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Does a Hierarchical Internet Necessitate Multilateral Intervention?

*Rob Frieden**

As the Internet matures and commercializes¹ it becomes more hierarchical,² particularly regarding the terms and conditions for

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¹ "When the National Science Foundation commercialized the Internet between 1992 and 1994, it took what might be called a minimalist approach, allowing market forces to develop the technology. It was a grand experiment with markets, and, by some perspectives, an unusual way to develop infrastructure." Shane Greenstein, *On the Net: The Recent Commercialization of Access Infrastructure*, IMP MAGAZINE (Dec. 22, 1999), at http://www.cisp.org/imp/december_99/12_99greenstein.htm.

² [T]he providers of Internet connectivity [can] be classified as a loose hierarchy broken down into roughly four tiers. At the top are nationwide (or worldwide) Internet backbones, which provide nationwide Internet services using extensive owned or leased fiber facilities. They generally have peering arrangements or private peering connections with the other national backbone providers and are "transit-free," so they do not have to rely on transit agreements. UUNET (owned by WorldCom) and iMCI are examples of these large national backbone providers. The second group of providers are national Internet backbone networks that use facilities leased from underlying fiber telecommunications providers, but which pay transit fees to one or more national backbone providers. A third group comprises the Regional or local ISP Internet connectivity providers, which lease some regional or local network fiber facilities and equipment and interconnect with other small providers at the public NAPs make up another category. They typically purchase transit backbone services from any of the national backbone providers. The last group is made up of ISPs that do not have a network, but instead rely on others for wholesale Internet connectivity services. Small "Mom & Pop" ISPs are typical of this type.

Constance K. Robinson, *Network Effects in Telecommunications Mergers, MCI Worldcom Merger: Protecting the Future of the Internet*, in TELECOM DEALS: M&A, REGULATORY AND FINANCING ISSUES 517, 535-36 (Kraus et al. eds., 2000); see also Robert M. Frieden, *Without Public Peer: The Potential Regulatory and Universal Service Consequences of Internet Balkanization*, 3 VA. J.L. & TECH. 8 (1998), at http://vjolt.student.virginia.edu/graphics/vol3/home_art8.html; Robert M. Frieden, *Last Days of the Free Ride? The Consequences of Settlement-Based Interconnection for the Internet*, 1 INFO No. 3, 225-38 (1999).

The result of technological advancement in telephony markets is a regulatory

network interconnection between Internet Service Providers (ISPs).³ The previous "democratic" Sender Keep All (SKA) system⁴ promoted positive networking externalities,⁵ but also

gap between conventional service providers and service providers that use new Internet technologies. As the technologies mature, both traditional market issues and concerns regarding regulatory controls are increasingly raised by competitors as well as regulatory agencies. The reluctance to regulate the new telecommunications technologies is based in the fear that the technology is not mature enough to bear the burden of regulation.

Seth A. Cohen, *Deregulating, Defragmenting & Interconnecting: Reconsidering Commercial Telecommunications Regulation in Relation to the Rise of Internet Telephony*, 18 J.L. & COM. 133, 147 (1998).

³ Internet Service Providers typically provide the necessary telecommunications link to the Internet, such as local seven-digit telephone numbers. Additionally, they may provide some content and offer additional services, such as electronic mail addresses.

⁴ Taunya L. McLarty, *Liberalized Telecommunications Trade in the WTO: Implications for Universal Service Policy*, 51 FED. COMM. L.J. 1, 41 n.203 (1998). "Sender Keep All" and "Bill and Keep" arrangements refer to the absence of a monetary transfer when ISPs agree to route the traffic of another ISP to yet another ISP (also known as transiting), or to the final recipient. These terms also refer to a business relationship among telecommunications carriers: "Each carrier sets consumer collection rates and keeps 100%. This allows new entrants, but it does not encourage operators to receive calls because no compensation is given to allow incoming calls over their system." *Id.* ISPs may use the term "peering" or "true peering" to identify a "Sender Keep All" or "Bill and Keep" arrangement. Currently, peering typically occurs only when ISPs of equal size expect to route roughly equivalent traffic streams. In practice, peering now occurs only among large ISPs with extensive transmission facilities and traffic volumes. *Id.*

⁵ A positive network externality exists when the cost incurred by a user of the Internet does not fully reflect the benefit derived with the addition of new users and points of communications. *See, e.g.*, Joseph Farrell & Garth Saloner, *Standardization, Compatibility and Innovation*, 16 RAND J. ECON. 70, 70 (1985); Michael L. Katz & Carl Shapiro, *Network Externalities, Competition and Compatibility*, 75 AM. ECON. REV. 424, 426 (1985). Positive network externalities refer to an accrual in value, including increased access to information, increased ease of communication, and a decrease in a variety of transaction and overhead costs. *See United States v. Microsoft Corp.*, 84 F. Supp. 2d 9, 20 (D.D.C. 1999) (findings of fact) ("A positive network effect is a phenomenon by which the attractiveness of a product increases with the number of people using it."); *United States v. Microsoft Corp.*, 87 F. Supp. 2d 30 (D.D.C. 2000) (conclusions of law); *United States v. Microsoft Corp.*, 97 F. Supp. 2d 59 (D.D.C. 2000) (final judgment), *petition for cert. filed*, 69 U.S.L.W. 3111 (U.S. July 26, 2000); CARL SHAPIRO & HAL R. VARIAN, *INFORMATION RULES: A STRATEGIC GUIDE TO THE NETWORK ECONOMY* 183-84 (1999); Mark A. Lemley & David McGowan, *Legal Implications of Network Economic Effects*, 86 CAL. L. REV. 481, 483 (1998); Peter S. Menell, *An Analysis of the Scope of Copyright Protection for Application Programs*, 41 STAN. L. REV. 1045, 1066 n.119 (1989) ("network externality" describes a class of goods for which the utility . . . derived from the good's consumption increases with the number of

generated free rider opportunities⁶ and great potential for network congestion, particularly at “public peering” sites where ISPs of any size could secure interconnection with other ISPs at low cost.⁷ The individual networks that make up the Internet remain well integrated, but a more hierarchical pricing arrangement has developed.⁸ Now only the largest ISPs continue to “peer” on a

other persons consuming the good”); Carl Shapiro, *Exclusivity in Network Industries*, 7 GEO. MASON L. REV. 673 (1999).

⁶ Free ridership refers to the ability to tap into valuable services without having to pay. In some instances, service providers consider free ridership unavoidable and even a social benefit, similar to the manner in which advertiser-supported commercial television makes it possible for consumption of high-cost content without a direct payment and without indirect payment through consumption of the products and services advertised. Digital technology, however, greatly exacerbates the free ridership problem as one can cheaply and easily make perfect duplicates of valuable intellectual property not intended for free use. The Internet provides a cheap medium for widespread dissemination of purloined content. “Bringing social order to the Internet thus requires overcoming free rider problems similar to those necessary to bring order to the west.” Andrew P. Morriss, *Miners, Vigilantes & Cattlemen: Overcoming Free Rider Problems in the Private Provision of Law*, 33 LAND & WATER L. REV. 581, 688 (1998); see also *Alvord-Polk, Inc. v. Schumacher & Co.*, 37 F.3d 996, 1010-11 (3d Cir. 1994) (denying summary judgment for defendants on antitrust claims that wallpaper vendors accessible by toll-free telephone numbers constituted “free riders” of full service vendors who incur the cost of creating and distributing wallpaper sample books, salesperson advice, and showroom displays) (citing *Continental T.V., Inc. v. GTE Sylvania, Inc.*, 433 U.S. 36, 55 (1977)); *Big Apple BMW, Inc. v. BMW of N. Am., Inc.*, 974 F.2d 1358, 1376-77 (3d Cir. 1992).

⁷ A peering arrangement describes the situation where firms exchange data traffic without charging one another (bill-and-keep). A local peering arrangement is when the exchange occurs at a site close to the end-users. This proximity essentially improves the performance and speeds of the Internet connection, as data traffic travels less distance.

Deborah A. Lathen, FEDERAL COMMUNICATIONS COMMISSION, CABLE SERVICES BUREAU, *Broadband Today*, 59 n.128 (1999), available at <http://www.fcc.gov/Bureaus/Cable/Reports/>.

⁸ Robinson, *supra* note 2, at 531-32.

At the beginning of [Internet] privatization, most of the networks had peering agreements with each other. With the massive growth of the Internet, the . . . [public peering points also known as Network Access Points] became congested, slowing down the speed of the connection and resulting in more lost data, and lowering the quality of connection to the rest of the networks. The larger networks responded to this problem by investing in private dedicated connection points which provide faster and more accurate connections. Generally, only the big national networks have these private peering connection points. Over time, as individual networks grew, large nationwide backbone providers began to complain that small local or regional ISPs were free riding

SKA basis, while demanding payment from smaller operators.⁹

Requiring smaller ISPs to pay for access to larger ISPs' networks constitutes a rational business transaction and reflects a maturing, more businesslike attitude among ISPs. However, it constitutes a significant change in circumstances and imposes substantial new costs on smaller ISPs, some of which object to what they consider a one-sided exploitation of superior bargaining power.¹⁰ No matter how justified and efficiency enhancing on a macro-level, the commercial, unregulated nature of ISP interconnection negotiations now requires sizeable transfer payments where none previously existed.¹¹ Much of the payments flow to Tier-1 ISPs located in North America, leading some ISPs and their governments in other locales to claim that the transfer payments violate international trade, antitrust, and economic development policies.¹² North American ISPs and governments

on the large providers' substantial network investments. To deal with the free riding issues, the larger network providers began to create policies to restrict future peering arrangements with small and regional ISPs that had not invested in growing their networks. They stopped peering and entered into transit agreements where the national backbones charged the small network or ISP "transit fees" for carrying and terminating their traffic.

Id.

⁹ *Id.*

¹⁰ *Id.* "In essence, the smaller [ISP] networks became customers of the larger ones." *Id.* at 532.

¹¹ *Id.*

¹² *International Charging Arrangements for Internet Services, Australia's Objectives for the Project*, Asia-Pacific Economic Cooperation Telecommunications Working Group, 19th Meeting, PLEN/G/03, at http://www.apii.or.kr/apec/atwg/previous.html?apec_previous_select=19&apec_previous_select2=03&x=14&y=1 (Mar. 2, 1999). For example, at the request of several Asia-Pacific governments, the Asia-Pacific Economic Cooperation Telecommunications Working Group initiated an inquiry into International Charging Arrangements for Internet Services (ICAIS). Representatives of the Australian government and commercial Internet ventures asserted the need for "equitable distribution of costs and benefits, including return on investment. The model should encourage effective working of open markets in the relevant services and facilities. It should also work in situations where closed markets interconnect with open markets." *Id.* On the other hand, representatives of the United States government and commercial Internet ventures stated "that cost efficient arrangements for Internet traffic will continue to be worked out most quickly if the Internet market is left unhampered." *U.S. Background Paper: International Charging Arrangements for Internet Services (ICAIS)*, Asia-Pacific Economic Cooperation Telecommunications Working Group, 19th Meeting, PLEN/G/03, at http://www.apii.or.kr/apec/atwg/previous.html?apec_previous_

have responded by emphasizing the commercial nature of Internet peering and the rationale for not extending burdensome and unnecessary "legacy regulation."¹³

This article will explore the nature of the Internet interconnection dispute with an eye toward examining the strategies used to raise the issue in multilateral telecommunications and trade policy forums like the International Telecommunication Union (ITU) and the World Trade Organization (WTO).¹⁴ The article will also consider several future scenarios and whether the problem will abate or intensify.¹⁵ This consideration involves an assessment of whether Internet traffic flow and content will more substantially diverge from a North American centrality and whether interconnection arrangements will become even more finely calibrated.¹⁶

I. Marketplace Consequences of a Hierarchical Internet

As Internet industry segments mature, many governments wind down and eventually terminate their role as incubator and anchor tenant. In many nations, including the United States, governments helped promote Internet use and proliferation of the

select=19&apec_previous_select2=03&x=14&y=1 (Feb. 22, 1999); Dan Lundberg, *AT&T Position Regarding Internet Charging Mechanisms and the Development of the Asia-Pacific Internet Infrastructure*, submitted by the United States of America, Asia-Pacific Economic Cooperation Telecommunications Working Group, 19th Meeting, PLEN/G/02, available at http://www.apii.or.kr/apec/atwg/previous.html?apec_previous_select=19&apec_previous_select2=03&x=14&y=1 (Feb. 22, 1999).

¹³ MICHAEL KENDE, *THE DIGITAL HANDSHAKE: CONNECTING INTERNET BACKBONES*, (FCC, Office of Plans and Policy, Working Paper No. 32, 2000), available at <http://www.fcc.gov/opp/workingp.html> (last visited Feb. 5, 2001).

In recent years, some carriers, particularly those from the Asia-Pacific region, have claimed that it is unfair that they must pay for the whole cost of the transmission capacity between international points and the United States that is used to carry Internet traffic between these regions. After analyzing the case presented by these carriers, the paper concludes that the solution proposed by these carriers, legacy international telecommunications regulations, should not be imposed on the Internet.

Id.; see also JASON OXMAN, *THE FCC AND THE UNREGULATION OF THE INTERNET*, (FCC, Office of Plans and Policy, Working Paper No. 31, 1999), available at <http://www.fcc.gov/opp/workingp.html> (last visited Feb. 5, 2001).

¹⁴ See *infra* Parts I-III, V.C.3-4.

¹⁵ See *infra* Part IV.

¹⁶ See *infra* Part V.

Internet infrastructure.¹⁷ Having concluded that the Internet has reached a critical mass, most governments now endorse the view that a largely commercial and private environment will best serve the national interest.¹⁸ Most governments now favor a privatized Internet, but not an environment that one could deem completely unregulated.¹⁹ As the Internet becomes a major medium for a variety of private and commercial transactions, activities previously considered illegal or warranting government oversight will also trigger government involvement.²⁰

The privatized, commercial Internet²¹ has evidenced economic

¹⁷ *ACLU v. Reno*, 929 F. Supp. 824, 831 (E.D. Pa. 1996), *aff'd*, *Reno v. ACLU*, 521 U.S. 844 (1997).

The Internet had its origins in 1969 as an experimental project of the Advanced Research Project Agency ("ARPA"), and was called ARPANET. This network linked computers and computer networks owned by the military, defense contractors, and university laboratories conducting defense-related research. The network later allowed researchers across the country to access directly and to use extremely powerful supercomputers located at a few key universities and laboratories. As it evolved far beyond its research origins in the United States to encompass universities, corporations and people around the world . . .

Id.

The Internet is an international network of interconnected computers. It is the outgrowth of what began in 1969 as a military program called "ARPANET," which was designed to enable computers operated by the military, defense contractors, and universities conducting defense-related research to communicate with one another by redundant channels even if some portions of the network were damaged in a war. While the ARPANET no longer exists, it provided an example for the development of a number of civilian networks that, eventually linking with each other, now enable tens of millions of people to communicate with one another and to access vast amounts of information from around the world.

ACLU, 521 U.S. at 849-50.

¹⁸ For a helpful analysis of present and future challenges to Internet development, see COMMITTEE ON THE INTERNET IN THE EVOLVING INFORMATION INFRASTRUCTURE, COMPUTER SCIENCE AND TELECOMMUNICATIONS BOARD, *THE INTERNET'S COMING OF AGE* (2000), available at <http://bob.nap.edu/books/0309069920/html/> (last visited Feb. 5, 2001).

¹⁹ For background on the development of the Internet's business structure, see KEVIN WERBACH, *DIGITAL TORNADO: THE INTERNET AND TELECOMMUNICATIONS POLICY* (FCC, Office of Plans and Policy, Working Paper No. 29, 1997), available at <http://www.fcc.gov/opp/workingp.html>.

²⁰ *Id.*

²¹ Over the near-term, the Internet and the PSTN will begin to look increasingly similar with overlapping functions. As the Internet matures, ISPs

characteristics similar to those of telecommunication networks.²² Tier-1 ISPs have accrued favorable economies of scale²³ and scope²⁴ through growth in both customer base and the inventory of bandwidth available for service.²⁵ Having made the investment to accommodate burgeoning demand, Tier-1 ISPs must find new profit centers in addition to monthly subscriptions.²⁶ These operators have found they can efficiently provide many Internet-mediated services, including electronic commerce and advertiser-supported access to desirable content, and also force smaller ISPs, which have not achieved similar growth or expanded their bandwidth inventory, to pay for access and transit services.²⁷

To achieve positive economies of scale and scope, telecommunications and Internet operators alike have worked to expand their customer base, available bandwidth, number of interconnection sites, and the content that they host, as opposed to

will become more diversified and universal peering arrangements will become less practicable. The need for "settlements," at least with respect to some functions, will arise. Universal service contributions will be difficult to escape, particularly for phone-to-phone [Internet-mediated telephony] that utilizes IP-based packet-switching over dedicated facilities, but does not necessarily actually utilize the public Internet. Over the long term, however, the real issue is not whether IP Telephony and basic voice telephony are consistently regulated according to familiar PSTN concepts.

Aileen A. Pesciotta, *Regulation of International Communications in the Age of the Internet: Lagging Behind the Future*, 33 INT'L LAW. 367, 371 (1999).

²² For a helpful background on the nature of telecommunications regulation in the context of competition policy, see Michel Kerf & Damien Geradin, *Controlling Market Power in Telecommunications: Antitrust vs. Sector-Specific Regulation*, 14 BERKELEY TECH. L.J. 919 (1999).

²³ Economies of scale refer to the "[r]eductions in the average cost of a product in the long run resulting from an expanded level of output." THE MIT DICTIONARY OF MODERN ECONOMICS 122 (4th ed. 1992).

²⁴ Economies of scope refer to the condition that occurs "when it is cheaper for one firm to produce multiple, related products rather than for independent companies to make them separately." *Business Basics Online*, at http://www.multimedia.calpoly.edu/development/busen/alpha/e/economy_of_scope.html (last visited Feb. 5, 2001).

²⁵ Pesciotta, *supra* note 21.

²⁶ See, e.g., Melanie Austria Farmer, *ISPs Dipping into Data Storage to Stay Ahead*, CNET News.com, at <http://www.canada.cnet.com/news/0-1004-200-2198186.html> (July 3, 2000).

²⁷ Robinson, *supra* note 2, at 532.

providing access to content hosted elsewhere.²⁸ Massive, multi-billion dollar mergers and acquisitions evince the desire to achieve scale and scope economies in a speedy fashion—acquiring the market share of a competitor, rather than migrating customers and revenues from competitors.²⁹ The quest to achieve scale and scope economies constitutes one of the major reasons the Internet has become more hierarchical,³⁰ with a small set of major carriers operating the key backbone routes and capturing a large market share measured by bandwidth, number of subscribers, minutes of use, revenues, number of discrete “hits” to internal web sites, or number of discrete Domain Numbering System sites internal to (“hosted” by) the network.³¹ The small number of major backbone ISPs, coupled with an increasingly commercial orientation, has made it possible for the Tier-1 ISPs to demand and secure payments from smaller ISPs for access to their networks and content.³²

Without concluding whether a more hierarchical Internet promotes greater economies of scale and scope, the concentration of Tier-1 ISPs’ market share has made it possible to secure a superior bargaining position vis-à-vis smaller ISPs:

As the cooperative, nonprofit ethos of the Internet began to fade, however, some providers began to have second thoughts about connecting directly to one another [through open peering]. Today, large backbone providers such as AT&T, Cable & Wireless, GTE, PSINet, Sprint, Qwest Communications, and UUNET consider one another peers and don’t hesitate to connect to each other. However, they often spurn

²⁸ *See id.*

²⁹ *Id.*

³⁰ For additional background on the impact of a hierarchical Internet industry structure on universal service policy objectives, see Frieden, *Last Days of the Free Ride?*, *supra* note 2, at 225-38; Frieden, *Without Public Peer*, *supra* note 2.

³¹ For a compilation of statistics on ISPs, see *Directory of Internet Service Providers* (12th ed. 2000), BOARDWATCH MAGAZINE, at <http://www.ispworld.com/isp/TOC.htm> (last visited Feb. 5, 2001); *see also ISP Statistics*, BOARDWATCH MAGAZINE, at http://www.ispworld.com/src/ISP_Statistics.htm (last visited Feb. 5, 2001).

³² *See, e.g., WorldCom Policy for Settlement-Free Interconnection with Internet Networks*, UUNET, at <http://www2.uu.net/peering/> (Jan. 2001). For example, UUNET, a major Tier-1 ISP, will interconnect with another ISP on a SKA peering basis if the ISP meets certain requirements with respect to geographic scope, traffic exchange ratio, backbone capacity, and traffic volume. *Id.*

smaller nationwide providers³³

While technical and operational factors do impact the Tier-1 ISPs' interconnection decision-making process, the "main reason for not peering, however, is economic."³⁴ Some observers suggest that marketplace-driven negotiations should never trigger government scrutiny, while others would argue the legitimacy of antitrust or competition policy analysis when assessing the terms and conditions for Internet access.³⁵

A. Does a Small Set of Tier-1 ISPs Reduce Consumer Welfare?

Assessing whether Internet access pricing triggers the need for government involvement requires an examination of whether consumers suffer when a small number of backbone ISPs agree to restrict SKA "true peering." Such an assessment involves an examination of ISP market share and the state of competition over all components in a complete Internet link, including local access to the subscriber's ISP and the local ISP's links with other ISPs for access to the rest of the world both in terms of telecommunications carriage and content creation or dissemination. In general, a healthy and efficiently operating Internet industry can exist³⁶ even under a hierarchical structure coupled with a limited number of Tier-1 ISPs.³⁷ This finding requires some qualification, however,

³³ Jonathan Angel, *Toll Lanes on the Information Superhighway*, NETWORK MAGAZINE (Feb. 1, 2000), at <http://www.networkmagazine.com/art/>.

³⁴ *Id.*

³⁵ See generally ECONOMICS OF REGULATION AND ANTITRUST 377 (W. Kip Viscusi et al. eds., 2d ed. 1998). For background on U.S. antitrust law and policy, see HERBERT HOVENKAMP, *FEDERAL ANTITRUST POLICY: THE LAW OF COMPETITION AND ITS PRACTICE* (1994); RICHARD A. POSNER, *ANTITRUST LAW: AN ECONOMIC PERSPECTIVE* 8 (1976); Georges J. Alexander, *Antitrust and the Telephone Industry after the Telecommunications Act of 1996*, 12 SANTA CLARA COMPUTER & HIGH TECH. L.J. 227 (1996). For background on antitrust and telecommunications-specific rules in the European telecommunications markets, see Paul Nihoul, *Convergence in European Telecommunications: A Case Study on the Relationship Between Regulation and Competition Law*, 2 INT'L J. COM. L. & POL'Y 1 (1998).

³⁶ See Tom Downes & Shane Greenstein, *Do Commercial ISPs Provide Universal Access?*, in COMPETITION, REGULATION AND CONVERGENCE: SELECTED PAPERS FROM THE 1998 TELECOMMUNICATIONS POLICY RESEARCH COMMITTEE (Sharon Gillett & Ingo Vogelsang eds., 1998).

³⁷ KENDE, *supra* note 13.

as bottlenecks can exist in the Internet topology within a region.³⁸ Likewise, the potential does exist for price squeezes—the ability of one competitor to raise the costs of others for a service element needed by all competitors and supplied by one or few operators.³⁹

It is important to recognize that a hierarchical Internet industrial structure results in different types of ISPs incurring different costs for access to both content and carriage.⁴⁰ Such price differentials have triggered the Internet access pricing dispute because some stakeholders consider differences in the cost of Internet access evidence of price gouging and anticompetitive conduct by the Tier-1 ISPs.⁴¹ Others note that no ISP has

In conclusion, the presence of a large number of top-tier backbones can prevent any anti-competitive actions. In a competitive backbone market, no large backbone would unilaterally end peering with another, as it has no guarantee that it will benefit from such an action. Furthermore, there would be no insurmountable barrier to entry or growth of smaller backbones. Larger top-tier backbones would continue to compete to provide transit services to smaller backbones. These smaller backbones would be able to resell these services to their own customers, and would not seem to face any barrier to acquiring either the infrastructure or customer base that could enable them eventually to join the ranks of the larger backbones and qualify for peering. Actual, as well as potential, entry by new backbones would act to constrain the actions of larger incumbent backbones, keeping prices at competitive levels.

Id.

³⁸ See, e.g., *AT&T Corp. v. City of Portland*, 216 F.3d 871 (9th Cir. 2000) (reversing lower court's grant of summary judgment that municipal cable television franchising authority may condition transfer of a franchise on the cable operator providing competing ISPs with open access to its broadband network). For example, when cable television companies provide Internet access, they incur no compulsory obligation to provide access to any ISP as would be the case if a telephone company common carrier provided such access. AT&T, the largest cable television service provider, typically only provides direct access to a preferred ISP, Excite@Home. *Id.*

³⁹ KENDE, *supra* note 13; *United States v. Aluminum Co. of Am.*, 148 F.2d 416, 437-38 (2d Cir. 1945) (articulating the following four-part test for price squeezes: (1) a firm has monopoly power with respect to one product; (2) its price for that product is higher than a "fair price"; (3) that product is required to compete in a second market where the monopolist itself competes; and (4) the monopolist's price in the second market is so low that competitors cannot match it and still earn a "living profit").

⁴⁰ Jack Rickard, *Editor's Notes*, BOARDWATCH MAGAZINE, May 1998, at <http://www.ispworld.com/> (on file with author). For example, telecommunications transmission costs have not become completely distance insensitive. ISPs located farther from the server on which content is hosted typically incur higher telecommunications transmissions costs than closer ISPs.

⁴¹ *Id.*

experienced an inability to secure interconnection.⁴²

Without offering an opinion on the equities involved in different access terms and conditions, several major causes for the difference exist.

First, the facilities-based, long-haul telecommunications transmission marketplace has such substantial market entry and operational costs that relatively few operators can efficiently and effectively enter and remain in the market. This view, supported by an empirical analysis of the telecommunications infrastructure and its ownership, contrasts with the comparatively low costs and low barriers to market entry in reselling the long-haul services of a Tier-1 ISP.⁴³

Second, the nature of Internet access, from a consumer (end-user) point of view seamlessly blends access to content and the telecommunications transport needed to acquire and deliver the content. Users expect their ISPs to deliver content quickly and effectively regardless of where the content is physically hosted.

Third, ISPs recover the cost of Internet-mediated content and the telecommunications transport costs without separately itemizing or disaggregating these costs. With the proliferation of Internet-mediated services triggering the need for ever-increasing telecommunications transport costs, ISPs have augmented revenues from end-user subscriptions with revenue streams from advertisers, a share of electronic commerce revenues and where possible, payments from other ISPs for transiting their networks.

Fourth, traffic flows and, more importantly, end-user demand for content and Internet-mediated services, directly impact the terms and conditions for Internet access.⁴⁴ ISPs offering superior

⁴² KENDE, *supra* note 13. "[P]eering arrangements are the result of commercial negotiations; each backbone [operator] bases its decisions on whether, how and where to peer by weighing the benefits and costs of entering into a particular interconnection agreement with another backbone." *Id.*

⁴³ Jonathan Weinberg, *The Internet and "Telecommunications Services," Universal Service Mechanisms, Access Charges, and Other Flotsam of the Regulatory System*, 16 YALE J. ON REG. 211 (1999).

⁴⁴ See Geoff Huston, *Interconnection, Peering, and Settlements*, Proc. of the 9th Ann. Conf. of the Internet Soc'y, at <http://www.isoc.org/inet99/longtoc.htm> (last visited Feb. 5, 2001); for more extensive background on the importance of traffic volumes and flow, see GEOFF HUSTON, *ISP SURVIVAL GUIDE: STRATEGIES FOR RUNNING A COMPETITIVE ISP* (1998).

content or content delivery options can demand and fetch premium compensation, the product of commercial negotiation that factors in demand and supply elasticities as well as consumer expectations regarding quality of service.⁴⁵

An FCC Working Paper on Internet Peering concludes that Tier-1 ISP denial of cost-free interconnection with smaller ISPs does not demonstrate a strategy to drive out competitors or raise their costs.⁴⁶ Larger ISPs may seek to prevent free riding by smaller ISPs, who, for example, may disproportionately use the larger ISP's network.⁴⁷ In addition, they may seek to generate new transit revenue streams from smaller ISPs by providing access to their network and the networks of other ISPs with which they have peering arrangements.⁴⁸

B. Subjecting the Internet Market Structure to Traditional Antitrust or Competition Policy Analysis

Traditional antitrust or competition policy analysis considers individual firms in the context of the markets in which they operate with an eye toward determining whether and how a firm might engage in anticompetitive and market distorting behavior.⁴⁹

⁴⁵ THE MIT DICTIONARY OF MODERN ECONOMICS, *supra* note 23, at 342 (stating that price elasticity of demand refers to the "responsiveness of the quantity demanded of a good to its own price"); *see also* INTERNET ECONOMICS (Lee W. McKnight & Joseph P. Bailey eds., 1998).

⁴⁶ KENDE, *supra* note 13. "[T]he presence of a large number of top-tier backbones can prevent any anticompetitive actions." *Id.*

⁴⁷ *Id.* "One reason a backbone may refuse to peer is that it believes that peering would enable their other backbone to free ride on its infrastructure investments." *Id.*

⁴⁸ *See id.*

⁴⁹ *See, e.g.,* Thomas A. Piraino, Jr., *Identifying Monopolists' Illegal Conduct Under The Sherman Act*, 75 N.Y.U. L. REV. 809, 810 (2000).

The most significant antitrust cases of the last century have been brought under Section 2 of the Sherman Act (Section 2), which makes it illegal for a firm to "monopolize, or attempt to monopolize," interstate commerce. In cases involving the Standard Oil Company, the Aluminum Company of America (Alcoa), IBM, AT&T, and Eastman Kodak, the federal courts have established certain basic principles of monopoly regulation. Decisively rejecting the notion that monopolies should be deemed illegal in and of themselves, the courts have found monopolists liable under Section 2 only when they have engaged in predatory conduct.

Id. (footnotes omitted).

This analysis has two major tasks: the macro-level definition of the relevant product or service and geographical markets,⁵⁰ and the micro-level assessment of individual firm market share and potential to engage in practices that harm competitors and consumers.⁵¹

Traditional antitrust or competition policy analysis emphasizes the following: (1) a vertical examination primarily of individual firm behavior⁵² and its impact on competition and consumer welfare;⁵³ and (2) a horizontal examination of conduct occurring between actors, including conspiracies in restraint of trade.⁵⁴ In the matter of Internet peering, complaints have addressed decisions by several Tier-1 ISPs to require payments for interconnection and transit services.⁵⁵ Even though the Tier-1 ISP market may evidence some concentration, no single carrier has acquired, or attempted to acquire, a monopoly.⁵⁶ As no unilateral conduct by a single firm is

⁵⁰ Bob Rowe, *Substance Plus Process—Telecom Regulation Reforms to Protect Consumers, Preserve Universal Service, and Promote Competition in 2000: A New Regulatory Regime for Federal-State Relations and Universal Service Support*, 71 U. COLO. L. REV. 879, 888 (2000).

Market concentration measurements typically examine the relevant geographic market, relevant product market, number of firms participating in the market, and the market share of each firm to produce a number which may be used to compare the concentration of markets, the change in concentration over time, or the possible change in concentration if a particular transaction occurs.

Id.

⁵¹ See, e.g., *United States v. Aluminum Co. of Am.*, 148 F.2d 416, 424 (2d Cir. 1945) (finding that 90% market share constituted monopoly power, but that it was doubtful if 60% would be enough, and “certainly” 33% would not be enough).

⁵² 15 U.S.C. § 2 (2000). The Sherman Act prohibits monopolization, attempts to monopolize, and conspiracies to monopolize. *Id.* No evidence exists that any single Tier-1 ISP has market power or has conspired with other Tier-1 ISPs to achieve market domination collectively by coordinating a single peering policy.

⁵³ See, e.g., *Brown Shoe Co. v. United States*, 370 U.S. 294, 320 (1962). The antitrust laws protect competition, not specific, individual competitors. *Id.*

⁵⁴ 15 U.S.C. § 1 (2000). The Sherman Act condemns all contracts, combinations, and conspiracies in restraint of trade. *Id.* Other U.S. federal statutes addressing horizontal anticompetitive conduct include the Clayton Act, 15 U.S.C. § 12 *et seq.* (2000) and the Federal Trade Commission Act, 15 U.S.C. § 45 (2000).

⁵⁵ See, e.g., KENDE, *supra* note 13 (“In recent years, a number of non-U.S. carriers have objected to interconnection agreements governing flows of Internet traffic between international points and the United States.”).

⁵⁶ *Id.* (“In conclusion, the presence of a large number of top-tier backbones can prevent any anticompetitive actions.”).

implicated, a horizontal examination is necessary.

C. Defining the Relevant Product/Service and Geographical Market

How one defines the market for Internet access and Internet-mediated services directly affects conclusions as to whether the market is robustly competitive or subject to market power and domination by the Tier-1 ISPs. Any definition of Internet markets should consider the functional equivalency or substitutability of a product or service in determining the "relevant" product or service market.⁵⁷ Markets can be defined as including all goods and services considered by consumers to constitute an alternative to the others.⁵⁸ Economists and courts considering antitrust cases typically measure the substitutability of products and services in terms of cross-elasticities.⁵⁹

Internet access and Internet-mediated services constitute elements of the single, broader market for bandwidth capable of transporting digital bitstreams.⁶⁰ Digitization makes it possible to assemble and deliver a variety of different types of services over a single medium.⁶¹ While all bits do not have the same function or

⁵⁷ Robert Pitofsky, *New Definitions of Relevant Market and the Assault on Antitrust*, 90 COLUM. L. REV. 1805, 1831-33 (1990); see also U.S. Department of Justice & Federal Trade Commission, *Horizontal Merger Guidelines* (1992, as amended 1997), reprinted in 4 Trade Reg. Rep. (CCH) ¶ 13,104.

⁵⁸ *Satellite Television v. Cont'l Cablevision, Inc.*, 714 F.2d 351, 355 (4th Cir. 1983), cert. denied, 465 U.S. 1027 (1984).

⁵⁹ *Eastman Kodak v. Image Technical Servs, Inc.*, 504 U.S. 451, 469 (1992). Cross-elasticity of demand between products is defined as "the extent to which consumers will change their consumption of one product in response to a price change in another." *Id.*; see also HOVENKAMP, *supra* note 35, at § 3.2 (1994) ("A relevant market is the smallest grouping of sales for which the elasticity of demand and supply are sufficiently low that a firm with 100% of that grouping could profitably reduce output and increase price substantially above marginal cost."); *Tampa Elec. Co. v. Nashville Coal Co.*, 365 U.S. 320, 327-28 (1961) ("[T]he threatened foreclosure of competition must be in relation to the market related.").

⁶⁰ For a helpful technical background on the Internet, see Lance J. Hoffman et al., *How the Internet Works*, Cyberspace Policy Institute, at <http://www.cpi.seas.gwu.edu/library/papers.html> (last visited Feb. 5, 2001). The Internet transports traffic representing many different types of content, such as text, graphics, audio, and video. All content is converted into digital bitstreams for transport. *Id.*

⁶¹ See also Russ Haynal, *Internet: "The Big Picture,"* at http://www.navigators.com/internet_architecture.html (last visited Feb. 5, 2001).

value, a data transport pipe, like that owned and operated by the Tier-1 ISPs (or their telecommunications carrier parent or affiliate), can serve as the medium for delivering a variety of Internet-mediated services and the bitstreams they generate.⁶² Accordingly, an appropriate market definition considers long-haul data transport via telecommunications. Given the international nature of the Internet topology, a global geographical market seems appropriate for purposes of assessing the potential for market domination and anticompetitive practices.

D. Individual or Collective Behavior of Firms—Evidence of Market Power

Having defined the overall service market and the geographical nature of the market, antitrust or competition policy then requires an examination of the companies serving these markets.⁶³ This examination considers whether and how one or more firms have market power—ability to affect the price or supply of one or more elements that make up international data transport services.⁶⁴ The appearance of market power correlates with firm size and market penetration, but a finding of market power does not result simply because one firm has a large market share and large capitalization.⁶⁵ Some markets operate efficiently and competitively, despite the fact that a few large enterprises have captured a dominant market share.⁶⁶ On the other hand, one small, thinly capitalized enterprise might have a near monopoly in a market narrowly defined by type or locality.⁶⁷

In examining the international data transport marketplace, one can see that a dichotomy exists in terms of market entry costs⁶⁸ and

⁶² *Id.*

⁶³ See *supra* note 50 and accompanying text.

⁶⁴ THE MIT DICTIONARY OF MODERN ECONOMICS, *supra* note 23, at 268 (defining market power as the “ability of a single, or group of buyer(s) or seller(s) to influence the price of the product or service in which it is trading”).

⁶⁵ *United States v. Aluminum Co. of Am.*, 148 F.2d 416, 424 (2d Cir. 1945).

⁶⁶ See, e.g., *FTC v. Butterworth Health Corp.*, 946 F. Supp. 1285 (W.D. Mich. 1996) (holding that a merger of hospitals resulted in permissible market concentration).

⁶⁷ See, e.g., Peter Bowman Rutledge, *A Brief Review of Merger Control in the United States*, 13 INT’L L. PRACTICUM 8, 10 (2000).

⁶⁸ Low barriers to market entry may overcome evidence of market anticompetitiveness. See, e.g., *FTC v. Cardinal Health, Inc.*, 12 F. Supp. 2d 34, 55

opportunities for local and regional ISPs on one hand, and long-haul, national and international ISPs on the other hand.⁶⁹ This dichotomy underscores the importance of the baseline market definition exercise because one might infer market power based on high market share in narrowly defined markets, while another might infer no market share based on a diluted market penetration when using a larger market definition.

Perhaps the commercial aviation marketplace provides a helpful example of a similarly dichotomous market. Relatively few financial and other barriers exist to prevent the creation of a new airline. With a handful of airplanes, leased by a fully leveraged venture, new airlines can enter the marketplace. Absent barriers to accessing airport terminal and landing space, the airline can serve a few routes and provide significant competition to incumbents already on those routes. No one would mistake this small and incremental competition, however, as a threat to the financial viability of a major incumbent carrier's services. For example, a nation like the United States may have hundreds of national airlines, but still have only six major carriers controlling over seventy percent of the total market as measured by industry-appropriate criteria.

Depending on one's perspective and market definitions, the commercial aviation marketplace in the United States can be characterized as robustly competitive or oligopolistic notwithstanding low barriers to market entry and a general downturn in overall rates since deregulation stimulated market

(D.D.C. 1998) ("A court's finding that there exists ease of entry into the relevant product market can be sufficient to offset the government's prima facie case of anticompetitiveness."); *United States v. Long Island Jewish Med. Ctr.*, 983 F. Supp. 121, 149 (E.D.N.Y. 1997) ("A merger is not likely to cause an anti-competitive effect if other participants can enter the relevant markets and reduce the likelihood of a price increase above competitive levels."); *United States v. United Tote, Inc.*, 768 F. Supp. 1064, 1071 (D. Del. 1991) ("United Tote's second argument is that it is so easy to enter the totalist market that high market share does not accurately reflect an ability to exercise market power."); *McCaw Pers. Communications, Inc. v. Pac. Telesis Group*, 645 F. Supp. 1166, 1174 (N.D. Cal. 1986) ("The existence of low barriers to entry may rebut a prima facie showing of illegality, even where the combined market share of the merged firms is quite high.").

⁶⁹ KENDE, *supra* note 13. Market costs vary substantially between operating as a local or regional Internet Service Provider and operating a major Tier-1 ISP backbone. Given quite low market entry costs, over 4,000 ISPs operate in the United States. However, only about forty also qualify as Tier-1 backbone operators. *Id.* at Figures 7, 8.

entry. Despite the absence of bottlenecks in terms of access to capital, airport terminal space, and runway landing slots, few airlines compete for long-haul traffic or offer a thoroughly national and international route system.

One would have a harder time justifying the view that a few ventures dominate the market for Internet access and Internet services if these markets were defined in the context of the total number of ventures pursuing some aspect or element of the multifaceted international data transport marketplace. Conversely, a narrower definition of the Internet marketplace, emphasizing the market share held by Tier-1 ISPs, could support the view that these operators share market power and the ability to extract high rates while imposing "unfair" terms and conditions.

The Internet marketplace does share certain elements with the commercial aviation marketplace. While a nation might have hundreds, if not thousands, of ISPs, the overall market segments into a large percentage of total ISPs serving single localities or regions, with a limited number of ISPs operating the major long-haul backbone networks needed for national and international services.⁷⁰ The startup costs for local ISPs evidence limited barriers to market entry. A new ISP can enter the marketplace simply by leasing a few local trunks from the local exchange carrier to provide subscribers with access to a modem bank for access to and from the Internet, secured by the interconnection of those local lines with a few inter-exchange carrier lines that access the transit services of a larger ISP in terms of size and reach.⁷¹

On the other hand, a major backbone Internet operator does not appear overnight. These Tier-1 operators must have the financial and operational wherewithal to construct or lease and manage a nationwide network of high capacity lines. Few enterprises can amass the needed investment and skills. Accordingly, it should come as no surprise that most of the Internet Tier-1 ISPs are subsidiaries or affiliates of major telecommunication carriers.⁷²

⁷⁰ See Hoffman et al., *supra* note 60.

⁷¹ See *id.*

⁷² Bill McCarthy, *Introduction to the Directory of Internet Service Providers, 12th Edition*, BOARDWATCH MAGAZINE, at <http://www.ispworld.com/isp/Introduction.htm> (last visited Feb. 5, 2001). Using number of interconnection as a measure of market dominance, Broadwatch magazine ranks UUNET, an MCI WorldCom subsidiary, as the

Using the global geographical market definition and characterizing the relevant service market as one involving data transport, the existence of a small number of Tier-1 ISPs can raise questions about the potential for the exercise of market power. No empirical evidence supports the view, however, that such market power exists. A unilateral decision by one or more Tier-1 ISPs to eliminate open, public peering does not, by itself, constitute an exercise of market power or an anticompetitive practice.⁷³ While such a decision raises the cost of doing business for smaller ISPs, it may reflect legitimate business judgment rather than a concerted effort to drive smaller ISPs out of the market, thereby reducing the supply of ISP services despite the growing demand for Internet services and bandwidth. Decisions regarding whether and how to peer do not necessarily reflect the exercise of market power.⁷⁴ Likewise, the peering decisions of Tier-1 carriers do not directly impact the supply of bandwidth.⁷⁵ A peering decision typically does not directly impact a telecommunication carrier's decisions of whether and when to deploy additional satellite or submarine cable transmission capacity.⁷⁶ A peering decision may have a direct impact on the price of Internet services to consumers, but many factors impact pricing decisions and one would need to conduct further analysis to conclude that a change in peering policy constituted the primary reason for an increase in end-user prices.

II. Exercise of Market Power in Anticompetitive Ways

We have seen that dominant market share serves as a primary potential indicator of market power. Other indicators exist,

leading ISP with a 23.93% market share, followed by Sprint with 13.5%, and Cable & Wireless with 7.45% of the market. AT&T, Genuity (formerly GTE Internetworking), Verio (a subsidiary of Nippon Telephone), and Qwest follow. *Id.*

⁷³ KENDE, *supra* note 13. "It is important to differentiate between larger backbones refusing to *interconnect* with smaller backbones, versus the larger backbones only refusing to *peer* with smaller backbones. Instead of peering with the smaller backbones, the larger backbones may offer them a transit arrangement." *Id.*

⁷⁴ *Id.* ("In a competitive market, a backbone may refuse to peer with a smaller rival for legitimate rather than anti-competitive, reasons.").

⁷⁵ *Id.* ("[C]ompetition among the larger top-tier backbones gives them an incentive to provide transit arrangements to smaller backbones in place of peering.").

⁷⁶ *Id.*

however, that may contribute to a finding of market power even if the computed market share typically would not point toward monopolization or market domination. A firm may exercise market power by engaging in practices that adversely impact competitors, the robustness of competition, and consumer welfare. The potential for such adverse effects increases when competitors need to collaborate on the joint provision of a service, or when competitors need to rely on access to the facilities or services of another competitor to assemble all the elements necessary for a complete service. Internet service provision requires both collaboration (network interconnection) and cooperation (access by small ISPs to the backbone trunks of Tier-1 ISPs on fair, cost-based terms and conditions).

Decisions by Tier-1 ISPs not to collaborate or cooperate may result from legitimate business decisions or may constitute an anticompetitive practice. The refusal to interconnect facilities may constitute a "concerted refusal to deal."⁷⁷ In antitrust jurisprudence, this practice refers to an attempt to drive a competitor out of business or to raise its cost of doing business, resulting in the reduction of marketplace attractiveness.⁷⁸ Even if a Tier-1 ISP continued to permit lesser ISPs to interconnect, the terms and conditions might constitute a "price squeeze,"⁷⁹ an attempt to raise

⁷⁷ 15 U.S.C. § 1 (2000). A boycott or a company's organized refusal to deal constitutes one of the core anticompetitive practices deemed illegal by section 1 of the Sherman Act. *Id.*

⁷⁸ *Monsanto Co. v. Spray-Rite Serv. Corp.*, 465 U.S. 752, 761 (1984) (citing *United States v. Parke, Davis, & Co.*, 362 U.S. 29 (1960); *United States v. Colgate & Co.*, 250 U.S. 300, 307 (1919)) ("A manufacturer generally has a right to deal, or refuse to deal, with whomever it likes, as long as it does so independently."). However, joint or concerted action might well violate antitrust laws. *See, e.g., United States v. Scuba Retailers Ass'n*, 6 Trade Reg. Rep. (CCH) ¶ 45,096 (S.D. Fla. 1996) (discussing a trade association of scuba equipment retailers trying to curtail mail order sales).

⁷⁹ A price squeeze involves "a situation where a firm manipulates the input and output prices faced by a competitor to prevent that firm from competing effectively." William B. Tye, *The Price of Inputs Sold to Competitors: A Response*, 11 YALE J. ON REG. 203, 212 n.24 (1994). In telecommunications and Internet markets, some competitors may need to lease the facilities or services of a competitor. For example, a small ISP typically secures long-haul, broadband transmission capacity used for transit services from a larger, Tier-1 ISP. If the larger ISP raised its transit charges but did not raise rates for similar services it provides directly to end-users, it might be deemed to have engaged in a price squeeze by deliberately raising the costs incurred by rivals. *See, e.g., Debra J. Aron & Steven S. Wildman, Effecting a Price Squeeze Through Bundled Pricing*, in COMPETITION, REGULATION AND CONVERGENCE: CURRENT TRENDS IN

competitors' costs and lower their marketplace attractiveness by increasing the cost of an essential facility,⁸⁰ bottleneck,⁸¹ or service element needed by the lesser ISP to provide a complete end-to-end service. ISPs with superior bargaining power may also leverage this power to extract concessions from lesser ISPs, including agreements not to compete in certain service or geographical markets, setting a price floor on the service offered by the lesser ISP, or tying access to a desired service, such as tying long-haul backbone trunks to a commitment to buy or lease less desired and competitively provisioned services.⁸² Tier-1 ISPs may attempt to enforce these anticompetitive restraints by threatening to drive noncompliant lesser ISPs out of business with predatory prices, deliberate below-cost rates, or threats to raise or eliminate access opportunities.

The potential for anticompetitive practices and leveraging bottlenecks exists in both the aviation and Internet industries. Absent government ownership or effective regulation in the aviation industry, the airport operator could discriminate in favor of one particular airline in the manner in which it assigns (or denies) access to space in the airport terminal and opportunities to

TELECOMMUNICATIONS POLICY RESEARCH (Sharon Gillette & Ingo Vogelsang eds., 1999).

⁸⁰ An essential facility is so important to the free flow of commerce and public policy concerns that courts mandate access even though it may be privately owned. The essential facility doctrine originally covered physical assets such as railroad bridges. *United States v. Terminal R.R. Ass'n*, 224 U.S. 383, 394-97 (1912). It now extends to intangible resources including the common carrier telecommunication facilities of competing carriers. *MCI Communications Corp. v. AT&T Co.*, 708 F.2d 1081, 1131-33 (7th Cir. 1983) (requiring AT&T to interconnect its facilities with a long distance telephone service competitor).

⁸¹ A bottleneck constitutes a potential choke point in the flow of commerce. In telecommunications and Internet traffic, a bottleneck exists where traffic tends to back up due to congestion or limitations in the ability of the facility to handle the volume of traffic sent. Robert B. Friedrich, *Regulatory and Antitrust Implications of Emerging Competition in Local Access Telecommunications: How Congress and the FCC Can Encourage Competition and Technological Progress in Telecommunications*, 80 CORNELL L. REV. 646, 659 (1995); see also Mark Cooper, *Open Access to The Broadband Internet: Technical And Economic Discrimination in Closed, Proprietary Networks*, 71 U. COLO. L. REV. 1011, 1013-14 (2000); Michael T. Osborne, *The Unfinished Business of Breaking Up "Ma Bell:" Implementing Local Telephone Competition in the Twenty-first Century*, 7 RICH. J.L. & TECH. 4 (2000), at <http://www.richmond.edu/jolt/admin/v7i1/note1.html>.

⁸² Piraino, *supra* note 49, at 824.

take off or land aircraft. In the Internet industry, access to the local loop and backbone networks of Tier-1 carriers may be viewed as constituting essential facilities whose access terms and conditions could choke off or stimulate competition.⁸³ To the extent lesser ISPs do not have alternatives to Tier-1 ISP backbone trunks, the lesser ISPs may have to comply with unilateral or collective policies designed to manage competition. Tier-1 ISPs, however, can exercise market power only if their single or collective (collusive) behavior forecloses competitive alternatives. Whether Tier-1 ISPs can force lesser ISPs to comply with unilaterally set terms and conditions on such key matters as interconnection and transit pricing depends on the lesser ISPs' alternatives. Alternatives may include self-help, the construction and operation of their own backbone facilities, or the lease of such facilities from telecommunication carriers who do not also operate as Tier-1 ISPs.

A. How Might Anticompetitive Practices Occur: Tier-1 ISPs Bear Limited Regulatory Burdens

Tier-1 ISPs might have the opportunity to engage in anticompetitive practices because of lax antitrust or competition policy enforcement and a general predisposition not to regulate the Internet.⁸⁴ Additionally governments might not consider matters such as interconnection and peering policy as constituting anticompetitive practices. In this examination of how extensively governments engage in regulatory oversight, the analogy between ISPs and commercial airlines breaks down somewhat.

ISPs incur substantially less government oversight than their airline counterparts for four primary reasons. First, governments regulate the telecommunications transport function performed by the carriers who lease facilities to Tier-1 ISPs.⁸⁵ Second,

⁸³ See *supra* note 80 and accompanying text.

⁸⁴ See, e.g., OXMAN, *supra* note 13; President William J. Clinton & Vice President Albert Gore, Jr., *A Framework For Global Electronic Commerce* (1997), at <http://www.ecommerce.gov/framework.htm> (articulating the beliefs that "the private sector should lead," "governments should avoid undue restrictions on electronic commerce," and "where governmental involvement is needed, its aim should be to support and enforce a predictable, minimalist, consistent and simple legal environment for commerce").

⁸⁵ For example, the European Union, in Council Directive 90/387/EEC, art. 3, 1990

notwithstanding its growing importance, the Internet has not approached the status of public utility or functional equivalent of telecommunications.⁸⁶ Third, most governments have purposefully embraced a hands-off strategy with an eye toward promoting entrepreneurialism and private initiatives.⁸⁷ Finally, until recently ISPs themselves have emphasized connectivity and global reach even if the network interconnection, access, and pricing policies employed to reach that goal (open peering and Sender Keep All) reduced profitability and resulted in the possibility that some ISPs would bear disproportionately greater financial burdens to build up the network infrastructure than others.⁸⁸

III. Rationale for Regulatory Asymmetry Between Telecommunications Regulation and Internet Unregulation

In the past, national regulatory authorities have adopted an

O.J. (L 192) 1, 2, establishes baseline principles that facilities-based telecommunication carriers must apply when leasing lines and interconnecting with enterprises providing value-added services. While the carriers negotiate terms and conditions in a commercial, arm's length atmosphere, Open Network Provision principles direct the providers of the underlying transmission capacity to offer access on terms and conditions based on criteria that are objective and transparent, that are published in an appropriate manner, and that guarantee equal and non-discriminatory access in accordance with Community law. Gunter Knieps, *Interconnection and Network Access*, 23 FORDHAM INT'L L.J. 90, 92 (2000).

⁸⁶ Mark Schankerman, *Symmetric Regulation for Competitive Telecommunications*, 8 INFO. ECON. & POL'Y 55 (1996). Regulatory asymmetry can work when the products or services involved do not constitute functional equivalents. However, proliferating and developing Internet services have begun to include features that consumers may consider as unregulated substitutes for regulated telecommunication services, such as Internet telephony. "In general terms symmetric regulation means providing all suppliers, incumbents and new entrants alike, a level playing field on which to compete: the same price signals, the same restrictions, and the same obligations But all forms of asymmetric regulation contain an intrinsic bias toward some firms or technologies" *Id.*

⁸⁷ Sam Paltridge, *Working Party on Telecommunications and Information Services Policies, Internet Traffic Exchange: Developments and Policy*, Organization for Economic Cooperation and Development, DSTI/ICCP/TISP/98(1) (1998), at <http://www.oecd.org/dsti/sti/it/cm/prod/traffic.pdf> (last visited Feb. 5, 2001). "In the newly liberalized environment for international infrastructure, provision regulators would, no doubt, be loath to intervene in the commercial negotiations between ISPs. Moreover, it is not easy to discern what would be the consequences of such intervention." *Id.*

⁸⁸ See, e.g., KENDE, *supra* note 13.

inconsistent and dichotomous regulatory regime as between the Internet and telecommunications. Internet access issues currently lack a regulatory forum because governments have largely refrained from interfering with a commercial, self-regulating system. Accordingly, the national telecommunications regulatory authorities typically lack jurisdiction to adjudicate an Internet access dispute unless the complainant characterizes the dispute in the context of a refusal to provide a telecommunications service by a carrier with a legal obligation to do so.⁸⁹ Other adjudicators, including courts, may provide a substitute forum, but it may prove helpful to explore the reason why governments have refrained from creating a uniform regulatory regime and forum for addressing both telecommunications and Internet disputes.

A. The Internet Is Considered a Contestable or Competitive Market

Simply put, governments have not installed a regulatory regime for the Internet because they do not believe that one is needed. Advocates for regulatory relief on Internet access issues will dispute this by emphasizing the need for closer antitrust or competition policy scrutiny using a better calibrated market definition.⁹⁰ Advocates for Internet access relief allege that the consolidation in the long-haul market segment accords Tier-1 ISPs the power to distort the bargaining process and to extract "supracompetitive," overly generous compensation for access to and transit through their networks.⁹¹ These advocates believe the competitive playing field has tilted in favor of Tier-1 ISPs who can exploit the inelastic demand for their transport service and the content they have available.⁹² Some Internet access relief advocates would characterize the Tier-1 ISP networks as "essential

⁸⁹ *Id.* Internet Service Providers typically do not incur the same regulatory burdens as common carriers and face no legal obligation to provide service on terms and conditions as a public utility. *Id.*

⁹⁰ *Id.* ("The Asia-Pacific carriers have argued that, based on their equation of traffic flows to benefits, U.S. backbones should share the cost of the transmission capacity between the Asia-Pacific region and the United States, a system that would essentially impose legacy international regulations on the Internet.").

⁹¹ *Id.* Supracompetitive refers to prices that exceed what a competitive marketplace would generate.

⁹² *Id.*

facilities”⁹³ and “bottlenecks,” because all long-haul Internet traffic must traverse these facilities in much the same way as this traffic might have only one local loop routing option provided by an incumbent local exchange carrier monopoly.⁹⁴ If governments adopt the view that Tier-1 ISP networks constitute essential facilities or bottlenecks, then these governments have an economic and legal rationale for applying regulatory instruments aimed at “improving” the terms and conditions for access, including the interconnection or access charges imposed by Tier-1 ISPs on smaller ISPs.

Notwithstanding market consolidation by the Tier-1 ISPs, governments have yet to adopt the view that the long-haul Internet access marketplace is oligopolistic and uncontestable. First, absolute denial of access to Tier-1 ISP facilities apparently has not occurred. Advocates for government intervention dispute the terms and conditions for such access, not that they lack access

⁹³ The “essential facility” doctrine in antitrust or competition policy supports government intervention to mandate access by competitors to a facility or service provided by one competitor based on the following assumptions: (1) that the competitor has the ability to exert monopoly power over the essential facility, such as the ability to deny access or provide discriminatory access, including the imposition of higher access rates on competitors, thereby leading to a price squeeze; and (2) that competitors cannot practically or reasonably duplicate the facility. Daniel Glasl, *Essential Facilities Doctrine in EC Antitrust Law: A Contribution to the Current Debate*, 15 EUR. COMPETITION L. REV. 306 (1994); William B. Tye, *Competitive Access: A Comparative Industry Approach to the Essential Facility Doctrine*, 8 ENG. L.J. 337, 346 (1987). *But cf.*, Phillip Areeda, *Essential Facilities: An Epithet in Need of Limiting Principles*, 58 ANTITRUST L.J. 841 (1990) (discussing when and why the essential facilities doctrine should be limited); Allen Kezsbom & Alan Goldman, *No Shortcut to Antitrust Analysis: The Twisted Journey of the ‘Essential Facilities’ Doctrine*, 1996 COLUM. BUS. L. REV. 1 (1996).

⁹⁴ Policy and Rules Concerning Rates for Competitive Common Carrier Servs. and Facilities Authorizations Therefor, 85 F.C.C.2d 1, 21-22 (1980) (First Report and Order).

A firm controlling bottleneck facilities has the ability to impede access of its competitors to those facilities. We must be in a position to contend with this type of potential abuse. We treat control of bottleneck facilities as *prima facie* evidence of market power requiring detailed regulatory scrutiny. Control of bottleneck facilities is present when a firm or group of firms has sufficient command over some essential commodity or facility in its industry or trade to be able to impede new entrants. Thus bottleneck control describes the structural characteristic of a market that new entrants must either be allowed to share the bottleneck facility or fail.

Id. (footnotes omitted).

opportunities. Similarly, no evidence supports the view that Tier-1 ISPs have conspired or coordinated efforts to fetter smaller ISPs with discriminatory Internet access terms and conditions. Tier-1 ISPs operating in the United States now require access and transit payments from smaller ISPs, regardless of their location. However, the imposition of higher, distance-sensitive charges on ISPs operating outside of North America and far from a Tier-1 ISP's Point of Presence imposes a comparatively greater financial burden than that borne by closer ISPs. Lastly, no indication exists that Tier-1 ISPs have engaged in a strategy to raise smaller ISPs' costs of doing business with an eye toward driving them out of the market. Tier-1 ISPs have not entered markets with lower predatory rates.

The strongest case for government intervention lies where self-correcting marketplace outcomes cannot be relied upon to remedy short-term problems.

A cautious approach would be to reject any possibility of mandatory access except where it is 'essential' to the existence of competition. If applicants for access can plausibly invent around the network monopoly, establish their own competitive networks, or join other networks that may not be equivalent but are acceptable alternatives to the dominant network, any consideration of court-ordered access may be eliminated.⁹⁵

Advocates for a "hands-off" approach to Internet access issues emphasize the suitability of marketplace remedies, as discriminatory or unfair access terms and conditions should generate incentives for smaller ISPs to set up their own competitive networks or collectively join with other smaller ISPs to create a rival long-haul network.⁹⁶ Likewise, they consider the profits accruing to Tier-1 ISPs appropriate rewards for risk-taking

⁹⁵ Robert Pitofsky, *Antitrust Analysis in High-Tech Industries: A 19th Century Discipline Addresses 21st Century Problems*, 4 TEX. REV. L. & POL. 129, 138 (1999); see also David J. Teece & Mary Coleman, *The Meaning of Monopoly: Antitrust Analysis in High-Technology Industries*, 43 ANTITRUST BULL. 801 (1998) (discussing the reasons that current antitrust analytical frameworks could hurt innovation).

⁹⁶ KENDE, *supra* note 13 ("Any regulation of the Internet backbone market would represent a significant shift in the unregulated status quo under which the Internet industry has grown at unprecedented rates, and therefore would require a corresponding significant shift in the competitiveness of the market.").

and achieving marketplace success.⁹⁷ Expropriating some or all of the monetary fruits of Tier-1 ISPs' labors simply rewards free riders and risk-averse players. Also, a hands-off approach would free government of the difficult, if not impossible, task of resolving equity and operational issues for which government has no particular skill or impartial template.⁹⁸

IV. Applying Antitrust or Competition Policy to Three Near-Term Marketplace Scenarios

Three near-term marketplace outcomes may occur in the Internet access dispute: (1) the status quo may be extended; (2) Tier-1 ISPs may consolidate network management in ways similar to how telecommunication carriers manage deployment of international satellite and submarine cables; and (3) rapid deployment of additional long-haul transmission capacity may lead to a robustly competitive marketplace, making bandwidth a tradable commodity.

A. Scenario One: The Status Quo Continues

Reasonable people can disagree as to whether the status quo raises legitimate antitrust or competition policy concerns. Concentration of ownership and control over long-haul bandwidth can create both incentives and opportunities for operators of such essential facilities to act in a cartelized and anticompetitive way. No coordinated behavior has become evident, however, nor does it appear that the unilateral decision of any one or more Tier-1 ISPs can have a markedly anticompetitive impact on the market for Internet transport and access to Internet-mediated services and content.

One might conclude that Tier-1 ISPs have raised the cost of an essential service element to competitors, thereby demonstrating that the Tier-1 ISPs have engaged in an illegal price squeeze. However, one could just as well conclude that the international data transport marketplace segments into backbone, long-haul

⁹⁷ *Id.* at 39 ("[C]ompetitive pressures and responses are the hallmark of competition in the Internet industry and make any international regulation for Internet interconnection unnecessary.").

⁹⁸ Leonard W.H. Ng, *Access and Interconnection Issues in the Move Towards the Full Liberalization of European Telecommunications*, 23 N.C. J. INT'L L. & COM. REG. 1, 30 (1997).

carriage, and regional or local carriage. Under this sort of market segmentation, Tier-1 ISPs in effect do not compete with smaller ISPs, nor do they take over their local markets. A decision to raise access and transit fees would not constitute a price squeeze, in part because the Tier-1 ISP does not intend on predatorily driving smaller ISPs out of the market so that the Tier-1 ISP might expand its market and geographical reach. In a nutshell, the status quo has generated major disputes because different stakeholders perceive the Internet marketplace differently. Without a shared baseline in terms of market definitions, inferences and extrapolations will differ, particularly as to whether universally understood anticompetitive practices have occurred.

1. Arguments That Anticompetitive Practices Have Occurred

Proponents of regulatory and other types of relief to Tier-1 ISP peering policies argue that prices to smaller ISPs have increased without justification. Tier-1 carriers need not meet in a smoke-filled room to collude or engage in a conspiracy. The term "conscious parallelism" refers to uncoordinated, but identical, pricing decisions and other decisions made by erstwhile competitors.⁹⁹ This practice frequently occurs in commercial aviation as carriers signal pricing strategies implicitly through their ticket reservation systems. A carrier seeking to raise rates hopes that competitors will match the fare increase, thereby making the initiating carrier's rate increase "stick." Should the

⁹⁹ Basically, the doctrine of conscious parallelism establishes a means by which a tacit agreement or understanding in restraint of trade may be proven. Under this doctrine, if certain competitors engage in a course of conduct that would be detrimental to any one of the competitors if such competitor acted alone and is beneficial to all of the competitors if such conduct is undertaken by all, then it may be inferred that the competitors agreed to undertake such conduct. Frequently, this commonality of interest in all competitors undertaking the same course of conduct is referred to as "interdependence."

Conrad M. Shumadine et al., *ANTITRUST AND THE MEDIA*, 582 PLI/Pat 229, 418-19 (1999); see also Patrick Bolton et al., *Predatory Pricing: Strategic Theory and Legal Policy*, 88 GEO. L.J. 2239 (2000); James E. Meeks, *Predatory Behavior as an Exclusionary Device in the Emerging Telecommunications Industry*, 33 WAKE FOREST L. REV. 125, 131 (1998) (viewing predatory pricing in strategic terms, dominant-firm price cutting that raises entry barriers and harms potential competition is anticompetitive when it appears probable that the low pricing will not be maintained if entry is deterred).

other carriers not follow up with the same rate hike, the initiating carrier typically lowers its rates to the previous level. Conscious parallelism alone does not sufficiently prove a conspiracy and violation of the Sherman Act.¹⁰⁰

Tier-1 ISPs can conspire to raise the costs of their data transport access and transit service through a series of seemingly unilateral decisions. While one Tier-1 ISP may have initiated the decision to abandon public peering, it could not have made this decision stick unless and until all other Tier-1 ISPs executed the same change in peering policy. Absent a cost-based or demand-based justification, the decision to change peering policies may evidence a decision by the Tier-1 ISPs to foist costs onto other ISPs with an eye toward bolstering the Tier-1 ISPs' profitability and market dominance. This attempt to dominate, if not monopolize the data transport marketplace, should trigger antitrust or competition policy safeguards designed to protect consumers and competitors from attempts to tilt the competitive playing field in favor of one select group of market players.

2. Arguments That Anticompetitive Practices Have Not Occurred

Tier-1 ISPs justify their revised peering policy as a rational and cost-based response to changed circumstances. The Internet has largely made the transition from infant industry incubation to a maturing and commercializing private industry. The largest ISPs can no longer ignore differences in ISP size, traffic streams, amount of bandwidth available, subscriber population, number of peering or interconnection sites, and scope of content hosted. ISPs have had to wean themselves from government subsidies, and they now have to pay closer attention to the requirements and expectations of their investors.

Greater sensitivity to the bottom line requires ISPs to scrutinize telecommunication transport costs and to determine whether they have borne a fair, and not excessive, share of costs. This attention has triggered greater vigilance against free riding,

¹⁰⁰ *Theatre Enters. v. Paramount Film Distrib. Corp.*, 346 U.S. 537, 540-41 (1954) ("[T]o be sure, business behavior is admissible circumstantial evidence from which the fact finder may infer agreement. But this Court has never held that proof of parallel business behavior conclusively establishes agreement or, phrased differently, that such behavior itself constitutes a Sherman Act offense . . .").

which in this context refers to “the previous ability of smaller ISPs to exploit public peering for access to bandwidth, content, network functionality, and transit services . . . in excess of what they contribute for use by other ISPs and their subscribers.”¹⁰¹ The decision to change peering policies and to shift the financial burden responds to the legitimate and reasonable rebalancing of the data transport financial burden. Because North American ISPs have contributed to the creation and hosting of keenly desired content and have upgraded their networks to provide pathways capable of handling multimedia applications, they have a commercial opportunity to “recoup their investment and to capture the fruits of their labor.”¹⁰² Accordingly, a change in peering policy reflects the need to recover increasing network infrastructure upgrade costs and to charge what the market will bear given the inelastic demand for the content they host and the network access and transit services they offer.¹⁰³

B. Scenario Two: Tier-1 ISPs Behave Like Their Telecommunications Carrier Counterparts

The second near-term scenario involves the cartel-like behavior in which international telecommunication carriers have historically engaged, albeit at a decreasing and unsustainable level.¹⁰⁴ This view sees an ironic outcome: just as the international telecommunications marketplace becomes increasingly competitive, robust and open consolidation among Tier-1 ISPs makes the backbone data transport market increasingly concentrated, managed, and cartelized.¹⁰⁵ While market concentration and high market share alone do not signal an anticompetitive market, the incentive, and perhaps the opportunity,

¹⁰¹ James Savage, Robert Frieden, & Timothy Denton, *International Charging Arrangements for Internet Services/Module 3: The Final Report*, ch. 4 (Mar. 2000), at <http://www.tmdenton.com/InternetCharging/icaiss3.htm> (third report of a comprehensive analysis of international charging arrangements for Internet access (ICAIS) performed for the Telecommunications Working Group of the Asia-Pacific Economic Cooperation Telecommunications Committee). The term ICAIS is a label for the issue of “who should pay, and how much.” *Id.* at ch. 1.

¹⁰² *Id.* at ch. 4.

¹⁰³ *Id.*

¹⁰⁴ *Id.*

¹⁰⁵ *Id.*

to engage in such practices increases.

Tier-1 ISPs may choose as a frame of reference the "old school" and "clubby" international telecommunication environment that served as the predominant industrial model from the onset of telegraphy to the late 1980s.¹⁰⁶ During that time period, international submarine cable consortia and international or regional satellite cooperatives largely managed the telecommunication marketplace.¹⁰⁷ Management refers to the carriers who collectively made facilities deployment decisions, going so far as to allocate usage between cable and satellites.¹⁰⁸ This management process emphasized carrier convenience, conservation of capital, and risk sharing over consumers' interests, entrepreneurship, and the considerable benefits of competition.¹⁰⁹

Centralized management may seem anachronistic and ludicrous in this time of privatization, liberalization, deregulation, competition, and globalization. But we should note that these descriptive characteristics of the telecommunication marketplace have appeared only recently. Few incumbents would willingly part with guaranteed market share and a quiet life in exchange for potentially greater upsides, but substantially more volatility, risk, uncertainty, and hard work. Tier-1 ISPs manage to acquire market share through "superior business skills, efficient operations, the first to market ('early mover') advantage and access to plenty of capital to fund growth."¹¹⁰ In addition, these ventures benefit from opportunities to buy market share through strategic mergers and acquisitions.¹¹¹ Having secured a dominant market share, the Tier-1 ISPs have every incentive to try to sustain their comparative advantage and to perpetuate their market dominance.

¹⁰⁶ See ROB FRIEDEN, *INTERNATIONAL TELECOMMUNICATIONS HANDBOOK* 15 (1996); Lawrence J. Spiwak, *From International Competitive Carrier to The WTO: A Survey of the FCC's International Telecommunications Policy Initiatives 1985-1998*, 51 *FED. COMM. L.J.* 111 (1998).

¹⁰⁷ FRIEDEN, *supra* note 106, at 15-16.

¹⁰⁸ *Id.* at 53, 105.

¹⁰⁹ See *id.* at 54, 105-06.

¹¹⁰ Savage, Frieden, & Denton, *supra* note 101, at ch. 4.

¹¹¹ *Id.*

1. *Arguments That Anticompetitive Practices Have Occurred*

The rationale that Tier-1 ISPs will sustain their marketplace dominance is based primarily on the view that they must take affirmative and anticompetitive steps to foreclose outsiders and smaller ISPs from bringing technological and other innovations to market. This view parallels the charge that the Microsoft Corporation violated antitrust or competition policies to sustain its monopoly.¹¹² Faced with the potential for lost market dominance in either their core market (personal computer operating systems) or developing markets (World Wide Web browser software), Microsoft allegedly engaged in predatory and strong-arm tactics.¹¹³ The company offered a free Web browser where consumers previously had to buy it; this constituted possible evidence of predatory pricing.¹¹⁴ The company also allegedly forced personal computer manufacturers to feature this software as a condition for the opportunity to buy the more intensely desired Windows operating system.¹¹⁵ Collectively, the alleged activities of Microsoft worked to extend its market dominance by leveraging inelastic demand for access to its computer operating system to secure market dominance in a new and heretofore separate market for Web browsers.¹¹⁶

Tier-1 ISPs can sustain their market dominance by leveraging the inelastic demand for their hosted content.¹¹⁷ One could argue that Tier-1 ISPs tie this demand with the somewhat more elastic demand for data transmission capacity, with the result that smaller ISPs incur a comparatively higher financial burden. But even if a tying arrangement¹¹⁸ does not exist, because Internet charging

¹¹² See *United States v. Microsoft Corp. (Microsoft III)*, 84 F. Supp. 2d 9, 19 (D.D.C. 1999) (findings of fact); see also Piraino, *supra* note 49, at 812-19, 840.

¹¹³ See *Microsoft III*, 84 F. Supp. 2d at 37, 64-70, 111-12.

¹¹⁴ *Id.* at 44-45.

¹¹⁵ *Id.* at 58, 69.

¹¹⁶ See *id.* at 69; Piraino, *supra* note 49, at 824.

¹¹⁷ Savage, Frieden, & Denton, *supra* note 101, at ch. 4.

¹¹⁸ "A tying arrangement arises when a seller conditions the sale of one product or service (the tying product) on the purchase of a separate product or service (the tied product)." Dustin Rowles, Legal Update, *Is it a Tie-In or an Integration? U.S. v. Microsoft Weighs In*, 6 B.U. J. SCI. & TECH. L. 12 (2000), available at <http://www.bu.edu/law/scitech/> (last visited Feb. 5, 2001); see also *In re Data Gen. Corp.*

blends access to data transport and content, Tier-1 ISPs have every incentive to press their marketplace advantage by managing deployment of Internet backbone routes and controlling access to these essential, and possibly bottleneck, facilities.

2. Arguments That Anticompetitive Practices Have Not Occurred

The strongest argument that Tier-1 ISPs cannot operate as a cartel, now or in the future, lies with the reasons that telecommunications carriers can no longer do so. Former global or regional satellite cooperatives like Intelsat, Inmarsat, and Eutelsat face robust facilities-based competition from in-orbit satellites operated by private entrepreneurial ventures.¹¹⁹ The traditional submarine cable consortia comprised of incumbent carriers face direct competition from new carrier ventures that lack the incumbency advantage, but nevertheless find ample demand for their state-of-the-art fiber-optic cable technology.¹²⁰ Simply put, even if the Tier-1 ISPs could manage to discipline each other to engage in cartel-like behavior, any market entry barriers they would attempt to erect would prove impossible in thwarting newcomers.

With the proliferation of routing options worldwide, Tier-1

Antitrust Litig., 490 F. Supp. 1089, 1100 (N.D. Cal. 1980) (upholding the rule that any design that is cheaper for the consumer escapes antitrust liability). By requiring customers to buy both the tying and the tied products, a monopolist extends its market power from the tying to the tied product market. Piraino, *supra* note 49, at 824.

¹¹⁹ See Requests for Special Temporary Authority To Change Points of Communications from Inmarsat to Inmarsat Limited, 14 F.C.C.R. 6283 (1999). Inmarsat was privatized in April 1999, having previously spun-off ICO, Ltd., a mobile satellite service venture currently under bankruptcy reorganization. *Id.* Intelsat has taken steps toward privatization, including the spin-off in 1989 of New Skies, Ltd., a commercial venture operating six of Intelsat's satellites. Congressional and stakeholder concerns about a level competitive playing field slowed the process of further privatization until a compromise was reached reflected in the Open-Market Reorganization for the Betterment of International Telecommunications Act (the ORBIT Act). ORBIT Act of 2000, Pub. L. No. 106-180, § 47, 114 Stat. 48 (2000). This act amends the Communications Satellite Act of 1962 to establish a statutory framework for the privatization of Intelsat and Inmarsat and directs the President to report to Congress concerning the progress of privatization in relation to certain objectives, purposes, and provisions. *Id.* § 47, 114 Stat. at 48, 57.

¹²⁰ FRIEDEN, *supra* note 106, at 101.

ISPs will not be able to discipline the marketplace.¹²¹ At least in theory, smaller ISPs displeased with new peering policies of one or more incumbent Tier-1 ISPs should have the opportunity to secure backbone data transmission services from new carriers, such as Global Crossing, Level Three, Pacific Gateway Exchange, and FLAG Telecommunications.¹²²

C. Scenario Three: Long-Haul Data Transmission Becomes a Fungible Commodity

The third scenario extends the currently experienced, extraordinary demand for bandwidth with equally impressive rollouts of new capacity, using state of the art circuit multiplication technologies.¹²³ While one side of the calculus may skew the supply of data transmission capacity temporarily toward glut or scarcity, this scenario involves a fundamental reshaping of the industry, including the manner in which carriers provide capacity and resellers or end-users acquire it.

In this scenario, telecommunications transport capacity becomes fungible and tradable like bushels of corn and other commodities. In a spot market for data transmission bandwidth, the market has become robustly competitive, and all suppliers have become "price takers" with no single supplier or group, including the Tier-1 ISPs, in a position to set prices.¹²⁴ Market price-setting in real time juxtaposes with the current model that largely relies on "direct negotiations and significant price differentials based on volume requirements, traffic route, and consumer/reseller demand elasticities."¹²⁵ In this current environment, suppliers can price differentiate based on user characteristics and general market conditions. A commodity market environment operates more dynamically and in closer relation to immediate marketplace conditions.

¹²¹ Savage, Frieden, & Denton, *supra* note 101, at ch. 4.

¹²² KENDE, *supra* note 13 ("[B]ackbones that have been denied peering can nevertheless enter the backbone market, because competition among the larger top-tier backbones gives them an incentive to provide transit arrangements to smaller backbones in place of peering.").

¹²³ Savage, Frieden, & Denton, *supra* note 101.

¹²⁴ *Id.*

¹²⁵ *Id.*

1. Arguments That Anticompetitive Practices Have Occurred

Few situations exist where one or more suppliers can successfully corner or manipulate a commodity market. However, that does not suggest that players do not attempt to affect the market, or that such endeavors do not have some kind of impact. Anticompetitive practices that generate an impact do not eliminate supply, but create temporary negative impacts on supply that can quickly trigger a price increase.¹²⁶ Attempts to coordinate supply of a commodity, like oil, do not always work, as individual suppliers or governments have incentives to “cheat” and capture market share at higher per-unit prices. However, efforts to discipline suppliers can work, particularly when the number is manageable, as is the case with Tier-1 ISPs.

Even in a commodity market, suppliers may attempt to collude and operate a cartel. Such anticompetitive practices include attempts to fix prices, often by setting a price floor target, with supply geared to sustain that level.¹²⁷ Suppliers may have some success at calibrating supply to a target price, but such management typically cannot work over the long term as demonstrated by the fluctuations in commodities over time.

Antitrust or competition policy agencies may have difficulty in policing telecommunication bandwidth markets in much the same way as commodities futures and stock market trading create incentives for fraud and other deceptive tactics. Tier-1 ISPs may try to run up prices in a commodity trading marketplace, but the success of such activities depends largely on whether they can control the options available to resellers and end-users. For example, effective price-fixing in the submarine cable marketplace will prove unsustainable unless equally effective price-fixing takes place in satellite markets, as most Internet applications can use either transmission medium.

2. Arguments That Anticompetitive Practices Have Not Occurred

In a market able to reflect nearly instantaneous changes in

¹²⁶ *Id.*

¹²⁷ *Id.* at ch. 5.

price, any significant impact on price can trigger close scrutiny. What Tier-1 ISPs may be able to achieve in closed-door negotiations and nondisclosure agreements, they cannot achieve when the spot market offers such quick responsiveness. Under these conditions, Tier-1 ISPs should be disinclined to risk exposure and potential civil or criminal liability for attempts to fix prices and to collude with other suppliers.

The second scenario offers Tier-1 ISPs some degree of legitimacy to meet and manage the marketplace in ways similar to what cooperatives do to ensure the supply of some commodities, such as milk. A Dairy Board can meet and attempt to "stabilize" the price of milk, complete with price floors, ostensibly to promote the widespread availability of such an essential product, as well as to promote the apparent public benefit of sustaining family farms. In the third scenario, no such legitimate forum exists, and presumably each and every supplier must respond to marketplace conditions.

V. An Assessment of Outcomes in the Near-Term

In the near-term, a dichotomy of outcomes exists between instances where one or more stakeholders pursue a course of action in external forums to redress grievances, versus outcomes where stakeholders do not undertake any external actions, relying instead on technological and marketplace factors and their direct involvement to remedy existing problems.¹²⁸

A. "Do Nothing" Scenarios

Several near-term scenarios involve significant change affecting Internet stakeholders without any significant steps directed at redress.¹²⁹

The volatility of the Internet and the pace of change in Internet market segments means that a "do nothing" approach nevertheless will result in stakeholders facing significantly different conditions in the months ahead. The robustness of the Internet economy means that what had appeared unimpeachable and unchangeable may become dislodged and upended. Dominant market shares may become unsustainable as

¹²⁸ *Id.*

¹²⁹ *Id.*

incumbents fail to sustain their technological and marketplace leadership in the face of innovations and the next "killer application." Already in the short history of the Internet, ventures as large as IBM and as small, but promising, as Pointcast (first mover in "push" technologies delivering Internet subscribers with massive amounts of mostly unsolicited content), have lost their opportunity to extract monopoly rents, or at least to capitalize on first to market (so-called first mover) advantages.¹³⁰

B. Internet Access Issues May Become Less Troublesome

The matter of Internet access has presented a problem to some ISPs primarily because the access and transit services provided by Tier-1 ISPs constitute a significant portion of the smaller ISPs' operating expenses compared to other ISPs.¹³¹ Smaller ISPs and ones operating in localities far from North America have incurred substantially higher overall costs in doing business relative to similarly situated ISPs in other regions.¹³² One near-term scenario presents the Internet access problem as only temporary because the solution is available to ISPs, their government, and the marketplace.¹³³

*1. Changes in Traffic Flows and Market Conditions
Support Better Peering Terms and Conditions*

Regardless of their geographical location, ISPs smaller than Tier-1 operators incurred higher telecommunication transport costs when Tier-1 ISPs began charging smaller ISPs for access to the network, thus replacing open peering arrangements.¹³⁴ Tier-1 ISPs were able to change the fundamental terms and conditions for network connectivity because smaller ISPs needed Tier-1 ISPs more than the Tier-1 ISPs needed them.¹³⁵ Any change in the balance of power and network access needed over time will translate into different Internet access terms and conditions.

¹³⁰ *Id.*

¹³¹ *Id.*

¹³² *Id.*

¹³³ *Id.*

¹³⁴ *Id.*

¹³⁵ *Id.*

Asia-Pacific ISPs can secure better Internet access terms and conditions when and if demand elasticities and traffic flows trend more closely toward parity for inbound and outbound traffic flows. The move toward parity occurs primarily when in-region content grows in availability and popularity and when ISPs opt to host such content.¹³⁶ Currently, the desirability of content hosted in North America places ISPs located elsewhere in a “demand-inelastic position.”¹³⁷ However, this situation does not mean that ISPs’ subscribers in Asia-Pacific regions purposefully eschew indigenous, non-North American content. Cable television network programmers in the region have found that their subscribers prefer both kinds of content.¹³⁸ For example, the launching of MTV Asia resulted from the failure of the standard North American version of the popular music video network to gain significant market share.¹³⁹ To the extent that a market opportunity exists for indigenous content, local programmers will attempt to satisfy market demand over time.

Internet access relief will not, however, necessarily be the result of less reliance on North American content. ISPs must locate the content closer to subscribers and outside North America. As anomalous as it may seem, currently non-North American ISPs are penalized for locating content closer to their subscribers.¹⁴⁰ Despite the burden of self-provisioning lines all the way to North America, the cost of such routing can undercut shorter and more direct routing in-region.¹⁴¹ A recent article in *The Industry Standard*, a widely read Internet news magazine, reported that an Australian-based content provider has opted to locate its content in North America because it could save forty percent in hosting and telecommunications costs.¹⁴² Lower Internet access costs in North America only bolster the incentive to host content there.

Even if Internet access terms and conditions more closely

¹³⁶ *Id.*

¹³⁷ *Id.*

¹³⁸ *See id.*

¹³⁹ *See id.*

¹⁴⁰ *Id.*

¹⁴¹ *Id.*

¹⁴² Stewart Taggart, *Australia: Fed Up Down Under*, 3 THE INDUS. STANDARD NO. 5, 260 (Feb. 14, 2000).

approximated a telecommunications model of equal line cost-sharing, telecommunication transport providers outside North America would continue to offer comparatively less attractive and more expensive rates. Surely economies of scale and scope contribute to North American carriers' comparative cost advantage. But pricing policies, particularly for local loop access, and the comparatively less robust degree of competition factor prominently as well.

Accordingly, changes in pricing policies and the scope of competition might drive rates closer to North American levels. Quite possibly, carriers outside North America can "unleash pent-up demand" for Internet services by lowering access costs.¹⁴³ Empirical evidence suggests that a reduction in end-user rates and intermediate pricing factors, like international accounting rates, can stimulate substantial increases in consumer demand, so that operators can make up in volume what they lose in margins.¹⁴⁴

2. *Lower Transmission Costs Reduce Significance of the Issue*

Much of the Internet access dispute stems from the comparatively greater percentage of total operating costs allocated to the telecommunication transport portion in Asia-Pacific regions.¹⁴⁵ According to John Hibbard, Telstra's Managing Director of global wholesale business, "up to 70 percent of an Australian ISP's costs are due to the international segment to the U.S. . . . [thereby] load[ing] up the domestic cost structure"¹⁴⁶ The Internet access dispute may grow less troublesome thanks to lower per-unit transmission costs to North America coupled with the proliferation of in-region ISPs and transmission options.¹⁴⁷ Despite the seemingly unquenchable demand for ever-expanding bandwidth, there is a near-term future where the variety of new, extremely high bandwidth, such as Dense Wave Division Multiplexing fiber-optic cable projects, actually changes the region's infrastructure supply from one of scarcity to one of at

¹⁴³ Savage, Frieden, & Denton, *supra* note 101, at ch. 5.

¹⁴⁴ *Id.*

¹⁴⁵ *Id.*

¹⁴⁶ Taggart, *supra* note 142, at 265.

¹⁴⁷ Savage, Frieden, & Denton, *supra* note 101, at ch. 5.

least temporary abundance. Even if Asia-Pacific subscribers “persisted in their preference for North American content, with commensurate traffic routing by their ISPs, the cost of such a routing topology would decline on a per unit of capacity basis.”¹⁴⁸ Reduction in reliance on North American content and routing options would contribute to reaching closer parity in demand elasticities.

C. A Contrary View: Internet Access Issues May Become More Troublesome

Despite optimism that conditions may improve and at least partially abate Internet access concerns, the potential for the status quo to extend into the future must be acknowledged. The financial burden borne by smaller ISPs may grow more acute if demand for high bandwidth applications stimulates increasing requirements, offsetting even large reductions in per-unit costs.¹⁴⁹ Under this scenario, Tier-One ISPs can maintain or increase their market power and demand even greater compensation. At the very least, leaving Internet access to commercial negotiations will result in some degree of lag because certain contracts may have long terms before coming up for renewal and renegotiation. Similarly, the negotiation process and the balance of power in these contracts may weigh factors other than traffic flow and transmission costs more heavily.

1. “Do Something” Scenarios

Because Internet stakeholders have engaged in “self-help” or resorted to external forums for redress, several near-term scenarios will significantly affect them. Self-help means that smaller ISPs take affirmative steps to improve their negotiating leverage with Tier-1 ISPs.¹⁵⁰ Additionally, they can attempt to ventilate Internet access issues in a number of bilateral and multilateral forums, regardless of whether these issues lend themselves to examination, much less resolution, in these forums.¹⁵¹

¹⁴⁸ *Id.*

¹⁴⁹ *Id.*

¹⁵⁰ *Id.*

¹⁵¹ *Id.*

2. *Aggrieved ISPs Pursue "Self-Help"*

Smaller ISPs have every financial incentive to find ways to minimize their reliance on Tier-1 ISPs for Internet connectivity. They can enhance bargaining leverage to seek better terms and conditions at contract renewal time by pursuing alternatives to contract renewals. To achieve this end, smaller ISPs should exploit their affiliation or subsidiary relationship with a facilities-based carrier. Integrated international carriers with an ISP affiliate or subsidiary can efficiently load voice, data, and Internet traffic on self-provisioned and leased lines. Additionally, the burden of whole circuit provisioning does offer some operational advantages. For example, in some nations, including the United States, "the self-provisioning of circuits to a foreign point provides greater opportunities for low cost access to the public-switched telephone network in the foreign country without toll revenue sharing or an accounting rate settlement."¹⁵²

Self-help also includes the use of technological remedies including a recalibration of bandwidth sizing for outbound and inbound traffic. The asymmetrical nature of Internet traffic¹⁵³ lends itself to asymmetrical transmission pathways to and from North America. This means that smaller ISPs need not provide an identical amount of bandwidth when outbound traffic to North America might require substantially less bandwidth than the return flow; a file request of a few bytes outbound to North America can trigger an onslaught of several hundred thousand bytes, representing the requested content augmented by advertisements and other commercial inducements that help support the availability of the content.¹⁵⁴ Technical options like caching of the most frequently viewed World Wide Web pages in local servers can help conserve bandwidth.¹⁵⁵

Self-help involves both unilateral and jointly undertaken

¹⁵² *Id.*

¹⁵³ *Id.* Typically, far greater volume of Internet-mediated traffic travels to users than from users. It takes very few bytes of data to request the delivery of a large file possibly comprising millions of bytes. *Id.*

¹⁵⁴ *Id.*

¹⁵⁵ *Id.* Caching involves the temporary storage of Internet content at a location that is closer to end-users, thereby obviating the need to deliver that content over longer distances to reach end-users. *Id.*

efforts by smaller ISPs. In the latter category, Asian or Pacific ISPs can coordinate more closely to aggregate traffic for efficient long-haul loading to North America. In addition, they could pursue alternative peering opportunities in-region, as well as with other ISPs in North America willing to provide better Internet access terms and conditions.

3. *Stakeholders Seek Redress in Multilateral Forums*

The Internet access matter may become a subject for examination by multilateral trade telecommunications and regional development forums because some stakeholders have failed to secure what they consider suitable resolution in the context of commercial negotiations between ISPs.¹⁵⁶ Under circumstances where a matter has become a chronic irritant and financial drain, it follows that these stakeholders would seek new forums for resolution.

4. *Stakeholders Seek Redress at the ITU*

The International Telecommunication Union (ITU) provides a forum primarily for setting standards, allocating spectrum, registering spectrum, allocating satellite orbital arc usage, and recommending policies and procedures in telecommunications.¹⁵⁷ This specialized agency of the United Nations lacks enforcement powers but has proven effective because most nations recognize the value in achieving uniform "rules of the road."¹⁵⁸ Over the years the ITU has lent its "good offices" for addressing and attempting to resolve complex and contentious issues.¹⁵⁹

In view of the convergence of telecommunications and information processing technologies, the ITU has begun to address matters relating to the Internet, including standard-setting for Internet-mediated telephony and Domain Name registration.¹⁶⁰ Additionally, the ITU has addressed matters like international

¹⁵⁶ *Id.*

¹⁵⁷ Jannat C. Thompson, *Space for Rent: The International Telecommunications Union, Space Law, and Orbit/Spectrum Leasing*, 62 J. AIR L. & COM. 279, 285-86 (1996).

¹⁵⁸ *Id.* at 286-87.

¹⁵⁹ FRIEDEN, *supra* note 106, at 65.

¹⁶⁰ *See id.* at 81.

accounting rates that arguably have a trade policy aspect.¹⁶¹

The nature of this assignment does not require consultants to analyze whether and how the ITU would accept an invitation to examine Internet access issues. Reasonable people could disagree as to whether Internet connectivity, pricing, and access issues sufficiently parallel the types of telecommunications policies considered by and promulgated through the ITU. For example, the ITU can legitimately address a matter like international accounting rates because a direct link exists to tariffing, interconnection, and telecommunication development matters clearly within its purview.¹⁶² Internet access matters do not appear to have as close and direct a link, thus making it difficult for ITU representatives to reach a consensus on whether to study Internet access issues, much less promulgate recommendations on how nations should address them.

In October 2000, the issue of Internet traffic settlements appeared before the ITU's World Telecommunications Standardization Assembly (WTSA)¹⁶³ that met in Montreal. The WTSA delegates agreed to a "Recommendation"¹⁶⁴ concerning the

¹⁶¹ INTERNATIONAL TELECOMMUNICATION UNION, *Series D: General Tariff Principles*, at <http://www.itu.int/intset/itu-t/d155/d155.htm> (July 1996); see also INTERNATIONAL TELECOMMUNICATIONS UNION, *Reforming the International Accounting Rate System*, WTP Forum (1998), at <http://www.itu.int/intset/> (last visited Feb. 5, 2001).

¹⁶² *Id.*

¹⁶³ See INTERNATIONAL TELECOMMUNICATION UNION, *World Telecommunication Standardization Assembly (WTSA-2000), Structure of the Assembly*, at http://www.itu.int/ITU-T/wtsa/wtsa_structure.html (last visited Feb. 5, 2001). The World Telecommunications Standard Assembly (WTSA), previously known as the World Telecommunication Standardization Conference, addresses a wide variety of issues relating to setting standards and uniform "rules of the road" in telecommunications. *Id.*

¹⁶⁴ Thompson, *supra* note 157, at 287. ITU Recommendations do not generate a binding treaty commitment. *Id.*

The Recommendation, which is voluntary, suggests that parties involved take into account the possible need for compensation for elements such as traffic flow, number of routes, geographical coverage and the cost of international transmission among others when negotiating such commercial arrangements. In addition, the Assembly agreed that while international Internet connections remain subject to commercial agreements between operating agencies, there is a need for on-going studies in this area.

WTSA 2000 Outcome, Report on the Outcome of the Assembly (Oct. 6, 2000), at <http://www.itu.int/newsroom/press/documents/wtsa2000rep.htm#International> [hereinafter *WTSA 2000 Press Release*].

need for providers of direct international Internet connections to take into account in their commercial arrangements the “possible need for compensation between them for the value of elements such as traffic flow, number of routes, geographic coverage and cost of international transmission amongst others.”¹⁶⁵

While non-binding and rather general in language, the existence of any Recommendation evidences how important this issue is to many nations. Nations like the United States objected to any official consideration of the issue in view of the belief that Internet peering involves a commercial bilateral relationship.¹⁶⁶ Nevertheless, a compromise was drafted in the waning hours of the Assembly.

The discussions on this very contentious issue found a positive outcome on the last day of the Assembly. The purpose of the Recommendation is to set out the *principle* according to which there should be bilateral agreement when two providers establish a circuit between two countries for the purpose of carrying Internet traffic.¹⁶⁷ The possible need for compensation between the providers has also been recognized. At present, when providers install Internet circuits, they generally have a choice between the “sender-keeps-all” or peering system of bilateral connections when traffic is more or less balanced, or the asymmetrical system whereby the initiating provider pays for the whole connection with the other country (full-circuit cost).¹⁶⁸

5. Stakeholders Seek Redress at the WTO

The World Trade Organization (WTO) provides a forum primarily for shaping trade policy and resolving trade disputes.¹⁶⁹ While Internet access issues may not fit within the scope of responsibilities conferred to the WTO by treaty, stakeholders may still try to recast the matter in trade terms. As with the ITU, consultants need not analyze thoroughly whether and how the

¹⁶⁵ *The World Telecommunications Standard Assembly*, at <http://www.itu.int/newsroom/press/documents/diii.htm> (last visited Feb. 5, 2001) (displaying the text of the Recommendation).

¹⁶⁶ Savage, Frieden, & Denton, *supra* note 101, at ch. 5.

¹⁶⁷ *The World Telecommunications Standard Assembly*, *supra* note 165.

¹⁶⁸ *WTSA 2000 Press Release*, *supra* note 164.

¹⁶⁹ Savage, Frieden, & Denton, *supra* note 101, at ch. 5.

WTO would accept an invitation to examine Internet access issues. As a threshold matter, a number of different outcomes might result. First, the WTO Directorate may reject application as outside the reach of the WTO. Second, representatives might not reach a consensus for even limited WTO study. Third, as in the case of international accounting rates, a "Gentlemen's Agreement" might forestall involvement in the short term.

6. Stakeholders Seek Redress in National Forums

Stakeholders might also pursue national forums in tandem with a multilateral forum campaign. Even if the ITU and WTO do not address Internet access issues, a national regulatory authority may do so, despite the difficulty in asserting extraterritorial jurisdiction on ISPs not operating domestically. National regulatory authorities might attempt to unilaterally remedy perceived problems by ordering structural and regulatory remedies, perhaps similar to the manner in which the United States Federal Communications Commission prescribed benchmark settlement rates for telecommunication carriers.¹⁷⁰ Alternatively, national regulatory authorities might pursue liberalization, privatization, and deregulation initiatives that could stimulate competition, resulting in downward pressure on local loop and long-haul rates. Lower telecommunication costs should reduce Asian or Pacific ISPs' costs and narrow the financial penalties and comparative

¹⁷⁰ See 1998 Biennial Regulatory Review Reform of the International Settlements Policy and Associated Filing Requirements, IB Docket No. 98-148, Report and Order and Order on Reconsideration, 14 F.C.C.R. 7963 (1999); see also Policy Statement on International Accounting Rate Reform, 11 F.C.C.R. 3146, 3146 (1996) (stating intent to update accounting rate policies to encourage competition and technological innovation); International Settlement Rates, IB Docket No. 96-261, Report and Order, 12 F.C.C.R. 19806, 19891, 19894 (1997) (creating four transition periods for compliance with benchmarks and responding to the potential for expanded opportunities for one-way bypass of an accounting rate settlement created by the Basic Telecommunications Service Agreement); Regulation of International Accounting Rates, CC Docket No. 90-337, Phase II, Fourth Report and Order, 11 F.C.C.R. 20063, 20083, 20094 (1996) (permitting carriers to negotiate alternatives to the traditional settlement rate system for routes where effective competitive opportunities exist for U.S. carriers); 1998 Biennial Regulatory Reviews Reform of International Settlements Policy and Associated Filing Requirements, IB Docket No. 98-148, 13 F.C.C.R. 15320 (1998) (proposing largely to abandon accounting rate scrutiny for traffic to World Trade Organization Member nations); Rob Frieden, *Falling Through the Cracks: International Accounting Rate Reform at the ITU and WTO*, 22 TELECOM. POL. No. 11 (December 1998).

disadvantages they face. Yet another scenario involves adjudication by a national court on antitrust or competition policy claims.

VI. Conclusion

The Internet access dispute provides a timely case study of how important the Internet has become in terms of both communications and commerce. Concerns about the Digital Divide have triggered a multi-billion dollar campaign to subsidize telecommunications and Internet access in the United States and elsewhere.¹⁷¹ ISPs incurring higher access charges and their consumers want to shape the issue in terms of equity and universal service, not in terms of commercial negotiation and a maturing, commercializing Internet.

Higher access costs may potentially disadvantage smaller ISPs, as well as ISPs located far from North America and other concentrated sources of desired content. But the nature and scope of such disadvantage largely depends on what percentage of the total cost it constitutes for ISPs and their customers. No one likes to incur new and sizeable expenses without much warning and seemingly without adequate explanation of why the prior pricing regime created free rider opportunities that unfairly burdened large ISPs. Absent evidence that accepted competition policy and trade principles have been violated, however, the imposition of new interconnection and transit charges does not warrant intervention by multilateral forums.

¹⁷¹ See, e.g., NATIONAL TELECOMMUNICATIONS AND INFORMATION ADMINISTRATION, *Closing the Digital Divide*, at <http://www.digitaldivide.gov/> (last visited Feb. 5, 2001).

