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Introduction to a Special Issue on Network Neutrality

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Abstract

"Network neutrality" encompasses a wide-ranging debate over what limits, if any, should be placed on network providers in pricing or managing Internet traffic. The articles in this volume tackle various aspects of this debate: Have other transportation networks been truly "neutral"? Should broadband providers be allowed to charge content providers for connecting with end users? How much price discrimination is appropriate and is it confined to network operators? How large are the potential costs of constraining traffic management practices? What are the tradeoffs from mandated loop unbundling to deter discrimination and what market power threshold justifies interventions?

1 The Issues

Traditionally, transmission quality and pricing of traffic on the public Internet were largely independent of the content of packets or the identity of the sender or receiver. This model – reflecting the "end-to-end" principle, which envisions an Internet of best efforts networks that do not provide built-in quality of service (QoS) assurances – is under increasing strain. In particular, as consumers adopt broadband-intensive applications, such as interactive video services that demand higher QoS than available under uniform treatment, network providers are looking to support those services. Broadly speaking, the network neutrality debate addresses what deviations should be permitted from the traditional model.

To date, the debate has focused on providers of residential broadband access, who are often perceived to have market power and incentives to abuse it under certain situations. Rejecting calls for increased regulatory oversight, broadband providers argue that to ensure efficient network use, they need increased flexibility in prioritizing or otherwise managing Internet traffic as well as in pricing such arrangements. Specifically, broadband providers have expressed an interest in charging providers of Internet content or applications (for brevity, "content providers") for access to their residential subscribers, and in setting prices – to content providers or consumers – based on QoS levels. They argue that restrictions on such arrangements would be inefficient and would undermine their ability to defray the high investment costs of upgrading consumer broadband networks.

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Proponents of restrictions fear that network operators could misuse any permitted flexibility in network management or pricing practices to extract inflated payments from content providers, to discriminate against them when they compete against the offerings of an integrated broadband provider, or – as an unintended consequence – to frustrate the success of innovative applications through unduly restrictive network management practices. Furthermore, they fear that as incumbents expand the deployment and use of higher-priced "private networks" to handle all types of IP traffic (voice, video and data), they may under-invest in facilities for the public Internet in order to steer users to the higher-priced alternatives. Competitors, therefore, are pressing for increased oversight over how such private IP networks are used.

In the U.S., the network neutrality debate moved beyond a largely hypothetical discussion of the above concerns in 2008 when the Federal Communications Commission (FCC) investigated and sanctioned Comcast for discriminatory network management practices.[1] Putting aside the concerns that this proceeding underscored the institutional failings of the FCC (Weiser 2009a), the FCC's *Comcast* decision made clear the need to develop a new model of regulation to address dynamic issues that are not well suited for traditional command-and-control regulation (Weiser 2009b). These issues are all the more relevant given that the Federal Trade Commission (FTC) has signaled its interest in commencing a consumer protection agenda in this area (Weiser 2008) and that the Comcast case involved, among other things, alleged failures by the company to disclose its relevant network management practices to consumers. And, in a sign that concerns over network neutrality are shared in both Congress and the executive branch, the recently enacted American Recovery and Reinvestment Act included a set of "open access" requirements that any provider receiving funding for broadband built-out will be required to follow. Finally, as discussed by Wallsten and Hausladen (2009), the network neutrality debate has spread beyond the U.S., with numerous jurisdictions around the world considering different possible restrictions on the behavior of network operators.

Quoting Yogi Berra, Odlyzko (2009) cautions that "[i]t's tough to make predictions, especially about the future." Nevertheless, the issues encompassed in the network neutrality debate are likely to remain at the forefront of telecommunications policy for years to come – and indeed are the modern descendants of concerns about network discrimination that arose throughout the 20th century. The articles in this special issue, overviewed below, use theoretical, empirical, and institutional analyses in an effort to provide light to a debate all too often characterized by overheated rhetoric.

2 Levinson

Extreme versions of network neutrality regulation would bar network providers from charging for providing higher levels of QoS. Such prohibitions entail obvious inefficiencies, however. In particular, mandating equal treatment of applications that differ in their tolerance of delay or jitter is not neutral in any meaningful sense (i.e., it distorts the path of technological development and advantages a particular type of Internet traffic), and denies valuable experimentation in the marketplace. In addition, uniform pricing may well price out some consumers or applications (Hermalin and Katz 2007). Nevertheless, the

[1] Earlier versions of the Network Neutrality controversy are discussed by Yoo and Wu (2006).

merit of such proposals is sometimes touted as self-evident by invoking simplistic analogies, such as the suggestion that society does not want some people to enjoy a fast lane to the Internet and others relegated to the slow lane.[2] In his short piece, Levinson (2009) documents that this and other analogies to transportation networks are inaccurate.

Levinson explains that various transportation networks regulated as common carriers, such as railroads, have long engaged in price discrimination both directly (for example, student discounts), and indirectly (for example, offering a menu of service qualities at different prices). Examples of the latter include three classes of passenger service and overnight, two-day, and ground shipment of freight. Unlike strong versions of network neutrality, common carrier obligations have traditionally allowed for reasonable discrimination. More recently, policymakers are increasingly considering such models in public roads by giving drivers a choice between faster speeds on toll roads or travelling slower on non-toll roads. Pursuing this example, Levinson observes that transaction costs can limit the efficiency of such schemes (at one point 67 percent of the London Congestion Charge went to enforcement and collection costs), but adds that such costs are not fixed and can change with technology. Consequently, the presence of potential transaction costs does not justify a categorical bar on differential pricing for Internet offerings.

Reflecting the importance and complexity of the issues related to Internet pricing, the papers by Musacchio, Schwartz, and Warland (2009) and by Odlyzko (2009) both address this issue in depth. The former analyzes the effects of allowing broadband operators to charge content providers as well as their residential subscribers, drawing on the economic theory of two-sided markets and pricing of complementary services. The latter paper focuses on the conceptually distinct (though empirically related) issue of price discrimination.

3 Musacchio, Schwartz, and Warland

This article develops an intricate theoretical model to compare economic welfare under two alternative pricing regimes. Under "one-sided pricing," any residential broadband provider ("ISP") may only set price to its end user customers. Under "two-sided pricing," any ISP may also charge (or pay) all content providers, which derive revenue from online advertising to end users, for the ability to reach its end users.[3] The analytical framework tracks the economic literature on two-sided markets (e.g., Caillaud and Jullien 2003, Armstrong 2006, Rochet and Tirole 2006, Armstrong and Wright 2008): a platform owner (here, an ISP) links two groups (end users and content providers) that value access to each

[2] The better analogy, at least to Atkinson and Weiser (2006), is to insist on a level of evolving service for basic broadband services so that innovators can always rely on a best efforts network that is sufficient for deploying new applications – even if that network does not provide the same quality that is available to those able to pay for guaranteed levels of service.

[3] Some have argued that Internet content providers should not be charged to reach users because they already pay for first-mile access on their end (and for long-haul transport). However, the cost of providing access is much higher on a user's end (per bit of data carried) since a typical content provider generates much larger volume and can enjoy steep economies of scale. For example, Odlyzko (2009) estimates that the average price of a communication between a residential user and Google is more than one hundred times higher for the user. Even if these prices include significant mark-ups over marginal costs, the implied discrepancy in costs is striking. As discussed in the text, broadband providers have argued for the right to charge content providers to help defray the cost of providing residential access instead of recovering it entirely from users.

other and are thus complementary in generating higher use of the platform. A key novel feature here is that network traffic depends not only on prices but also on the investments made by ISPs and content providers. The authors derive the equilibrium investment levels, prices, and utilization under the two alternative pricing regimes. Depending on parameter values, either regime can be superior for overall welfare and even for each of the parties. In addition, two-sided pricing is relatively less beneficial when the number of ISPs is larger: each ISP ignores the fact that raising its charge to content providers (or under other parameter values, lowering its payments to them) will harm other ISPs and their end users by reducing investment of content providers, and this negative externality increases with the number of ISPs.

The model assumes an exogenous number of content providers, *M*, and ISPs, *N*. To capture ISPs' perceived market power, in an admittedly polar way, each ISP is viewed as having a captive base of end users; thus, ISPs behave as local monopolists. Symmetry is assumed among ISPs, content providers, and end users. Besides aiding tractability, this symmetry helps focus on the effects of allowing broadband providers to charge (or pay) content providers while abstracting from other aspects of the network neutrality debate (price discrimination and efficiency reasons for differential treatment).

Each ISP charges its end users a price p per unit of traffic and, if permitted, also charges any content provider a price q for such traffic; q is the charge for the "right" to access users, which is constrained to 0 under one-sided pricing but otherwise may be positive or negative. In a symmetric equilibrium, any content provider's traffic level is given by $D = (1/M^v)[c^v t^w]e^{-p/\theta}$, where: c and t are the investment levels of content providers and ISPs, respectively; v, $w > 0$ are parameters reflecting the importance to end users of these investments; and $\theta > 0$ is a parameter capturing the price-sensitivity of users' demand—higher θ makes demand *less* price-sensitive (reduces the elasticity). Term $[c^v t^w]$ affects network 'quality' as perceived by end users. A content provider's variable profit equals the traffic to its site multiplied by its margin, $a - q$, where a is the exogenous price it gets from online advertising. Any content provider also incurs a cost of investment, which is independent of traffic volume (a fixed cost) but rises with the quality of its site.

The sequence of moves is as following. First, ISPs simultaneously choose their levels of investment (t) and prices (p, q). Second, having observed these choices, content providers simultaneously choose their investments (c). Finally, the prices to end users along with all the investment levels determine users' traffic. A regime of one-sided pricing (favoured by network neutrality proponents) constrains q to 0; two-sided pricing allows q to be positive or negative: content providers pay ISPs or vice versa.[4]

The authors derive the equilibrium under each alternative regime. The expressions for equilibrium prices offer useful insights. If pricing is one-sided, then $q = 0$ by definition, while the equilibrium price to end users is $p = \theta N(1-v)/[N(1-v) + v)]$. It rises with θ, falls with v, and rises with N. These effects can be understood as follows. A larger θ makes end users' demand less elastic, thus raising the profit-maximizing p by the usual logic. A larger v increases the importance of investment by content providers in stimulating traffic, from which ISPs also benefit; to encourage such investment ISPs cut price to end users, since the profitability of investment to content providers rises with the volume of expected

[4] As the authors observe, the assumption that ISPs set prices before content providers invest is important. Under two-sided pricing, if ISPs could not pre-commit to q, then content providers – here modelled as passive price-takers towards ISPs – would be deterred from investing, expecting that once they have sunk their investment costs, ISPs would set the access price q at a level that extracts all the advertising revenue.

traffic (recall that the investment cost is independent of volume). Finally, p rises with N due to a negative externality. An increase in any ISP's price to its end users will lower their traffic volume and, thus, will reduce investment by all content providers, which harms all ISPs. When N is larger each has ISP has a smaller share of the end-user market and, hence, internalizes a smaller share of the market-wide harm from raising its own price.

If two-sided pricing is allowed, the equilibrium prices become $p = \theta - a$ to end users and $q = a - \theta v/[N(1 - v) + v)]$ to content providers. As before, p rises with θ since users' price sensitivity is then lower. But now p falls with a, since a higher advertising price lets ISPs collect a higher price q from content providers for traffic generated by end users, inducing ISPs to cut price to end users so as to increase their traffic. The price to content providers decreases in θ since a higher θ induces higher p (as noted), making it more valuable for ISPs to stimulate traffic by cutting price to content providers so as to boost their investments. For the same reason, q also decreases with v (the importance of content provider investments in stimulating end user traffic). Finally, q rises with N, the number of ISPs, by the externality logic mentioned earlier. Figure 5 illustrates the equilibrium price to content providers as a function of the number of ISPs and of a/θ, the advertising price relative to the parameter of users' price insensitivity. Consistent with the above discussion, q increases with N and with a/θ: a higher advertising price or a higher price-sensitivity of end users (lower θ) induce ISPs to charge more to content providers. Conversely, when a/θ is low, q is negative: ISPs pay content providers in order to encourage their investments.

The authors show – for different N, v, and w – the ratio of profits under one- vs. two-sided pricing for ISPs (left panels of Figures 3 and 4), and for content providers (right panels), as functions of a/θ. The ratio can be less than 1 – one-sided pricing is inferior – for ISPs when a/θ is high, and even for content providers when a/θ is very high. Intuitively, a higher advertising price and a larger price sensitivity by users (smaller θ) serve to increase content provider profits relative to those of ISPs and induce low investment by ISPs if ISPs can collect revenue only from end users. Thus, for high a/θ both parties can benefit if ISPs may charge also content providers, as allowed only under two-sided pricing. For low a/θ the ratios again are often less than 1, this time because raising network traffic requires stimulating investment by ISPs through payments *from* ISPs to content providers. For intermediate values of a/θ, one- sided pricing tends to be superior. The range of a/θ for which this occurs rises with the number of ISPs, because, as explained, a larger N aggravates the double-marginalization type distortion under two-sided pricing. Overall, the paper provides sensible results, suggesting that the efficient pricing regime is likely to be highly context-specific.

4 Odlyzko

In a provocative and wide-ranging essay, Odlyzko identifies the core issue in network neutrality regulation as price discrimination (differential pricing): how much discrimination and what forms should be permitted? The desire of broadband providers for discretion in handling and pricing Internet traffic is driven, he contends, not by genuine traffic management motives, but by incentives to price discriminate based on the value of different content or applications.[5] After analysing the issue, he argues that broadband providers do not need price discrimination to finance efficient networks and thus advocates some limits on their network management and pricing practices. However, in a display of 'neutrality' between the main protagonists, he cautions that a dominant search engine, if unconstrained by regulation, could engage in more extreme forms of price discrimination than could broadband providers.

Odlyzko stresses that price discrimination is not evil from an economic standpoint, given its well-known potential to expand output. Rather, the resistance to the practice comes from perceptions of equity or other social norms. This tension between efficiency and "equity" has, over the years, shaped the type and extent of discrimination that society has tolerated in network industries. Like Levinson, Odlyzko notes that extensive price discrimination has long been permitted in transportation sectors such as railroads, canals, and turnpikes both in the U.K. and the U.S. (Indeed, it was sometimes mandated in pursuit of income distribution or other political or economic goals.) At times, the basis for permissible discrimination has included the type of cargo as well as its destination, discrimination that might be possible in the Internet through the use of deep packet inspection. Moreover, in the communication and transportation industries, the cost of providing access to residential consumers has been subsidized by charges on businesses that transact with consumers, offering some precedent to broadband providers' wish to charge content providers for access to end users.

What, then, is different about allowing price discrimination in the Internet? Odlyzko suggests several distinctions. First, the potential gains from differential pricing appear very large. He presents ballpark comparisons (Table 1) designed to illustrate the order-of-magnitude differences in average prices paid per megabit of data in different applications: \$1,000 for wireless texting, \$1 for wireless voice, \$0.01 for residential Internet use, and \$0.0001 for small ISPs purchasing access to the Internet backbone. Although some of these differences can be explained by cost differentials stemming from access technologies or scale economies (e.g., when serving a small ISP as compared to a residential user), the differences are striking.

Second, and more controversially, Odlyzko argues that broadband carriers do not need added revenue from price discrimination to finance residential broadband infrastructure. Projections of dramatic growth in Internet traffic are driven by the growth of video, and Odlyzko argues that carriers have systematically over-valued the importance to users of content, including video, compared to connectivity services (such as texting or social networking sites) that use much less bandwidth. Expanding networks to handle large video growth would thus be a mistake. Moreover, Odlyzko argues, most video should not be delivered via real-time streaming, but in ways that demand far less instantaneous capacity or network quality. Finally, he argues that carriers' projections of Internet traffic growth are overstated, as are their estimates of the cost of network expansion. (Among other things, he criticizes the study by Clarke (2009), as discussed below in the review of that paper.)

[5] In passing, he characterizes Comcast's practices towards BitTorrent as less consistent with managing congestion and more with preventing competition against its own video offerings. Whatever the validity of this particular assessment, distinguishing between "bad" discrimination and legitimate differences will often be difficult in practice. For a discussion of this in the context of the main U.S. antitrust law against price discrimination, the Robinson-Patman Act, see Schwartz (1986).

In short, Odlyzko resists giving broadband operators leeway for price discrimination (except by offering consumers different connection speeds) or increased ability to vertically integrate into content or applications to facilitate price discrimination. Such moves, he fears, would result in carriers simply wasting investment on "intelligent pipes" and on developing proprietary services, a task to which they are ill-suited. In his view, the operators' own shareholders may benefit from network neutrality rules that would limit such wasteful ventures and force them to stick to their core competence – providing basic connectivity with relatively little price discrimination.

Whatever the merits of price discrimination, Odlyzko stresses an important point that is often overlooked: the potential for price discrimination and other departures from network neutrality is not confined to broadband operators or other facility providers. It exists at any Internet segment where a dominant provider emerges. As a hypothetical example, he discusses Google, the leader in online search advertising. The tracking and customization functions enabled by the Internet offer rich opportunities for personalized price discrimination – akin to individually-tailored college tuition discounts based on rich information about the student's ability to pay in the 'old economy'. For example, search ads may be targeted to an individual based on his online activities and location and the ads may include price offers based on estimates of his willingness to pay derived from such information. Google or another content provider could obtain additional personalized information if users widely migrate to "cloud computing" whereby their data and software applications are centrally hosted with that provider. (Odlyzko argues that Google's stock price can be explained by the rich potential for price discrimination under such a scenario.)

In conclusion, he advocates (and anticipates) network neutrality limits on broadband operators, but cautions that this would leave great scope for price discrimination by bottleneck owners elsewhere in the Internet value chain. Indeed, limits on broadband operators alone would increase the potential profit from price discrimination at other stages. Thus, "it would be wise to prepare to monitor what happens and be ready to intervene by imposing neutrality rules on them when necessary."

5 Clarke

A central issue not addressed in depth by the above articles is traffic management practices. Such practices have clear potential to serve efficient purposes, such as enhancing security and privacy, alleviating network congestion, and prioritising traffic that is especially sensitive to delay or jitter (OECD 2006). Moreover, as Odlyzko (2009) cautions:

> It appears very hard to regulate a packet data network like the Internet, which depends for its basic justification on statistical multiplexing. … The question of how one deals with legitimate network management issues, as well as with services that appear to reside most naturally in the network, is a thorny one.

As highlighted by the Comcast controversy, network neutrality proponents fear that traffic management may be misused to discriminate against certain traffic for anti-competitive or price discrimination reasons. Some proponents of network neutrality even urge that all such practices be avoided by simply adding more network capacity. Clarke's paper examines the costs associated with such a policy, endeavoring to bring empirical analysis to a debate without enough of it.

Clarke begins with a lucid description of the workings and capacities of the three main technologies used to provide residential broadband access: Digital subscriber line, cable modem, and passive optical networks (used, for example, by Verizon's FiOS service). He then points out that today most residential consumers use their broadband connections quite lightly – over a day, less than 1% of the potential maximum throughput, and less than 3% even during the network busy-hour. This is because most consumers use the Internet only intermittently and mainly for low bandwidth applications such as email and web browsing. However, he states that usage patterns are changing, with the growth of peer-to-peer applications (users send large files to one another) and, especially, of real-time video services. These trends, he suggests, imply a more continuous use of the network and larger bandwidth needs.

The rest of his paper estimates the costs of expanding network capacity to handle expected traffic growth under the following scenario: (a) most Internet users switch to obtaining their video service through IP delivery; (b) video delivery occurs in a "unicast" format – a separate data stream is sent across the Internet from the program supplier to each user; and (c) costs are computed using today's technology. The unicast assumption reflects a polar version of an unmanaged network. Clarke notes that much less bandwidth would be needed under multicast distribution – a single copy of the program stream is sent from the source over some parts of the Internet and replicated closer to the individual users – but a multicast network requires network management practices that may be constrained (either financially or technically) under certain network neutrality rules.

The estimated costs under unicast distribution are substantial, ranging from \$143 to \$416 per customer, depending largely on the extent of High Definition TV viewing. Interestingly, the key driver is not the cost of expanding first-mile access to consumers, although it does contribute. The main cost comes from expanding capacity drastically in aggregation networks ("middle mile") and in the backbone. Today, this capacity is largely shared among users who typically use only a very small fraction of their last-mile connections; thus, the shared portions of the network (middle mile and backbone) require only about 50 Kbps of capacity per residential user, roughly 1/30th to 1/100th of the maximum capacity of an average last mile connection. The capacity of these shared resources would have to be expanded drastically if consumers migrate heavily to watching IPTV delivered via unicast services.

Odlyzko (2009), as noted above, criticizes Clarke's study. He views the cost estimates as prima facie implausible, because they would render unprofitable AT&T's IPTV offering, U-verse. In response, Clarke points out that IPTV is offered by AT&T and other broadband operators on a *managed* basis, using multicasting and other techniques to economize on bandwidth. Odlyzko further argues that Clarke has overestimated the growth rate of IPTV adoption and, more importantly, has ignored future cost reductions. Clarke counters that cost reductions may be rather limited for several reasons. First, capacity expansion must occur mainly at points where resources are already shared so scale economies may have largely been exhausted. Second, if adopted, network neutrality regulations may impede technological progress if, for example, they limit practices such as data compression or routing algorithms that can improve capacity utilization but may also affect the quality of traffic (and, hence, may be constrained by anti-discrimination rules).

Finally, he suggests, it is possible that customers' demand for video quantity and quality may exceed the usage profiles assumed in his calculations.

Without taking a position on the validity of the Clarke-Odlyzko debate, we believe that such analyses are exactly what policymakers need in order to appreciate the potential reasons behind and justifications for network management efforts.

6 Wallsten and Hausladen

While Clarke focuses on rules that constrain traffic management practices of network operators, Wallsten and Hausladen examine a structural policy related to network neutrality: mandated unbundled access for independent ISPs to an incumbent's last-mile broadband loops. Unbundling has a long history in telecommunications as an attempt to prevent anti-competitive discrimination by an incumbent against competitors in adjacent markets that require access to its 'bottleneck' last-mile facilities (Nuechterlein and Weiser 2007; Schwartz 1997). Wallsten and Hausladen begin with a useful survey of policies towards network neutrality in Europe (both individual states and the European Union), Japan and South Korea. In so doing, they highlight two points: (1) most jurisdictions are receptive at some level to network neutrality concerns (ambiguous though they may be); and (2) a common remedy, especially in Europe, is unbundled access to telephone companies' last-mile facilities so that independent ISPs can offer their own DSL service. In principle, greater competition – whether between different platforms or between resellers on a monopoly platform – can ameliorate network neutrality concerns.[6] The U.S., in abandoning the so-called "line sharing" requirement, has moved away from unbundling as a means of spurring broadband competition (of the "intra-platform" sort) and has instead emphasized facilities-based competition, mainly between telephone and cable companies.

Evaluating the potential costs of mandated last-mile access, Wallsten and Hausladen investigate empirically whether this has reduced incentives to invest in advanced broadband infrastructure. They assemble a new data set covering 27 European countries form July 2002 through July 2007, with information about the number and type of broadband connections offered. For incumbents and entrants separately, they estimate regressions where (a) the dependent variable is the number of fiber connections (per capita) and (b) the explanatory variables are the number of connections offered by entrants (also per capita) through unbundled loops or bitstream access, per capita income, and country- and time- fixed effects. Controlling for these other factors, they find a negative correlation between fiber connections offered by either incumbents or entrants, and the number of connections via unbundled loops or bitstream access (Figure 3). They repeat these regressions but changing the dependent variable from fiber connections to either the number of cable connections, of wireless broadband connections, or of DSL connections over entrants' own facilities. A negative correlation is again found with the number of unbundled loops, though not with the number of bitstream connections. By contrast, they find a positive correlation between fiber connections offered by incumbents and connections offered by entrants over their own cable facilities (Table 4).

[6] Wallsten and Hausladen note, however, that an ability to discriminate (assuming the incentive exists) can remain to the extent independent ISPs still rely on access to facilities managed by the broadband provider, as when such ISPs use bitstream access instead of a fully unbundled loop.

The authors view the above results as collectively suggesting that mandated unbundling, at least of loops if not always bitstream access, discourages investment in all types of new facilities, by both incumbents and entrants, whereas inter-platform competition spurs deployment of new infrastructure. While these results are interesting, they should not be read as suggesting that unbundling should universally be abandoned in favour of purely facilities-based competition. In particular, there are at least two countervailing arguments. First, the scope for inter-platform broadband competition, at least in the short term, may be quite limited in some countries where telephone companies mostly own the only line into the home because cable networks were not as extensively deployed as in the U.S. Second, even if mandated unbundling causes disincentives to new investment, it may spur valuable broadband competition using the incumbent's facilities and, hence, expanded use of this existing infrastructure.[7] Consequently, additional work and analysis is necessary before developing more conclusive policy judgments about the desirability of loop unbundling

7 Speta

Speta picks up a strand of the Wallsten and Hausladen analysis to suggest that the network neutrality debate in the U.S. should be viewed as an interim question until sufficient evidence is provided regarding the nature and extent of the incumbent's market power. He stresses that this is still an under-examined issue. More generally, Speta highlights that the lack of transparency and understanding of network offerings is a concern that policymakers should focus on remedying (either through FCC or FTC oversight). Putting the two points together, Speta argues that "to the extent there is any competition in the market, making the carriers' practices transparent would assist market discipline."

Speta, despite his prior scepticism of network neutrality rules, calls for a categorical "no blocking" rule on both policy and political grounds. Not only does he see an economic basis for such a rule – as a check on using interconnection as a strategic tool against competitors – he highlights that "the social value of interconnected networks is quite significant." In so doing, he rejects the suggestion that differentiated network services can justify any denials of interconnection.

In Speta's view, the ultimate solution to the network neutrality debate is to bring greater empirical analysis to bear on the relevant set of issues and on the market power issue in particular. As he puts it, "the market power question is the right question because network neutrality policy should not be divorced from a theory of network foreclosure." (See also Farrell and Weiser 2003). In that regard, he views the Comcast proceeding as an unfortunate precedent and reflective of the FCC's tendency to avoid true empirical analysis in favor of impressionistic judgments. Going forward, he urges, the agency needs to reform its process of policy-formation and ground the substance of its regulations in a richer and

[7] There are case studies arguing that this occurred in France and Japan and that the increased intra-platform competition has even stimulated fiber deployment. See Leila (2006) explaining that, as a result of France's pro-competition policies, "[o]ver 1.1 million French subscribers pay as low as €29.99 ($36) monthly for a 'triple play' package called Free that includes 81 TV channels"; Nobuo (2003) explaining how, by 2003, increased competition has led to 9 million DSL customers, from a base of just 10,000 prior to the unbundling regulation; Bremner (2004) reporting that Japan's Yahoo BB!, which relied on line sharing, provided 10 megabits per second of broadband access at $20 to $30 in 2004.

more grounded basis in economic reality. Ideally, he suggests, such a firmer grounding would provide some structure for any network neutrality regulations to be managed with a lighter touch than traditional regulation – either using after-the-fact adjudications or self-regulation to that end.

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