Defending the Internet Revolution in the Broadband Era:
When Doing Nothing is Doing Harm

François Bar
Stephen Cohen
Peter Cowhey
Brad DeLong
Michael Kleeman
John Zysman

BRIE Working Paper # 137
E-conomy Project™ Working Paper # 12

August, 1999

François Bar is Assistant Professor of Communication, Stanford University; Director, Network Research, Stanford Computer Industry Project (SCIP). Stephen Cohen is Professor of City and Regional Planning, UC Berkeley; Co-Director of the Berkeley Roundtable on the International Economy (BRIE). Peter Cowhey is Professor, Graduate School of International Relations and Pacific Studies, UC San Diego; Director, University of California Institute of Global Conflict and Cooperation; former Chief, International Bureau, Federal Communications Commission. Brad De Long is Professor of Economics, UC Berkeley; formerly Deputy Assistant Secretary for Economic Policy, United States Department of Treasury. Michael Kleeman, formerly Vice President of Boston Consulting Group. John Zysman is Professor of Political Science, UC Berkeley; Co-Director of the Berkeley Roundtable on the International Economy (BRIE). They received research assistance from Christian Sandvig, PhD Candidate, Department of Communication, Stanford University.
At various times, past and present, the authors have had occasions to consult with or work for companies and government agencies that have diverse stakes in the outcome of this debate. However, this document reflects only the authors' collective analysis.
Comments are encouraged. The authors have put this paper forward to provoke discussion and debate. Please send comments to e_conomy@uclink4.berkeley.edu.

I. Network Openness, Internet Evolution, and User-driven Innovation

America's stunning success in promoting the Internet revolution owes a major debt to determined regulatory action that encouraged all aspects of network openness and interconnection.[1] America Online and other Internet service providers, not the Regional Bell Operating Companies, popularized mass subscriptions to the Internet. Personal computers, the Netscape browser and Cisco, not AT&T, drove the architecture of data networking and the Web. All these innovations were possible because the Federal Communications Commission decided in the 1960s that the emerging world of data networking should not be treated like telecom services. Therefore, it exempted all forms of computer networking from much of the regulatory baggage, including fees to fund various cross-subsidies for telecom services, involving the telecom network. As a result it prevented telephone companies from dictating the architecture of data networks. Otherwise instead of broadband Internet connections we would be headed for an ISDN world. The FCC allowed specialized providers of data services, including Internet Service Providers (ISPs), and their customers access to raw network transmission capacity (through leased lines) on cost-effective terms. First, regulatory policy forced open access to networks where the monopoly owners would try to keep things closed. Second, the resulting competition allowed the FCC to free the service providers from detailed regulation that would have kept them from using the full capabilities of the network in the most open and free manner.

Thanks to the FCC policy of "openness" and competition, specialized networks and their users could unleash the Internet revolution. This assured the widest possible user choice and the greatest opportunities for users to interact with the myriad of emerging new entrants in all segments of the network. To be sure, the FCC strategy emerged haltingly but it followed a rather consistent direction. The Commission supported competition and innovation by keeping the critical network infrastructure open to new architectures and available to new services on cost effective terms. The instruments of FCC policy were to make leased lines (and, lately, network functions) available on cost-oriented terms and to forebear from regulating Internet and other data services. It set in motion a virtuous cycle of cumulative innovation, new services,

[1] Oxman, Jason. *The FCC and the Unregulation of the Internet*. (OPP Working Paper No. 31). Washington, D.C.: Federal Communications Commission. July 1999.

infrastructure development, and increased network usage with evident economic benefits for the U.S. economy.[2]

Open infrastructure policy fostered user-driven innovation. "By user-driven innovation, we simply mean that the principal sources of new ideas driving economic growth will emerge from a long-term process of experimentation and learning as business and consumer users iteratively adopt and evolve application of information technology and E-commerce."[3] Such user-centered innovation processes flourish in an environment in which users are granted access to a wide range of choices of facilities, services, and network elements.[4] As our discussion of the Internet's evolution will make clear, experimentation with what might be called "network performance features" was an unglamorous but critical underpinning for innovation and services. The rejection of a monopoly over network architecture was critical to these innovations. And, in a totally unexpected collateral benefit, the virtuous circle of policy and market innovation came to be recognized by the rest of the world as the right template for network competition and the growth of the Internet. It thus gave the US a voice in global policy that went far beyond its political and market power.

As Cable moves from "broadcast" to "broadband" the Cable infrastructure becomes a key element in digital video, data, and voice communications and all the issues about network openness return to the forefront. Unfortunately, in a misreading of its own history the FCC may abandon its successful policy just as a new generation of services, including broadband Internet services, are defining the future of networking and the electronic economy. After a series of courageous decisions in the 1990s to hold its course on data networking, even after the economic stakes grew bigger, the FCC is now starting to confuse the instruments of its successful policy with the logic of its strategy. That strategy, again, was to allow competition and innovation by keeping the critical network infrastructure open to new architectures and available to new services on cost effective terms. The instruments of FCC policy were to make leased lines (and, lately, network functions) available on cost-oriented terms and to forebear from regulating Internet and other data services.

---

[2] Bar, Francois and Michael Borrus. *The Path Not Yet Taken: User-driven Innovation and U.S. Telecommunications Policy*. (mimeo., 1997).
[3] Ibid.
[4] Ibid.

On August 11 the FCC decided not to open a formal proceeding on access to high speed Internet service.[5] It did so although it had previously acknowledged a concern that deployment of closed access Cable system might reduce competition in the access, or ISP market, and had stated it would continue to monitor the question.[6] While the FCC may believe this simply continues its "unregulation" of the Internet, we should be clear that this non-intervention constitutes instead a fundamental policy reversal. For thirty years the basic policy has been to foster competition, in particular cost oriented access to essential local network facilities, and an open network architecture. Non-intervention, as such, was not the policy. The FCC decision on access to high speed Internet service reverses rather than continues 30 years of policy direction. Critically, it constitutes, by not opening a formal proceeding, a decision is to permit closed access.

The decision to permit closed access is a decision to limit competition, experimentation, and innovation in the Internet just as broadband services are beginning to emerge and this new segment of the economy is starting to grow.[7] Unless care is taken to assure that competition in Internet access service continue, these conditions of competition and openness will be undermined in the emerging broadband phase of Internet evolution. And, collaterally, it erodes the ability of the United States to lead global policy on the next generation of broadband Internet services. Any reversal of the successful and established policy should itself require justification.

The policy stakes are much larger than the competitive fates of particular groups of ISPs. The risk, if competition is not maintained, is to the continuing evolution of the Internet, to the core innovation in and the evolution of electronic network-based business, and therefore to the competitive development of the network economy as a whole. The consequence would be that the dynamic of expansion and innovation driven by the users, as much or more as by the network providers, will be undercut. Since the harm that would result from damage to the dynamic of the Internet evolution is so great, there should be great priority given to assuring competition, and there should be a presumption that competition in access and throughout the Internet system must be maintained. We are not talking here about regulation of the Internet, that is, of the network of networks that make up the Internet nor of dealings among the ISPs. Rather, we are

[5] See: "Net Access Probe Denied by FCC." *San Jose Mercury News.* August 12, 1999, p. 4C.
[6] Federal Communications Commission (Memorandum Opinion and Order) CS Docket No. 98-178, February 17, 1999. para. 62.
[7] Oxman, op. cit.

talking about assuring competition for access to the Internet over local networks. That is, open access should be assured unless it can be definitely demonstrated that competition in access and, consequently, throughout the Internet system can be maintained.

The relevant form of open access is access to the "last mile" to connect to the Internet for alternate ISP providers and other network users. Open access must be provided for each additional component of the communications and data network system, as it has been required of the communications system to date. The government should make clear the principle that if market power exists, whatever becomes the natural channel of Internet access will have to architect itself to allow competition.[8] Openness should depend on clear policy principle, not on corporate discretion.

A debate about the policy choice of assuring relevant open access to connect to the Internet, as defined just above, is forced by significant mergers such as the acquisition by AT&T of TCI and now is proposed acquisition of MediaOne. One way the FCC could move to assure an open access policy for all providers is to make its approval conditional or contingent on open access for all providers of broadband service, whether cable companies or traditional local telephone companies, and ensure that the consumers have a free choice of broadband Internet providers.

Indeed, we believe that the Commission needs to define the critical elements of "open access" through a rulemaking. The answers are not simple. For example, starting from a very different philosophy than the FCC about network development and interconnection, but a shared commitment to strong competition, the British telecom regulator, OFTEL, has advocated a rather inclusive definition of open access for broadband networks.[9] We recognize that the questions now facing the FCC include these: 1) What are the harms to the public interest if market power can be exercised over network access to broadband services? 2) Are there enough network infrastructures for the next phase of Internet services, broadband services, to make regulatory intervention unnecessary to assure open architectures on non-discriminatory terms? 3) Would regulatory intervention in pursuit of openness undermine the creation of broadband

[8] We thoroughly agree with Lawrence Lessig, and have adapted his language here. Lessig, Lawrence. "The Cable Debate, Part II." *Industry Standard.* July 26, 1999. See: http://www.thestandard.net/articles/display/0,1449,5621,00.html

[9] We are not here talking about regulation of the Internet, that is, of the network of networks that make up the Internet nor of dealings among the ISPs. Rather, we are talking about assuring competition for access to the Internet over local networks, broadband as well as narrowband, access that is necessary to avoid situations that will require

infrastructure? 4) If there is a strong case for regulatory oversight, what would be the least intrusive way of doing so?

The competitive development of a broadband Internet system is so rapid that policy decisions made now will profoundly shape the future trajectory of its development. Any risk of limited competition in access should therefore be scrutinized carefully and immediately; post-hoc solutions will not compensate for a less than optimal market development. The FCC refusal to even scrutinize carefully a policy reversal when that risks substantially limiting competition in the Internet access market and hence through the Internet system, is as disturbing as it is surprising.

As a practical matter, the most immediate policy choice for this principle of continued open access and competition within the Internet involves Cable systems that provide broadband service. This particular debate concerns the tie between AT&T and @Home. However, this particular matter simply forces the more general issue. In the Cable case, as we shall argue, the most immediate concerns are the mass market (as opposed to the business market) because cable modems appear to be the dominant network option available for residential broadband over the next five years. The policy principle advocated here would in no way suggest limiting AT&T's ability to integrate vertically into ownership of ISPs, or regulate the price for broadband access services. Rather, we think that the issues are openness of the architecture for "last mile services" on broadband networks and openness of the network to competitive service providers.

A. *The Internet has entered a Third Phase.*

As we enter the third phase of the Internet's evolution, characterized by the diffusion and adoption of broadband technologies, we note that while each phase posed a different set of policy challenges and took place in a different environment, there are important common threads. From the late 1960s to the early 1990s the Internet was in its first phase of a physical, network, and social engineering prototype of interest to military and research organizations. From the early 1990s until today the Internet has been in its second phase, that of mass adoption and commercialization of narrowband networks largely through the use of dialup modems which provide intermittent IP connections. Phase Two saw the Internet take full advantage of equal access to key elements of the telephone network and to provide widespread network access. The

---

regulation in the future. Assuring an open and competitive Internet requires open and competitive access.

central applications in phase one were file transfers and e-mail, while the explosion of the World Wide Web constituted the main event of phase two. Throughout however, except perhaps for a lucky few, these applications were deployed over slow, narrowband connections.

We are entering a Third Phase of the Internet's history, when a critical mass of users are about to experience high-speed access to the Internet from their home. The range and character of services and businesses available on the Internet has mushroomed in the past several years; entire industries and segments of industries are being transformed. In itself this is a clearly new step. But existing services will be used differently and new businesses will come on line with the increased functionality that full-time broadband makes possible. Services such as online banking, interactive video telephony, home networking, and voice over IP will come of age. It is not simply the radical jumps in transfer speed, jumps from 26 up to 600 times, but that the functions to which a full time connected broadband network can be turned, the way it can be used, represents a distinct evolution that will distinguish the broadband network from its dial-up narrowband cousin.

In 1990, at the dawn of the second phase of the Internet revolution, nobody had quite envisioned the Web or the influence it would have. Similarly today, no one can tell what will characterize the third phase, but one thing is certain: access to the narrowband world will no more provide reliable access to the services and functions of the broadband world than the monochrome, text-only computer displays in use throughout the Internet's first phase could have done justice to the second-phase web. If there is one thing that examining the first two phases teaches us, it is that the uses of this technology that will blossom during the rapidly approaching Third Phase, if competition in the network during this third phase is open, will come as a surprise. It is impossible to predict in a next phase of open Internet development either what the value generating uses of information technology will be, or what optimum network and market structures are necessary to deliver them to users. The answers will be created by experimentation by users and competition among those providing the users the tools for that experimentation. And this experimentation will include broadband content, video, interactive services, and IP telephony based services, many of which a monopolist provider might like to inhibit. A market and network structure that continues to promote this extensive competition throughout the Internet is clearly required.

B. The Internet's success through the first two phases resulted directly from the network's openness.

1. A large variety of service and content providers could share existing infrastructure, the basic phone network. Policy decisions, we should be clear, forced network incumbents to open their networks to these new entrants. In addition to access, FCC policy allowed for flat rate pricing mechanisms for the Internet, largely by exempting ISPs from access charges for data, and it did not impose cross-subsidy requirements on rates for data transport. There are exceptions to this policy of openness.

2. Experimentation by users and competition among providers, across the range of segments that constitute the Internet, generated a surge of self-sustaining innovation. Perhaps the most dramatic single example is the emergence and evolution of the World Wide Web, which was driven almost entirely by its users who pioneered all of the new emerging applications. The World Wide Web in turn facilitated a new round, indeed another surge, of innovation that has opened into a world of Internet based E-commerce. This network openness and the user-driven innovation it encouraged was a distinct departure, we should be clear, from the supply-centric, provider-dominated, traditional model. In that traditional model a dominant carrier or broadcaster offers a limited menu of service options to subscribers; experimentation is limited to small-scale trials with the options circumscribed and dictated by the supplier. Open access to the network led to rich experimentation by many actors. It is a safe bet that few people ever—back in the days of 300 baud modems—thought that 28.8K data communications would flow over ordinary voice phone lines. Even speeds of 9600 bits-per-second were seen as likely to be accomplished only with expensive, cleaned, better-than-voice lines: ISDN or some similar special service. The diversity of experimentation and the competition on a relatively open network was key, since nobody could foresee what would be the successful applications. Openness allowed many paths to be explored, not only those the phone monopolies, the infrastructure's owners, would have favored. It is a safe bet that without regulatory-mandated openness, only those connections and projects that the Regional Bell Operating Companies (RBOCs) and monopoly franchise CATV networks would have favored would have been attempted. It is doubtful that without such regulatory-mandated openness the Internet Revolution would have occurred.

3. Indeed, many of the most successful paths challenged the very core of the phone monopoly business and many of the technology and business assumptions of the industry. The Internet is largely distance price insensitive, both because of the character of the emerging technologies and the particular regulatory setting under which they can operate. The Internet, where flat-fee pricing had you pay the same price for one or many e-mails, for sending them around the corner or around the world, forces profound change for the traditional telephone companies.

4. Promoting ever-greater openness of the U.S. telecommunications infrastructure has been a significant theme of U.S. regulatory policy and an important element of the Internet's success.[10] The FCC unbundled "network elements," not end services but the specific functional elements of the network. And, of course, with that came Long Run Incremental Cost Pricing for the interconnection charges. Indeed, US policy has gradually, though not always intentionally and still incompletely, been moving toward support of the new user-driven innovation paradigm. The major regulatory decisions taken by the FCC over the past 40 years have opened the network and shifted the impetus for telecommunications innovation from incumbent carriers to network users, alternative equipment suppliers and new entrants.[11] Crucially, they protected the competitive space for new entrants to develop into viable commercial firms against entrenched incumbents by mandating interconnection to essential facilities and constraining the incumbents' use of market power.[12] They indirectly fostered user-driven innovation by giving leading edge users --like financial services, energy and manufacturing firms-- broader access to enhanced facilities and communication capabilities. A critical group of innovations involved "network performance features." Examples of such enhanced access include higher speed connections, variable bandwidth, minimal error rates, tailored data services and a diverse and growing array of

[10] Oxman, op. cit.

[11] Policies and proceedings like the *Specialized Common Carrier*, *Carterphone*, *Execunet* and *Open Skies* decisions, and the *First* and *Second Computer Inquiries*, permitted new entry into equipment, network and service provision.

[12] "… established carriers with exchange facilities should, upon request, permit interconnection or leased channel arrangements on reasonable terms and conditions to be negotiated with the new carriers, and also afford their customers the option of obtaining local distribution service under reasonable terms set forth in the tariff schedules of the local carrier." Moreover, as there stated, "where a carrier has monopoly control over essential facilities we will not condone any policy or practice whereby such carrier would discriminate in favor of an affiliated carrier or show favoritism among competitors." See Federal Communications Commission, 29 F.C.C.2d 870; 1971, para 157. See, also, In the Matter of Use Of The Carterfone Device In Message Toll Telephone Service; Docket No. 16942; 13 F.C.C.2d 420; June 26, 1968; MCI v. FCC (Execunet I), 561 F.2d 365 (D.D.C. 1977), cert. denied, 434 U.S. 1041 (1978); MCI v. FCC (Execunet II), 580 F.2d 590 (D.D.C.), cert. denied 439 U.S. 980 (1978); Computer I, 28 F.C.C.2d 267 (1971); Computer II, 77 F.C.C.2d 384 (1980); Computer III *Notice of Proposed Rulemaking*, F.C.C.

network management, configuration and billing capabilities -- none of which were necessary to provide plain old telephone service (POTS) and were therefore largely unavailable from dominant carriers. More recently, the FCC policy of openness has moved to further enhance user-driven innovation and to broaden the possibilities for extended user-choice by enabling deeper access into the incumbent local network. This facilitated and in fact created the necessary preconditions for the success of digital subscriber line (DSL) and the rapid funding by the public markets of numerous competitors to the Incumbent Local Exchange Carriers (ILECs) for high-speed data services. It is these competitors that provide the majority of DSL access services today. In its *Third Computer Inquiry*, the FCC identified standards for critical software interfaces that were to be made available at affordable tariffed rates.[13] This gradually unfolding U.S. policy to enable user-centered innovation culminated, of course, in the FCC's implementation of the pricing and interconnection provisions of the new Telecommunications Act.

5. Throughout this history, and central to the issue at hand, the monopoly owners of the communications infrastructure strongly resisted opening their network to other service providers. AT&T desperately and effectively resisted for decades regulatory requirements that it allow other service providers to interconnect with its network, as the *Carterfone*, *Execunet*, *Open* S*kies*, and other cases all demonstrate. The RBOCs have pursued the same strategy against open network architecture (ONA) and the unbundling/interconnection provisions of the 1996 Telecommunications Reform Act. Yet policies forcing open access to the infrastructure resources the incumbents monopolized were the key to the flourishing of the dynamic communications market and the emergence of the Internet. On a fairly consistent basis the FCC rejected claims that networks had to be closed to generate enough investment incentives.[14] In each case the innovative development of the industry with new uses and new suppliers would have suffered had it been forced to develop in a "closed access" mode. This openness has in fact radically stimulated the use of ILEC telecom assets such as second lines.

85-397 (Aug. 16, 1985)

[13] See Expanded Interconnection with Local Telephone Company Facilities, (Special Access Order) CC Docket No. 91-141, September 17, 1992; Expanded Interconnection with Local Telephone Company Facilities, (Switched Access Order) CC Docket No. 91-141, August 3, 1993; and *Third Computer Inquiry.*

[14] The FCC consistently argued that LRIC allowed the sharing of network functions on terms that provided for a competitive return on capital. The furious debate over LRIC for unbundled network elements had this discussion as

C. *The Internet's Third Phase.*

As we enter this third phase of Internet evolution, the wide diffusion and adoption of broadband technologies, we face again a similar situation**.** Locally one provider, the largely monopoly Cable franchise, with significant market power in key market segments: broadband multi-channel video service to homes and broadband Internet access to homes outside the DSL circle, may prevent open access to the Internet.[15] Nationally the dominant Cable firm is arguing it should have the right to keep access closed, or at least discretionary. Based on the history we sketched so cursorily, it is really no surprise. The situation we face is essentially similar to these past episodes. The question is obvious. The successful policy trend of the past thirty years has been to force competition and assure open access to the incumbent infrastructure. Why, now, reverse that successful policy?

There is both a local and national story about Cable's power in the market for Internet access. Locally, Cable providers in each local market have substantial market power in the broadband access and broadband service provision, because the Cable franchisee, whether it be AT&T or anyone else, has a complete monopoly over the Cable infrastructure. Local franchises, moreover, only come up for (re)negotiation episodically or with a change of ownership, further reinforcing Cable's local monopoly power. Nationally, AT&T as the largest national provider with a position in a series of local markets represents a particularly significant case. Because of its recent acquisitions, AT&T now has substantial market power over large sections of the present and future broadband Internet. The traditional measure of "number of homes passed by a Cable system" in which AT&T has a stake is not quite market share, but rather share of the total local monopolies if you will. AT&T now controls the majority of the U.S. cable television infrastructure, and consequently will itself have a profound impact on the Internet's third phase. This share gives it significant influence because it allows the company to coordinate the activities of many local monopolists and shape the overall network architecture and standards. At the moment AT&T is building a vertical structure in partnership with @Home. The risks and costs of permitting a closed vertical structure, one that ties to one ISP and locks out others, would be the same whomever AT&T might choose as a partner.

---

a critical feature.

[15] We note that direct broadcast satellite services provide some alternative to cable television services, as do wireless cable services in some areas. Nonetheless, this does not change the fact that cable television systems generally have market power for multi-channel video services.

Again, we must keep the lines open, both Cable and DSL now and wireless broadband Internet access in the future, as it becomes a viable alternative. We must maintain openness of access, content, and Inter-network connectivity. For now though we focus on the Cable case. The next section of this paper makes the argument in detail that market power in regard to broadband access is a pressing problem today, not just a matter for future consideration.

II. Why do we think there is a problem today?

Permitting a single company to leverage its market power in pursuit of only the technology and service trajectories that serve its own commercial interests reverses three decades of policy moving toward openness. Critically, it will stultify the competition through the network structure that has facilitated experimentation and user driven innovation. Yet, Cable providers, which have franchise TV monopolies in most markets, are achieving substantial market power over Broadband Internet access.

The precise form of market power varies according to local market conditions. Sometimes we are dealing with a broadband monopoly; sometimes it is an asymmetric duopoly with one player open and one closed; and sometimes in the business market it is a duopoly plus, with companies having for some purposes additional options such as wireless. But in all cases, Cable has substantial market power even if it emerges in a situation of shared control. As the British regulator OFTEL argues, there must be "rules to deal with market power exercise by firms with control over capacity constrained systems."16 Such capacity constrained systems can create "joint dominance" a situation with competing, but a very limited number of, suppliers. In that case OFTEL argues that it may be necessary to apply the same rules that govern individual firms with market power.17

With this premise as our starting point, this section develops our argument in five parts. First, we reaffirm that broadband Internet access is a distinct and important market for policy purposes. Second, we spell out why Cable modem systems are the most important supply alternative for at least segment of the broadband market, the mass household market. Third, we

[16] "OFTEL's response to the UK Green Paper—Regulating communications: approaching convergence in the information age," January 1999. www.oftel.gov.uk/broadcast/gpia0199.htm p.4 paragraph 13.
[17] p. 59 of "Beyond the Telephone, the Television and the PC—III," OFTEL's second submission, March 1998, found at www.oftel.gov.uk/broadcast/dcms398/htm. It defines an "open state" as a market where "there is universal access control (i.e., all consumers can enter into a direct commercial relationship with the suppliers of electronic information delivered over electronic networks) and no scarcity of transmission capacity." (p. 9, par. 2.6)

explain why the problem of switching costs is so important in this market. Fourth, we argue that closed access to Cable modem networks also has harmful effects on the performance of DSL networks even though FCC regulation has "opened" these networks. And, fifth, we explain why a countervailing concern, investment incentives for network development, should not foreclose closer policy scrutiny.

A. *Defining the relevant markets.*

Broadband access is a distinct market: Narrowband access is not a substitute for broadband access. Competition from existing ISPs using narrowband access will not prevent exercise of market or monopoly power by an ISP like @Home that is vertically tied to broadband access.[18] Those who would argue the contrary assume that broadband and narrowband Internet access are substitutable products, when it is apparent after some investigation that they are not.[19] Not only are there substantial price differences between narrowband and broadband Internet access, but data transfer speed via cable modem is faster than narrowband offerings.[20] The connection nature of fast transfer rates of broadband access do not merely provide the same thing more quickly, rather, they enable real-time, bandwidth-intensive applications that would be impossible with dial up narrowband access.[21] If any of these applications are utilized, a narrowband Internet connection using a modem and standard telephone line cannot substitute for broadband access.

Of course, a separate distinction about relevant market rests on the classes of end users. As our discussion of supply availability notes, the FCC's distinctions between mass consumer (household) and business markets make sense. We think that a key matter of policy is whether small and medium-sized enterprise requires separate attention. But for purposes of simplicity we

[18] e.g., It has been argued that we must "forbear from imposing the *Computer II* regime on cable provided-Internet access services," unless "the cable Internet platform currently stands as an essential barrier to ISPs reaching their customers," Esbin, Barbara. *Internet over cable: Defining the future in terms of the past.* (OPP Working Paper No. 30). Washington, D.C.: Federal Communications Commission. August 1998. p. 96. This erroneously assumes that Internet service over a phone line using a modem and over a cable line a cable modem are identical products—if cable modems are the only feasible broadband route to the home, such a barrier exists.

[19] We recognize that the ISP/portal market and the broadband network access market are different. For the purposes of simplicity we do not spin out the distinctions throughout this paper. In our discussion we treat ISPs as a vertically related market to network access, but we also treat ISPs as a surrogate in some cases for users. We think for our purposes that this suffices. In our conclusion we return to the policy relevant distinction between the ISP and broadband access markets.

[20] Hamblen, Matt. "Cable Modems." *Computerworld*. June 21, 1999. p. 89.

[21] Kwok, Timothy C. "Residential broadband Internet services and applications requirements." *IEEE*

will focus on the mass market. The Third Generation Internet marketplace will be driven by the move of ubiquitous networking with broadband content into the home. The vision of home networks connected to the broader Internet with screens in numerous rooms of the home is part of this vision. Interactive video conferencing and low cost Voice over IP (VOIP) are also parts. But what really distinguishes this phase is the final convergence of TV and PC, of entertainment, education, and work at home, the seamless linking of the home into the larger electronic community. Broadband means lots of different kinds of content concurrently, full-time connected makes the home part of the network.

Third generation communication applications and patterns of Internet use will not necessarily be restricted to the home and will be adapted throughout the economy. But the mass market will be critically important to shaping the third generation Internet and e-commerce evolution because it will bring a population of broadband users large enough to constitute a critical mass able to sustain the development of a wide range of third generation applications. Again, the particulars of this third generation future are by definition unpredictable, but one might look back to the development of the second-generation web for insights. As the Internet became a mass medium through its second phase, the large population of Internet users created justification for continued innovation in browsers and server features. The large population of browser-equipped customers in turn created powerful incentive for merchants to offer electronic commerce applications and build a cyber-marketplace. The mass market was thus key in shaping the unfolding of second generation Internet and the current forms of early electronic commerce. Sustained development of the next generation of applications will similarly require large enough potential audience of users with broadband network access. Only if there is a critical mass of broadband-enabled users will the full range of broadband application and use patterns be explored. Closing off key segments of the broadband infrastructure to a monopoly provider would inevitably choke off the very innovation that has created value from today's Internet.

B. *There is limited availability of competitive network infrastructure or services*.

There is limited availability of competitive network infrastructure. Cable is still the only broadband option in many places for the mass market. The access alternatives for business are

---

Communications 35 (6). June, 1997. p. 76-83.

considerably better than for households. Indeed, the Local Exchange Carriers, incumbents and competitors alike, aim DSL deployment at business customers. Larger businesses in major commercial centers may have fiber optic connections from a CLEC. Alternatively, wireless broadband access services are emerging in most major urban centers. The situation for small and medium-sized enterprises is far less clear, and the FCC may need to clarify whether they constitute a separate class of customers for broadband access.[22] Most businesses in the United States lack cable infrastructures, and running cable to a business results in customer charges of thousands of dollars.[23] But in regard to our main focus, the main residential market, it is clear that wireless broadband Internet is not now and is not likely to be available in the very near future.

As a result, the network alternatives for the household market are few. A large share of U.S. households are simply unsuitable and will remain unsuitable for DSL services. Reading of the evidence varies, but at least of 40% perhaps 50% of the local loops in the country will not presently support DSL at anything near CATV speeds if at all.[24] What proportion of the existing copper loops is ultimately unsuitable (or prohibitively expensive to upgrade) for DSL service is a matter of debate, but it may fall significantly over time.[25] These limitations on the deployment of DSL are unlikely to be overcome easily or soon. DSL is unavailable to a significant portion of the American territory, or at least available anytime soon –Consequently, the benefits of DSL lines are unlikely to be available to many Americans.

---

[22] Yet another alternative for certain forms of broadband networking, broadband access over satellite networks, is primarily pertinent to larger businesses and their related networks of suppliers and distributors. This may change but the application for residential markets is very limited and the situation for smaller firms remains to be determined.

[23] Infonetics Research Inc., cited in: DePompa-Reimer, Barbara. "Cable modems, wireless networks slow to spark interest." March 1, 1999. p. 34.

[24] TeleChoice, cited in: Breidenbach, Susan. "Can't get enough DSL." *Network World.* November 16, 1998. p. 55. Note also that DSL can at best send one or two switched video channels. ImagicTV, cited in: Sullivan, Kristina B. "Video is making its way onto ADSL." *PC Week*. July 27, 1998. p. 81. The result will be that in a completely competitive market DSL and Cable would likely evolve in different ways..

[25] These limitations only apply to the copper portion of the loop. Where DLC is used at the serving area interface (where distribution and feeder cable meet), the only constraint will be on the length of the copper distribution cable. Over time, more DLC is being installed, so the percentage of lines with copper greater than 18K ft will decline. Although DSL is not now being provided over DLC, there are many products now (on soon to be) on the market that will make this possible. So I think the answer is that it the percentage of lines where DSL cannot be provided will fall significantly over time. DLC Trends presentation by Bellcore at GR-303 Integrated Access Symposium, San Diego, CA, July 29-30, 1998 - www.bellcore.com/gr/GR303.html#forum. Ultimately 50%, or more of all suburban/urban customers and 80% of rural customers will be served by DLC (assumes 9 kft. beyond CO to trigger for DLC deployment). Nationally, the average annual increase in DLC served lines is ~ 20% compared to an annual growth in working lines of 2%.

Although we are likely to see two wires into many homes; cable will be well positioned to become the leading technology for broadband services. Indeed, we are likely to see two distinct broadband "footprints," with little overlap, each with only one method of broadband access to the Internet. The Cable modem footprint generally covers only residential areas and clearly dominates in many suburbs.[26] At this point, 94% of homes wired for broadband Internet use Cable modems, more than a million households.[27] Fifty six million homes are currently passed by Cable modem service,[28] versus six million homes passed by DSL.[29] The differential will continue since cable modem shipments have clearly outpaced ADSL modem shipments every quarter for the last year, shipping six times as many modems in 1998.[30] Cable companies certainly deployed digital video services to compete with Direct Broadcast, for example, reaping substantial revenues from that deployment. While there are certainly separate costs to make cable interactive, less than 5-8% of the total bandwidth on a CATV systems is used for high speed data services. Holding a franchise monopoly for Cable TV created a foundation for cable to enter the market for broadband access.

We could debate the relative advantages of Cable and DSL.[31] However, quite independent of any inherent advantages that Cable or DSL may possess as a means for deploying broadband, the consequence of the rapid Cable residential roll out is that Cable will certainly have a massive, certainly difficult to dislodge, and perhaps, enduring deployment lead.[32] This initial path to dominance makes that enduring position likely and creates risks that require remedy.

---

[26] Freed, Les. *PC Magazine*. March 9, 1999. p. 172.
[27] Yankee Group, cited in: Barrett, Randy. "Cable, phone lines in battle for supremacy." *Inter@ctive Week.* January 25, 1999. p.69.
[28] Gecko Research, "Market Statistics and Projections." July 5, 1999. See: http://www.catv.org/modem/stats/
[29] TeleChoice, "2nd Quarter 1999 xDSL Deployment Summary." As of: August 10, 1999. See: http://www.xdsl.com/content/resources/deployment_info.asp
[30] Cahners In-Stat Group, "Digital Modem Market Shares." (Research Report CI99-04DS). Newton, MA. May 1999.
[31] For example, the bandwidth used for high speed data services, one might remark, is less than 5-8% of the total available on a CATV system, although Cable two way connections certainly require upgrades of the cable connection. Meanwhile ADSL customers will have the benefit of a dedicated connection. The debate about technical advantages cannot be separated from the particular path that Cable deployment has followed.
[32] Another alternative is the next (or third generation) of mobile wireless services. While high data speeds are often touted for these services, in practice speeds of 56 kb/s are likely to be the limit for the next several years.

C. *Switching costs are a critical element of the economics of this market.*

Considerable switching costs (the cost customers would incur to switch from the broadband access method to another) combine with early deployment leads for Broadband Cable allow the credible exercise of market power. The existence of these switching costs will permit Cable to maintain its significant deployment lead into the foreseeable future. Hence, even in the limited areas where Cable and DSL broadband access are both available, competition between different infrastructures is highly imperfect. Once a customer makes an initial decision for either Cable or DSL, or later perhaps for Wireless when it is available, they are pretty much stuck with it for a while. The switching costs have two sources: the physical architecture of the network and the logical architecture of the network.

1. The physical architecture of the network creates prohibitively high switching costs and hampers a customer's ability to switch between broadband access service providers using different physical delivery vehicles. Requirements for inside wiring, different terminal equipment, non-refundable connection charges, different computer set-ups in many cases and so forth can easily push the physical cost of switching from Cable to DSL – even where both are available—up to $600. Given that most industry surveys indicate that consumers are not willing to pay large sums for broadband access, they are even less likely, one would presume, to pay high sums to switch.[33] We provide a rough estimate of these physical switching costs below.

[33] The Yankee Group estimates that 16% of computer users are willing to budget $50 per month for high-speed Internet access—the approximate going rate by many accounts. Tedesco, Richard. "A race with two tortoises." *Broadcasting and Cable*. June 14, 1999. p. 80.

Table 1: Examples of residential switching costs: Cable modems vs. xDSL [a]

	Cable Modem [b]	DSL [c]
Installation	$103	149
Inside wiring [d]	**?** [e]	$100
Customer Premises Equipment	**275** [f]	234
One-time setup fee for connectivity	137	100
One-time setup fee from ISP	**?** [g]	38

[a] Figures in this table were averaged from the following product literature and trade press surveys: Excite@Home, "Product Guide." As of August 10, 1999. See "http://www.home.com/"; Depompa-Reimers, Barbara. "DSL gets a boost." *InternetWeek*. March 1, 1999. p. 34.; "Roll out the bandwidth." *Computer Letter*. Feb 8, 1999. p. 1.; Heckart, Christine and Briere, Daniel. *Network World*. "Low-cost DSL, cable carry bottlenecks." *Network World*. Feb 1, 1999. p. 28.; Hamblen, Matt. "Cable Modems." *Computerworld.* June 21, 1999. p. 89.; Tilley, Scott. "The need for speed: Experiences with consumer-oriented, high-speed Internet access technology." *Communications of the ACM*. July 1999. P. 23.; Mandel, Brett. "Broadband hits home." *Infoworld.* July 5, 1999. p. 30.

[b] Cable Modem prices given here represent lower-bound estimates, as potentially substantial costs are currently being capitalized by the monopoly Cable carrier, presumably with intent to recoup these costs in monthly billing.

[c] DSL prices given here may be skewed toward the high end, because a broader range of high-end offerings were sampled in the articles surveyed.

[d] Inside wiring may not be necessary at all locations.

[e] Presently paid by the monopoly carrier, presumably with intent to recoup these costs in monthly billing.

[f] Cost estimate of what is presently paid by the monopoly carrier—however, with the advent of greater standardization, "modems and set-tops are supposed to become consumer electronics items that consumers pick up and pay for" Higgins, John M. "All for just $5,000." *Broadcasting and Cable*. May 10, 1999. p. 16-18.

[g] May not be relevant to cable modems, as the ISP presently *is* the cable provider, or closely affiliated—or may be paid by the monopoly carrier.

For residential customers, switching broadband access method (from Cable to DSL or the reverse) is much more costly and cumbersome than either switching one DSL provider to another or switching among narrowband ISPs; there are no physical switching costs in these latter two cases. Moreover, the ILEC must provide access and collocation for any DSL or narrowband ISP competitor that requests it, while the Cable companies have no such obligations. Thus once the US broadband Internet infrastructure is built out, if cable lines remain closed–access ones, broadband cable Internet providers like AT&T will realize that they have several hundred dollars' worth of room to maneuver.

2. The logical architecture of the network also creates important switching costs. Information access and transmission systems become embedded with one's current provider. This is in contrast to narrowband Internet service provision or DSL service where the prohibition on bundling access and service allows customers to switch easily between ISPs and to have

equally convenient access to various kinds of content. Let us consider these several costs of switching from one broadband system to another.

a. Many everyday communication activities are tightly entangled with the customer's Internet provider, so that shifting provider may range from the inconvenient to the serious. With narrowband Internet access, the inconvenience was typically limited to getting a new e-mail address and modifying a few dial-up settings. However, because broadband Internet supports a wide range of new communication activities, switching among broadband access providers would be much mor5e cumbersome. For example, for customers who elect to use their "always-on" broadband connection to run web servers from their home, the switch would require a modification of the DNS tables to link their domain name to the new IP address they would receive.[34] Additional inconvenience would include the loss of adaptive setups that provide ease of access or access to special services.

b. If arguments about bundling are correct, the competitive situation is all the more alarming. Some market analysts estimate that merely the prospect of bundled services creates approximately $150 in new value per subscriber for a Cable system, irrespective of value created by the anticipated revenue from each individual service offering.[35] There may be competitive advantages in the package of services created, advantages in pricing those services, and advantages in a single bill. The consumer's preference for one bill is believed to be strong enough to reduce switching, even without price reduction for the services in a bundle. [36] Consider only the geographic monopolies noted above. In those areas competitors cannot create equivalent packages. Bundling with television offerings, whatever rules on control of program content there may be, certainly makes it easier for AT&T to create distinctive packages. AT&T could, and apparently intends, to offer integrated bundles of phones service (both local and long distance), Cable TV, mobile services, and ISP. Can competitors create equivalent alternative bundles? If not, what will be the market consequences? This of course increases resistance to switching one component of the bundle to an alternate supplier.

---

[34] Obviously at this time, this is only a "problem" DSL customers face since broadband cable customers are prohibited from running any kind of server from their home through their cable modem service, per the terms of their service agreement. The cost of that operation depends on the ISP providing the DNS service. For example, Pacific Bell Internet charges $100 for its DSL customers to link their IP address to a domain name (or to change such link)

[35] Higgins, John M. "All for just $5,000." *Broadcasting and Cable*. May 10, 1999. p. 16-18.

[36] This represents $49.5 million of the value of @Home's present subscriber base of 330,000.Estimate of @Home subscriber base from Kinetic Research, cited in: Lash, Alex. "Surfing the Skies." *The Industry Standard.* February

c. Customers may never find out what they're missing. Even more fundamentally, consumers may never be in position to decide whether switching broadband providers is worth the cost. With traditional products, we tend to think of switching costs as part of a rational decision between two well-known alternatives. For example, customers switching from one brand of cereal to another have all the information they need to make a rational choice: they know the prices, they see the packaging, they can easily compare objective nutritional value and subjective taste. Not so when picking between two alternative broadband access services. As we just described, prices are not always what they seem, with countless hidden costs ranging from re-wiring to domain name re-setting, and packaging is less than transparent when broadband services come as part of complicated and hard-to-compare bundles.

More insidious is the difficulty to assess real-life performance (the service's objective "nutritional value") or to really understand the difference between "open-access" and "closed-access" communication experiences (the service's subjective "taste"). Just like cereals, you don't know what you're missing until you buy the competitor's product and try it out. But if it's easy to buy two boxes of cereals and give them a taste-trial over breakfast, few customers will subscribe to both Cable service and DSL, and benchmark them against one-another for a month before picking the one they like best. The good news is that whichever they chose, it is likely to be much better than the analog modem it replaces. The bad news is that they'll probably never know how much better it could have been, had they picked the other one. Until two years ago, when France Telecom finally decided to take a real stab at offering mass-market Internet access, French citizens thought that second-generation Minitel was very cool. As they marveled at their new Minitel terminals displaying alpha-mosaic images faster than ever before, they never suspected that across the Atlantic (and across the Channel), the web had vastly overtaken their once-pioneering *telematique*. In such cases, when first-hand information is hard to obtain, we typically rely on others to help us chose. We follow the lead of neighbors, or read *Consumer Reports*. Operationally for broadband consumers, comparative shopping will generally mean comparing notes with friends and neighbors who have an alternative. There is clear evidence of this from the PC world. PC users, Austan Goolsbee and Peter Klenow have shown, are strongly influenced by their local social network.[37] But neighbors won't be much help if what broadband

---

1, 1999. p. 30.

[37] Goolsbee, Austan and Klenow, Peter. *Evidence on learning and network externalities in the diffusion of home computers.* Unpublished working paper. July, 1999. See: http://gsbpzk.uchicago.edu/GK.pdf

access service is available to them depends on which Cable providers controls the local monopoly. French customers certainly couldn't count on their French neighbors to tell them about the Internet.

Even trade magazine benchmarking reports may be of limited use because in the short term, until full-fledged third-generation services emerge, the differences between various flavors of broadband Internet access will seem subtle to the residential consumer. Indeed, the average household doesn't directly experience "open broadband Internet-access" or "dynamic caching" but rather the services delivered over broadband access infrastructure --web pages loading faster or smoother streaming video.

As in an earlier stage of the Net's evolution, the real differences --new communication patterns, new applications and interfaces, significantly different security and privacy implications -- will only emerge over time, through sustained use, as competing network performance features offered by broadband access providers play themselves out through the evolutionary unfolding of the third-generation Internet. These in turn will facilitate different forms of end services and other features that are important to users, like privacy and security.

Unless we preserve open access today, we will never find out because we may not even begin to explore alternative evolutionary paths. Customers will never be in a position to compare significantly different broadband experiences, and they will never know what they're missing. But perhaps America doesn't really have to lead in this round. It might want to wait for France to repay the favor, and come rescue it from the closed-Cable evolutionary trap a few years down the road.

D. *The adverse consequences of a closed Cable modem network may spill over to the performance of the DSL network.*

The resulting market structure will be complex: the precise market structure, or rather set of different local market structures, will only unfold over time. But however the structure of a local market unfolds, it is likely to be less than fully competitive.

In some set of markets -- likely given the limitations on DSL to be a significant set -- there will be only the Cable alternative. Either DSL service will be unavailable, or Cable's initial lead in deployment will result in an unwillingness of the local RBOC or competitors to spend resources deploying DSL in that area. In this case consumers are likely to be harmed: they will

pay the fees for access that an unregulated monopolist can charge, and they will suffer from limitations on the kinds of services offered and the degree of experimentation offered imposed by the single access provider.

In some markets the typical residence will possess two active wires capable of carrying broadband video services subsidizing high speed data services. Consumers seeking broadband service will have a choice between the AT&T-blessed access provider allowed to operate over the cable line, and the set of ISPs and LECs buying access over the telephone line from the local RBOC. Is there reason to think that consumers with the potential for dual access would be harmed vis-a-vis a situation in which ISPs could themselves offer access over either wire?

First--as discussed below--Cable's early lead in deployment, coupled with substantial physical and logical switching costs are likely to give AT&T/@Home substantial power even in potential dual access local markets. Second, the closing-off of ISP access to the cable wire changes the dynamics of the market in which ISPs and LECs face the RBOC. ISPs and CLECs purchase broadband access and collocate equipment at a regulated price, but regulators cannot fully specify the quality and reliability of service, or the responsiveness to ISP requests for assistance and accommodation. A credible threat on the part of ISPs to vote-with-their-feet and desert telephone wire for cable wire would provide significant discipline on the RBOC, and get its incentives to provide high-quality and flexible service right.

This point should not be overstated: pride in the system and the satisfaction of doing a high-quality job are important motivating factors. But it is the case that in a regulated monopoly quality of service is one factor that can slip. And as long as the cable wire is closed, broadband access providers will face a monopolist in their RBOC. Better to have the market--in this case, competition from the cable wire for the business of each broadband Internet access provider--as a source of discipline as well.

In some markets there will be an effective duopoly of networks, Cable on the one hand and DSL on the other. The precise market structure that will result from Cable's position, or rather the set of local market structures that will result, will only unfold over time. In some significant set of markets there will be only the Cable alternative; in others the precise balance will evolve reflecting local conditions such as customer requirements and the precise sequence and timing of the deployment of each alternative. The open question is what will be the competitive dynamic of a duopoly in which one is closed and the other is open. Before assuming

that the Cable company will not gain much by closing its system, one must consider whether matters such as the negotiation between the LECs will have any incentive to cooperate with competing ISPs. If both network providers are open, then the ISPs can negotiate with the owners of both wires to the home and give their business to the one with the best terms and conditions. Perhaps both network owners would prefer not to cooperate with the ISPs, but if both were open that would be a much harder implicit bargain to strike. The consequences for the innovative dynamic of the Internet will be quite different in these three cases: effective monopoly, asymmetric duopoly with one side closed and the other open, and real competition between network owners and amongst ISPs.

E. *Is There a Problem Assuring the Investment for a Broadband Era?*

The supply side incentives of a closed Cable network are not so great that the FCC should avoid a significant policy investigation today. The FCC's policy choice about broadband cable necessarily addresses two markets simultaneously. They are the broadband access market, the focus here, which includes high speed data and the other services it supports such as interactive video teleconferencing and the phone/fax access network market. An upgraded cable television network not only hastens the provision of broadband access to households, it also permits a second line to the home for phone/fax service competition and therefore accelerates the emergence of competition in the local loop. Some contend that the creation of a viable cable broadband network has the added pro-competitive effect of forcing faster rollout of DSL by the RBOCs, the local telephone companies.

Those who would justify closed access to broadband cable claim an adverse result on network build-out. They argue that reducing the total return on investment in broadband by ending the exclusive use of @Home or introducing significant regulatory uncertainties over the rules for broadband access (thus forcing a discount on total return) can only slow build-out of cable broadband (and thus slow deployment of DSL).[38] Whether there would be an influence on the investment and hence the pace of the build-out of cable broadband is debatable; we have substantial doubts about the size of the effect being so great as to preclude a significant policy initiative on broadband access. In fact the industry often builds out their upgraded network to

[38] Bruce M. Owen and Gregory L. Rosston, Cable Modems, Access and Investment Incentives (filed on behalf of the National Cable Television Association).

support digital video and higher quality analog video in a monopoly franchise providing a low cost platform for the addition of high speed data services.

To begin, the ILECS are investing in DSL, not simply to compete with broadband cable, but also as a means to cope with exploding Internet modem calls without deploying more expensive central office equipment, and also to move toward a data network regardless of what Cable is doing. [39] The more fundamental question is about the effect on cable broadband build-out.

The Cable networks are franchise monopolies in most markets and built, capitalized and largely upgrade under a monopoly market operation. AT&T did not buy companies in competitive markets, but rather they bought video distribution monopolies. These monopolies had, arguably, largely made the decision to upgrade their networks to digital video in order to compete with direct broadcast and, perhaps most importantly, to have cable phone penetration. AT&T paid substantial amounts to do this, some estimates run as high as fifteen billion dollars in access and interconnection fees in 1998, about a third of its domestic wireline revenues. [40] Cut those charges in half and AT&T net income doubles. Little surprise that some estimates suggest that AT&T plans to have extensive and exclusive cable /phone penetration in four to five years. In that case, gains from video services, let alone Internet access, are just gravy. Seen that way, AT&T got the basic advantage of Internet access for a small marginal cost. Moreover, the modifications required to add Internet capacity to an existing digital Cable system are much lower than the estimates of the costs required for upgrade of the digital network itself.[41] Given the imperatives and advantages just described, it would hardly seem that Internet access needs to be closed in order to justify the upgrade of capacity.

---

[39] Bar and Borrus, op. cit.

[40] Larry Darby, "Open Access: The AT&T Internet Business Case?" The Last Mile Telecom Report, August 12, 1999.

[41] Providing broadband Internet access via cable modem is estimated by the FCC to cost the cable operator $800-1000 per subscriber. Federal Communications Commission. "Deployment of advanced telecommunications capability to all Americans in a reasonable and timely fashion, and possible steps to accelerate such deployment pursuant to section 706 of the Telecommunications Act of 1996." (Report) CS Docket No. 98-146. February 2, 1999. chart 2. Federal Communications Commission. "Annual assessment of the status of competition in markets for the delivery of video programming." (Fifth Annual Report) CS Docket No. 98-102. December 23, 1998. para. 40. DePompa-Reimer, Barbara. "Cable modems, wireless networks slow to spark interest." *Internet Week 34* (1). March 1, 1999.

F. In sum, closed Cable creates local monopolies in many places and nationally gives AT&T extraordinary influence over this one critical piece of the emerging broadband Internet. The OFTEL notion of "joint dominance" in capacity constrained markets, invented to describe a British market where DSL has a commanding headstart over Broadband Cable, seems also to apply to the flip case of the United States where Cable is in the lead.

III. The Damaging Consequences of Control over Cable Access to the Internet.

Cable control of broadband access to the Internet will have two sets of damaging consequences. First, and our primary concern, the innovation and experimentation that has been central to the Internet explosion will be stifled if not precluded. Second, Cable owners will have the capacity to control network services; voice, data, and video distribution and a material part of the video content and much of the data/Internet content delivered through the cables. The risks and harms outlined here would occur whenever there is a monopoly provider of tied access and ISP service.[42] The case at hand is that of AT&T/@Home, so it again is the focus of our discussion there.

A. @Home's concept of what can/should be done over the Internet precludes a range of innovation and experimentation by other service providers and end-users.

1. Already @Home service is configured so as to force usage to fit the specific patterns that generate most profits for @Home. Many of the practices are @Home's own practical responses to network management challenges, and others look a lot like what other network providers do. However, they become worrisome if, as we believe the case to be, the closed network reduces the ability of rivals to deliver services efficiently and if consumers cannot access alternate ISPs, and where there is a geographic monopoly this is certainly the case. The practices involve a number of elements.[43]

a) Limits on the overall amount of downstream video. Of course, this increases the importance of positioning as a favored partner of @Home.

[42] Indeed, if switching costs are very high, there may be considerable harm from a set of vertically integrated access/ISP providers. Rather than competition, after the initial decision there may be an information feudalism, a set of separated cyber communities and markets.

[43] See: At Home Corporation. *@Home Acceptable Use Policy*. http://www.home.com/support/aup/ July 13, 1999.; At Home Corporation. *@Home User Guide*. http://www.home.com/support/netscape/ (Visited August 12, 1999); At Home Corporation. *@Home Frequently Asked Questions*. http://www.home.com/support/netscape/faq/faq.html (Visited August 12, 1999)

b) Limits on up-stream traffic, that is the ability of consumers to experiment with their own uses of the network including VOIP and interactive video teleconferencing.
c) Prohibitions on setting up servers. (Web, FTP, POP.)
d) Technical biasing against and limits on the performance for non-partner content will structure the cyber marketplace, limiting experimentation and innovation.
e) Prohibitions on using @Home for work, which forces the purchase of the more expensive @Work service. That means it will be difficult to hook up to corporate LANs from home, which will limit the present diffusion of innovative forms of work at home.

While it will still be possible to receive Internet service from other ISPs, though still paying for @Home ISP service, alternative service providers will be denied access to key features of the @Home network, such as dynamic caching and collocation on the @Home network. They are thus forced to compete with their hands tied behind their backs**.**

2. Closure and limits preclude experimentation with a wide range of alternative patterns of use. Provider domination of the processes of experimentation, learning, and innovation that preceded deregulation and the Internet will have been re-established. @Home will be the monopsony buyer, or at least dominate a major segment of the market, for network software tools and hardware equipment. If there is open interconnect on Cable then the dynamic or logic of network innovation in the broadband era is likely to unfold with the force, pace, and innovative imaginativeness of the narrowband era. The logic of development that has characterized the Internet to date would be likely to continue. ISPs other than @Home would experiment with different patterns of service, different packages of service offerings. Each ISP would itself become a client for innovative software and hardware companies. The dynamics of innovation would be sustained.

At this formative stage in broadband evolution, we need to encourage the widest possible experimentation with available alternatives and the widest possible experimentation by competing providers and innovative users. That would involve alternate, unforeseen, patterns of use for the Internet; alternate kinds of content and means of delivering content; alternate ways of structuring the E-commerce market place.

B. Cable providers will have the capacity to control network services and content.

AT&T/@Home appears to have the intention of leveraging Cable access monopoly into markets that ride on top of Cable access. This goes well beyond the bundling of Internet service provision with other AT&T services. Its significance is far beyond the simple bundling of Gateway services such as e-mail or web hosting with the basic service provision.

1. There is clearly a range of strategies available for the provider of a large cable modem network to "bias" Internet access to the advantage of some content over others. Though these practices may be intelligent ways to speed up the Internet experience for customers, some practices could easily be abuses if applied differentially. The difficulty is that if a single ISP, in this case AT&T/@Home often being the ISP by default for a substantial piece of the national community, has sole access to these strategies. Then at its discretion and at its discretion alone, it could systematically shape what content gets to the end-users under optimal conditions. Worse, it could shape the very terms of innovation on the Internet. Open access would assure that other ISPs could use the Cable infrastructure to pursue similar approaches, where appropriate, and would foster healthy competition of network applications, programming and architecture.

The @Home annual report is very clear and includes details of how @Home offers speedier service to Internet content providers who agree to become "content partners" and share their revenue stream.[44] Under the sole control of a broadband access monopoly, the potential for serious abuse is evident. Consider in particular :

> "The @Media group offers a series of technologies to assist advertisers and content providers in delivering compelling multimedia advertising and premium services, including replication and co-location. Replication enables our content partners to place copies of their content and applications locally on the @Home broadband network, thereby reducing the possibility of Internet bottlenecks at the interconnect points. Co-location allows content providers to co-locate their content servers directly on the @Home broadband network. Content providers can then serve their content to @Home subscribers without traversing the congested Internet."[45]

Similarly the report notes that:

> "we have established relationships with certain of our interactive shopping and gaming partners whereby we participate in the revenues or profits for certain

[44] At Home Corporation 1998 Annual Report. February 29, 1999.
[45] Ibid., p. 8.

transactions on the @Home portal. We also allow certain of our content partners to sponsor certain content channels for a fee."[46]

These quotes point to two behaviors that could bias the marketplace. The first is "collocation", the second is "replication". Both function to allow @Home to privilege partners and exclude competitors – they differ only slightly in their implementation. @Home has developed partnerships with non-competing firms in each of several content areas (interactive shopping, gaming, digital audio, digital photography, and search services) and it is presently collecting "fees relating to content partnering arrangement".[47] @Home sees these practices as "programming" and it sees itself as programming the Internet.[48]

@Home is promoting itself as offering collocation service to offer better performance to @Home customers, but the term "collocation" is not meant in the nondiscriminatory sense that those familiar with telecommunications are wont to use. Rather, each partnership appears to be exclusive to a particular area of content. A collocated partner has faster access to @Home consumers because of a presence on the same network. @Home has, as of 1998, already collocated at least one partner (SegaSoft) and plans to collocate others.

Replication is manipulation of the caching system to favor partners. It essentially speeds requests for certain content by pre-loading it at sites that are close and well-connected to subscribers. As of 1998, it currently replicates news feeds from CNN and Bloomberg. @Home then promotes replicated and collocated partners on its portal and with its "wizards", making competitors harder to get to. The result is the creation of a cyber-marketplace which systematically favors the providers of content, services or transactions who have a privileged financial relationship with the monopoly owner of the infrastructure that supports that cyber-marketplace. If customers had a real choice of broadband access infrastructure, this would matter less, but within the current situation, when they become customers of @home's access infrastructure, they automatically and unknowingly receive access to a cyber-marketplace biased to favor @home's financial partners.

In addition, it is certainly is possible to manipulate the caching system in many other ways to favor partners. @Home has the incentive, given its relationship with content providers, to further utilize the caching system to actually slow requests to competitors to it's

[46] Ibid., p. 9.
[47] Ibid.
[48] Ibid., p. 8.

"programming", rather than merely speeding it's own brands. @Home's annual report also notes that "local caching servers can compile far more comprehensive usage data than is normally attainable on the Internet".[49] If this data were shared with partners, this would be a further barrier to competition. Not only could an @Home partner know detailed information about @Home subscribers using their service, it would also be possible to know the same detailed information about who was using a competitors' service or to restrict access to a competitors' service while substituting their own.

2. @Home proposes in its own materials to structure the cyber marketplace, to steer @Home customers, unknowingly, toward merchants who partner with @Home. @Home can structure the cyber marketplace both through the advantageous positioning and access of partners and through @Home's devices such as "how-do I" wizards. @Home's own reports show that they will provide superior quality performance to those merchants on their network. Either you are on @Home's service network or the majority of broadband customers (those that use AT&T @Home cable television service) will not be able to access your site, AS INTENDED by the merchant.

3. These capacities to structure the marketplace are of startling significance. They are particularly important if a single ISP has a local monopoly and of broad significance if a single ISP has enough local monopolies or dominant positions locally to influence the very structure of the cyber marketplace. And, we should note, even allowing the choice of another ISP for no additional fee (e.g., a customer could substitute AOL for @Home) would not correct the competitive problems created by broadband access architecture that rewarded @Home with performance advantages over all rivals. There are at least two reasons:

a. First, E-commerce is certainly one of, if it is not the killer application of the broad band era. The unfolding of e-commerce will drive innovation throughout all segments and elements of a competitive network. Yet suddenly the competition across segments and elements that has driven the evolution will be squeezed into and captured by a vertical structure with a single buyer, the ISP provider: @Home.

b. Second, business to business E-commerce has dominated until now. Broadband will facilitate the evolution of retail E-commerce. Closed access would, as a matter of policy, permit @Home to structure the cyber marketplace for a significant portion of the American consumer

[49] Ibid., p. 10.

population. With control of the broadband service provision, @Home would become a truly dominant influence in American retail. Even if @Home's control of the broadband market is more limited, then nonetheless, that one provider would, for a substantial portion of the American consumer community, structure the cyber marketplace. The biases will not be obvious and they will not necessarily be brought to the attention of the consumer. The competitive possibilities of E-commerce, ease of entry and experimentation producing new business strategies and new business organization, would be wiped away. The broad gains to the American economy lost.

Both the suppliers of the network component and services and the users of the network will both confront the AT&T/@Home market power. The Internet and E-commerce will evolve as the result of strategy choices of AT&T and @Home alone, not as a result of market competition. What might that world look like?

IV. Conclusion

Joint dominance in broadband access, much less monopoly power over local broadband access in many cases, raises serious challenges to serving the public interest. In the absence of regulatory measures to assure open access, the resulting vertical integration and closed access defeats the fundamental innovation dynamics that have made the Internet successful: open standards, open access, a clear set of competitive principles and prohibitions against leveraging access control into control of service architecture, communication patterns and content. Such vertical disintegration has traditionally led to real competition and innovation in each segment, as well as competition and innovation in alternative ways to package combinations of services.

The policy problem arises at the moment at which the cable television "broadcast" system, built up with local monopolies and successfully built out because of the appeal of cable TV offerings, is being transformed into a digital system and integrated into the national communications network. Consequently the current debate stems from a collision between the policy legacy from the monopoly origins and restricted access of Cable as Broadcast and the evolving Open Access thrust of policy that has enabled the successful explosion of competition throughout the segments and elements of the network facilitating user-driven innovation and the Internet revolution. Reversing policy innovation that has led to broad American communications leadership would be, at best, foolish and unwise.

But what can be done? We think that the most important point is to recognize that the market is ripe for an explicit set of policy decisions, not wait and see. The question as to the right prescription is not one that we wish to resolve here. But we would offer some observations about how to proceed.

To begin, some see the policy issues as primarily being that consumers should not have to pay twice for use of an ISP other than @Home. This emphasis on nondiscriminatory access to the broadband Cable network for all ISPs, they suggest, requires only a light regulatory touch. However, it should be noted that a nondiscrimination rule in itself might not solve the underlying problems that we are addressing. For example, suppose that the rule simply said that AOL will pay the same as @Home for access to the Cable broadband network. This would not prevent AT&T from taking its rents on the network access charge and simply bundling in @Home for no fee. This would be like Microsoft making its money off Windows while charging nothing for its browser.[50] Is this satisfactory, or not? After all, AOL could change its business model to the one used by Yahoo (or AOL in its UK operations for some customers) where there is no monthly charge for email and access. Revenues derive from ads and sales commissions.

Arguably, the "don't pay twice" rule, while straightforward, only addresses one of the least important issues discussed in this paper. The real issue is the ability to achieve an open architecture for broadband services. Policy makers should be aiming to stimulate innovative designs and uses of the network. But the vertical arrangement between the AT&T/TCI broadband network and an ISP may defeat this because the network will be optimized to give superior performance to the preferred ISP.

As we have stressed throughout this paper, the problem is not just the adverse effect on competition in the markets for ISPs. The closed architecture of the underlying broadband network will also restrict alternative "network performance features" that are so vital to innovation. In its decision on the AT&T purchase of TCI the FCC rightly expressed concerns about some matters of the network architecture, but settled for rather toothless promises by AT&T in its filings to the Commission.

The right question is whether policy alternatives exist that are lighter handed than the regulatory regime for DSL imposed on the ILECs and yet responsive to the issues posed by

[50] In effect, it is like the first DOJ consent decree with Microsoft whereby Microsoft ended its licensing agreement provision that charged OEMs for Windows on every system that they shipped (even if the OEM had installed Unix or OS2 on the computer instead of Windows).

broadband cable networks. It is precisely in regard to the intersection of market power, even jointly shared with other providers, and network architecture that the British telecom regulator, OFTEL has proposed a powerful policy agenda for the UK. This initiative is particularly interesting because Oftel, while being a credible advocate competition, has generally been less disposed than the FCC to "unbundle" network elements for local access. Yet OFTEL now argues that the regulator should use its power to force disclosure of the underlying network architecture, and a form of mandatory mediation among all stakeholders about how to make the architecture sufficiently nondiscriminatory in order to blunt the worst effects of market power.

The OFTEL approach is one way to think about an intermediary policy solution. It is not proposing anything like unbundling of network elements or LRIC pricing. But it is looking for a halfway house to the challenge explored in this paper.

As such, OFTEL's approach serves as an important referent in the current policy debate. It recognizes the problem and creates the condition for an informed and open public debate to address it, rather than simply wish that it will all go away if regulators let the Cable companies proceed. Box One outlines OFTEL's thinking in detail. Differences in Oftels premises and the particularly the specifics of the British policy and regulatory discussion mean that Oftel's answer may not be right for America. We would note, from the perspective regulation that the recently announced Canadian policy on Internet access is in fact much more intrusive. But surely Oftel's questions are the right ones.[51]

Finally, we would note in closing that it would be highly desirable in itself if the United States again established itself as the international policy leader for broadband services. Silence in policy in the United States takes away America's significant advantage globally in shaping the policy for the next generation of global Internet services. Problems about how to assure competitive network infrastructure for broadband access exist everywhere in the world. The FCC's silence creates a leadership vacuum in the global policy area that others will surely fill, perhaps with results that the United States may not like.

[51] OFTEL begins with some premises that the FCC might reject. For example, OFTEL is especially concerned about settop boxes. And its analysis of market power is influenced by the fact the underlying network offering DSL in the UK has not been subject to unbundling in the same manner as in the United States.

BOX ONE : THE OFTEL APPROACH:

- *"As service providers provide an increasing diversity of services across undifferentiated digital network, relying on intelligence in consumers[52] equipment, it will become even more important to ensure that the entry barriers are not used abusively. Regulators will need to retain backstop regulatory powers to intervene in the market to ensure interoperability. There should be a common framework for intervention. This does not mean that regulators should set standards. OFTEL believes that increasingly interoperability will be based on voluntary agreements within the industry. The regulators role should be to facilitate industry cooperation and to police anti-competitive behaviour. Only if the benefits from intervention clearly outweigh the potential adverse effects should standards be imposed on the market. For example, one of the main obstacles to the voluntary approach is that a consensus can be undermined by standards imposed by a dominant operator which become the de facto standard for a given service or application. This outcome can be either benign or malign - or various shades in between. Regulatory intervention may be justified to prevent those with market power from imposing their own proprietary standards on the wider industry where this raises others[53] cost, prevents or impedes market entry or otherwise distorts fair competition."*

- *"OFTEL believes that the concept of interface control may be the basis of a common approach to interoperability. This has three key aspects:*

- *mandatory publication of standards for all;*

- mandatory consensus - seeking process for operators with market influence backed by discretionary powers for the regulator to intervene if this fails." Within this type of rule there will need to be careful consideration given to the role of intellectual property rights ('IPR')."

Source: OFTEL's response to the UK Green Paper—Regulating communicatins: approaching convergence in the information age," January 1999. www.oftel.gov.uk/broadcast/gpia0199.htm

---

[52] Oftel further asserts: 4.25 Such *ex ante* rules are required for those who act as "gatekeepers" but escape the legal/economic definition of dominance (though they have the clear *potential* to become dominant). Control of access gateways can distort downstream markets. If such distortion occurs it would be extremely difficult to redress after the event. In order to prevent such distortions *ex ante* rules should apply where the consumer, or other end-user of services, faces significant switching costs in moving to another supplier or service. The rules should be subject to a carefully defined "trigger" to avoid catching any operator unnecessarily. They must also be applied in a way which is technology-neutral (i.e. so that it is the market, not the regulator, who determines the relative success of any competing technologies). They should be the minimum necessary to allow the downstream markets to function normally, without unnecessary restriction or distortion of competition. ***OFTEL, "Beyond the Telephone, the Television and the PC—III," OFTEL's second submission, March 1998, found at www.oftel.gov.uk/broadcast/dcms398/htm.***

[53] 4.26 Specific rules for ensuring interoperability between different operators, between operators and service providers, and between different service providers are also required. Such rules are likely to become increasingly important in the networked IT field. As service providers provide an increasing diversity of services across undifferentiated digital networks, relying on intelligence in consumers' equipment, it will become even more important to ensure that the entry barriers constituted by the technical/proprietary control systems embedded in customers' equipment are not used abusively. 6.8 This problem of balance is similar to issues of interconnection and interoperability of telecommunication networks. OFTEL's experience is that regulatory intervention in interconnection issues is likely to foster more positive outcomes than unconstrained commercial negotiation and believes this to be generally true for interoperability and bottleneck control issues. Indeed, OFTEL has adopted this approach in relation to gateway control to and through digital networks. OFTEL does not envisage a need to regulate the services carried over such networks.