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# Network Neutrality after Comcast: Toward a Case-by-Case Approach to Reasonable Network Management

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# Network Neutrality after *Comcast*: Toward a Case-by-Case Approach to Reasonable Network Management

**by**

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## Introduction

Over the past few years, network neutrality has emerged as perhaps the most contentious issue in communications policy. The issue has been the focus of numerous congressional hearings[1] and played a pivotal role during the consideration of comprehensive reform legislation in 2006.[2] Network neutrality also drew substantial attention from the Federal Trade Commission, which conducted two days of hearings and authored a lengthy report on the subject.[3] Most importantly, it has been a recurrent issue before the Federal Communications Commission (FCC), having influenced the clearance of numerous mergers[4] and prompted a recent notice of inquiry.[5] Network neutrality even emerged as a point of contention during the

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[1] *See, e.g.*, *The Internet Freedom Preservation Act of 2008: Hearing on H.R. 5353 Before the Subcommittee on Telecommunications and the Internet, House Committee on Energy and Commerce*, 110th Cong. (May 6, 2008); *Net Neutrality and Free Speech on the Internet: Hearing Before the Task Force on Competition Policy and Antitrust Laws, House Committee on the Judiciary*, 110th Cong. (March 11, 2008); *Communications Reform Bill Hearing II: Hearing on S. 286 Before the S. Comm. on Commerce, Science & Transportation*, 109th Cong. (2006); *Network Neutrality: Competition, Innovation, and Nondiscriminatory Access: Hearing Before the Telecom and Antitrust Task Force of the H. Comm. on the Judiciary*, 109th Cong. 4 (2006); *Net Neutrality: Hearing Before the S. Comm. on Commerce, Science & Transportation*, 109th Cong. (2006).

[2] *See* Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847, 1859-60 (2006).

[3] *See* FED. TRADE COMM'N, STAFF REPORT ON BROADBAND CONNECTIVITY COMPETITION POLICY (June 2007), *available at* http://www.ftc.gov/reports/broadband/v070000report.pdf.

[4] *See* Daniel F. Spulber and Christopher S. Yoo, *Mandating Access to Telecom and the Internet: The Hidden Side of* Trinko, 107 COLUM. L. REV. 1822, 1873-74 (2007) (discussing the role network neutrality played in the SBC-AT&T, Verizon-MCI, Adelphia-Time Warner, and AT&T-BellSouth mergers); Sprint Nextel Corp. and Clearwire Corp., Applications for Consent to Transfer Control of Licenses, Leases, and Authorizations, FCC 08-259, at 41 ¶ 99 (Nov. 7, 2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-259A1.pdf; Applications of Cellco Partnership d/b/a Verizon Wireless and Atlantis Holdings LLC for Consent to Transfer Control of Licenses, Authorizations, and Spectrum Manager and *De Facto* Transfer Leasing Arrangements, Memorandum Opinion and Order and Declaratory Ruling, FCC 08-258, at 88 ¶ 191 (Nov. 10, 2008), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-08-258A1.pdf.

[5] Broadband Industry Practices, Notice of Inquiry, 22 F.C.C.R. 7894 (2007).

presidential campaign.[6] Given Barack Obama's support for network neutrality both as a U.S. Senator and as a presidential candidate,[7] pressure for the adoption of network neutrality regulation will likely intensify in the near future.

I have long argued for a middle course in network neutrality. Rather than regulating network management practices through categorical, *ex ante* restrictions, I have advocated an *ex post*, case-by-case approach that imposes liability when and only when a particular practice is shown to give rise to harm competition.[8] Such a case-by-case approach would strike a balance between two opposing considerations. On the one hand, economic theories exist that demonstrate circumstances under which vertical integration and exclusivity arrangements can harm consumers. On the other hand, the scholarly consensus recognizes that those circumstances are quite limited and that vertical integration and exclusivity arrangements often benefit consumers. A case-by-case approach offers the promise of allowing regulatory authorities to redress the potential anticompetitive harms without preventing the realization of the potential benefits.

The FCC's recent order sanctioning Comcast for its network management practices embraced the type of *ex post*, case-by-case approach described above.[9] That said, the ultimate impact of the order remains unclear. As an initial matter, Comcast is currently challenging the

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6 *See* Lee Gomes, *Debugging Obama-McCain*, FORBES, Oct. 13, 2008, at 72.

7 *See* Obama '08, Barack Obama: Connecting and Empowering All Americans, Through Technology and Innovation, http://www.barackobama.com/pdf/issues/technology/Fact_Sheet_Innovation_and_Technology.pdf; Barack Obama, Net Neutrality (June 8, 2006), http://obama.senate.gov/podcast/060608-network_neutral/.

8 *See* Christopher S. Yoo, *Would Mandating Broadband Network Neutrality Help or Hurt Competition?: A Comment on the End-to-End Debate*, 3 J. ON TELECOMM. & HIGH TECH. L. 23, 43-46, 58-59 (2004) [hereinafter Yoo, *Comment on End-to-End*]; Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1, 7-8, 24, 75-76 (2005) [hereinafter Yoo, *Beyond Network Neutrality*]; Yoo, *supra* note 2, at 1854-55, 1900, 1908; Christopher S. Yoo, *Network Neutrality, Consumers, and Innovation*, 2008 U. CHI. LEGAL F. 179, 186-87, 212, 227, 238, 246-47, 257, 261 [hereinafter Yoo, *Consumers, and Innovation*].

9 Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-to-Peer Applications, Memorandum Opinion and Order, 23 F.C.C.R. 13028 ¶¶ 28-40 (2008).

legality of that order in the courts. Congress is poised to consider network neutrality legislation that would change the regulatory landscape considerably if Comcast should prevail in its challenge. Even if the Comcast order is upheld and serves as the foundation for a regime of network neutrality, by its nature the FCC's decision was limited to the particular fact pattern that was before the agency, which inevitably left the vast majority of the substantive content of the resulting case-by-case approach to future cases. Thus, the precise manner in which network neutrality regulation will be implemented remains an open question.

In this chapter, I discuss the type of considerations that a case-by-case approach should take into account. In particular, I address claims that network neutrality is needed to preserve innovation, protect consumers, and promote competition on the Internet, showing that on closer inspection the issues are not as clear as network neutrality proponents suggest. On the contrary, the ambiguousness of network neutrality's policy implications make it ideally suited to a case-by-case approach instead of *ex ante* prohibitions. Moreover, the potential benefits from deviating from network neutrality provide important considerations that a well designed case-by-case approach should take into account.

**Network Neutrality and Innovation**

When the Internet first arose, it was designed around a protocol known as TCP/IP. One of TCP/IP's distinguishing features is that it routes traffic without any awareness of the source of the traffic or the application with which it is associated.[10] Since those early days, network providers have begun to experiment with different network architectures. Some are prioritizing traffic associated with certain applications over other traffic. Others are charging higher prices to content and application providers who use higher bandwidth services.

[10] TCP/IP stands for transmission control protocol/Internet protocol.

According to network neutrality proponents, these changes threaten innovation in Internet content and applications in two ways. First, content and application providers' success depends in no small part on the number of customers they can reach. Allowing network providers to exercise greater control over the traffic flowing through their networks would enable those network providers to restrict the number of end users that any particular content or application provider could reach either by blocking them entirely or by charging content and application providers more in order to reach them.[11]

Second, TCP/IP fosters a particular type of innovation. Network neutrality proponents argue that one key to the Internet revolution is the commitment to an architecture in which the pipes through which the data flows are as simple and general as possible and in which all of the intelligence is concentrated in the computers operating at the edge of the network. This architecture frees content and application providers from the need to obtain permission from network providers before deploying their innovations. In other words, TCP/IP promotes innovation by decoupling content and application providers from the network through which that content and those application travel. Any deviation that creates a tighter integration between the network and the content/applications that the network is carrying would chill innovation by raising the danger that part of the value of any innovations might be captured by the network provider.[12]

Although there is certainly considerable truth to both of these claims, upon closer inspection, we find that in many cases deviations from network neutrality would actually prove

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[11] *See, e.g.*, Mark A. Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. REV. 925, 932 (2001) ("Because it does not discriminate in favor of certain s uses of the network and against others, the Internet has provided a competitive environment in which innovators know that their inventions will be used if useful.").

[12] *See, e.g.*, *id.* at 930-33, 939-46; LAWRENCE LESSIG, THE FUTURE OF IDEAS 34-37, 40-41, 162 (2002); Tim Wu, *The Broadband Debate, A User's Guide*, 3 J. ON TELECOMM. & HIGH TECH. L. 69, 73-74 (2004).

more effective in promoting innovation. The possibility that innovation might benefit from allowing network providers to experiment with different architectures not only suggests that *ex ante* network neutrality restrictions would probably be a policy mistake; it also provides an important consideration that any case-by-case approach must take into account.

***Changes in the Optimal Level of Standardization***

Consider first the claim that standardization and interoperability facilitate innovation by guaranteeing that content and application providers will be able to reach the broadest possible range of potential customers.[13] There is no question that standardization provides many benefits. Being able to offer products that are interoperable with as many other products as possible lowers the risks of innovation. Standardization also benefits consumers by maximizing price competition among those products.

Despite these benefits, not all products are standardized, nor should they be. Economic theorists have long recognized that one of the inevitable costs of standardization is the loss of product variety that must be traded off against the benefits of standardization. Such losses are trivial if customer preferences are homogeneous and in effect everyone wants the same thing. In those cases, the optimal solution is to standardize the network in accordance with what consumers desire most. A different situation obtains when end users' preferences vary widely. As customer preferences become increasingly heterogeneous, eventually the optimal solution is to establish multiple standards, with each tailored toward a different subsegment of end users.

The shifts in the population of end users have changed in ways that make moves toward a more diverse, nonstandardized Internet more likely. What began as a medium through which a

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[13] For a more technical discussion of the ideas that follow, see Yoo, *Beyond Network Neutrality*, *supra* note 8, at 33-37; Yoo, *Consumers, and Innovation*, *supra* note 8, at 212-14, 243-45; Yoo, *Comment on End-to-End*, *supra* note 8, at 56-59.

small number of academics sent e-mail and shared files has evolved into a mass market phenomenon. A rapidly growing number of end users are using the network in an ever increasing variety of ways.

Viewed from this perspective, the deployment of protocols optimized to perform different tasks may represent nothing more than the response of an industry attempting to meet consumer demand. As what consumers want becomes increasingly varied, it is natural and inevitable that the network will evolve to meet those demands. In other words, the shift away from the one-size-fits all Internet may actually represent nothing more than the natural byproduct of network providers' attempts to satisfy what consumers want.

I advance this argument without taking anything away from the benefits that standardization and interoperability can provide. In fact, a network firm faces powerful incentives to adhere to the existing standard. Moreover, the emergence of sufficient competition among last-mile providers should be sufficient to protect against anticompetitive outcomes without any need for governmental intervention.

Suppose, for example, that there are three network providers that all interconnect through the same protocol. How should policymakers respond should one of those providers wish to deviate from that protocol in a way that renders it noninteroperable with the other providers? Three outcomes are possible. First, the new standard may provide significant benefits to all consumers, in which case the provider that changed standards will increase its customer base until the other network providers follow suit. If so, the optimal result emerges without government intervention, and the last thing that policymakers should do is step in to compel adherence to the old standard. Second, the new standard may hold no appeal for consumers, in which case the network provider that changed standards will hemorrhage customers to its

competitors until it returns to the fold. Once again, the optimal solution will occur without the need for governmental intervention to mandate the old standard. Third, the new standard may appeal to some consumers, but not to others. If there are a sufficient number of customers that prefer the new standard, the result may well be that the provider that shifted to the new standard will continue to employ it, while the other providers continue to adhere to the old standard. In this case, nonstandardization yields benefits, and it would be a mistake for policymakers to intervene to mandate adherence to the old standard.

This simple example illustrates the economic insight that any firm seeking to differentiate its services does so in the face of powerful incentives to remain standardized and will only do so if it believes that the new standard will provide sufficient benefits to offset the reduction in the value of the network caused by the reduction in the number of other end users that its customers could reach through its network. In fact, this effect is so strong that the traditional concern in the economic literature is that network firms will be too unwilling to deviate from the existing standard and will adhere to established technologies even after they have become obsolete.[14] Even these concerns are dissipated if there is sufficient competition among network providers. Although the last-mile broadband market has not to date been highly competitive, in the last three years mobile wireless broadband networks have emerged as an increasingly viable broadband alternative. Furthermore, as I discuss in greater detail below, additional increases in competition among last-mile broadband depends in no small part on network providers' ability to prioritize traffic on the basis of applications and content.

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[14] *See* Yoo, *Beyond Network Neutrality*, *supra* note 8, at 73. For a review of the literature on tipping and lock-in in the context of broadband, see Christopher S. Yoo, *Vertical Integration and Media Regulation in the New Economy*, 19 YALE J. ON REG. 171, 278-82 (2002).

Note also that this hypothetical is framed as a polar choice between complete interoperability and completely noninteroperability. As network neutrality proponents acknowledge, complete noninteroperability is rarely a problem. Consumers can easily detect any attempt to completely block access to particular content and applications and are likely to force network providers to desist from any such practice.

The real issue lies in the spectrum of partial interoperability lying between these two extremes. In this space, prioritizing one set of applications does not preclude subscribers from running other applications. Instead, it represents a form of partial interoperability, in which all applications run on all networks, but some applications run better on some networks than others. One aspect of the economic literature on standardization that has been largely overlooked shows that the presence of perfect, low cost adapters that can serve as a gateway between two technologies essentially eliminates any anticompetitive concerns associated with nonstandardization.[15] When adapters are imperfect, the welfare implications are ambiguous.[16]

Circumstances thus exist where permitting network providers to deviate from the current network architecture may actually enhance rather than inhibit innovation on the Internet. Whether that is the case depends largely on the underlying heterogeneity of demand. And the presence of adapters might in some (but not all) cases ameliorate any welfare losses caused by nonstandardization. The complexity and the fact-intensiveness of the analysis offers strong support for a case-by-case approach that carefully examines each set of circumstances before intervening in order to make sure that the preconditions for harming innovation are met. The

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[15] *See* Michael L. Katz & Carl Shapiro, *Network Externalities, Competition, and Compatibility*, 75 AM. ECON. REV. 424, 439 (1985) ("[I]f the costs of adapting are negligible, and there are no other entry barriers, the market will be perfectly competitive.").

[16] *See* Joseph Farrell & Garth Saloner, *Converters, Compatibility, and the Control of Interfaces*, 40 J. INDUS. ECON. 9, 32 (1992) ("[C]onverters might seem to promise the benefits of compatibility without the loss of variety due to standardization Indeed, when converters are costless and perfect, this is true; but that is rare. In general, the welfare impact of the availability of converters is ambiguous.").

failure to undertake such nuanced assessments creates the real danger that mandating network neutrality may actually harm the innovation that network neutrality proponents seek to promote.

***Changes in the Optimal Level of Integration Between Networks and Applications***

As noted earlier, network neutrality proponents also contend that innovation is best promoted when there is minimal integration between the traffic riding on the network and the network itself. The claim is that decoupling content and applications from the network frees content and application providers to pursue whatever innovation they would like without having to seek permission from the network owner. The problem with this argument is that no protocol is optimized for every application. Thus the commitment to any particular architecture inevitably favors certain types of innovation over others, which suggests that the term "network neutrality" represents something of a misnomer.

The way that the current network architecture is skewing innovation can most easily be understood by focusing on two principles around which the current network is designed.[17] First, TCP/IP routes traffic on a "best efforts" basis, that is, it routes traffic without providing any guarantees that any particular packet will actually arrive at its destination. If the network becomes congested, some packets will be dropped and will have to be resent. Second, TCP/IP routes traffic on a "first come, first served" basis without giving priority to content associated with any particular application.

This approach to routing worked well for traditional early Internet applications, such as traditional e-mail and web browsing. Both primarily conveyed text and as a result were not particularly bandwidth intensive. In addition, for these applications delays of a fraction of a

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[17] For a more technical discussion of the ideas that follow, see Yoo, *Beyond Network Neutrality*, *supra* note 8, at 8, 20-23.

second were almost imperceptible, and consumers were not adversely affected if any particular packet was dropped and had to be resent.

Many contemporary Internet applications, such as streaming video, telemedicine, and online video games, are less tolerant of delay.[18] The problem is that TCP/IP cannot guarantee the quality of service that these applications need to survive. Although network neutrality proponents have suggested that the better solution would be for network providers to build more bandwidth,[19] the bandwidth limitations of some modes of transmission (such as wireless) are so severe that deploying more bandwidth is not a realistic solution under any time frame. Even when adding bandwidth is feasible, maintaining sufficient capacity is quite a challenge when conservative estimates project that network demand is growing at 50% each year and might double in the near future. The unpredictability of geographic shifts in population further complicates bandwidth planning, as do the unexpected surges in demand caused by the emergence of new services like YouTube. Bandwidth, moreover, cannot be expanded instantaneously. Unless network providers are expected to be perfectly prescient, situations will exist in which expanding bandwidth is simply not available as an option. In those circumstances, a simple solution would be to prioritize traffic associated with applications that are less tolerant of delay over traffic associated with applications that are more tolerant of delay.[20]

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[18] Another oft-cited example is Internet telephony, also known as voice over Internet Protocol (VoIP). Indeed, telephony is one of the examples that the scientists who laid out the Internet's original architecture said would be an exception to the system of end-to-end rechecking that characterized TCP/IP. *See* J.H. Saltzer et al., *End-to-End Arguments in System Design*, 2 ACM TRANSACTIONS ON COMPUTER SYS. 277, 285 (1984). Somewhat ironically, modern VoIP services do not even use TCP/IP, opting instead for a protocol known as UDP. Moreover, even though voice is relatively sensitive to delay, its bandwidth requirements are so low that it can be carried effectively through the bandwidth that exists today. *See* Edward W. Felten, Nuts and Bolts of Network Neutrality 9 (July 6, 2006), *available at* http://itpolicy.princeton.edu/pub/neutrality.pdf).

[19] *See, e.g.*, LESSIG, *supra* note 12, at 47; *Net Neutrality: Hearing Before the S. Comm. on Commerce, Science, and Transportation*, 109th Cong. 3-4 (2006) (statement of Gary R. Bachula, Vice President, Internet2), *available at* http://commerce.senate.gov/pdf/bachula-020706.pdf.

[20] *See* Yoo, *Beyond Network Neutrality*, *supra* note 8, at 22-23, 70-71; Yoo, *Consumers, and Innovation*, *supra* note 8, at 187-90, 228-32.

Network providers confronted with these constraints have no choice but to turn to some form of network management. Consider AT&T's uVerse offering. Rather than undertaking the expense of rewiring its entire service area for fiber, AT&T is attempting to deploy a triple play of voice, data, and multichannel video through a VDSL platform traveling over the existing network of telephone wires. To do so, AT&T must deploy a wide variety of techniques to conserve bandwidth. For example, instead of following cable television's practice of transmitting all of the available channels regardless of whether the subscriber is watching them, AT&T employs a switched digital video technology that only transmits those channels that customers are actually viewing. In addition, AT&T violates network neutrality by prioritizing its own IP video traffic over other traffic, a practice that was explicitly condoned by the network neutrality commitment included in the order approving AT&T's acquisition of BellSouth.[21]

A similar problem is faced by mobile wireless broadband providers. Many of them throttle video for the simple reason that unless they do so, the decision by a small number of end users to download video would render the service unusable for every other customer. Other mobile wireless providers are experimenting with a wide range of alternative solutions. Some are employing increasingly intelligent networks that can detect whether a particular mobile device is located in a high bandwidth or low bandwidth area. When in a low bandwidth location, the network holds back traffic associated with applications like e-mail that are not particularly sensitive to delay and gives priority to traffic associated with applications like voice that are very sensitive to delay. Many of these solutions are quite innovative. The problem is that they require a greater degree of prioritization and integration between networks, applications, and devices than permitted by most forms of network neutrality. Barring prioritization and

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[21] AT&T Inc. and BellSouth Corp. Application for Transfer of Control, Memorandum Opinion and Order, 22 F.C.C.R. 5662, 5814 (2007).

restricting intelligence to the edges of the network would foreclose these solutions from being implemented, which in turn would place a burden that would fall particularly disproportionately hard on those applications that are sensitive to latency.

TCP/IP's inability to support the new demands that end users are placing on the network has led many of the leading figures in the establishment of the Internet to suggest that the existing network architecture may be becoming obsolete.[22] It also explains why the National Science Foundation has begun a project known as the Global Environment for Network Innovations dedicated to providing a new platform to avoid the limitations built into the Internet's current design that inhibit emerging applications and technologies.[23]

These examples illustrate that government mandated adherence to the Internet's current design would be anything but neutral. Contrary to the claims of network neutrality proponents, the Internet's current architecture only fosters competition among a particular subset of Internet content and applications, i.e., those content and applications optimized for the network as it exists today. It effectively discriminates against innovations that depend on a different network design.

This in turn suggests that allowing network providers to experiment with architectures that prioritize particular applications and permit a closer integration of network, applications, and devices would foster a different and perhaps deeper kind of innovation. If so, mandating that the Internet remain seamlessly interoperable with the intelligence residing solely at the edges of the

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[22] *See* Andrew Orlowski, *Father of Internet Warns Against Net Neutrality*, THE REGISTER, Jan. 18, 2007, http://www.theregister.co.uk/2007/01/18/kahn_net_neutrality_warning/ (quoting TCP/IP co-author Robert Kahn); David Talbot, *The Internet Is Broken*, MIT TECH. REV., Dec. 2005/Jan. 2006, at 63, *available at* http://www.technologyreview.com/article/16356/ (quoting Internet elder statesman and onetime chief protocol architect David D. Clark); Carol Wilson, *Point of No Return*, TELEPHONY, Apr. 3, 2006, *available at* http://voip-blog.tmcnet.com/blog/rich-tehrani/voip/point-of-no-return.html (quoting former FCC Chief Technologist and so-called "grandfather of the Internet" David Farber).

[23] GENI: Global Environment for Network Innovations, Conceptual Design Project Execution Plan, GDD-06-07, at 7 (Jan. 10, 2006), *available at* http://www.geni.net/GDD/GDD-06-07.pdf.

network might have the perverse effect of inhibiting the very innovation that network neutrality proponents seek to promote. The possibility that innovation might well be better promoted by allowing greater integration between the network and the applications and devices running on it is thus an important consideration that should be taken into account in any case-by-case approach to network neutrality.

**Network Neutrality and Consumers**

Network neutrality proponents often frame their arguments in terms of consumers as well as innovation. One argument is that network neutrality would maximize consumer choice by allowing end users to assert complete control over the content and applications they access. For the reasons laid out above, it would only maximize choice among a constrained set of options, i.e., content and application optimized for the existing set of protocols. At the same time, it would limit consumer choice by forestalling the emergence of innovations based on architectures that allow a tighter integration of the network and applications. This loss is often hard to discern, as it is difficult to determine the value of an opportunity that never appeared. But the loss to consumers is quite real nonetheless.

I would like to focus the rest of this section on the two other claims about how network neutrality would affect consumers. The first is that allowing network providers to offer prioritized service would create a two-tiered Internet in which only the rich would get the fast lane, while those unable or unwilling to pay would be consigned to the slow lane.[24] The second

[24] *See, e.g.*, Lawrence Lessig & Robert W. McChesney, *No Tolls on the Internet*, WASH. POST, June 8, 2006, at A23; 152 CONG. REC. S8367-68 (daily ed. July 27, 2006) (statement of Sen. Ron Wyden).

is that allowing network providers to charge content and application providers more for premium services would force consumers to pay twice.[25]

Closer analysis reveals that these claims are more complicated and controversial than network neutrality proponents suggest. In many cases, permitting network providers to offer multiple classes of services may actually lower the prices that consumers pay. Any attempt to mandate network neutrality must take into account the possibility that doing so may end up harming as well as benefiting consumers.

***The Potential Consumer Benefits from Tiered Services***

The error in the claim that only deep pocketed consumers and corporations would be able to gain access to the fast lane is well illustrated through an analogy to postal services.[26] It is simply false that only the rich and the well heeled use overnight mail and that small companies and consumers of moderate means are consigned to using first class mail. Instead, customers choose their service based on how much they need a given level of service. Customers who do not mind if a particular letter takes as many as three days to travel from coast to coast will continue to use first class mail regardless of their ability to pay. Conversely, companies with business models that depend on overnight delivery recognize that overnight service requires greater costs. They willingly and gladly pay more for faster services for the simple reason that without premium prices, the overnight services on which their business models depend would not exist. This is true whether the firm is a Fortune 500 with enormous reserves or a startup that is working hard to conserve its cash. Similarly, consumers who absolutely, positively need a

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[25] *See, e.g.*, *Net Neutrality: Hearing Before the S. Comm. on Commerce, Science, and Transportation*, 109th Cong. 6 (2006) (statement of Vinton G. Cerf, Vice President and Chief Internet Evangelist, Google, Inc.), *available at* http://commerce.senate.gov/pdf/cerf-020706.pdf [hereinafter Cerf testimony].

[26] *See* Yoo, *Consumers, and Innovation*, *supra* note 8, at 232-33.

letter delivered overnight are similarly grateful for the existence of carriers able to provide those services. Although they would no doubt wish to pay the lowest price possible, they recognize that the price for an overnight letter will inevitably exceed the 42 cents needed for a first class stamp.

Consider further what would happen if the postal authorities forbade carriers from differentiating between overnight mail and regular first class mail and instead required them to offer a single class of service. The postal service would face three choices. It could require that all mail travel as first class mail, in which case all letters would take three days to travel coast to coast and cost 42 cents. Unifying service in this manner would frustrate the interests of businesses and consumers who need overnight delivery but can no longer obtain it no matter how much they might be willing to pay for it. Alternatively, the postal service could require that all mail travel as express mail, in which case all letters would travel coast to coast overnight and would cost over $15. This would force all mailers to pay higher prices even though many of them would not need speedy delivery. Lastly, the postal service could split the difference, such as by delivering coast-to-coast mail in two days for a cost of approximately $5 in a manner similar to priority mail. Although this service would be well suited to some customers, it would simultaneously increase the prices of those who were perfectly happy with the level of service provided by first class mail and deny service to those who need overnight delivery. The more straightforward solution is to allow the postal service to offer multiple classes of service. That way, each customer can obtain the services they need while only paying for the levels of service that they actually need.

How does this play out in the context of the Internet? The fact that traffic is growing at a rate of 50% a year or more means that network providers must invest heavily to increase the

bandwidth capacity of their networks. Verizon has committed to investing $24 billion to deploy its fiber-based FiOS network. Other providers have chosen less costly solutions, such as AT&T's deployment of its VDSL uVerse network and the cable industry's upgrade to DOCSIS 3.0. But even in those cases, the capital expenditures are significant.

In an ideal consumer world, network providers would provide these bandwidth enhancements without raising prices. The reality is that network providers must have some reasonable prospect of recovering these capital expenditures if they are expected to undertake them. Thus, absent the unlikely event of direct government subsidies, a network provider that was unable to offer different classes of service would have to raise the prices for all consumers to the price needed to support the higher level of service. This would have the unfortunate effect of raising prices for end users who only use the Internet for low bandwidth applications like e-mail and are perfectly happy with the service they were receiving before. Moreover, unless some form of metered pricing is imposed, the price would be set equal to the usage levels of the average consumer. This would overcharge below-average users while simultaneously undercharging above-average uses, in effect forcing low-bandwidth users to cross subsidize high-bandwidth users.[27]

Moreover, a network provider that is only allowed to offer a single class of service will choose the bandwidth level that appeals to the largest number of customers possible. Limiting network providers to offering a single class of service thus makes it unlikely that those consumers who do want the highest level of bandwidth possible will be able to get it. The situation is quite different if you allow differential pricing. Rather than raise prices on everyone, network providers have the ability to charge higher prices to those who need the enhanced

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[27] *See* Yoo, *supra* note 2, at 1853-54.

services without raising the prices for those who were happy with the prior levels of service. Such a solution would accord with economic efficiency and general ideas of fairness, in that it would require those who need and benefit from the improved service to pay for those improvements without placing additional burdens on those who do not benefit from the service enhancement.

On a broader level, these insights about the benefits of differential pricing for enhanced services provides another example of how the Internet is evolving away from one-size-fits-all solutions. By focusing exclusively on the consumer benefits from nondiscrimination among the content and applications that exist today, network neutrality proponents overlook the benefits arising from the ability to tailor pricing and services to individual consumers' needs.

***The Economics of Two-Sided Markets***

At a somewhat more technical level, economic theory not only justifies allowing network owners to charge differential prices to consumers. The economics of two-sided markets also identifies potential consumer benefits from allowing network operators to impose differential prices on content and application providers as well.[28]

The economics of two-sided markets are somewhat complex. Conventional economics has long recognized the existence of "network economic effects," which cause a network to increase in value as the number of users connected to it increases. To use a classic example, the value of a telephone network to consumers is thus determined by more than just the price charged and the services provided, as is the case with most goods. It also depends on the number

[28] For a more extended discussion of the implications of the economics of two-sided markets for network neutrality, see Yoo, *Consumers and Innovation*, *supra* note 8, at 222-27.

of other subscribers connected to the network. The more people you can reach through the network, the more valuable it becomes.

The telephone system is an example of a one-sided market, in that the value to any particular caller is determined in no small part by the number of similarly situated callers. When a market is two sided, instead of bringing together a single class of similarly situated users, networks bring together two completely different classes of users. In those cases, the value is determined not by the number of users of the same class, but rather the number of users of the other class. To put it in terms of a concrete example, consider the economics of broadcast television, which generates revenue from advertisers based on the number viewers the industry can deliver. The value of the network for advertisers is not determined by the number of other advertisers. Instead, the value of the network increases with the number of a different class of network participants (i.e., television viewers).

The economics of two-sided markets indicate that it may be socially beneficial for content and application providers to subsidize the prices paid by end users. The fact that the Internet has become increasingly dominated by advertising revenue paid to content and application providers rather than network providers makes this particularly likely to be true. An advertiser's willingness to pay for an ad on any particular website depends on the number of end users viewing that website. Under these circumstances, the optimal solution may be for the website owner to subsidize the total number of end users by making payments to the network provider to help defray their costs of connection. The costs of subsidizing more users would be more than offset by the additional revenue generated by the fact that advertisers can now reach more potential customers.[29]

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[29] *See id.* at 225-26.

These revenue-side pressures are reinforced by cost-side considerations. The cost of connecting content and application providers to the Internet is quite low, typically only requiring a single high-speed line to a small number of business locations. The cost of connecting end users to the Internet is much higher, requiring the wiring and upgrading of equipment in entire neighborhoods. In an industry in which the primary revenue is flowing to content and application providers and the costs involved in connecting content and application providers are much smaller than the costs of connecting end users, one would expect some cash to flow from content and application providers to those who are providing connections to end users.[30]

These dynamics are again well illustrated by broadcast television. In many ways, broadcast television and the Internet are analogous. The movie studios that create television programs play a similar role to content and application providers. Television networks aggregate programs and deliver them nationally in much the same manner as server-side network providers and backbone providers. Local broadcast stations provide last-mile connectivity that is quite similar to the role played by DSL and cable modem providers. In addition, the revenue structure is quite comparable, in that television networks receive advertising revenue in much the same manner as content and application providers. Furthermore, the cost structure is somewhat similar in that connecting individual homes is much more costly than distributing programming nationally.

For decades, the standard business arrangement has been for television networks to subsidize the operations of local broadcast stations by paying them to be members of their

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[30] *See* P. Faratin et al., Complexity of Internet Interconnections: Technology Incentives and Implications for Policy 13 (Sept. 30, 2007) (paper presented at the 35th Annual Telecommunications Policy Research Conference), *available at* http://web.si.umich.edu/tprc/papers/2007/797/Clark%20Lehr%20Faratin%20Complexity%20Interconnection%20TPRC%202007.pdf.

television networks. The industry's revenue and cost structure make such arrangements quite logical. The cost of paying these broadcast stations to affiliate with a network is more than offset by the increase in advertising revenue made possible by the fact that the network is now able to reach a larger audience. Broadcast television thus represents a prime example of when firms operating on one side of the market find it economically beneficial to subsidize end users on the other side of the market.

Furthermore, the magnitude of the affiliation fees that the networks pay to broadcast stations is anything but uniform. The precise amount paid varies with the relative strength of the network and the relative strength of the broadcast station. Stronger broadcast stations receive more, while weaker ones receive less. Equally interesting is the fact that in recent years, the cash flow has begun to vary in its direction as well as magnitude, with weaker stations having to pay rather than be paid to be part of the television network. The dynamic nature of this pricing regime benefits consumers by providing incentives for networks to invest in better quality programming and by providing an incentive for stations to provide better carriage.

Pricing flexibility is the standard mechanism by which our society rewards socially beneficial behavior and reallocates resources. This process of equilibration works well so long as entry barriers are relatively low and inputs are relatively mobile. These conditions are easily met with respect to content and applications, which are already very competitive and unprotected by entry barriers (and therefore likely to remain that way). The upsurge of mobile wireless as a last-mile platform has made these conditions easier to satisfy on the network provider side as well. The impending emergence of new broadband platforms made possible by the 700 MHz auction and other technologies promises to open the last-mile to competition still further in the future.

The two-sided market analysis reveals the problems with the claim that allowing network providers to charge content and application providers for premium services would force consumers to pay twice. As a general matter, pricing flexibility makes it easier for network providers to recover the costs of building additional bandwidth. Left to their own devices, network providers would set prices designed to maximize the revenue generated by each side of the market. So long as competitive entry is sufficiently feasible to prevent network providers from simply pocketing the extra returns, facilitating network providers' ability to generate revenue from one side of the market will reduce the proportion of the fixed costs that the network provider will have to recover from the other side of the market. Thus granting network providers pricing flexibility with respect to content and application providers should reduce the economic burden borne by end users.

Conversely, preventing network providers from exercising pricing flexibility with respect to content and application providers while permitting them to exercise pricing flexibility against end users simply increases the proportion of the cost network providers must recover directly from end users. This simultaneously raises the prices paid by consumers and decreases the likelihood that the capital improvements will ever be built.[31] Conversely, enhancing pricing flexibility on both sides of the market increases the likelihood that network providers will recover a greater proportion of the costs of upgrading the network from content and application providers. Charging content and application providers premium prices for premium services is thus a way to reduce, not increase, the burden borne by consumers.

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[31] *See Wall Street's Perspective on Telecommunications: Hearing Before the S. Comm. on Commerce, Science, and Transportation*, 109th Cong. 3-4 (2006) (testimony of Craig E. Moffett, Vice President and Senior Analyst, Sanford C. Bernstein & Co.), *available at* http://commerce.senate.gov/pdf/moffett-031406.pdf.

This is not to say that allowing network providers to offer multiple classes of services would always be economically beneficial. If perfect price discrimination were feasible, differential pricing schemes would invariably benefit society. Perfect price discrimination is impossible, however, and to the extent that price discrimination is imperfect, the practice might reduce as well as increase economic welfare. That said, economic textbooks generally conclude that imperfect price discrimination is more likely to be beneficial than not.[32] In any event, the real possibility that price discrimination may benefit and not just harm consumers counsels strongly against erecting a categorical ban against the practice and provides an important consideration that a well designed case-by-case approach should take into account.

**Network Neutrality and Last-Mile Competition**

Perhaps the most important consideration that should be incorporated into a case-by-case analysis is the impact that any network neutrality mandate would have on competition in the last mile. It is often overlooked that mandating access to the existing network represents only one of two ways to promote competition in content and applications. The other is to promote entry by new last-mile providers.[33] Once a sufficient number of last-mile providers exists, any content or application provider unable to obtain access from one last-mile provider will simply turn to one of its competitors. Indeed, most network neutrality proponents agree the emergence of competition in the last-mile would render network neutrality regulation unnecessary.[34]

There are a number of important considerations that should inform the choice between these two approaches. As an initial matter, experience has shown that mandated access regimes

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[32] *See* RICHARD G. LIPSEY ET AL., ECONOMICS 241 (8th ed. 1987); F.M. SCHERER & DAVID ROSS, INDUSTRIAL MARKET STRUCTURE AND ECONOMIC PERFORMANCE 495 (3d ed. 1990).

[33] *See* Yoo, *Comment on End-to-End*, *supra* note 8, at 67-68.

[34] *See, e.g.*, Cerf testimony, *supra* note 25, at 7.

are extremely difficult to implement.[35] For example, if the network provider offers its own content and applications, a simple nondiscrimination mandate will simply lead the network provider to charge a nondiscriminatory price that is so exorbitant that independent providers of content and applications will not be able to pay it. The fact that the vertically integrated content and applications will also have to pay the higher price is of little consequence, because any losses suffered by the content and application division will be offset by gains enjoyed by the networking division. Thus, absent rate regulation, the network provider can continue to exclude unaffiliated content and applications simply by transferring profits from one division to another. In addition, without rate regulation, access rules simply require the network owner to share its monopoly while continuing to allow it to charge the monopoly price. The lack of any price decrease means that consumers do not benefit at all.[36]

Any access regime must thus necessarily be accompanied by rate regulation. As I have argued at greater length elsewhere, rate regulation is particularly likely to fail when the commodity being regulated varies in quality. For example, research has shown that cable operators were able to defeat regulation by degrading the quality of their programming. Thus, regulators seeking to impose rate regulation over such providers must undertake the difficult job or regulating quality as well as price. Furthermore, the implementation of rate regulation is particularly ineffective in industries undergoing rapid technological change.[37]

The fact that compelled access forces two unwilling business partners to do business with one another means that the network provider will do no more than the minimum necessary to

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[35] *See* Yoo, *Beyond Network Neutrality*, *supra* note 8, at 37-48; Yoo, *supra* note 2, at 1896-97; Yoo, *supra* note 14, at 244-46, 268-69.

[36] *See* Yoo, *Beyond Network Neutrality*, *supra* note 8, at 15; Yoo, *Comment on End-to-End*, *supra* note 8, at 56.

[37] *See* Christopher S. Yoo, *Architectural Censorship and the FCC* , 78 S. CAL. L. REV. 669, 685-87 (2005); Yoo, *Beyond Network Neutrality*, *supra* note 8, at 42-43.

comply with its legal obligations. The parties can be expected to argue over a wide range of nonprice issues. As the Supreme Court has recognized, such negotiations are likely to be extremely protracted and difficult to police when the interface is complex and multifaceted, as the network owner will have an almost limitless number of ways to degrade service at its disposal.[38] Thus in order to succeed, access requires nearly comprehensive regulation of the business relationship between the two parties. It is for these reasons that the FCC's experience policing access regimes has not been a happy one. The agency's attempts to implement such varied regimes as leased access, video dialtone, and open video services have largely failed. Equally troubling is the difficulties the agency has encountered implementing the access provisions of the Telecommunications Act of 1996, which has engendered a decade of litigation and few real benefits.[39]

Perhaps most troubling is that the mandatory access approach contains no exit plan. When competitive entry is possible, short-run supracompetitive returns are not only unproblematic, they are essential to the proper functioning of the economic system. It is the desire to share in these supracompetitive returns that stimulates others to reallocate resources and sell a competing product. This entry will occur until all supracompetitive returns are dissipated. The imposition of rate regulation as part of access regulation short circuits this mechanism, because limiting the network provider's ability to earn supracompetitive returns reduces the incentive for others to enter the market. This dynamic is again nicely illustrated by the broadcast television industry. The longstanding triopoly of television networks led the FCC to impose a wide variety of measures to limit broadcast networks' profitability. Because these rules limited the profitability of new networks as well as incumbents, they actually became an entry barrier, as

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[38] *See* Verizon Commc'ns Inc. v. Law Offices of Curtis V. Trinko, LLP, 540 U.S. 411, 414 (2004).

[39] *See* Yoo, *Beyond Network Neutrality*, *supra* note 8, at 39-42; Yoo, *supra* note 14, at 244-46, 268-69.

demonstrated by the fact that the Fox network needed to be exempted from these rules before it became viable.[40] Access regulation is thus best understood as surrender to the putative monopoly and presumes that regulation will be indefinite.[41] Such an approach might be defensible if entry by competitors is impossible. As noted above, that precondition becomes less true with every passing year.

Consider the alternative, which is promoting innovation and consumer benefits by promoting competition in the last mile. Even network neutrality proponents concede that the need for regulation disappears once sufficient last-mile competition has emerged. As it turns out, there is a deep connection between the prioritization of applications and promoting last-mile competition. The connection is illustrated by the problems faced by companies using white spaces in the spectrum to provide wireless broadband in rural areas. Given the limited amount of bandwidth they are permitted to use, these companies must prioritize time sensitive applications (such as voice) over less time sensitive applications (such as file downloading) if they are to provide adequate service. In addition, they completely bar certain high-bandwidth applications altogether, as a single user employing them would prevent any other user from obtaining service. Such prioritization is an integral part of their survival as a last-mile competitor.

Another example is AT&T's uVerse network, which uses the limited bandwidth previously deployed for voice communications to offer video as well. Because video is one of those applications that are very sensitive to delay, the only way AT&T can offer an acceptable video service is by giving video traffic priority over other traffic. The resulting competition with cable for multichannel video helps satisfy one of our nation's longest standing goals in communications policy. Certain technologies simply cannot provide the guaranteed quality of

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40 *See* Yoo, *Beyond Network Neutrality*, *supra* note 8, at 49 n.188.

41 *See id.* at 11, 51, 76; Yoo, *Comment on End-to-End*, *supra* note 8, at 56.

service needed to support high bandwidth applications like video unless video traffic is given priority.

As noted earlier, mobile broadband providers are similarly experimenting with different solutions to solve the strict bandwidth limitations that they face. Many throttle video for the simple reason that if they did not do so, video downloading would render the service unusable by other customers. Others prioritize traffic associated with latency-sensitive applications over other traffic. Others are transferring functions in to the computing power contained in handheld devices. Still others are transferring functions into the network itself.

I have shown elsewhere how allowing network providers greater flexibility in managing congestion on the Internet can provide real benefits to consumers.[42] Indeed, it is possible to analyze the engineering tradeoff between building additional bandwidth and permitting network providers to prioritize traffic. If network providers are not allowed to use prioritization to guarantee throughput rates, they must maintain additional bandwidth to ensure that sufficient excess capacity exists to carry that traffic without delay. A recent study estimated that a network without prioritization might have to maintain up to 60% more capacity than a network offering prioritized service.[43] The need to maintain excess capacity will deter the buildout of broadband networks by raising the density of customers needed for the service to break even. The failure to prioritize thus threatens to worsen the digital divide by making it more difficult to serve rural areas.

These examples underscore the incredible variation in technical challenges confronting different transmission technologies and how innovative the industry has been in meeting those

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[42] *See* Yoo, *supra* note 2, at 1863-85.

[43] *See* Joseph D. Houle et al., The Evolving Internet—Traffic, Engineering, and Roles 5 (paper presented at the 35th Annual Telecommunications Policy Research Conference, Sept. 30, 2007), *available at* http://web.si.umich.edu/tprc/papers/2007/786/Evolving%20Internet.pdf.

challenges. Without the ability to prioritize traffic on the basis of the underlying application, many of these providers could not survive as last-mile competitors. It is difficult to predict which, if any, of these strategies will prove successful. Indeed, it is quite likely that different portions of the industry may adopt different solutions dictated by their underlying technology.

Any case-by-case approach must be careful to take these considerations into account and to leave network providers with enough flexibility to experiment with different strategies. Too strict an approach would forestall innovative solutions to address bandwidth limitations.

## Recommendations and Conclusions

To date, the debate over network neutrality has been framed in largely categorical terms, with both sides trying to claim the virtues of freedom, innovation, consumer welfare, and competition. A closer analysis of the issue reveals that it is more complex and variegated than the terms of the existing debate suggest. The economic literature does acknowledge the existence of circumstances under which deviations from network neutrality might give rise to anticompetitive harms. At the same time, the literature shows that those harms can only arise under limited circumstances and that deviations from network neutrality may actually create substantial benefits.

The ambiguity of network neutrality's policy implications underscores the propriety of adopting a case-by-case approach. As the Supreme Court has long recognized, *ex ante*, categorical rules are blunt instruments that do not permit fine distinctions. This is why the Supreme Court has reserved them for things that are so clearly detrimental that little would be lost if the practice were to be banned altogether. And even then, the Supreme Court has long recognized that such *ex ante* approaches should not be applied when a practice is so new that the Court does not have sufficient experience to predict the likely economic impact of prohibiting it.

When a practice is either new or when its economic impact is unclear, as seems to be the case with deviations from network neutrality, the better approach is to take an *ex post*, case-by-case approach.[44]

The bigger question is how that case-by-case approach should be applied. The foregoing analysis identifies numerous considerations that policymakers should take into account. In most cases, these considerations require a close examination of the facts of each particular case. Eventually, enough precedents will exist to permit those planning in the shadow of network neutrality rules to discern the principles being applied. The problem is that considerable uncertainty will exist until a sufficient critical mass of decisions is reached,

The FCC would thus be well advised to offer more details about the approach it will apply in future cases. The most logical approach would be to use the basic principles animating antitrust law to fill in the content of the case-by-case analysis. Antitrust jurisprudence represents perhaps the most systematic and comprehensive body of law designed to evaluate practices to make sure that they promote the interests of consumers and innovation. Equally importantly, by placing the burden of proof on the party challenging a particular practice, antitrust law is designed to ensure every economic actor has enough breathing room to experiment with different approaches. Although it is tempting to place the burden of proof on those who wish to deviate from the status quo, there are risks in adhering to, as well as deviating from, the status quo. That is why leading theorists have concluded that prophylactic regulation in favor of the status quo is

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[44] For classic statements, see *Northern Pacific Railway Co. v. United States*, 356 U.S. 1, 5 (1957); *Continental T.V., Inc. v. GTE Sylvania Inc.*, 433 U.S. 36, 49-51 (1977); *Broadcast Music, Inc. v. Columbia Broadcasting System, Inc.*, 441 U.S. 1, 8-9 (1979); *Business Electronics Corp. v. Sharp Electronics Corp.*, 485 U.S. 717, 723 (1988). For the Court's most recent statements, see *State Oil Co. v. Khan*, 522 U.S. 3, 10 (1997); *Texaco Inc. v. Dagher*, 547 U.S. 1, 5 (2006); *Leegin Creative Leather Products, Inc. v. PSKS, Inc.*, 127 S. Ct. 2705, 2712-13 (2007).

justified only when the potential adverse consequences are truly catastrophic and irreversible.[45] Any other rule would prevent society from finding which, if any, alternative states of the world might be socially beneficial.[46]

In addition, antitrust law teaches that any case-by-case approach must also be careful to protect consumers, not competitors. Every change inevitably creates winners and losers, and deviations from the status quo are often opposed by the players dominating the current market, as they are the ones with the most invested in the network as it exists today and thus are the ones with the most to lose. The success that the Internet has enjoyed under its current architecture should not blind policymakers to the fact that the world is constantly changing. They should instead take care to remain open to the possibility that abandoning the one-size-fits-all solution that has long characterized the Internet may be the best way to promote invitation and to benefit consumers.

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[45] *See* CASS R. SUNSTEIN, LAWS OF FEAR: BEYOND THE PRECAUTIONARY PRINCIPLE 26-34 (2005).

[46] *See* Yoo, *Beyond Network Neutrality*, *supra* note 8, at 12, 74; Yoo, *supra* note 2, at 1852, 1855, 1899, 1908.