

# **Does a Hierarchical Internet Necessitate Multilateral Intervention?**

Rob Frieden  
Professor, Penn State University  
105-C Carnegie Building  
University Park, Pennsylvania 16802  
(814) 863-7996; rmf5@psu.edu

As the Internet matures and commercializes, it has become more hierarchical particularly regarding the terms and conditions for network interconnection between Internet Service Providers (“ISPs”). The previous “democratic” Sender Keep All (“SKA”) system promoted positive networking externalities, but also generated free rider opportunities and great potential for network congestion. The individual networks that make up the Internet remain well integrated, but a more hierarchical pricing arrangement has developed. Now only the largest ISPs continue to “peer” on a SKA basis, while demanding payment from smaller operators.

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 substantial change in circumstances and imposes substantial new costs on smaller ISPs, some of whom object to what they consider a one-sided, exploitation of superior bargaining power. No matter how justified and efficiency enhancing on a macro-level, the commercial, unregulated nature of ISP interconnection negotiations now require sizeable transfer payments where none previously existed. Much of the payment flows to Tier-1 ISPs located in North America, leading some ISPs and their governments in other locales to claim the transfer payment violate international trade, antitrust and economic development policies.

This paper 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 and the World Trade Organization. The paper also will offer a prediction whether the problem will abate or grow acute. This consideration involves an assessment whether Internet traffic flows and content will more substantially diverge from a North American centrality and whether interconnection arrangements will become even more finely calibrated.

## **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, government helped promote Internet use and proliferation of the Internet infrastructure. 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. Most governments now favor a privatized Internet, but not an environment that one could deem completely unregulated. As the Internet becomes a major medium for a variety of private and commercial transactions, activities previously considered illegal or warranting government oversight similarly will trigger such government involvement when the Internet provides the medium or conduit.

The privatized, commercial Internet has evidenced similar economic characteristics to telecommunication networks.<sup>1</sup> Tier-1 ISPs have accrued favorable economies of scale and scope through growth in terms of both customer base and the inventory of bandwidth available for service. Having made the investment to accommodate burgeoning demand, Tier-1 ISPs must find new profit centers in addition to monthly subscriptions. 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. To accrue 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 they offer access to as opposed to providing access to content hosted elsewhere. Massive, multi-billion dollar mergers and acquisitions evidence 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.

The quest to accrue scale and scope economies constitutes one of the major reasons the Internet has become more hierarchical<sup>2</sup> with a small set of major carriers operating the key backbone routes and capturing a large market share however measured, e.g., by bandwidth, number of subscribers, minutes of use, revenues, number of discrete “hits” to internal web sites, number of discrete Domain Numbering System sites internal to (“hosted” by) the network, etc. 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 the content they host.

Without concluding whether a more hierarchical Internet promotes greater economies of scale and scope, the concentration of Tier-1 ISPs’ market share, however measured, has made it possible to secure a superior bargaining position vis a 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 smaller . . . ISPs.<sup>3</sup>

While technical and operational factors do impact the Tier-1 ISPs' interconnection decision making process, the "main reason for not peering, however, is economic."<sup>4</sup> While one can suggest that marketplace drive negotiations never should trigger government scrutiny, others would argue the legitimacy of antitrust/competition policy analysis<sup>5</sup> when assessing the terms and conditions for Internet access.

### **Does a Small Set of Tier-1 ISPs Reduce Consumer Welfare?**

A key question in for assessing whether Internet access pricing triggers the need for government involvement involves an examination 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, viz., local access to the subscriber's ISP, 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/dissemination. In general a healthy and efficiently operating Internet industry operates even under a hierarchical structure coupled with a limited number of Tier-1 ISPs. However, this finding requires some qualification as bottlenecks can exist in the Internet topology within a region. Likewise, the potential does exist for price squeezes, i.e., 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.

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. Such price differentials have triggered the Internet access pricing dispute, because some stakeholders consider pricing differential evidence of price gouging by the Tier-1 ISPs, while others consider the differential the logical and reasonable consequence of unequal bargaining power.

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

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 our 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;

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;

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; and

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

### **Subjecting the Internet Market Structure to Traditional Antitrust/Competition Policy Analysis**

Traditional antitrust/competition policy analysis considers individual firms in the context of the markets within which they operate with an eye toward determining whether and how a firm might engage in anticompetitive and market distorting behavior. This analysis has two major tasks: 1) the macro-level definition of the relevant product/service and geographical markets; and 2) the micro-level assessment of individual firm market share and potential to engage in practices that harm competitors and consumers.

### **Defining the Relevant Product/Service and Geographical Market**

How one defines the market for Internet access and Internet-mediated services directly affects conclusions 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. Markets can be defined as including all goods and services considered by consumers to constitute an alternative to the others. Economists measure the substitutability of products and services in terms of cross-elasticities.

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

### **Individual or Collective Behavior of Firms--Evidence of Market Power**

Having defined the over service market and the geographical nature of the market, antitrust/competition policy then requires an examination of the companies serving these markets. This examination considers whether and how one or more firms have market power, the ability to affect the price or supply of one or more elements that make up international data transport services. 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 has a large capitalization. Some markets operate efficiently and competitively, despite the fact that a few quite large enterprises have captured the dominant market share. On the other hand, one small, thinly capitalized enterprise might have a near monopoly in a market narrowly defined by type or locality.

In examining international data transport marketplace, one can see that a dichotomy exists in terms of market entry costs and opportunities exists between local and regional ISPs, on one hand, and long haul, national and international ISPs on the other hand. This dichotomy underscores the importance of the baseline market definition exercise, because one might infer market power based 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. Few financial and other barriers exist to foreclose the creation of a new airline. With a handful of airplanes, leased by a fully leveraged venture, a new airline enters the marketplace. Absent barriers to accessing airport terminal and landing space, the airline can serve a few routes and provide significant competition to incumbents. However, no one would mistake this small and incremental competition as coming close to fostering robust and full competition to what a major incumbent carrier provides. A nation like the United States might have 100s of national airlines, but nevertheless have six major carriers controlling over 70 percent of the total market as measured by industry-appropriate criteria, e.g., "revenue miles" and "seat miles."

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 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 dominant 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 multi-faceted 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 shared market power and the ability to extract high rates and impose “unfair” terms (“monopoly rents” in economics).

The Internet marketplace does appear to evidence parallels to commercial aviation. 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 quite limited number of ISPs operating the major longhaul backbone networks needed for national and international services. The startup costs for a local ISPs evidence quite 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 interexchange carrier lines that access the transit services of a larger ISP up the hierarchy of ISP in terms of size and reach.

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.

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. However, no empirical evidence supports the view that such market power exists. A unilateral decision by one or more Tier-1 ISPs to eliminate open, public peering, by itself, does not constitute an exercise of market power, or anticompetitive practices. While such a decision raises the cost of doing business for smaller ISPs, it may reflect legitimate business judgment rather than evidence 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. The decision whether and how to peer does not necessarily reflect the exercise of market power. Likewise, the peering decisions of Tier-1 carriers does not directly impact the supply of bandwidth. A peering decision typically does not directly impact a telecommunication carrier’s decision whether and when to deploy additional satellite or submarine cable transmission capacity. 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.

### **Exercise of Market Power in Anticompetitive Ways**

We have seen that dominant market share serves as a primary potential indicator of market power. However, other indicators exist 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 impacts grows when competitors need to collaborate in 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 needed to provide a complete service. Internet service provision requires both collaboration, e.g., network interconnection and cooperation, e.g., 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 to 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.” In antitrust jurisprudence this practice refers to an attempt to drive a competitor out of business or to raise its cost of doing business with the impact of reducing its marketplace attractiveness. Even if a Tier-1 ISPs continued to permit lesser ISPs to interconnect, the terms and conditions might constitute a “price squeeze,” i.e., an attempt to raise competitors costs and lower their marketplace attractiveness by increasing the cost of an essential facility, bottleneck or service element needed by the lesser ISP to provide a complete end-to-end service. ISPs having 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, tying access to a desired service, e.g., longhaul backbone trunks, with a commitment to buy or lease less desired and competitively provisioned services. 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 with the threat to raise or eliminate access opportunities.

The potential for anticompetitive practices and leveraging bottlenecks exists in both aviation and Internet industries. In aviation absent government ownership or effective regulation, 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 take off or land aircraft. In the Internet access to the local loop and the backbone networks of Tier-1 carriers may be viewed as constituting essential facilities, whose access terms and conditions

could choke off or stimulate competition. To the extent lesser ISPs do not have alternatives to Tier-1 ISPs backbone trunks, the lesser ISPs may have to comply with unilateral or collective policies designed to “manage competition.” However, Tier-1 ISPs can exercise market power only if their single or collective (collusive) behavior forecloses competitive alternatives. Whether Tier-1 ISPs can discipline lesser ISPs into submission and acquiescence to unilaterally set terms and conditions on such key matters as interconnection and transit pricing depends on whether and how the lesser ISPs can resort to alternatives, including 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 a Tier-1 ISP.

### **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/competition policy enforcement and a general predisposition not to regulate the Internet. Additionally governments might not consider matters like interconnection and peering policy as constituting anticompetitive practices. In this examination of how extensive governments engage in regulatory oversight, our analogy between ISPs and commercial airlines breaks down somewhat. ISPs incur substantially less government oversight than their airline counterparts, for four primary reasons:

- 1) governments regulate the telecommunications transport function performed by the carriers who lease facilities to Tier-1 ISPs;<sup>6</sup>
- 2) notwithstanding its growing importance, the Internet has not approached the status of public utility or functional equivalent to telecommunications;<sup>7</sup>
- 3) most governments have purposefully embraced a hands-off strategy with an eye toward promoting entrepreneurialism and private initiatives; and
- 4) until recently ISPs themselves have emphasized connectivity and global reach even if the network interconnection, access and pricing policies employed to reach that goal, e.g., open peering and Sender Keep All reduced profitability and resulted in the possibility that some ISPs would bear disproportionately greater financial burdens to build out the network infrastructure than others.

### **Rationale for Regulatory Asymmetry Between Telecommunications Regulation and Internet Unregulation**

Heretofore national regulatory authorities have adopted an 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 authority lacks jurisdiction to adjudicate an Internet access dispute

containing an allegation of marketplace abuse or anticompetitive practices. Other adjudicators, including courts, may provide a substitute forum, but it may prove helpful to explore the reason governments have refrained from creating a uniform regulatory regime and forum for addressing both telecommunications and Internet disputes.

### **The Internet Is Considered a Contestable or Competitive Market**

Simply put governments have not installed a regulatory regime for the Internet, because they believe one is not needed. Advocates for regulatory relief on Internet access issues will dispute this by emphasizing the need for closer antitrust/competition policy scrutiny using a better calibrated market definition. Advocates for Internet access relief allege that the consolidation in the long haul market segment accords the 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. These advocates believe the competitive playing field has tilted in favor of the Tier-1 ISPs who can exploit the inelastic demand for their transport service and the content they have available. Some Internet access relief advocates would characterize the Tier-1 ISP networks as “essential facilities”<sup>8</sup> 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. If government adopted the view that Tier-1 ISPs 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/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 denials of access to Tier-1 ISP facilities apparently have not occurred. Advocates for government intervention dispute the terms and conditions for such access, not that they lack access opportunities. Similarly, no evidence exists to support 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 impose 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. In fact the prevailing market entry strategy of Tier-1 carriers in the region involves acquisitions on terms deemed quite generous, e.g.,

America On-Line's acquisition of OzMail.

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, that arguably might eliminate any consideration of court-ordered access."<sup>9</sup>

Advocates for a "hands off" approach to Internet access issues emphasize the suitability of marketplace remedies, i.e., 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. Likewise, they consider the profits accruing to Tier-1 ISPs appropriate rewards for risk taking and achieving marketplace success. 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 free government of the difficult, if not impossible task, of resolving equity and operational issues for which government has not particular skill or impartial template.<sup>10</sup>

### **Applying Antitrust/Competition Policy to Three Near Term Marketplace Scenarios**

Three near term marketplace outcomes may occur in the Internet access dispute: 1) extension of the status quo; 2) Tier-1 ISPs 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 leads to a robustly competitive marketplace making bandwidth a tradeable commodity. We will subject each scenario to antitrust/competition policy scrutiny.

#### **Scenario One: The Status Quo Continues**

Reasonable people can disagree whether the status quo raises legitimate antitrust/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. However, no coordinated behavior has become evident, nor does it appear that the unilateral decision of any one or more Tier-1 ISP 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 carriage and regional or local carriage. Under this sort of market segmentation, Tier-1 ISPs in effect do not compete with smaller ISPs such that the decision to raise access and transit fees does not constitute a price squeeze. 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.

### **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. The term “conscious parallelism” refers to the uncoordinated, but identical pricing decisions by erstwhile competitors. This practice frequently occurs in commercial aviation as carriers signal pricing strategies implicit 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 other carriers not follow up with the same rate hike, the initiating carrier typically lowers its rates to the previous level.

Tier-1 ISPs can collude and 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/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 player.

### **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, commercializing private industry. The largest 1 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 as well they have to pay

greater 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 ridership, 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. 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. Accordingly, a change in peering policy reflect the need to recover ever 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.

### **Scenario Two: Tier-1 ISPs Behave Like Their Telecommunications Carrier Counterparts**

The second near term scenario involves cartel-like behavior in which that international telecommunication carriers have engaged historically, albeit at a decreasing and unsustainable level. This view sees an ironic outcome: just as the international telecommunications marketplace grows increasingly competitive, robust and open consolidation among Tier-1 ISPs makes the backbone data transport market increasingly concentrated, managed and cartelized. While market concentration and high market share by itself does not signal and anticompetitive market, the incentive and perhaps the opportunity to engaged 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. During that time period, international submarine cable consortia and international/regional satellite cooperatives largely managed the telecommunication marketplace. By management we mean that the carriers collectively made facilities deployment decisions, going so far as to allocate usage between cable and satellites. This management process emphasized carrier convenience, conservation of capital and risk sharing over consumers’ interests, entrepreneurship and the considerable benefits of competition.

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 willingly part with guaranteed market share and a quiet life for potentially greater upsides, but drastically more volatility, risk, uncertainty and hard work. As Tier-1 ISPs have managed 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. Additionally these ventures have benefitted by opportunities to buy market share through strategic mergers and acquisitions. Having secured a dominant market share, the Tier-1 ISPs surely have every incentive to try to sustain their comparative advantage and to perpetuate their market dominance.

### **Arguments That Anticompetitive Practices Have Occurred**

The rationale that Tier-1 ISPs will sustain their marketplace dominance lies primarily in 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/competition policies to sustain its monopoly. Faced with the potential for lost market dominance, in either their core market, i.e., personal computer operating systems, or developing markets. i.e., World Wide Web browser software, Microsoft allegedly engaged in predatory and strong arming tactics. The company offered free of charge a Web browser where consumers previously had to buy it, possibly evidence of predatory pricing. 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. 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.

Tier-1 ISPs can sustain their market dominance by leveraging the inelastic demand for the content they host. One could argue that Tier-1 ISPs tie this demand with 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 arrangement does not exist, because Internet charging 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.

### **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. The Intelsat, Inmarsat, Intersputnik and Eutelsat

cooperatives face robust facilities-based competition from in-orbit satellites operated by private entrepreneurial ventures. The traditional submarine cable consortia comprised of the incumbent carriers face direct competition from new carrier ventures lacking the incumbency advantage, but nevertheless finding ample demand for their state of the art fiber optic cable technology. Simply put even if the Tier-1 ISPs could manage to discipline each other to engage in cartel-like behavior, market entry barriers they would attempt to erect would prove impossible to thwart newcomers.

With the proliferation of routing options worldwide, Tier-1 ISPs will not have the ability to discipline the marketplace. 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, e.g., Global Crossing, Level Three, Pacific Gateway Exchange, FLAG Telecommunications, etc.

### **Scenario Three: Long Haul Data Transmission Becomes a Fungible Commodity**

Scenario Three extends the currently experienced extraordinary demand for bandwidth with equally impressive rollouts of new capacity using state of the art circuit multiplication technologies. 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 and the manner by which carriers provision capacity and reseller/endusers acquire it.

In this scenario telecommunications transport capacity becomes fungible and tradeable like bushels of corn and other commodities. A spot market for data transmission bandwidth means that the market has become robustly competitive that all suppliers become “price takers” with no single supplier, or group, including the Tier-1 ISPs in a position to set prices. 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. 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.

### **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. The anticompetitive practice that generate an impact, do not eliminate supply,

but create temporary negative impacts on supply that can quickly trigger a price increase. Attempts to coordinate supply of a commodity, like oil, do not always work, as individually 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 the Tier-1 ISPs.

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

Antitrust/competition policy agencies may have incur difficulty in policing telecommunication bandwidth markets in much the same way as commodities futures and stock market trading creates 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.

### **Arguments That Anticompetitive Practices Have Not Occurred**

In a market able to reflect nearly instantaneous changes in prices, any significant impact on price can trigger close scrutiny. What Tier-1 ISPs may be able to achieve in closed door negotiations and non disclosure 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/criminal culpability for attempts to fix prices and to collude with other suppliers.

Scenario Two offered 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, e.g., 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 and as well to promote the apparent public benefit of sustaining family farms. In Scenario Three no such legitimate forum exists and presumably each and every supplier must respond to marketplace conditions.

### **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.

### **“Do Nothing” Scenarios**

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

### **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. Small 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. One near term scenario presents the Internet access problem as temporary and solvable, because the solution is available to ISPs, their government and the marketplace.

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

Regardless of their geographical location, ISPs smaller than the Tier-1 operators incurred higher telecommunication transport costs when Tier-1 ISPs replaced open peering with access for compensation. The Tier-1 ISPs could get away with changing the fundamental terms and conditions for network connectivity, because smaller ISPs needed them more than they needed the smaller ISPs. Any change in the balance of power and network access need over time will translate into different Internet access terms and conditions.

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 can occur primarily when in-region content grows in availability and popularity and when ISPs opt to host that content in region. Currently the desirability of content hosted in North America places ISPs located elsewhere in a demand inelastic position. However, this situation does not mean that ISPs subscribers in Asia/Pacific purposefully eschew indigenous, non-North American content. Cable television network programmers in the region have found that their subscriber prefer both kinds of content. 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. To the extent that a market opportunity exists for indigenous content, then over time local programmers will attempt to satisfy market demand.

However, Internet access issue relief will not necessary result simply because 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 incur a cost penalty for locating content closer to their subscribers. 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. 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.<sup>11</sup> Lower Internet access costs to *North America* would only bolster the incentive to host content there.

One can conclude that even if Internet access terms and conditions more closely approximated a telecommunications model of line cost sharing on a 50/50 basis, telecommunication transport providers outside North American would continue to offer comparatively less attractive and more expensive rates. Surely economies of scale and scope contribute to a North American carrier 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 of North America can unleash pent-up demand for Internet services by lowering access costs. Empirical evidence supports the view that a reduction in end user rates, and intermediate pricing factors like international accounting rates, tend to stimulate substantial increases in consumer demand, so much so that operators can make up in volume what they lose in margins.

### **Lower Transmission Costs Reduce Significance of the Issue**

Much of the Internet access dispute stems from the comparatively greater percentage of total operating costs allocatable to the telecommunication transport portion in Asia/Pacific. 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] loading up the domestic cost structure."<sup>12</sup> The Internet access dispute can grow less troublesome thanks to the benefit of lower per unit transmission costs to North America coupled with the proliferation of in-region ISPs and transmission options. Despite the seemingly unquenchable demand for ever expanding bandwidth, we can envision a near term future where the variety of new extremely high bandwidth, Dense Wave Division Multiplexing fiber optic cable projects actually changes the region's infrastructure supply from one of scarcity to one of at least temporary glut. 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. And reduction in reliance on North American content and routing options would contribute to reaching closer parity in demand elasticities.

### **A Contrary View: Internet access Issues May Become More Troublesome**

Despite our optimism that conditions may improve and at least partially abate Internet access concerns, we have to acknowledge the potential for the status quo to extend into the future. The possibility exists for the financial burden borne by smaller ISPs to grow more acute if demand for high bandwidth applications stimulates ever increasing requirements offsetting even large reductions in per-unit costs. 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 as contracts may have long terms before coming up for renewal and renegotiation. As well, the negotiation process and the balance of power in them may heavily weigh other factors in addition to traffic flow and transmission costs.

### **Do Something Scenarios**

Several near term scenarios involve significant change affecting Internet stakeholders, because they have engaged in "self-help" and/or resorted to external forums for redress. By self-help we mean that smaller ISPs can take affirmative steps to improve their negotiating leverage with Tier-1 ISPs. 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.

### **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 their 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 accrue 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.

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 traffic lends itself to asymmetrical transmission pathways to and from North America. By this we mean that smaller ISPs need not provision 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. Caching of the most frequently viewed World Wide Web pages in local servers and other technological options can help conserve in bandwidth. Self-help involves both unilateral and jointly undertaken efforts by smaller ISPs. In the latter category, Asia-Pacific ISPs can coordinate more closely to aggregate traffic for efficient long haul loading to North America. As well they could peruse alternative peering opportunities in-region and with other ISPs in North America willing to provide better Internet access terms and conditions.

### **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. Under circumstances where a matter has become a chronic irritant and financial drain, it follows that these stakeholders would seek new forums for resolution.

### **Stakeholders Seek Redress at the ITU**

The International Telecommunication Union (“ITU”) provides a forum primarily for standard setting, allocating spectrum, registering spectrum and satellite orbital arc usage and recommending policies and procedures in telecommunications. 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.” Over the years the ITU has lent its “good offices” for addressing and attempting to resolve complex and contentious issues.

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. As well the ITU has addressed matters, like international accounting rates, that arguably has a trade policy aspect.

The nature of this assignment does not require the consultants to analyze whether and how the ITU would accept an invitation to examine Internet access issues. Reasonable people could disagree whether Internet connectivity, pricing and access issues have a close enough parallel to 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. Internet access matters do not appear to have as close and direct a link, such that the ITU representatives may not reach a consensus on whether to study Internet access issues much less promulgate recommendations on how nations should address them.

### **Stakeholders Seek Redress at the WTO**

The World Trade Organization (“WTO”) provides a forum primarily for shaping trade policy and for resolving trade disputes. Internet access issues may not fit within the scope of responsibilities conferred to the ITU by treaty, although we should note that such a limitation may not stop stakeholders from trying to recast the matter into one that does. The nature of this assignment does not require the consultants to analyze thoroughly whether and how the WTO would accept an invitation to examine Internet access issues. As a threshold matter we note a number of different outcomes might result:

The WTO Directorate rejects application as outside reach of the WTO;

Representatives might not reach a consensus for even limited WTO study; and

As in the case of international accounting rates, a “Gentlemen’s Agreement” might forestall involvement in the short term.

### **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 does not address Internet access issues, a national regulatory authority might, despite the difficulty in asserting extraterritorial jurisdiction on ISPs not operating domestically. National regulatory authorities might attempt unilaterally to remedy perceived problems by ordering structural and regulatory remedies, perhaps in manner similar to how the United States Federal Communications Commission prescribed benchmark settlement rates for telecommunication carriers.<sup>13</sup> Alternatively national regulatory authorities might pursue liberalization, privatization and deregulatory initiatives that could stimulate competition resulting in downward pressure on local loop and long haul rates. Lower telecommunication costs should reduce Asia/Pacific ISPs' costs and narrow the financial penalties and comparative disadvantages they face. Yet another scenario involves adjudication by a national courts on competition policy/antitrust claims.

## **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. ISPs incurring higher access charges and their consumers want to shape the issue in terms of equity and universal service, and not in terms of commercial negotiation and a maturing, commercializing Internet.

Higher access costs may have the potential to disadvantage smaller ISPs and ones far from North American 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 why the prior pricing regime created free rider opportunities that unfairly burdened large ISPs. But absent evidence that accepted competition policy and trade principles have been violated, the imposition of new charges does not warrant intervention by multilateral forums in a commercial negotiation.

## **NOTES**

<sup>1</sup> For a helpful background on the nature of telecommunications regulation in the context of competition policy *see* Michel Kerf and Damien Geradin, "Controlling Market Power in Telecommunications: Antitrust vs. Sector-Specific Regulation an Assessment of the United States, New Zealand and Australian Experiences," 14 *Berkeley Technology Law Journal* 919 (Fall 1999).

<sup>2</sup> For additional background on the impact of a hierarchical Internet industry structure on universal service policy objectives *see* Rob Frieden, "Last Days of the Free Ride? The Consequences of Settlement-Based Interconnection for the Internet," 1 *Info* No. 3, 225-238 (June, 1999); Rob Frieden, "Without Public Peer: The Potential Regulatory and Universal Service Consequences of Internet Balkanization," 3 *Virginia Journal*

of Law & Technology 8 (Fall, 1998) available at <http://vjolt.student.virginia.edu/>.

- <sup>3</sup> Jonathan Angel, "Toll Lanes on the Information Superhighway," 15 Network Magazine, No. 2, 42, 44 (Feb. 2000).
- <sup>4</sup> *Id.* at p. 46.
- <sup>5</sup> *See generally*, W. Kip Viscusi et al., *Economics of Regulation and Antitrust* 377 (2d ed. 1998). For background on United States antitrust law and policy *see* Richard A. Posner, *Antitrust Law: An Economic Perspective* 8 (1976); Herbert Hovenkamp, *Federal Antitrust Policy: The Law of Competition and Its Practice* (1994); Georges J. Alexander, "Antitrust and the Telephone Industry after the Telecommunications Act of 1996," 12 Santa Clara Computer and High Tech. Law Journal, 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 International Journal of Communications and Law and Policy 1 (1998/99).
- <sup>6</sup> For example in the European Union, Council Directive No. 90/387/EEC, art. 3, O.J. L 192/1, at 2 (1990) establishes baseline principles that facilities-based telecommunication carriers must apply when leasing lines and interconnecting with enterprises providing value added services. While the carriers do 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 objective criteria, that must be transparent, and published in an appropriate manner and that guarantee equal and non-discriminatory access in accordance with Community law. *See* Gunter Knieps, *Interconnection and Network Access*, 23 Fordham Int'l L.J. 90(2000).
- <sup>7</sup> 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, e.g., 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 . . . ." Mark Schankerman, *Symmetric Regulation for Competitive Telecommunications*, 8 Info. Econ. & Pol'y 55 (1996).
- <sup>8</sup> The "essential facility" doctrine in antitrust/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, i.e., 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. *See* Daniel Glasl, *Essential Facilities Doctrine in EC Antitrust Law: A Contribution to the Current Debate*, 6 European Competition Law Review 306 (1994); William B. Tye, *Competitive Access: A Comparative Industry Approach to the Essential Facility Doctrine*, 8 Energy L.J. 337, 346 (1987). But compare with Phillip Areeda, "Essential Facilities: An Epithet in Need of Limiting Principles," 58 Antitrust Law Journal 841 (1989); Allen Kezsbom and Alan Goldman, "No Shortcut to Antitrust Analysis: The Twisted Journey of the 'Essential Facilities' Doctrine," 1996 Columbia Business Law Review 1 (1996).
- <sup>9</sup> Robert Pitofsky, "Antitrust Analysis in High-tech Industries: A 19th Century Discipline Addresses 21st Century Problems," 4 Texas Review of Law & Politics 129, 138 (Fall, 1999); *see also* David J. Teece & Mary Coleman, "The Meaning of Monopoly: Antitrust Analysis in High-Technology Industries," 43 Antitrust Bulletin. 801 (1998).
- <sup>10</sup> *See* Leonard W.H. Ng, "Access and Interconnection Issues in the Move Towards the Full Liberalization of European Telecommunications," 23 North Carolina Journal of International Law and Commercial Regulation, 1