed to Assist Policymakers in the Debate Over Network Neutrality

Economic theory can provide a useful tool to assist policymakers who are considering arguments for and against network neutrality principles. However, it is extremely important that economic theory be applied correctly. If the economic impact of abandoning network neutrality principles is selectively evaluated, economic theory can easily be abused in the policy discussion surrounding the future of the Internet.

An economic evaluation of network neutrality issues should:

- Recognize the existing benefits arising from network neutrality and open access principles which have influenced the structure and operations of the Internet. These include the demonstrated benefits of competition among Internet service providers (ISPs), and competition among providers of Internet content, services, and applications. If it is alleged that competitive harms arise from network neutrality and open access principles, these should be identified and the overall impact on

[161] See § 706(c) of the 1996 Act.

competition of maintaining or abandoning network neutrality principles should be evaluated.

- Acknowledge the risks to innovation which may arise if network neutrality principles are abandoned, and broadband gatekeepers are allowed to engage in strategic differentiation of their networks which results in discrimination against producers and users of Internet services. If it is alleged that network neutrality principles which encourage innovation at the network edge are interfering with innovation in the network core, or other innovation, this expected innovation should be evaluated in a context which considers the overall impact on innovation of maintaining or abandoning network neutrality principles.

- Recognize the important role that the standardization of network protocols has on the production and consumption of Internet content, applications, and services. The consequences of the standardization of network protocols include compatibility and interoperability, which contribute to substantial economic network effects[162] that benefit consumers and producers who use the Internet. The standardization associated with Internet protocols, by encouraging innovation and competition at the network edge, has led to tremendous product variety and consumer benefits. If it is claimed that abandoning standardization of network protocols is a preferred alternative, the alleged benefits arising from the elimination of standardization should be weighed against the consequences arising from the elimination of standardization, including the loss of compatibility, interoperability, and network effects.

- Examine the prospects for last-mile broadband competition, which is a critical assumption associated with those that advocate for the abandonment of network neutrality principles. It should be determined whether the scale economies and sunk costs associated with last-mile overbuilds, or other factors, contribute to entry barriers which make it likely that consumers will continue to face highly concentrated markets for broadband access.

- Evaluate the role that government can play when market power is associated with the provision of bottleneck inputs used by firms operating in competitive markets, such as is the case when consumers utilize last-mile broadband facilities to access the Internet and utilize myriad sources of Internet content, applications, and services.

[162] Economic network effects are present when the value of a good or service increases as the number of individuals using the good or service increases. For example, prior to the mid-1990s, private e-mail systems were not connected to the Internet, but allowed electronic communication among a relatively small group of users. Once the Internet was privatized, private e-mail systems could connect to the Internet, which greatly expanded the number of individuals who could be reached by e-mail. The ability to send an e-mail message to anyone with an Internet connection increased the value of e-mail, thus exhibiting network effects.

C. Advocates of "Network Diversity" Fail to Consider the Benefits of Network Neutrality, the Limits of Network Competition and the Harm of Network Discrimination

Recent arguments by Vanderbilt University Law Professor Christopher Yoo and the Phoenix Center, among others, against network neutrality, purport to be supported by economic theory. However, these arguments are not based on a reasonable application of economic theory. Thus, these advocates for abandoning network neutrality fail to bolster the proposition that the abandonment of network neutrality principles will generate benefits for society.

For example, Professor Yoo argues that the most promising future direction of the Internet is one characterized by multiple, "separate but optimized" last-mile broadband access networks, which may utilize proprietary protocols, inhibit the performance of certain applications, or prevent users from accessing some types of information.[163] However, to reach the conclusion that such an approach is desirable, Professor Yoo ignores significant facts regarding innovation associated with an Internet governed by network neutrality and open access principles, and facts regarding the economics of Internet usage.

Likewise, it has been suggested by the Phoenix Center that network neutrality principles may contribute to the "commoditization" of last-mile broadband facilities, which will in turn discourage investment and result in harms to social welfare.[164] These claims are entirely unsupported by economic theory or the facts associated with how innovation and

[163] Christopher S. Yoo, "Promoting Broadband Through Network Diversity," February 6, 2006, Available at http://www.ncta.com/DocumentBinary.aspx?id=286 ("Yoo Study")

[164] George S. Ford, Thomas M. Koutsky and Lawrence J. Spiwak, "Network Neutrality and Foreclosing Market Exchange: A Transaction Cost Analysis," Phoenix Center, March 2007, Available at http://www.phoenix-center.org/pcpp/PCPP28Final.pdf

economic growth have been encouraged by policies consistent with network neutrality principles.

Professor Yoo suggests that:

> The decision to permit network diversity to emerge does not ultimately depend on the conviction that it would yield a substantively better outcome, but rather from a technological humility that permits exploration to proceed until policymakers can make a clearer assessment of the costs-benefit tradeoff.[165]

However, there is ample evidence that a policy of network diversity will result in a patently inferior outcome that will favor incumbent last-mile broadband providers to the detriment of consumers and Internet innovators. The incumbent network owners currently possess market power in last-mile broadband access networks and network diversity policy will encourage the leveraging of this market power into higher levels of the Internet. Implementing a policy of network diversity will undermine the vibrant competition and rapid innovation in the provision of Internet content, applications and services, which has characterized the Internet since its privatization in 1995. Professor Yoo argues that this competition need not be protected, but, if it is not, there is no question of harm to consumers.

Professor Yoo counsels policy makers that they should offer "humility" and deference to market forces.[166] With regard to the exercise of market power, the Regional Bell Operating Companies (RBOCs) and the cable companies have proven themselves anything but "humble".[167] Deference to market forces that are associated with market power, is bad advice. Given the dim prospects for last-mile competition, ample evidence regarding the RBOCs' and cable operators' attitudes toward competition, and the absence of any showing

[165] Yoo Study, p. 7.
[166] Id., p. 27
[167] Id., p. 22

that abandoning network neutrality will *improve* the lot of consumers, *humility* in the face of market power is a prescription for disaster.

The Internet, based on a foundation of network neutrality and open-access principles, was perhaps the greatest innovation of the 20th century. Advocates who prescribe the replacement of open-access principles with a policy of multiple, closed networks should bear a heavy burden of proof. They have fallen far short of that mark.

D. The Benefits Of Network Neutrality And The Cost Of Abandoning

1. The Principle Network Neutrality Is Responsible for Vibrant Competition and Rapid Innovation

How the Internet will evolve in an environment of increasing concentration in telecommunications markets is a critical policy issue. Data processing and data communication services first emerged in an environment of structural separation, one where the providers of telecommunications services were prohibited from providing electronic data processing and data communication services (now known as "information services") on an integrated basis. In a series of landmark rulings beginning in the late 1960s, the Federal Communications Commission (FCC) determined that the provision of information services by telephone companies was best accomplished by requiring the separation of the providers of information services from the providers of telecommunications services.

It is safe to say that this separation of telecommunications and information services contributed to the foundation on which the Internet would develop. By excluding telephone companies from the integrated provision of telecommunications and information services and requiring that telephone companies provide telecommunications technologies to information service providers on a nondiscriminatory basis, the information service sector, including the

Internet, was free to develop under the influence of competitive market forces, without the interference of telephone-company market power.

Furthermore, the telecommunications facilities that enabled the development of new information services, including Internet services, were provided under regulatory oversight. Access to bottleneck facilities, initially, both local and long distance, was mandated by regulators at rates which were "just and reasonable." Later, pro-competition policies pursued to encourage long-distance entry in the telephone market contributed to an abundance of competitively provided long-distance transmission capacity, which was quickly put to use as the Internet expanded during the early privatization period of the mid-1990s. Long distance competition and consumer choice was made possible and continues to depend on a form of network neutrality – an obligation on local telephone companies to provide "equal access" for competing long distance service providers.

Dial-up Internet access, the first mass-market means of accessing the Internet, provided neutral transmission capacity which encouraged vibrant competition in the ISP market. Consumers could pick and choose among ISPs which best served their needs, the telephone company did not have the ability to interfere with consumer choice. Additionally, unmetered flat rates for Internet access were encouraged due to the fact that regulators had favored flat-rate local service, further boosting the popularity of the new Internet services. Thousands of ISPs, accessed by consumers through local flat rate calling, adapted the technical capabilities of the Internet for mass market consumers and offered an array of services that drove adoption.[168]

[168] Shane Greenstein, Building and Developing the Virtual World: Commercializing Service for Internet Access (March 31, 2000); Tim Berners-Lee, Weaving the Web: The Original Design and Ultimate Destiny of the World Wide Webby Its Inventor (1999) pp. 80-81.

2. Open and Standardized Network Protocols Fueled Internet Innovation

The Internet opened new dimensions for human interaction, and provided new engines of economic growth. At the foundation of the technology that has enabled these developments is a novel philosophy of communication network design. Prior to the emergence of the Internet, communication networks were designed and operated by telephone companies. The telephone network, operating under the control of AT&T and other telephone monopolies, was designed to place computer intelligence "inside" the network, out of the reach of end-users. The telephone network was operated in a manner that limited the end-user's ability to attach innovative devices to the network, or otherwise take advantage of network technology in ways not designed (and sold) by the telephone company. The telephone company was the seller of network services, and end-users were the buyers of network services—end of story.

The Internet turned the telephone-company model "inside out". Any device that abided by the standardized and open Internet protocols could be attached to the network, and any innovator who utilized these publicly available Internet protocols could develop new content, applications, and services which would be provided over the Internet. Devices (mainly computers) attached to the edge of the network thus became the most important component of the Internet. The computers at the "network edge" could either supply network applications, content, or services, or could be used to consume network applications, content, or services. Further innovations led to the blending of computer functions at the network edge, such as those associated with file sharing technologies, where those at the network edge simultaneously produce and consume Internet content and applications.

The foundation of the innovations which are associated with the Internet—e-mail, web browsing, search engines, online auctions, e-commerce, streaming media, file sharing—are open and standardized network protocols. No firm has the ability to act as a gatekeeper associated with access to the protocols, and thus determine which applications, content, or services should be allowed to use the Internet. Innovation associated with the Internet has been fueled by the high level of deference to the network edge, and the equal opportunity to utilize network resources enabled by Internet protocols and pro-competitive policies.

In the early development of the Internet, those involved were determined that the network not "step on the toes" of the developers of the technologies which would ultimately use the network.[169] Those that designed the initial Internet protocols could not anticipate what direction future innovation might take. As a result of this insight, open and neutral protocols underlie how the Internet operates today. [170] The greatest potential for innovation associated with the development of new network applications occurs when the underlying network does not introduce artificial or arbitrary constraints on how those at the network edge innovate.

E. UNGROUNDED, SELECTIVE THEORY CAN MISLEAD POLICYMAKERS

1. The Potential Downside of Differentiated Last-Mile Broadband Networks Must be Evaluated

Those advancing economic arguments directed at the alleged harms arising from network neutrality fail to address the impact of the transformation from an "open access, network neutrality" world, to one where the owner of the last-mile access pipe dictate how end-users may utilize network resources. The costs and benefits of "network differentiation"

[169] Interview with Stephen Crocker, p. 20, Charles Babbage Institute Oral Histories, Available at http://www.cbi.umn.edu/oh/display.phtml?id=150

[170] Robert E. Kahn and Vinton G. Cerf, "What is the Internet," in Mark Cooper (Ed.), *Open Architecture as Communications Policy* (Stanford: Center for Internet and Society, 2004).

or "network diversity" must be thoroughly evaluated, and economists have extensively studied the pros and cons of sellers differentiating their products. While the Phoenix Center now points to only benefits associated with network differentiation, it is notable that in another Phoenix Center paper published in July of 2005, a clear recognition of the importance of evaluating the *benefits and costs* of product differentiation is presented, and the Phoenix Center identified in 2005 issues with product differentiation which they now ignore completely:

> As to whether consumers are better off as a result of product differentiation, the answer is "it depends." Consumers usually value variety, *so while differentiation results in higher prices, the value of increased variety may offset the reduction in consumer welfare from higher prices.* So, there is a trade-off for consumers between variety and price. Differentiation is not always beneficial to consumers, and some firms may excessively differentiate in an effort to more aggressively soften price competition. *One type of differentiation that would harm consumers is differentiation through sabotage, where one firm reduces the quality of a rival's product instead of improving its own quality.* Product differentiation may also create entry barriers by forcing entry to incur increased sunk advertising costs to win customers.[171]

Consumers may not benefit from network differentiation. Furthermore, firms may have the ability to differentiate their product by degrading the quality of a rival's product, an all too real prospect when considering the need for network neutrality policy.

Professor Yoo and the Phoenix Center's evaluations of network differentiation present an overly simplified and unrealistic view of how a policy that abandoned network neutrality would affect consumers and firms. They completely ignore the impact of the abandonment of network neutrality on current competition in markets for, and the availability of, Internet content, services, and applications of consumers' choosing. Both Professor Yoo and the

[171] George S. Ford, Thomas M. Koutsky and Lawrence J. Spiwak, "Competition After Unbundling: Entry, Industry Structure and Convergence," Phoenix Center Policy Paper Number 21, July 2005, p. 24 [emphasis added], Available at http://www.phoenix-center.org/ppapers.html

Phoenix Center ignore negative impacts on the ability of individuals and firms operating at the network edge to innovate and invest. This downside of network differentiation in last-mile broadband facilities will have a significant and negative impact on social welfare. Furthermore, the very real possibility that the operators of last-mile broadband access facilities would differentiate their product by sabotaging access to Internet content, applications, and services of the user's choice is a tremendous oversight in both the Yoo and the Phoenix Center's analysis of the impact of network differentiation.

2. Evaluation of Alternatives To Network Neutrality Must Include the Negative Impact of Change on Competition and Innovation

This possibility is more than hypothetical. For example, in 2005 Vonage, a provider of Internet telephone service over broadband access facilities, complained to the FCC that Madison River Telephone Company had blocked ports used for VoIP applications, effectively disabling consumers' ability to utilize VoIP. On March 3, 2005, the FCC approved a settlement agreement in which Madison River agreed to pay the U.S. Treasury a fine of $15,000, and to no longer block VoIP ports.[172] Sabotaging non-cooperative competitors by excluding them from the "fast lane," or extorting rents, while favored affiliates and partners are given advantages, are consequences which must be anticipated from telephone and cable companies who demand the right to discriminate and exclude. The "separate but optimized" world that Professor Yoo invents to claim a benefit for network diversity would require blocking, impairment, or discrimination to achieve the separation that he argues will be beneficial. If deference to the network edge is abandoned due to the attack on network neutrality principles, then innovation will undoubtedly be affected. If innovation is slowed or

[172] See: *In the Matter of Madison River Communications, LLC and affiliated companies*, File No. EB-05-IH-0110 Acct. No. 200532080126 FRN: 0004334082, DA 05-543. Order issued March 3, 2005.

prevented due to the abandonment of network neutrality principles, then significant harm to consumers and firms will result.

3. Vertical Integration Grounded on Facilities-Based Market Power has Potentially Significant Anticompetitive and Anti-Consumer Effects

One likely consequence of the abandonment of network neutrality principles would be increased "vertical integration." With vertical integration the owners of last-mile broadband facilities could acquire providers of Internet content, services, and applications, and sell consumers bundles of e-mail services, search engine capability, and e-commerce—similar to the bundling strategies pursued by telephone and cable companies with voice and video services that they currently offer. Such a transformation, would rob consumers of their ability to choose and diminish the benefits of competition which are currently available to users of Internet content, services, and applications.

Professor Yoo argues that such vertical integration is beneficial, however, his interpretation of vertical integration rests solely on the "Chicago School" of economics' teachings regarding the desirability of vertical integration. Professor Yoo overlooks other economic interpretations of vertical integration, including the extensive literature associated with post-Chicago analysis of vertical relationships.[173] This alternative literature rejects the simplified structure of the Chicago School's approach to vertical relationships and utilizes the tools of modern industrial organization theory to analyze market structures, which are more

[173] See, for example, Michael Riordan and Steven Salop, "Evaluating Vertical Mergers: A Post-Chicago Approach," *Antitrust Law Journal, Vol. 63,* 1995; Oliver Hart and Jean Tirole, "Vertical Integration and Market Foreclosure," *Brookings Papers on Economic Activity*, 205, 1990; Martin K. Perry, "Vertical Integration: Determinants and Effects," in *Handbook of Industrial Organization*, (Richard Schamlensee and Robert Willig eds.) 1989; Jean Tirole, *The Theory of Industrial Organization*, Chapter 4, MIT Press, 1989.

complex (and realistic) than the approach taken by the Chicago School.[174] Professor Yoo's myopic approach to the evaluation of vertical integration can only lead to incorrect advice regarding the appropriateness of network neutrality principles.

Providers of last-mile broadband facilities who possess market power will be unlikely to increase bandwidth in response to increased end-user or third-party content providers demand for bandwidth. Rather, the natural and more profitable way to "manage" end-user or third-party providers will be to raise prices for, or otherwise limit the ability to utilize, the bandwidth needed for the successful delivery of content and applications.[175] The ability to charge an end-user or a third-party provider each time they activate an application that *competes* with offerings similar to those provided by the last-mile broadband provider (e.g. video, gaming and voice) indicated that the biggest "innovation" resulting from the policy of network diversity will be higher prices for those who use Internet applications that provide an alternative to the broadband provider's offerings. These higher prices for use of Internet content, services, and applications will act as a tax on consumption of services provided by third-party sources. This effective taxation will undermine innovation and incentives to invest at the network edge.

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[174] David S. Evans and Michael Salinger. "Competition Thinking at the European Commission: Lessons from the Aborted GE/Honeywell Merger," George Mason Law Review, Vol. 10, Spring 2002, p. 512.

[175] "Cisco Service Control: A Guide to Sustained Broadband Profitability," Cisco Systems White Paper, p. 6 While this white paper was accessed by the author on February 16, 2005 on the Cisco website, it has since been removed. It is available at http://www.democraticmedia.org/PDFs/CiscoBroadbandProfit.pdf

IX. THE GRIM REALITY OF FACILITY COMPETITION AND THE NEED FOR NONDISCRIMINATION

A. Critics of Network Neutrality Downplay Entry Barriers in Last-Mile Broadband Networks

As has been discussed in previous sections of these comments, most consumers in the U.S. face a highly concentrated market for broadband services. A recent analysis published by the Government Accountability Office (GAO) finds a duopoly broadband market, with the supply of residential broadband access coming almost exclusively from telephone company DSL and cable company Cable Modem service.[176] Similarly, the Federal Communication Commission's most recent statistics regarding broadband deployment also show the vast majority of all broadband subscribers either using either DSL or Cable Modem service.[177] As last-mile broadband competition does not exist, there must be some factors contributing to this outcome, and economists typically evaluate *entry barriers* when examining why a market displays scant evidence of competitive entry.

When considering entry barriers which contribute to the highly concentrated markets for broadband services which are a reality for consumers, it immediately becomes clear that the substantial fixed and sunk costs of building last-mile networks discourage entry. Communication networks also experience economies of scale and density, which also contribute to entry barriers. The unit costs of building a network are lower the closer consumers are in proximity to one another, and lower the more consumers that are present in a

[176] "Broadband Deployment is Extensive throughout the United Sates, but it is Difficult to Assess the Extent of Deployment Gaps in Rural Areas", United States Government Accountability Office, Report to Congressional Committees, GAO-06-426, May 2006, p. 12

[177] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission

given area. Likewise, geographic characteristics, such as terrain, soil conditions, and weather extremes will impact the costs of constructing a network, and may contribute to entry barriers.

Thus, high-density downtown urban areas are more likely to see more than one or two providers of last-mile broadband facilities. Consumers residing in suburban or rural areas are much less likely to have choices among broadband providers, and in rural areas, to have broadband service at all.[178] However, even in high-density urban areas, residential consumer choice may be limited due to the fact that entrants in the broadband market frequently specialize in serving business firms, or due to multi-tenant building landlords who enter into exclusive agreements with a single broadband provider, typically the incumbent telephone or cable television company.

Both Professor Yoo and the Phoenix Center fail to adequately address entry barriers, such as economies of scale, and the prospects for last-mile broadband competition. The Phoenix Center simply ignores the presence of scale economies in last-mile broadband access networks. They rely on a technical economic model that assumes that there are no cost advantages associated with firm size. In other words, the unit cost of production for an incumbent monopoly firm producing all output is exactly the same as the unit cost for each firm when competition is introduced.[179] This is a highly unrealistic assumption.

Professor Yoo, in contrast, acknowledges that scale economies exist, but he fails to provide a reasonable explanation of how the entry barrier arising from scale economies might be overcome. He opines that differentiated networks could overcome their cost disadvantage

[178] The GAO report found that while "it is clear that the deployment of broadband networks is extensive, the data may not provide a highly accurate depiction of local deployment of broadband infrastructures for residential service, especially in rural areas." GAO, *op. cit.*

[179] The cost structure assumed in the Phoenix Center paper results in the same unit costs for the firms in question under the cases of monopoly and duopoly, as shown in their equations (7), (17), and (25).

by charging higher prices for their differentiated services because consumers will place a higher value these services, which will be provided over 'separate but optimized networks.'[180] He cautions, however, that we should not expect the market power of the dominant networks to disappear quickly and attaches no significance to the fact that the exercise of market power burdens consumers with overcharges and stifles innovation. [181] He offers no predictions about when or if competition will be sufficient to end the abuse of market power, only the theoretical principle that we should prefer to solve these problems with competition policy.

Moreover, Professor Yoo fails to consider the net impact of his "separate but optimized" networks on consumer choice. Consumers will evaluate the overall impact of an alternative "optimized network," which in Professor Yoo's view will provide differentiated and non-standardized services. Any gains in consumer satisfaction from the non-standardized services will be weighed by consumers against the higher price for the service, and the losses in consumer satisfaction resulting from the degradation in interoperability and loss of network effects, which result from selecting a non-standardized alternative network. Consumer recognition of the downside of non-standardized network services undermines the market feasibility of the non-standardized services.

B. Sunk Costs Make Last-Mile Broadband Competition Less Likely

Economists have devoted considerable energy to understanding the important role that sunk costs play in shaping market behavior and outcomes. Sunk costs play a critical role in influencing broadband market outcomes. However, the importance of sunk costs is downplayed by the Phoenix Center and Professor Yoo. When last-mile broadband facilities are constructed, a firm necessarily incurs significant sunk costs. Sunk costs are not

[180] Yoo Study, p. 24
[181] Yoo Study, p. 27.

recoverable once they are made. For example, when fiber optic cable is deployed, all of the substantial costs of installing those cables (digging trenches, tearing up streets, running conduit, stringing wires on poles) are sunk. The value of the network, should the business venture fail, will be a fraction of the installed price, with the difference between the depreciated value of the assets and the market value (which may be zero) reflecting the sunk costs.[182] Unlike other firms which face large investment costs, such as an airline which may resell its aircraft should a particular route prove to be unprofitable, broadband network providers who are forced to dispose of their assets are only able to recover a fraction of their investment once it is made (and that fraction may be close to zero). The need to incur sunk costs increases the risk for any entrant considering building its own facilities, and thus makes those investments less likely.

Importantly, however, economists also recognize that sunk costs, if incurred by an incumbent firm, increase the likelihood that any new entrant will face a vigorous pricing response by the incumbent. Economic theory tells us that firms who have already incurred sunk costs should disregard these costs for competitive pricing purposes. In other words, incumbents who have incurred sunk costs, if pressured by new entrants, should be expected to drop prices to very low levels—levels that do not contribute to the recovery of the incumbent's sunk costs until the entrant is repelled. Such a prospect further discourages entrants. New market entrants must take a forward-looking view of sunk costs, and will not be able to justify incurring sunk costs if the expected pricing response of the incumbent

[182] Motorola's Iridium satellite telephone system provides a real-world example of sunk costs. Motorola constructed its system by investing over $5 billion. Market demand did not materialize, Iridium fell into bankruptcy, and the assets were eventually sold for $25 million. The non-recoverable "sunk" costs thus approached 99.5 cents for every dollar invested. See http://www.forbes.com/2001/11/30/1130tentech.html

results in market prices which prevent the recovery of the sunk costs that the entrant will need to incur. Both Professor Yoo and the Phoenix Center downplay the impact of sunk costs on the potential for competition to emerge in last-mile broadband facilities, and this oversight undermines the credibility of their analyses and recommendations.

This blind spot is most remarkable in the case of the Phoenix Center, which spent the better part of a decade arguing that the market would support, at best, a very small number of competing facilities. Less then a year ago, Phoenix affirmed this finding.

> As consistently demonstrated by academic and Phoenix Center research, and again in this POLICY PAPER, given the *huge fixed and sunk costs* inherent to the construction and commercial operation of communications networks, the equilibrium level of concentration of terrestrial firms in local communications markets (voice, video, and data) will be relatively high… *fewness arises because scale economies and sunk costs limit the number of firms that can profitably serve a market – and local communications networks are notoriously riddled with scale economies and sunk costs.* Any policymaker interested in local communications markets should, therefore, start from the assumption that there will, at best, be only a "few" facilities-based firms.[183]

C. History Shows a Poor Track Record for Last-Mile Facilities-Based Competition

While alternative broadband access technologies exist, data shows that they have only established a trivial presence in the marketplace—the prospects for robust competition in last-mile broadband access markets are slim. Professor Yoo and the Phoenix Center ignore this historical evidence when developing their arguments that assume that robust last-mile broadband competition is likely.

Lessons learned in other telecommunications markets lead to the conclusion that there has been little luck in sustaining competition for last-mile facilities. For example, following the implementation of the Telecommunications Act of 1996, which eliminated legal entry

[183] George S. Ford, Thomas M. Koutsky and Lawrence J. Spiwak, "Competition After Unbundling: Entry, Industry Structure and Convergence," Phoenix Center Policy Paper Number 21, July 25, 2005, emphasis added, Available at: http://www.phoenix-center.org/papers.html

barriers in the local exchange market, competitive local exchange carriers (CLECs) emerged and began to construct new last mile-facilities, primarily in the core business districts of urban areas, targeting large business customers.[184] These independent alternative last-mile facilities have not proved durable. For example, two of the largest facilities-based CLECs, Teleport and MFS, were acquired by other, larger, CLECs (AT&T and MCI)[185] in the late 1990s.[186] AT&T and MCI expanded their facilities and competed for a time against incumbent local exchange carriers using these last-mile assets, however, this facilities-based last-mile competition was not sustainable. Now the assets of the formerly independent CLECs, AT&T and MCI, have been acquired by the incumbent carriers SBC (which now operates using the "AT&T" name) and Verizon. Very few facilities-based CLECs survive today. Thus, the last-mile competition that was envisioned under The 1996 Act has not proved to be enduring.

Similarly, with regard to wireless telephony, initial arrangements provided two cellular licenses in each market area, with the incumbent telephone company given the right of first refusal for one of the licenses, an arrangement which frequently resulted in the cellular carrier affiliated with the incumbent "competing" against an independent wireless provider. Of course, the "competition" under the cellular duopoly arrangements resulted in high prices and poor service quality, and low take-rates for the service. Spectrum reallocation and the new policy of FCC auctions resulted in increased wireless competition, with numerous licenses becoming available in any specific market area. This last-mile voice wireless competition is also proving to be less than durable. Due to the FCC's elimination of

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[184] See, for example, Richard G. Tomlinson, *Tele-Revolution*, Penobscot Press, 2000, Chapter 10.

[185] MFS was acquired by WorldCom, which later acquired MCI and began operating under the MCI brand name.

[186] "AT&T, SBC To Buy Carriers," *Information Week*, January 12, 1998, Available at http://www.informationweek.com/664/64iuatt.htm; "WorldCom becoming one-stop provider," Cnet News, September 8, 1997, Available at http://news.com.com/WorldCom+becoming+one-stop+provider/2100-1001_3-203013.html

restrictions on the amount of spectrum that can be controlled by a firm in a specific market area, major mergers of wireless firms have occurred. AT&T (the long distance provider and CLEC) spun off its wireless operations in 2001. Cingular Wireless then acquired AT&T Wireless in 2004 (jointly owned by the SBC and BellSouth at the time, now owned solely by AT&T). Voicestream wireless merged with Omnipoint Communications and Aerial Communications in 2000. Voicestream was later acquired by Deutsche Telecom and now operates under the T-Mobile name. In 2005, Sprint combined its wireless operations with the wireless operations of Nextel. Also in 2005, the wireless and local exchange operator, Alltel, acquired Western Wireless. Based on the evaluation of wireless markets in 2006, some industry observers indicate that the wireless market may still be "too crowded," and point to the likelihood of further consolidation.[187] The consolidation in the wireless industry points to an emerging oligopoly market in wireless, with the two largest wireless firms (AT&T Mobility and Verizon Wireless) being owned by two of the three remaining RBOCs. Thus, last-mile consolidation is evident in the wireless segment as well.

D. Fiber Deployment by Incumbents Will Make Additional Broadband Overbuilds Less Likely

Fiber optic cable deployment by incumbent telephone and cable companies will have a significant impact on the prospects for last-mile broadband competition. Once a customer is served by fiber cable, all non-mobile communications services could be provided over the single fiber pathway: voice, super-high-speed data, and HDTV quality video. Once fiber is put in place by one provider, the business case for additional high-speed last-mile facilities weakens. This fact is readily discernable by efforts of incumbents to block fiber-to-the-home

[187] "Wireless: Still Too Crowded," *BusinessWeek Online*, May 1, 2006. http://www.businessweek.com/technology/content/may2006/tc20060501_332841.htm?campaign_id=rss_tech

projects that have been pursued by municipalities. Both incumbent telephone companies and incumbent cable operators have taken steps to disable the attempts of municipalities to deploy fiber.[188] Thus, fiber optic cable, either connected directly to the household, or terminated near the home (and using existing metallic cable distribution to bridge the last few hundred feet), will provide a virtually unlimited supply of bandwidth to any end-user. Once fiber is deployed, its vast capacity will undermine the attractiveness of other technologies which are not capable of delivering the extremely high bandwidth which fiber is capable of delivering to end users. However, these facts are not weighed in the analyses offered by the Phoenix Center and Professor Yoo.

It is simply not reasonable to believe that capital markets will support numerous last-mile overbuilds, using fiber optics, wireless, or broadband over power line technology, especially if incumbent telephone company and cable companies are well on their way to deploying fiber to, or close to, the home. Alternative technologies have deployment or operational problems. For example, broadband over power line (BPL) technology, which has the potential to share existing electric company power distribution networks is currently in the trial phase, but problems have emerged with this technology, especially due to its generation of external interference which affects radio transmission of both public safety agencies and ham radio operators. The generation of radio interference has been an unresolved issue in several BPL trials, and led to the termination of at least one trial.[189] Other trials have

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[188] See, for example: "High-Speed SONET to Your Illinois Door? SBC, Comcast Say No," December 17, 2003, Available at http://www.tricitybroadband.com/news18.htm
See also: "Lafayette hits snag in fiber build," CNet News, February 24, 2005. http://news.com.com/Lafayette+hits+snag+in+fiber+build/2100-1034_3-5589315.html?tag=nl

[189] "BPL Trial Shelved," *BroadbandReports.com*, June 29, 2004, Available at http://www.dslreports.com/shownews/46964

terminated with the conclusion that economic viability is not likely. For example, according to the President of PPL Corporation, which provides electric power in Eastern Pennsylvania:

> While our market trials indicate that BPL technology is promising, the combination of a competitive marketplace and the need for significant scale has led us to the decision not to proceed as a retail communications service provider.[190]

BPL may offer some promise as an alternative last-mile facility if the interference problems can be overcome. However, BPL will face a market where incumbents have already gained first-mover advantage by deploying fiber. As was noted by one analyst: "By the time it (BPL) really arrives in the market, terrestrial broadband will be almost fully saturated."[191]

Fixed wireless services, such as WiMax service, may be deployed with lower levels of investment and sunk costs than fiber, but suffer from other limitations, including the requirement that high-frequency radio waves be utilized to provide the service. Higher frequency radio waves are more likely to require a direct line of sight between points of transmission.[192] Constructing line-of-sight wireless networks may be useful for network transport, but it is much more costly to install as a last-mile facility. The very high frequencies in which WiMax operates, ranging between 2GHz and 11GHz for the non-line-of-sight service, and up to 66GHz for the highest-speed line-of-sight transmission, indicates that the spectrum is not optimal for last-mile facilities

E. Network Neutrality and Differentiated Last-Mile Networks Are Not Incompatible

Critics of network neutrality argue that a harm arising from such a policy is the loss of differentiation in last-mile networks. It is argued that consumers will benefit from product

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[190] "PPL Corporation will End its Residential BPL Trial," Press Release, October 2005, Available at http://www.pplweb.com/newsroom/newsroom+quick+links/archived+news/2005/October/100305+Broadband+Trial+Ends.htm

[191] Ken Kerschbaumer, "Plug-and-Play Internet Wall-outlet broadband attracts heavy hitters," Broadcasting & Cable, 7/18/2005, Available at http://www.broadcastingcable.com/article/CA626059.html?display=Technology

[192] See, for example, George Abe, Residential Broadband, Cisco Press, 2000, p. 87.

differentiation in last-mile networks, and that policies which favor network neutrality will rob consumers of this potential benefit. This criticism of network neutrality is based on specious foundations. As discussed above, cable modem and DSL dominate the market for last-mile broadband. These broadband networks have inherent differences related to the technologies on which they are based. Consumers can also take advantage of last-mile differentiation related to the amount of bandwidth which consumers may purchase—higher download speeds improve application performance. But this differentiation is consistent with network neutrality.

While Professor Yoo and the Phoenix Center point to the alleged expansion of consumer benefits associated with further network differentiation, both fail to consider the impact of network differentiation on the expansive differentiation of Internet applications, content, and services which are provided on a competitive basis. Abandonment of network neutrality principles and the ability of last-mile broadband gatekeepers to discriminate have the potential to undermine existing product differentiation. Consumers today face extensive product variety associated with their use of the Internet. For example, consumers typically receive e-mail services from their ISP. However, numerous other e-mail providers offer services, some for free and some for a charge, which allows the consumer to select the e-mail offering which best, suits their needs. Similarly, consumers are presented with differentiation among e-commerce providers, which allows consumers to benefit from market leaders, such as Amazon.com, and niche market providers who may offer specialty services better suited to the needs of some customers. Professor Yoo and the Phoenix Center fail to address the likely downside of the abandonment of network neutrality principles—reduced competition and

product variety for Internet content, applications, and services. As a result, they provide an incomplete evaluation of how their policy proposals would impact consumers.

F. Network Differentiation Has Already Been Proved Inferior to Standardization and Network Neutrality

It is notable that network differentiation has already been tried by consumers in the narrow-band dial-up world, and consumers overwhelmingly rejected that approach to the provision of electronic information and communication services once the open-access Internet, built on a foundation of policies that promoted network neutrality, became available. At one time firms like America Online, GEnie, Delphi, Prodigy, and Compuserve offered consumers proprietary data processing and data communication services over incompatible and non-interconnected networks. This approach to selling data services ultimately faded, as the public Internet became available. Most of the firms that pursued the network differentiation business model no longer exist and those that do survive have combined Internet access with their proprietary offerings.

Consumers have already voted with their feet away from the proprietary data network model, once given the opportunity to consume electronic data and communication services in an open-access environment. The reason for this exhibited consumer sentiment is the same in the broadband world as it was in the dial-up world—consumers place a high value on services based on policies which encourage protocol standardization, interoperability, and network effects. It is only now, because of telecommunications policy reversals that enable the owners of last-mile broadband facilities to leverage market power in last-mile broadband markets, that the inferior market offering of restricted access to Internet services could be forced on the consuming public.

G. Standardization and Network Neutrality Have Repeatedly Proved Superior

The disregard for the history of communication networks in Professor Yoo's paper is rampant. Standardization and network neutrality have been the basis for competitive success in a wide range of services built on top of the last mile platform in addition to the Internet.

- As noted earlier, long distance competition rests on a form of network neutrality – "equal access".[193]
- To the extent that wireless competition exists, it was founded on the obligation of nondiscriminatory interconnection and carriage.
- The independent phone companies that emerged after the AT&T patents expired did not, for the most part, compete head-to-head with the incumbent, they gravitated to areas that had not been served and when AT&T refused to interconnect with them and carry their traffic, state and federal governments stepped in to require interconnection.
- The success of Direct Broadcast Satellite (DBS), which Professor Yoo attributes to an exclusive deal with the NFL for a sports package, ignores the fact that DBS actually began to thrive many years earlier, when Congress ordered cable operators to give satellite providers nondiscriminatory access to their programming through the 1992 Cable Consumer Protection Act.[194]
- The long history of successful, mandated interoperability and interconnection also lays to rest another claim that is frequently made in the effort to press policymakers to abandon network neutrality – the claim that imposing an obligation of non-discrimination on communication networks constitutes an unconstitutional taking of private property. The courts have rejected this argument repeatedly and much stronger principles of non-discrimination have been part and parcel of the transportation and communication networks of America since its founding.

These lapses of historical memory might be excusable, if the network operators themselves had not recently reminded us of their importance. In March of 2006, Time Warner, a cable operator seeking to provide telephone service, petitioned the FCC to require

[193] Yoo Study, p. 36 notes that recalcitrant last mile incumbents can make nondiscriminatory access difficult and concludes that such efforts must inevitably fail, notwithstanding the apparent success of in the interexchange market.

[194] Yoo Study, p. 26, as in the case of mandated interexchange "equal access," Yoo suggests that the program access rules are difficult to implement and assumes they have been a failure, notwithstanding the apparent success in stimulating the growth of DBS.

local telephone companies to stop blocking their telephone traffic.[195] In the same month, Verizon, a telephone company seeking to provide video service, filed a complaint at the Commission, demanding that cable operators give them access to programming under the 1992 Cable Act.[196] Network operators understand the power of discrimination and exclusion in network access.[197] At the Senate hearing on Competition and Convergence, each industry vigorously defended their demands for nondiscrimination when it came to telephone interconnection and cable programming, but they agreed that Internet service providers and applications developers should not be afforded the same protections.

H. CONCLUSION: NETWORK NEUTRALITY HAS BEEN HIGHLY SUCCESSFUL AND SHOULD NOT BE ABANDONED

Policy makers can benefit from the application of economic theory to the problems raised by the prospects of the abandonment of network neutrality principles. However, care should be exercised to ensure that economic theory is correctly applied, and that economic analysis is complete. The guidance offered by Professor Yoo and the Phoenix Center fails to satisfy the prerequisites of meaningful economic analysis of network neutrality and, as a result, they offer policymakers flawed advice regarding the future of the Internet.

The Internet succeeded not because the Federal Communications Commission could not regulate interconnection and carriage of communications networks, as Professor Yoo claims, but because it did so under the Computer Inquiries. The actual history is that by

[195] Time Warner, the second largest cable company, has petitioned the Federal Communications Commission to impose an obligation of nondiscriminatory interconnection on the incumbent local telephone companies, under Section 251 of the Act.

[196] Verizon, the second largest telephone company, has petitioned the Commission to impose an obligation of nondiscriminatory access to video programming under Section 628 of the Act.

[197] At the Senate Committee on Commerce, Science and Transportation hearing on Competition and Convergence, March 30, 2006, representatives of each of these industries pressed their claim to nondiscriminatory access, Available at http://commerce.senate.gov/hearings/witnesslist.cfm?id=1703

refusing to allow the telephone companies to discriminate, the FCC created a key part of the environment for the Internet to flourish.

Professor Yoo and the Phoenix Center's papers get the policy problem exactly backwards. They say we should not risk imposing network neutrality for fear of stifling competition and innovation in facilities. In truth, it was network neutrality that gave us the vibrant competition and innovation on the Internet that we have enjoyed for a quarter of a century. The public policy question is, "should we abandon network neutrality and risk destroying the Internet?" Since network neutrality has been such a dramatic success, critics must show very tangible benefits from changing that policy; these analyses do not even come close to meeting that burden.

X. THE MYTHICAL THIRD PIPE: HELP IS NOT ON THE WAY

A. CLAIMS OF A VIBRANTLY COMPETITIVE INTERMODAL BROADBAND MARKET DO NOT WITHSTAND CLOSE SCRUTINY

The incumbents who control the two dominant U.S. broadband platforms (cable and DSL) list a wide variety of technologies that they deemed as competitors. These included Broadband over Power line (BPL), satellite, mobile wireless, fiber, municipal WiFi, WiFi hot spots and Wi-MAX.[198] While it is true that these technologies *exist*, and are capable of providing data transfer at rates exceeding 200 kilobits per second (kbps), they can hardly be characterized as "competing" technologies. According to the FCC's own data, the two dominant platforms, cable modem and DSL, account for 96% of residential high-speed lines.[199] Below we offer further evidence that the remaining four percent of connections are not viable competitors to the cable-DSL broadband duopoly.

Broadband over Powerline. According to FCC data, Broadband over Powerline currently has slightly more than five thousand residential subscribers accounting for .0011 percent of total subscribers.[200] In their recent Section 706 filing (GN-07-45), Verizon references an estimate that BPL will increase from 400,000 subscribers in 2007 to 2.5 million in 2011.[201] Looking back to the Commission's *Fourth Inquiry*, Verizon cited a similar estimate that stated, "BPL will encompass six million power lines by 2006, promising

[198] See, e.g., Initial Comments of Verizon at 17 ("Verizon Comments"); Initial Comments of AT&T at 8 ("AT&T Comments"); NCTA Comments at 11; Comments of CTIA at 4 ("CTIA Comments"). All comments submitted in GN Docket No. 07-45

[199] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission

[200] Ibid.

[201] Verizon Comments at 20.

revenues of $3.5 billion".[202] This speculation has clearly not come to fruition. The hope for new competition from BPL providers seems to always remain just over the horizon.

Satellite. Similarly, satellite subscribers only account for .033 percent of total subscribers as of June 2006. The number of advanced service satellite connections actually *declined* by forty percent from December 2005 to June 2006.[203] Furthermore, the price, speed, and abundant restrictions of satellite leave the medium as a last resort for those unable to access a terrestrial service.[204] There is no evidence to suggest that the providers of satellite data services compete directly with cable modem and DSL providers.

Mobile Wireless. We have provided extensive evidence demonstrating that mobile wireless constitutes a complimentary service and does not compete head-to-head with DSL or cable modem service.[205] This is evidenced by the fact that 89.5% of mobile wireless connections are business subscriptions.[206] Also, as is the case with satellite service, these mobile wireless connections are slow and hampered by a variety of restrictions that are not placed on fixed line services.[207] It is also noteworthy that two of the top three mobile wireless providers are also the dominant DSL providers.[208] Despite this evidence, some commenters still insist that advances in wireless deployment and adoption means the U.S. broadband marketplace is alive with vigorous competition. For example, Verizon tried to explain away the poor U.S. standing in international broadband comparisons by asserting that "[w]ireless

[202] Initial Comments of Verizon at 11-12, GN Docket No. 04-54.
[203] This was a decline from 25,118 lines to 15,055 lines. *See*, "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.
[204] Initial Comments of Consumers Union, Consumer Federation of America and Free Press, GN Docket No. 07-45 at 13 ("CU Comments"). Comments of Roy A Elliot at 2, GN Docket No. 07-45.
[205] CU Comments at 29.
[206] CU Comments at 58.
[207] Ibid.
[208] Leichtman Research Group, May 2006.

broadband services are now more widely available in the U.S. than in Europe."[209] However, this claim does not withstand scrutiny, as it appears to be based on a report that contains no such conclusion.[210] We identified a much more recent survey conducted in partnership with TNS Media Intelligence. After surveying at least a thousand people in five European countries and the United States, the study showed that mobile wireless is more widely available in Europe.[211] Furthermore, a similar study found Europeans to be more likely to actually access web content from a mobile phone.[212]

In spite of the many claims to the contrary, we believe the record provides ample evidence to demonstrate that mobile wireless is not the third pipe competitor its supporters claim it to be, and is not the solution to America's broadband woes.

Fiber. While a welcome addition, Verizon's limited deployment of fiber does not constitute a new competitor nor does the presence of a fiber offering in a few high-income markets mean that advanced telecommunications technology is being deployed to *all* Americans. The excessive price, lack of symmetrical offerings, and restrictions do not constitute advanced telecommunications capability as envisioned under Section 706. Furthermore, when Verizon deploys its FiOS technology, it removes the copper lines that

[209] Verizon Comments at 24-25

[210] In making this assertion, Verizon based this claim on a sentence contained in the Commission's most recent report to Congress on the State of Competition in the Commercial Mobile Radio Services Industry (see *Eleventh CMRS Report*).. However, the Commission makes no such assertion in the section cited, but instead vaguely refers to a *Wall Street Journal* article on the subject of U.S. versus European deployment of wireless broadband (*see* Walter S. Mossberg, "Cingular Joins Rivals with Fast, Reliable Wireless Broadband, *Wall Street Journal*, January 19, 2006). The *Journal* article itself was published well over a year ago without any reference to where the European information was gathered, and the article also makes no mention of mobile wireless being more widely available in the U.S. than in Europe.

[211] Online Publishers Association, "Going Mobile: An International Study of Content Use and Advertising on the Mobile Web," March 2007, Conducted in partnership with TNS

[212] comScore Networks, "Europeans More Likely than Americans to Use Mobile Phones to Access the Internet," Mobile Tracking Study, 23 October, 2006.

could enable CLEC's to offer competitive services.[213] Thus the addition of the FiOS competitor comes with the elimination of *all* potential DSL competitors, including Verizon itself. Verizon claims that it has "deployed more fiber to mass-market premises than all carriers in Europe combined"[214] We remind the Commission that when comparing the United States to other countries, raw totals are meaningless due to the absolute size of the U.S. population. According to the OECD, as of December 2006 there were 0.3 fiber or LAN subscribers per 100 inhabitants in the U.S., in contrast to 2.6 in Denmark, 1.4 in Norway, 0.4 in the Slovak Republic, 0.4 in the Netherlands, and 0.4 in Italy. The deployment of Fiber in East Asia is even more impressive, with South Korea having 7 fiber or LAN subscribers per 100 inhabitants, while Japan has 6.2 -- over 20 times higher than the level observed in the U.S.[215]

Municipal WiFi & Fiber. It is ironic that some commenters point to municipalities offering fiber and wireless when making a case for a vibrant and competitive broadband market. The decision by these entities to provide this service to their citizens came in *direct response* to the substandard offerings of these same incumbent providers, who themselves fought tooth and nail to keep municipalities from deploying the service, even in some cases after gaining voter approval.[216] The proactive role taken by these government entities is a harbinger of the lack of competition and service provided by the incumbents.

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[213] Mike Musgrove, "FiOS Speeds Up Web, Phone and TV Access", *Washington Post*, May 8, 2005. The article states, "When Verizon installs the fiber-optic connection to your home, the technicians cut down the old, copper-line connection to the telephone network and will not replace it if you later decide to cancel."

[214] Verizon Comments at 26.

[215] Organization for Economic Cooperation and Development (OECD), "OECD Broadband Statistics to December 2006"

[216] See, for example, http://news.com.com/Voters+approve+citywide+fiber+project/2100-1033_3-5792387.html; http://www.theind.com/cover2.asp?CID=-447838148.

WiFi Hotspots. The claim of competition from WiFi hotspots is without merit. These hotspots are typically provided by a business in order to encourage customers to spend time in their establishment. While a valuable *complementary* addition to the broadband market, these connections are not substitutes for home broadband access. Similar to mobile wireless, commercial WiFi represents a complimentary service for those who routinely use broadband and want to constantly have it at their fingertips.

Verizon seeks to influence the commission by noting the raw number of WiFi hotspots in the U.S. compared to other OECD countries.[217] This is not a surprising result, given that the U.S. is the world's third most populated nation, and is once again is an example of a commenter using raw numbers in a situation where *per capita* information is appropriate. Section 706 requires deploying advanced telecommunications capability to *all* Americans in a reasonable and timely fashion, not just those with a wireless capable laptop and a craving for coffee.

Wi-MAX. Wi-MAX is an emerging technology that is currently not available in the overwhelming majority of local markets. According to the WiMax Forum, the technology has only been deployed in 250 markets worldwide. The U.S. deployments are largely test projects, limited to business customers in a few select major U.S. cities.[218] Commenters point to potential future offerings by Sprint and Clearwire.[219] The hope that these will bring about the elusive third pipe is just that, a hope. There is little evidence to suggest that these offering will be noticeably different from the current mobile wireless offerings. Carriers will likely target these products business users, who desire mobility as the distinguishing product feature,

[217] Verizon Comments at 26
[218] See http://www.wimaxforum.org
[219] AT&T Comments at 8; Verizon Comments at 18

and place less emphasis on speed and product flexibility, the product traits most coveted by residential users. Furthermore, comments by one incumbent insinuate that they will take action before allowing "new kids on the block".[220]

The Commission needs to take a proactive role to ensure new competitors enter the *existing* broadband market. Relying on niche and complimentary services in the hopes of finally achieving the intermodal panacea will not achieve Congress' goal of bringing advanced telecommunications capability to *all* Americans in a *reasonable* and *timely* fashion.

B. 3G AND 4G MOBILE WIRELESS CONNECTIONS ARE NOT BROADBAND SUBSTITUTES

To the extent that the Commission's broadband policy has been guided by any logic, it is the argument that intermodal or cross-platform competition will be the savior of the U.S. broadband market. While much of the rest of the world has opened up vigorous competition *within* platforms, we have staked our broadband future on competition *between* platforms. So far, it has not worked out—the U.S. broadband market has long been a rigid duopoly that shows few signs of weakening.

The lack of price competition between DSL and cable modem is apparent in the marketplace. Cable operators have made no attempt to match DSL on price. Comcast CEO Brian Roberts poured cold water on the idea that he is concerned about introductory price cuts in DSL. "We continue to believe and continue to charge for our services a rate that we think is a great value because the product is so much better. When Hyundai cuts their prices, BMW isn't exactly upset about it."[221] Though they have picked off consumers who want higher

[220] Comments of the National Association of Telecommunications Officers and Advisors, The National Association of Counties, The U.S. Conference of Mayors, and The National League of Cities at 13, GN Docket No. 07-45

[221] See: http://www.dslreports.com/shownews/65917

speeds, they primarily rely on bundled services to hold customers. The DSL operators have aimed their marketing strategy at transitioning dial-up customers with introductory rates to low-end DSL. However, this practice is ebbing. Recent industry analysis shows that introductory DSL prices are rising; so are prices for bundled services. According to a recent press report, Bank of America analyst David W. Barden noted that, "a duopoly is emerging where cable and phone companies can avoid provoking price cuts in their core services. Carriers, for instance, can discount DSL service while keeping prices up on phone service, and cable firms can drop prices for phone service but maintain higher pay-TV rates."[222]

The broadband problem in the U.S. flows from a simple policy mistake – a decision to rely upon a duopoly of telephone and cable companies to decide where and when to deploy this vital infrastructure with no overarching social responsibilities whatsoever. They have slow-rolled deployment, kept prices far above those in other nations, and emphasized bundles of services targeted to upper-income Americans built around "franchise" services. The result is restricted availability and a network that is intended to maximize short-run profits, not the long-run national interests of social welfare.

Though some might maintain that duopoly competition is sufficient, it is the expectation of a third pipe competitor that has propped up the logic of relying on intermodal competition to reach our policy goals. The steady promise is that of a viable wireless competitor right around the corner. This hypothetical wireless competitor will supposedly throw open the gates of competition, unleash market forces, and the genius of the invisible hand will drive down prices, increase innovation, and turn the U.S. back onto the path toward

[222] See: James S. Granelli, "Prices going up for phones, Net," February 1, 2007, *Baltimore Sun*, Available at http://www.baltimoresun.com/business/bal-bz.pricing01feb01,0,1370518.story?coll=bal-business-headlines

regaining global leadership in broadband technology. Some commentators claim that the wireless competitor has already arrived in the form of 3G mobile cellular broadband. For example, Steve Largent, the President and CEO of CTIA made this comment before the Senate Commerce Committee in May of 2006: "As we enter our third decade, the wireless industry is poised to enter a wireless renaissance, bringing advanced services like wireless Internet, to more than 200 million mobile Americans."[223] Recent data from the FCC seem to support this point of view. 60% of the increase in broadband connections over the past 6 months is due to mobile cellular wireless connections.[224]

But these promising statistics are only promising because they are misleading. The FCC counts a broadband capable PDA subscriber exactly the same as a residential DSL or cable modem subscriber when counting broadband connections. The problem is that the *wireless and wireline broadband products are in completely different product markets*. They are not comparable in either performance or price; they are not substitutable services; and they are certainly not direct competitors. Though no precise data exists, it seems obvious that ***the overwhelming majority of subscribers to mobile broadband devices have not cancelled their wireline broadband service as a result***. The wireless product is a complementary product, for which the consumer pays extra. Most consumers do not use mobile wireless broadband on cell phones for the same purposes as a residential broadband connection.

These new mobile broadband lines are for the most part mobile devices with a data service capable of accessing the Internet at >200kbps speeds. They are highly unlikely to be

[223] Testimony before the US Senate Committee on Commerce, Science and Transportation, S. 2686, Communications, Consumer's Choice, and Broadband Deployment Act of 2006, May 18, 2006.
[224] "High-Speed Services for Internet Access as of June 30, 2006," Industry Analysis and Technology Division, Wireline Competition Bureau, Federal Communications Commission.

used as a primary home broadband connection. In fact, 89.5% of mobile wireless connections are business subscribers, not residential subscribers.[225]

In total, 17% of all broadband lines counted by the FCC are now mobile wireless. But only 3.8% of advanced service lines are mobile wireless (>200kbps in both directions), and only 2.5% of residential advanced service lines are mobile wireless.[226] What's more, the three largest mobile data carriers are AT&T, Verizon and Sprint. Two of these three carriers are also ILECs, and are the number one (AT&T) and number three (Verizon) most subscribed to broadband Internet service providers, and are the top 2 DSL providers in the United States.[227] Sprint's joint venture with cable operators also diminishes any potential role it could play as a third pipe.

It is important to note that the multi-functionality of cellular phones with broadband data components may contribute to an overstating of the true level of mobile broadband use. A provider of a DSL line only reports to the FCC, the lines that are actively subscribed to (and presumably used). However, if a cellular customer's mobile device is capable of data transfers at >200 kbps, then they are counted as a broadband line, even if the customer rarely uses the device for non-voice purposes.

Furthermore, cellular broadband connections are duplicate connections -- that is, very few people subscribe to and use a mobile broadband connection as their home broadband connection. In addition, mobile wireless connections are not *practical* substitutes for cable or DSL connections. These connections are slow, have strict bandwidth caps, and other

[225] Ibid.
[226] Ibid.
[227] Leichtman Research Group, May 2006.

restrictions, such as users not being allowed to use the connection for VoIP applications (Internet phone) and numerous other Internet-based functionalities.[228]

Mobile wireless data services, while valued by consumers, are not competitors to wireline broadband service. They have not brought the competition necessary to drive down prices and drive up speeds in the overall broadband market. It would be unwise to bet that they will. Vertically integrated carriers that dominate the wireline broadband market are highly unlikely to offer a wireless broadband product that can potentially cannibalize their wireline market share. It is far better business to offer a complementary service.

If 3G mobile broadband won't bring us competition, surely the auction of the 700 MHz band will do so, right? Will 4G finally bring us the third pipe in this "wireless renaissance"? Not likely. The DTV transition has long been touted as the moment when wireless broadband will come into its own. A senior executive at Motorola made these comments in July of 2005: "The spectrum that will be made available at 700 MHz as a result of the transition to digital television provides a unique opportunity to provide facilities-based competitive broadband services."[229] His comments are typical of the hopes many have expressed. The frequencies vacated by the broadcasters in 2009 are up for auction early next year, and this "beachfront spectrum" is thought by many to be the answer to our broadband competition woes.

To be sure, the 700 MHz auction could be the last, best chance to bring a third pipe to the market. It has been hailed as such by legislators, regulators, and industry leaders alike. Yet the favorites to win this auction (the major cellular carriers) really do not intend to deliver

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[228] See: Tim Wu, "Wireless Net Neutrality," New America Foundation, February 2007, http://www.newamerica.net/publications/policy/wireless_net_neutrality

[229] Michael D. Kennedy, Senior Vice President, Motorola, Before the United States Senate Committee on Commerce, Science, & Transportation, July 12, 2005.

the third pipe. Further there are technical limitations that come with the proposed structure of the auction that would make it very difficult for any licensee to produce the desired outcome. It is quite a striking disconnect. All of the rhetoric about this auction promises the inauguration of the elusive third pipe in wireless broadband. But none of the facts of what the FCC is doing will realize those lofty goals.

Why is there such a divide between the rhetoric of 700 MHz as the promised land of the third pipe and the reality of the auction?

First, there is nothing that says the winning bidders must use the frequencies to offer wireless broadband services that are true competitors to DSL and cable. Looking at the likely winners of the auction, it is clear that a competitive market is the last thing on their minds. The incumbent carriers are thought by most odds-makers to be the most likely winners in this auction -- just as they were in the last spectrum auction for Advanced Wireless Services frequencies. These companies are the nation's leading providers of DSL service. Why would they use the 700 MHz licenses to offer a wireless broadband service that cannibalizes their own market share in DSL? The answer is they would not -- not here anymore than they have in 3G cellular broadband. They are far more likely to use this spectrum to offer new services that consumers will buy on top of their existing wireline voice service, wireline broadband service, and wireless voice service. This new service, 4G wireless, will be an enhanced mobile data service capable of delivering limited amounts of video and audio to a handheld device. This is not an unwelcome product, of course, but it will not solve the broadband problem; it will not bring a "third pipe"; and it will not bridge the digital divide to poor and rural communities.

Second, most of the other bidders in the pool will be looking to grab spectrum to fill out the geographic coverage area of their existing cellular networks. This will also allow them to compete, to some degree, with AT&T and Verizon Wireless, the industry leaders. This is not an unwelcome development either, but by itself, it will not solve our broadband problem.

Third, none of the spectrum blocks up for auction are large enough to provide a true alternative to DSL and cable modem, no matter the intentions of the bidders. The largest block up for auction is 10 MHz. That translates into about 15 mbps of capacity spread over a cell sector. Depending on the density of users in that sector, the actual throughput performance experienced by a customer will struggle to exceed 2 mbps on the download, and probably will be less.[230] That's not bad today, but down the line as DSL and cable providers eventually increase speeds to 5-10 mbps of throughput for each user, that wireless service will not be a true competitor. It will be a reasonable broadband experience for a wireless device used for limited applications, but it will not be a substitute for a residential wireline connection. To have that, we would have to allocate at least 30 MHz to the task.

Fourth, at present, none of the spectrum blocks up for auction are conditioned on "open access" rules -- though we have filed comments with the Commission asking for this and other proposals to maximize the utility of the auction.[231] Why are these important? Essentially, this is the only way to make a spectrum allocation into a truly competitive market for connectivity to the Internet, software applications, and devices that attach to the network.

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[230] This estimate of bit rates (roughly 1.5 bits per hertz) in the 700 MHz band was provided by an engineer responsible for one of the entities preparing to bid for a 700 MHz license. It was confirmed independently by two other wireless engineers as a reasonable estimate given the frequency, power levels and modulation schemes available today.

[231] Consumers Federation of America, et. al., "Ex Parte Comments of the Ad Hoc Public Interest Spectrum Coalition," PS Docket No. 06-229, WT Docket No. 06-150, 05-211, 96-86, April 5, 2007, Available at http://www.freepress.net/docs/pisc700mhzpart2.pdf

Open access simply means that the licensee sells access to the network on a wholesale basis at commercial rates. Any number of ISPs that choose to do so may come and buy bandwidth and compete for customers. Everyone shares the same transmitter and connectivity; they compete on customer service and price. These networks are neutral in two important respects. First, bandwidth on this network is available to any ISP on nondiscriminatory terms. Everyone pays the same rates for the same wholesale products to compete fairly in the market. Second, the network is neutral towards the devices and applications running on the network. Provided they do not harm the network, any innovative piece of software or hardware a company can dream up may connect to the network and sell to consumers. In turn, the broadband network provider is fully compensated for use of its network. This is the ultimate free market.

Such a system of intramodal competition in the 700 MHz band using blocks of spectrum large enough to compete with wireline products is the only chance to realize the impact of the elusive third pipe. If the Commission is interested in preventing a serious disappointment and the loss of a golden opportunity to deliver broadband competition, getting the auction process right is imperative.

C. CONCLUSION

The demonstrated failure of the cozy duopoly model to achieve the goals of the 1996 Act, the flawed theory of the benefits or discrimination, the clear initial signs of anti-competitive and anti-consumer practices, as well as the extremely dim prospects for vigorous competition in facilities, combine to create a very dismal future for broadband consumers in America. The best way to break out of this quagmire is to return to the success policies of

open communications that made the Internet possible and allowed the U.S. to be the world leader in the first generation of the digital age.