Journal of Competition Law & Economics, 6(3), 521–594
doi:10.1093/joclec/nhq003
Advance Access publication 5 July 2010

INNOVATION SPILLOVERS AND THE "DIRT ROAD" FALLACY: THE INTELLECTUAL BANKRUPTCY OF BANNING OPTIONAL TRANSACTIONS FOR ENHANCED DELIVERY OVER THE INTERNET

J. Gregory Sidak * *& David J. Teece*†

ABSTRACT

In October 2009, the Federal Communications Commission proposed "net neutrality" regulations, including a new rule that would have the effect of banning optional business-to-business transactions between broadband Internet service providers (ISPs) and content providers for enhanced delivery of packets over the Internet. The proposed "nondiscrimination" rule would have the ironic effect of actively discriminating against any kind of content or application that is differentiated by its need for greater assurance of higher quality transmission across the Internet (known as quality of service, or QoS) than undifferentiated best-effort delivery can offer. This result not only would reduce static efficiency by encouraging higher consumer prices, but also would reduce dynamic efficiency by retarding innovation. The proposed rule manifests an inverse relationship between means and ends, for it would actively thwart the Commission's stated purpose of promoting innovation both in and at the edges of the network. These economic considerations set the bar very high for those who claim that the new regulation is needed to prevent theoretical harms that have not materialized in more than a decade of real-world experience. By now, the economic arguments in favor of network neutrality regulation have coalesced around three principal theories. The first is the theory that, if permitted to charge suppliers of content or applications for optional higher quality delivery, network operators will ignore positive spillover effects and set charges at higher than socially optimal levels. The second is the theory that vertically integrated network operators will foreclose independent providers of Internet content and applications. A third and less clearly articulated theory is that the broadband ISP will degrade the quality of best-effort delivery of Internet packets—reducing the quality of best-effort delivery to that

* Chairman, Criterion Economics, L.L.C.; Ronald Coase Professor of Law and Economics, Tilburg Law and Economics Center (TILEC), Tilburg University, The Netherlands; President, The Coase Foundation for Law & Economics, Washington, D.C. E-mail: jgsidak@criterioneconomics.com.

† Thomas W. Tusher Professor in Global Business and Director, Center for Global Strategy and Governance, Haas School of Business, University of California, Berkeley. E-mail: teece@haas.berkeley.edu. We thank AT&T for financial support. However, the views express here are solely our own.

of a "dirt road"—as a means of coercing suppliers of content or applications into purchasing superior QoS. We show that none of these three theories of harm is plausible. Certainly, none justifies the proposed across-the-board ban on optional business-to-business QoS transactions between ISPs and content providers—transactions that could prove particularly valuable to smaller content providers looking to differentiate their offerings from and compete with larger content rivals that have the scale and resources to meet their QoS needs with third-party or self-deployed content delivery networks.

JEL: K20; K21; K23; L40; L50; L51; L52; L96; L98; O31; O38

I. INTRODUCTION

"The Internet revolution has ended just as surprisingly as it began. None expected the explosion of creativity that the network produced; few expected that explosion to collapse as quickly and profoundly as it has."[1] Lawrence Lessig's inaccurate assessment in November 2001 was perhaps the first marker in the network neutrality movement. Much has been said about network neutrality since creativity supposedly died in 2001. The early work by those advocating network neutrality regulation—primarily Lessig[2] and Tim Wu[3]—posited dire outcomes without explaining why those outcomes were likely to occur under real-world conditions or why they were consistent with settled economic understandings of the remarkably dynamic markets that had produced the Internet. Nor did the early proponents of network neutrality regulation explain how their recommended regulation would be targeted to remedy those theorized harms. The early proponents of network neutrality regulation also ignored the obvious costs of their proposed regulation. They shared a utopian view of technology and a dystopian view of the private ordering of economic activity. Their arguments eschewed the theoretical and empirical constructs of microeconomic analysis of competition and regulation found in peer-reviewed journals.

The work by law professors Lessig, Wu, and Barbara van Schewick[4] propounded several key assumptions or theories about network neutrality. First was the assumption that monopoly power exists in broadband Internet

[1] Lawrence Lessig, *The Internet Under Siege*, 127 FOREIGN POL'Y 56, 56 (2001).

[2] *See id*; LAWRENCE LESSIG, THE FUTURE OF IDEAS: THE FATE OF THE COMMONS IN A CONNECTED WORLD (Random House 2001) [hereinafter LESSIG, THE FUTURE of IDEAS]; Lawrence Lessig, *Congress Must Keep Broadband Competition Alive*, FIN. TIMES, Oct. 18, 2006; Lawrence Lessig & Robert W. McChesney, *No Tolls on the Internet*, WASH. POST, June 8, 2006, at A23; Net Neutrality, Hearing before the Sen. Comm. on Commerce, Science, and Transportation, 109th Cong., 2d Sess. 59 (2006) (testimony of Lawrence Lessig), *available at* http://www.lessig.org/blog/archives/Lessig_Testimony_2.pdf.

[3] Tim Wu, *Network Neutrality, Broadband Discrimination*, 2 J. TELECOMM. & HIGH TECH. L. 141 (2003).

[4] *See* Barbara van Schewick, *Towards an Economic Framework for Network Neutrality Regulation*, 5 J. TELECOMM. & HIGH TECH. L. 329 (2007).

access service. Although none of these proponents provided empirical evidence in support of this claim—or explanations for the observed rivalry between competing cable and DSL providers evident in their advertising and constantly improving bandwidth—it has remained a persistent refrain among proponents of network neutrality regulation. Ironically, although this ostensible monopoly power was a key predicate of network neutrality advocacy, proponents of network neutrality regulation continue to advocate for new *ex ante* prohibitions even as wireless broadband services increasingly compete with wireline services; indeed, they (and the Federal Communications Commission) now propose that network neutrality regulation be extended to wireless broadband services.

A second assumption of the early proponents of network neutrality regulation was the normative judgment that innovation "at the edges" of the network is more virtuous than innovation within the core of the network. This assumption led proponents to reason that regulation was justified at any cost to promote innovation at the edges. Third, the early proponents of network neutrality regulation speculated that the use of optional business-to-business transactions for "quality of service" (QoS) could lead to anticompetitive discrimination, or that network operators would use the threat of degraded best-effort service quality to force content and applications providers to pay for enhanced priority services. Although offering content providers QoS enhancement for a fee is not necessarily "discriminatory" in any economically meaningful sense of the term—just as it is not discriminatory for Honda to charge more for an Accord than a Civic—the ability of network operators and suppliers of content or applications to enter into voluntary QoS transactions emerged as a central issue in the debate over network neutrality regulation.

The first extended legal or economic critiques of proposals for network neutrality regulation appeared in 2005 and 2006 in congressional testimony and academic articles by Christopher Yoo[5] and Gregory Sidak.[6]

[5] Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1 (2005); Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 95 GEO. L.J. 1847 (2006).

[6] *See* J. Gregory Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, 2 J. COMPETITION L. & ECON. 349, 349 (2006), *available at* http://www.criterioneconomics.com/pdfs/A_Consumer_Welfare_Approach_to_Network_Neutrality_Regulation_of_the_Internet.pdf; Net Neutrality, Hearing before the Sen. Comm. on Commerce, Science, and Transportation, 109th Cong., 2d Sess. 59 (2006) (testimony of J. Gregory Sidak) [hereinafter *Sidak 2006 Senate Testimony*] (listing six essential characteristics of communications networks that rendered regulation unnecessary and likely harmful to investment and innovation incentives among network operators: the substantial sunk investments required to build networks, economies of scale, economies of scope, differential pricing, two-sided demand, and the susceptibility of networks to congestion); *see also* J. Gregory Sidak, Consumer Welfare and Network Neutrality, Presentation at the Federal Trade Commission Broadband Connectivity Competition Policy Workshop (Feb. 13, 2007), *available at* http://www.ftc.gov/opp/workshops/broadband/presentations/sidak.pdf (cited in FEDERAL TRADE COMMISSION STAFF REPORT, BROADBAND

"The problem," Yoo contended, "is that—as even network neutrality proponents concede—deviations from network neutrality may well be motivated by legitimate concerns about network management and that it can be difficult, if not impossible for experts to predict which architectural approach will eventually prevail."[7] Sidak observed that network neutrality regulation would harm social welfare by slowing broadband adoption and innovation.[8] Of particular relevance to the current debate on optional business-to-business QoS transactions, he stressed that, at its foundation, "the debate over network neutrality is essentially a debate over how best to finance the construction and maintenance of a broadband network in a two-sided market in which senders and receivers have additive demand for the delivery of a given piece of information—and hence additive willingness to pay."[9] Sidak criticized the proponents of network neutrality regulation for ignoring the consequences for consumers if regulation were imposed.[10] Scholarly opposition to network neutrality regulation grew quickly.

The FCC's October 2009 notice of proposed rulemaking (NPRM) on network neutrality only partially chronicles the robust body of literature that criticizes proposals for network neutrality regulation with respect to its effect on investment and innovation, competition, speech and civic participation, and congestion management.[11] Leading economists, technologists, and legal scholars who have publicly opposed proposals to impose network neutrality regulation now include William Baumol,[12] Gary Becker,[13] Dennis

---

CONNECTIVITY COMPETITION POLICY (June 2007), *available at* http://www.ftc.gov/reports/broadband/v070000report.pdf.).

[7] Yoo, *Network Neutrality and the Economics of Congestion*, *supra* note 5, at 1851.

[8] Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, *supra* note 6.

[9] *Id.* at 350.

[10] *Id.* at 474 ("It bears repeating that the stakeholders whose interests should weigh most heavily in the deliberations of policy makers are consumers, not any particular constituency of competitors.").

[11] Preserving the Open Internet; Broadband Industry Practices, Notice of Proposed Rulemaking, GN Dkt. No. 09-191, WC Dkt. No. 07-52, ¶¶ 60–80 (2009) [hereinafter *Network Neutrality NPRM*].

[12] *See, e.g.*, William J. Baumol, Martin Cave, Peter Cramton, Robert Hahn, Thomas W. Hazlett, Paul L. Joskow, Alfred E. Kahn, Robert Litan, John Mayo, Patrick A. Messerlin, Bruce M. Owen, Robert S. Pindyck, Scott J. Savage, Vernon L. Smith, Scott Wallsten, Leonard Waverman & Lawrence J. White, *Economists' Statement on Network Neutrality Policy* (AEI-Brookings Joint Center Working Paper No. RP07-08, Mar. 2007), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=976889#PaperDownload (last visited Mar. 10, 2010) [hereinafter *Economists' Statement*].

[13] *See* Declaration of Gary S. Becker & Dennis W. Carlton, In the Matter of Preserving the Open Internet, Broadband Industry Practices, GN Dkt. No. 09-191, WC Dkt. No. 07-52 (filed with the FCC on behalf of Verizon Jan. 14, 2010).

Carlton,[14] Richard Epstein,[15] David Farber,[16] Gerald Faulhaber,[17] Thomas Hazlett,[18] Scott Hemphill,[19] Paul Joskow,[20] Alfred Kahn,[21] Robert Kahn,[22] Michael Katz,[23] Bruce Owen,[24] Robert Pindyck,[25] Gregory Rosston,[26] Richard Schmalensee,[27] Marius Schwartz,[28] Vernon Smith,[29] Daniel Spulber,[30] and Leonard Waverman.[31] These scholars have demonstrated

[14] *See id.*

[15] *See* Richard A. Epstein, *Net Neutrality at the Crossroads*, FT.COM, Oct. 27, 2009, *available at* http://www.ft.com/cms/s/0/d9611768-c310-11de-8eca-00144feab49a.html?nclick_check=1.

[16] *See* Gerald Faulhaber & David J. Farber, *The Open Internet: A Consumer-Centric Framework*, GN Dkt. 09-191, WC Dkt. 07-52 (filed with the FCC on behalf of AT&T Jan. 14, 2010); David Farber & Michael Katz, *Hold Off on Net Neutrality*, WASH. POST, Jan. 19, 2007, at A19.

[17] *See id.*

[18] *See* Thomas W. Hazlett, *Broadbandits*, WALL ST. J., Aug. 12, 2006, at A9, *available at* http://online.wsj.com/article/SB115533922506533851-search.html.

[19] *See* C. Scott Hemphill, *Network Neutrality and the False Promise of Zero-Price Regulation*, 25 YALE J. ON REG. 135 (2008).

[20] *Economists' Statement*, *supra* note 12.

[21] *See* Alfred E. Kahn, Statement of Alfred E. Kahn, Robert Julius Thorne Professor of Political Economy, Emeritus, Cornell University, before the FTC Workshop on Broadband Connectivity Competition Policy, (delivered Feb. 13, 2007), http://www.ftc.gov/opp/workshops/broadband/presentations/kahn.pdf (Feb. 21, 2007 rev.).

[22] *See* Robert Kahn, Remarks at An Evening with Robert Kahn in Conversation with Ed Feigenbaum (Computer History Museum Jan. 9, 2007), *available at* http://www.computerhistory.org/events/index.php?id=1162920599; *see also* Andrew Orlowski, *Father of the Internet Warns Against Net Neutrality*, THE REGISTER, Jan. 18, 2007, http://www.theregister.co.uk/2007/01/18/kahn_net_neutrality_warning/ (last visited Mar. 10, 2010) ("Robert Kahn, the most senior figure in the development of the internet, has delivered a strong warning against 'Net Neutrality' legislation.").

[23] *See* Michael L. Katz, *Maximizing Consumer Benefits from Broadband*, GN Dkt. No. 09-191, WC Dkt. No. 07-52 (filed with the FCC on behalf of Verizon Jan. 14, 2010); Farber & Katz, *supra* note 16.

[24] *See* Bruce M. Owen, *Antecedents to Net Neutrality*, 30 REG. 14 (2007); Bruce M. Owen & Gregory L. Rosston, *Local Broadband Access:* Primum Non Nocere or Primum Processi? *A Property Rights Approach*, *in* NET NEUTRALITY OR NET NEUTERING: SHOULD BROADBAND INTERNET SERVICES BE REGULATED? 163 (Thomas M. Lenard & Randolph J. May eds., 2006).

[25] *Economists' Statement, supra* note 12.

[26] *See* Gregory L. Rosston & Michael D. Topper, *An Antitrust Analysis of the Case for Wireless Network Neutrality* (Stanford Inst. for Econ. Policy Research, Discussion Paper No. 08-040, July 2009); Owen & Rosston, *supra* note 24.

[27] *Economists' Statement, supra* note 12.

[28] *See* Declaration of Marius Schwartz, In the Matter of Preserving the Open Internet, Broadband Industry Practices, GN Dkt. No. 09-191, WC Dkt. No. 07-52 (filed with the FCC on behalf of AT&T Jan. 14, 2010) [hereinafter *Schwartz Declaration*].

[29] *Economists' Statement, supra* note 12.

[30] *See* DANIEL F. SPULBER & CHRISTOPHER S. YOO, NETWORKS IN TELECOMMUNICATIONS: ECONOMICS AND LAW (Cambridge Univ. Press 2009).

[31] *See* Leonard Waverman, *Comments on Network Neutrality*, 2 J. COMPETITION L. & ECON 475 (2006). This list is only partial. *See, e.g.*, Michael D. Topper, *Broadband Competition and Network Neutrality Regulation*, GN Dkt. No. 09-191, WC Dkt. No. 07-52 (filed with the FCC on behalf of Verizon Jan. 14, 2010); Gerald Faulhaber, David Farber, Michael Katz &

that arguments in favor of network neutrality regulation lack empirical support; fail to account for the impacts of customer choice, two-sided markets, competition, and innovation; rest on a misguided focus on only one component of social welfare—content provider welfare—rather than total welfare; and disregard the obvious costs of regulation.

These and other scholars opposing network neutrality regulation have explained that preemptive regulation is unjustified because there is no market failure in the provision of broadband access.[32] They have presented empirical evidence that the market for broadband access is both highly rivalrous and workably (even if not perfectly) competitive.[33] They reject the FCC's proposed regulation of wireless networks, as the wireless industry is both demonstrably competitive and subject to spectrum constraints.[34] Additionally, opponents of network neutrality regulation observe that antitrust law is sufficient to remedy any anticompetitive behavior that might arise.[35]

Opponents of network neutrality regulation argue that the FCC's proposed "nondiscrimination" rule, in particular, relies on incorrect assumptions about the current state of the Internet.[36] Different applications have different QoS requirements, and, in the interest of optimizing traffic, network operators treat—and have always treated—different types of traffic differently.[37] These scholars emphasize that network operators must continue to have the flexibility to manage traffic on their networks efficiently to ensure a high-quality experience for end users.[38] As Becker and Carlton

---

Christopher Yoo, *Common Sense on Net Neutrality* (2006), *available at* http://www.interesting-people.org/archives/interesting-people/200606/msg00014.html (last visited Mar. 10, 2010); William E. Kennard, *Spreading the Broadband Revolution*, N.Y. TIMES, Oct. 21, 2006, at A13; Robert Pepper, *Net Neutrality Debate Sets Out a False Choice*, NETWORK WORLD, June 12, 2006, *available at* http://www.networkworld.com/columnists/2006/061206-net-neutrality-no.html (last visited Mar. 10, 2010).

[32] Faulhaber and Farber observe that, "during ten years of experience without network neutrality regulations, there are just two incidents (the tiresomely familiar Madison River and Comcast cases) of any actual misbehavior by broadband ISPs." Faulhaber & Farber, *supra* note 16, at 1.

[33] Topper, *supra* note 31, at 5; *Schwartz Declaration*, *supra* note 28, at 31–34; Becker & Carlton, *supra* note 13, at 7.

[34] Faulhaber & Farber, *supra* note 16, at 31; *see also* Jeffrey H. Reed & Nishith D. Tripathi, *The Application of Network Neutrality Regulations to Wireless Systems: A Mission Infeasible*, GN Dkt. No. 09-191, WC Dkt. No. 07-52, at 5 (filed with the FCC on behalf of AT&T Jan. 14, 2010).

[35] *See, e.g.*, Faulhaber & Farber, *supra* note 16, at 33; Katz, *supra* note 23, at 5.

[36] *See, e.g.*, Katz, *supra* note 23, at 2.

[37] *Id.* at 8; Faulhaber & Farber, *supra* note 16, at 17 (citing Roger Bohn, Hans-Werner Braun, Kimberly C. Claffy & Stephen Wolff, *Mitigating the Coming Internet Crunch: Multiple Service Levels via Precedence*, 3 J. HIGH SPEED NETWORKS 2 (1994)); SPULBER & YOO, *supra* note 30, at 405–32.

[38] Becker & Carlton, *supra* note 13, at 5–6.

observe, there is no reason to assume that the FCC is better equipped than network operators to determine the optimal business practices in response to the demands of rapidly changing technologies and consumer tastes.[39] Opponents of network neutrality regulation also express concern that the FCC misunderstands the likely effects of its proposals on consumer welfare. As we detail below, the proposed nondiscrimination regulation is likely to make *both* broadband Internet service providers (ISPs) and content and application providers—as well as consumers—worse off.

Even scholars who have reserved judgment on the possibility that some targeted Internet regulation might be appropriate under some conditions, including the FCC's chief technology officer, have cautioned against sweeping limits on optional QoS transactions.[40] Indeed, even vocal *proponents* of network neutrality regulation have acknowledged that the potentially banned optional QoS arrangements may hold great promise for both content providers and consumers.[41] For example, in a 2008 hearing before the FCC on network neutrality, Lessig testified against a broad ban on QoS tiering, on the grounds that zero-price regulation "blocks productive discrimination—discriminations that actually help facilitate the spread of broadband and growth without risking a threat to network neutrality."[42]

Nonetheless, the FCC has proposed not only the codification of the four "Internet Policy" principles that it had endorsed in 2005,[43] but also the

[39] *Id.* at 22.

[40] *See, e.g.*, Jon M. Peha, *The Benefits and Risks of Mandating Network Neutrality, and the Quest for a Balanced Policy*, 1 INT'L J. COMM. 644 (2007); Howard A. Shelanksi, *Network Neutrality: Regulating with More Questions than Answers*, 6 J. TELECOMM. & HIGH TECH. L. 23 (2007); Joseph Farrell & Phil Weiser, *Modularity, Vertical Integration, and Open Access Policies: Towards a Convergence of Antitrust and Regulation in the Internet Age*, 17 HARV. J.L. & TECH. 85 (2003).

[41] *See, e.g.*, Robin S. Lee & Tim Wu, *Subsidizing Creativity Through Network Design: Zero Pricing and Net Neutrality*, 23 J. ECON. PERSP. 61, 73–74 (2009) ("network management and quality of service inherently requires some form of packet discrimination or content co-location, and are practices with which we do not necessarily take issue"); Second En Banc Hearing on Broadband Network Management Practices before the FCC, Dkt. 07-52 (Apr. 17, 2008) (testimony of Lawrence Lessig), *available at* Testifying @ FCC @ Stanford, Lessig Blog (posted Apr. 18, 2008), http://lessig.org/blog/2008/04/testifying_fcc_stanford.html [hereinafter *Lessig 2008 FCC Testimony*]

[42] *Id.* at 2.

[43] FCC, Policy Statement, Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, CC Dkt. No. 02-33, Review of Regulatory Requirements for Incumbent LEC Broadband Telecommunications Services, CC Dkt. No. 01-337, Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services; 1998 Biennial Regulatory Review—Review of Computer III and ONA Safeguards and Requirements, CC Dkt. Nos. 95-20, 98-10, Inquiry Concerning High-Speed Access to the Internet over Cable and Other Facilities, Internet over Cable Declaratory Ruling, GN Dkt. No. 00-185, Appropriate Regulatory Treatment for Broadband Access to the Internet over Cable Facilities, CS Dkt. No. 02-52, 20 F.C.C. Rcd. 14,986 ¶ 4 (2005). Seeking to "encourage broadband deployment and preserve and promote the open and interconnected nature of the public Internet," the FCC declared that consumers possess entitlements "to

additional nondiscrimination rule: "Subject to reasonable network management, a provider of broadband Internet access service must treat lawful content, applications, and services in a nondiscriminatory manner."[44] The FCC would define nondiscriminatory in this context to be synonymous with "no priority delivery fees." The agency states: "We understand the term 'nondiscriminatory' to mean that a broadband Internet access service provider may not charge a content, application, or service provider for enhanced or prioritized access to the subscribers of the broadband Internet access service provider."[45] Curiously, denying network operators and businesses supplying content and applications the ability to enter into voluntary transactions—unless the transaction occurs at a zero price—is the supposed means to achieve nondiscrimination.

From an economic perspective, the FCC's proposed definition of nondiscriminatory would permit a situation where Company X is supplied one level of QoS at a zero price and Company Y is supplied a superior level of QoS at the same price—zero. To an economist, it would be discriminatory to charge the same price for two products having different levels of performance. Yet, the FCC's zero-price rule for ISP-content provider transactions appears to mandate this result. Under the FCC's zero-price rule vis-à-vis content providers, broadband ISPs would be left to recover costs associated with whatever QoS enhancements they would make solely from end user consumers, assuming that a consumer-focused mechanism for distinguishing between QoS-sensitive and QoS-insensitive traffic could even be developed. The reality, of course, is that the proposed zero-price rule would likely discourage ISP participation in the optional business-to-business market for QoS. Such a rule is especially puzzling because numerous entities already provide Internet-based QoS enhancements for a fee to content providers. They include Akamai Technologies, BitGravity, Level 3 Communications, Limelight Networks, and other third-party content delivery networks (CDNs). CDNs store content and applications in multiple, dispersed servers located relatively close to end users, which reduces the latency that end users might otherwise experience if the content and applications were stored in a single, centrally located server. Thus, although traffic is often handled on a nonprioritized best-effort basis between a CDN and an end user, the use of a CDN can significantly enhance the service quality

access the lawful Internet content of their choice," "to run applications and use services of their choice, subject to the needs of law enforcement," "to connect their choice of legal devices that do not harm the network," and to benefit from "competition among network providers, application and service providers, and content providers." *Id. But see* Comcast Corp. v. FCC, No. 08-1291 (D.C. Cir. Apr. 6, 2010) (depriving FCC of authority to enforce Internet policy statement).

[44] *Network Neutrality NRPM*, *supra* note 11, at 41 ¶ 104.

[45] *Id.* ¶ 105.

experienced by the end user. Moreover, a number of large content providers such as Google self-provide QoS-enhancing facilities (for example, by locating data centers at various locations around the world to reduce the distance that data must travel from its facilities to end users). Firms apparently retain the freedom to negotiate and set the terms of such offerings and arrangements.

The FCC's proposed (though misnamed) nondiscrimination rule banning a charge on enhanced QoS is now the center of controversy in the network neutrality debate, and there have recently been several attempts to provide economic support for the proposed rule.[46] Three such papers are by Nicholas Economides,[47] Christiaan Hogendorn,[48] and Inimai Chettiar and J. Scott Holladay.[49] Their advocacy has coalesced around three basic theories. The first is the theory that, if permitted to charge suppliers of content or applications for prioritized delivery, network operators will ignore positive spillover effects and set prices for priority delivery above socially optimal levels, leading to the undersupply of content and applications. The second is the theory that vertically integrated network operators will foreclose or discriminate against independent providers of Internet content and applications, particularly those that compete with the network operator's own complementary service offerings. Economides also echoes a third and less clearly articulated theory that the broadband Internet access provider will intentionally degrade the quality of best-effort delivery of Internet packets—transforming, in Lessig's colorful imagery, the quality of best-effort delivery to that of a "dirt road"[50]—as a means of coercing suppliers of content or applications into purchasing superior QoS. It is on these three theories that we focus in this paper.

In Section II, we catalogue the social welfare harms that would flow from the FCC's adoption of its nondiscrimination rule prohibiting voluntary QoS transactions between network operators and suppliers of Internet content and applications at any price exceeding zero. The proposed rule would deny both consumers and providers of content and applications the benefits of mutually agreeable arrangements that improve quality—and the burden would fall particularly hard on smaller providers of delay-sensitive content that lack the scale of content giants that can afford to self-provide CDN

[46] The "nondiscrimination" rule can best be regarded as a "no priority access fee" rule. Nevertheless, in what follows, we will use the FCC's "nondiscrimination" language.

[47] Nicholas Economides, *Why Imposing New Tolls on Third-Party Content and Applications Threatens Innovation and Will Not Improve Broadband Providers' Investments*, GN Dkt. No. 09-191, WC Dkt. No. 07-52 (filed with the FCC on behalf of Google Jan. 14, 2010) [hereinafter Economides, *Imposing New Tolls on Third-Party Content*].

[48] Christiaan Hogendorn, *Spillovers and Network Neutrality*, GN Dkt. No. 09-191, WC Dkt. No. 07-52 (filed with the FCC on behalf of Google Jan. 2010).

[49] Inimai M. Chettiar & J. Scott Holladay, *Free to Invest, The Economic Benefits of Preserving Net Neutrality* (N.Y.U. Sch. of Law Institute for Policy Integrity, Report No. 4, Jan. 2010).

[50] *See* Lessig & McChesney, *No Tolls on the Internet*, *supra* note 2, at A23.

functionality or purchase it from third parties. If the sale of prioritized delivery to suppliers of content and applications were prohibited, consumers would lose the benefits of enhanced network efficiency and product differentiation. Particularly in dynamic markets, heterogeneous production choices and consumer tastes foster greater product innovation than do more homogenous choices and consumer preferences. As a result, product differentiation encourages innovation by increasing the heterogeneity of content and applications. Moreover, it is well established that increasing charges on one side of a two-sided platform typically leads to reduced charges to the other side. The FCC's proposal to prohibit ISPs from offering content providers QoS enhancements for a fee would thus force consumers to pay more than they otherwise would for their broadband subscriptions, and, all other factors remaining constant, the rule would reduce broadband adoption and diminish the value of the platform to users, content providers and platform owners alike. That result not only would reduce static efficiency by causing marginal price increases for consumers with elastic demand, but also would reduce dynamic efficiency by retarding innovation.

These economic considerations set the bar very high for the supposed benefits of preventing the theoretical harms predicted by proponents of the FCC's nondiscrimination rule. What are those predicted harms, how likely are they to occur, what other impacts of both the conduct that would be prohibited and the proposed regulation must be considered? We demonstrate that none of the theories advanced in support of the proposed nondiscrimination rule withstands scrutiny and that the proposed rule is likely to do much more harm than good even if the misconduct posited were to occur. In short, first principles of economics reveal that the FCC's proposed nondiscrimination rule does not merely lack a rational relationship between means and ends, as the agency's curious use of language in defining nondiscrimination alone would lead one to suspect. Rather, the proposed rule manifests an *inverse* relationship between means and ends; it would actively thwart the Commission's stated purpose of promoting innovation both in the core and at the edges of the network.

We evaluate first, in Section III, the spillover theory. The spillover theory assumes that positive spillovers, which accrue to users from innovation in content and applications, would be reduced in the absence of network neutrality regulation. However, well-functioning capital markets ensure that content and applications providers have a means of acquiring the necessary start-up capital to fund creative innovation; indeed, Internet content investment and innovation have been particularly robust notwithstanding that they typically confer benefits for which consumers do not pay. Spillovers are common in competitive markets, and their mere existence does not establish the existence of market failure that warrants regulatory intervention. Although proponents of network neutrality regulation claim that innovation is threatened by QoS-enhancement transactions between ISPs and content

providers, it is more plausible that the option of purchasing enhanced QoS promotes *greater* innovation among content and applications producers, who benefit from the assurance that a customer enjoys a more consistent and better experience when accessing their products. The proponents of network neutrality regulation also fail to acknowledge important negative externalities such as congestion, which the FCC's so-called nondiscrimination rule likely would exacerbate, particularly if the rule were extended to wireless networks. Moreover, the assumption that ISPs will not consider the effects of their pricing decisions on content investment and innovation is unfounded. Broadband network operators have strong incentives both to internalize the positive spillovers of content and applications—which increase the value of their broadband platforms—and to set efficient prices, for reasons deriving from (1) cross-platform competition, even if it is less than perfect, and (2) the internalization of complementary efficiencies (ICE), which creates pro-competition incentives regardless of the extent of platform competition. Even if one were to suppose that broadband ISPs would not fully internalize positive spillovers, that supposition could not justify price regulation, absent a showing that regulators would do a better job of discovering the "optimal" prices. The FCC's proposal for an obviously suboptimal zero price is strong confirmation that the agency would not.

In Section IV, we analyze the foreclosure theory and demonstrate that it is flawed on multiple fronts. Proponents of the foreclosure theory ignore the reality that many network operators are vertically integrated only in very limited respects into content or applications production or their substitutes, and thus lack even theoretical incentives to foreclose customer-valued content or applications from their networks outside those limited areas. But the foreclosure theory is flawed from the perspective of economic theory, even assuming that broad vertical integration is prevalent. The foreclosure theory depends upon the existence of monopoly power in the market for broadband access, which broadband ISPs generally do not have. Network operators similarly lack monopoly power in the market for content and applications, a market that is global in scope, and thus they simply lack the ability to foreclose access to Internet content. Moreover, as a result of the complementary nature of demand for broadband Internet access and content, the effects of which are heightened by the high price-to-marginal cost margins inherent in broadband networks, network operators have strong incentives to *promote* content and applications on their networks to attract more subscribers. The theory of vertical foreclosure also fails to incorporate the dynamic nature of competition in the market for broadband Internet access services. The foreclosure theory, instead, is premised on a simplistic theoretical framework of static-efficiency equilibrium and zero innovation that ignores the rapidly changing nature of competition and innovation. In any event, the harm posited by the foreclosure theory is an *anticompetitive* harm for which adequate, tailored remedies already exist in antitrust law—in

contrast to the FCC's overbroad proposal to prohibit all discrimination (and even *non*-discriminatory, voluntary arrangements between ISPs and content providers).

In Section V, we scrutinize the dirt road theory. It is not credible that a network operator would intentionally degrade its best-effort delivery of packets in hopes of inducing suppliers of content and applications to buy prioritized delivery of packets. The empirical evidence confirms that broadband ISPs have, in fact, been investing billions of dollars annually to *increase* the speed and *improve* the quality of best-effort Internet service, even while many broadband ISPs also provide prioritized delivery of video and voice packets over the same physical infrastructure. That outcome is exactly what economics would predict under real-world conditions of platform competition and complementarity between content availability and performance and demand for broadband Internet access services. Even if ISPs were to consider relegating traffic from content and applications providers who did not choose to pay for enhanced QoS to a full-time dirt road—as distinct from the beneficial prioritization of delay-sensitive traffic at times and places of congestion through packet-scheduling algorithms, which is the real issue here—the risk of loss of subscribers would mean, among other things, that ISPs would have no net incentive to do so. Charging different prices for different levels of service promotes inclusion, not exclusion.

II. THE BENEFITS TO CONSUMERS FROM PERMITTING THE CONTINUED AVAILABILITY OF OPTIONAL BUSINESS-TO-BUSINESS QoS TRANSACTIONS

Before considering the merits of the various theories of harm advanced by Economides and others, we summarize the benefits that would be lost if the Commission imposed its nondiscrimination rule. The lost benefits would affect both end users and suppliers of content and applications. Optional business-to-business transactions for QoS will enhance the efficiency of traffic flow over broadband networks, reducing congestion.[51] That enhanced efficiency benefits both the end users receiving content or applications and the content providers whose content or applications are demanded. Superior QoS is a form of product differentiation, and it therefore increases welfare by increasing the production choices available to content and applications providers and the consumption choices available to end users. Finally, as in other two-sided platforms, optional business-to-business transactions for QoS will allow broadband network operators to reduce subscription prices

[51] *See* Cisco Systems, Paul Sanchirico, Vice President, Service Provider Systems Unit, A Discussion with the FCC on the Open Internet (Dec. 8, 2009); *see also* Clarence Filsfils & John Evans, *Deploying Diffserv in Backbone Networks for Tight SLA Control*, IEEE INTERNET COMPUTING 58 (Jan.– Feb. 2005).

for broadband end users, promoting broadband adoption by end users, which will increase the value of the platform for all users.

A. Network Efficiency

Electronic communications are converging onto a single platform, the Internet protocol (IP) platform. In their seminal 1974 paper, Vinton Cerf and Robert Kahn stated that "[a] principal reason for developing such networks has been to facilitate the sharing of computer resources."[52] In the same paper, Cerf and Kahn presented a protocol design that would evolve into the now ubiquitous TCP/IP. Convergence to the IP platform is beneficial in several ways. The IP platform allows heterogeneous content to travel across a common architecture. Unlike circuit-switched networks, the IP platform sends information in packets—thus, an IP network is a packet-switched network. The transportation of data in packets entails that, rather than having to remain open for one stream of data for the entire duration of the data transmission, a given portion of bandwidth can accommodate numerous streams of data simultaneously. The use of a single protocol to transport heterogeneous types of traffic, as a 2006 paper by IBM Global Technology Services notes, "holds the potential for simplifying increasingly complex telephone and data networks."[53] Moreover, convergence permits the integration of different types of content that were previously separate, such as voice and video. At the same time, this convergence to IP makes combating congestion and maintaining efficient Internet traffic flows much more challenging. Different content and applications have different QoS needs. Real-time content is far less tolerant of latency or jitter than email is. Figure 1 shows the latency tolerances of some common Internet applications.

Increasingly diverse traffic is intermingled in broadband Internet networks, and the sharing of infrastructure means that congestion created by one type of traffic can impair the QoS of other traffic.[54]

The question is how best to address those challenges. Some proponents of network neutrality regulation would ban packet prioritization altogether, claiming that the prioritization of one packet of information over another in the context of a capacity constraint is a zero-sum game. Google makes this argument in comments filed with the FCC in January 2010.[55] This

[52] Vinton G. Cerf & Robert E. Kahn, *A Protocol for Packet Network Intercommunication*, 22 IEEE TRANSACTIONS ON COMM. 637 (1974).

[53] IBM Global Technologies, *Business Benefits of Converged Communications* (Oct. 2006), *available at* http://www-935.ibm.com/services/uk/igs/pdf/converged-communications-pov_0906.pdf.

[54] *See* Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, *supra* note 6, at 360–61.

[55] Comments of Google Inc., In the Matter of Preserving the Open Internet, Broadband Industry Practices, GN Dkt. No. 09-191, WC Dkt. No. 07-52, at 35 (filed with the FCC Jan. 14, 2010) [hereinafter *Google Comments*].

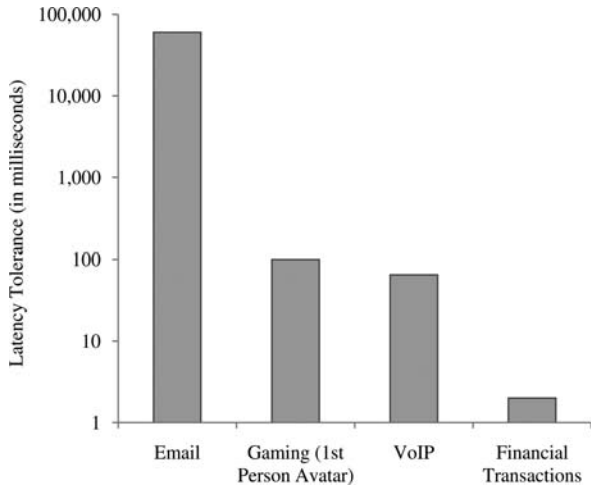

Figure 1. Average latency tolerances of common Internet applications.
Sources: Cisco Data Center, *Cisco AON Streamlines Financial Market Data and Trade-Order Latency*, http://www.cisco.biz/en/US/prod/collateral/contnetw/ps6692/ps6480/pr (last visited Jan. 29, 2010); Internap, Internet Services, Service Level Agreement, Aug. 2009, *available at* http ://www.internap.com/wp-content/uploads/DS_IS_SLA.pdf (last visited Jan. 29, 2010), Qwest Communications Company, LLC, Qwest iQ Analog and Digital VoIP, Qwest iQ Unify Bundles, and Qwest iQ Integrated Access Packages, Retail Service Level Agreement, July 14, 2009, *available at* http://www.qwest.com/legal/docs/IA_SLA_V7_071409.pdf (last visited Jan. 29, 2010); Mark Claypool & Kajal Claypool, *Latency and Player Actions in Online Games*, 49 COMMUNICATIONS of the ACM 40, 44 (2006), *Latency/Ping Guide*, Call of Duty Modern Warfare, Guides and Everything You Need, June 15, 2009, http://cod4guides.blogspot.com/2009/06/latencyping-guide.html (last visited Jan. 29, 2010).

argument asserts simplistically—and incorrectly—that prioritizing one packet necessarily degrades another. Consequently, it is argued, there is no net gain in social welfare.

That reasoning is fallacious on several grounds. First, it forgets that social welfare depends on "consumption" by human beings. Content distributed over the Internet differs radically in its susceptibility to latency and jitter. Moreover, not all packets of data traversing the Internet, when assembled at their destination into discernable pieces of information, are equally valuable to their human senders and recipients. Again, the ultimate welfare criterion is the utility of the data to senders and recipients. Technical measures of the speed of packet delivery are relevant to that welfare criterion, but by themselves they cannot measure individual utility or aggregate social welfare. It increases the economic welfare of society to deliver time-sensitive packets more quickly than time-insensitive packets. Indeed, there may be no discernible impact on the perceived quality of time-insensitive packets if packets that are time-sensitive receive priority at points and times of congestion. Packet delivery in congestion is a question of scheduling, not favoring some packets and "punishing" others; if multiple packets attempt to fit through a crowded "doorway" at the same time, scheduling algorithms must decide

which ones should go through first in an orderly fashion.[56] Indeed, Amazon (one of the original proponents of the "zero-sum game" theory) has recently recognized this point, cautioning the FCC that QoS enhancement is *not* a zero-sum game and that consumers and content providers can, in fact, mutually benefit from such practices.[57]

Second, as we discuss in more detail below, it does not make sense to assume that the amount of bandwidth devoted to Internet traffic and the resources devoted to generating and handling that traffic in an efficient manner are fixed. To the contrary, one would anticipate that optional business-to-business QoS transactions will affect the amount of investment that ISPs and content providers will make in capacity and efficient data handling. To the extent that such agreements elicit more investment in such capacity than would otherwise be the case, it is plausible that even packets delivered over best-efforts services will receive *more* resources under a regime that permits optional business-to-business QoS transactions than under the FCC's proposed nondiscrimination rule. Despite their theoretical arguments, the proponents of network neutrality regulation have, to our knowledge, given no credible basis for believing to the contrary.

Of course, the most efficient way to determine which packets should receive priority in congestion situations (and how much) is to allow network operators to elicit such information in market transactions by offering paid prioritization to those content and applications providers that value it. In market settings, the most efficient means of communicating information is through price signals.[58] Through optional business-to-business transactions for QoS, a producer of content or applications communicates its priority needs by choosing the QoS tier that is the optimal value for the price. Prices

[56] *See, e.g.*, *A Fairer Faster Internet Protocol*, IEEE, Dec. 2008, *available at* http://spectrum.ieee.org/telecom/standards/a-fairer-faster-internet-protocol (last visited Mar. 11, 2010).

[57] Amazon's vice president for regulatory matters wrote in January 2010:

> Over the years, net neutrality often was portrayed as a zero-sum game, where if one set of stakeholders would win, another necessarily would lose. But Amazon believes that, to the contrary, well-crafted net neutrality rules can benefit all three major classes of stakeholders in this issue: consumers and other users; providers of content, applications, services, and devices (for brevity, hereinafter referred to as 'content'); and the broadband Internet access service providers themselves. A win-win-win outcome is possible.
>
> In such an outcome, broadband Internet access service providers would have the regulatory certainty to pursue new business models with users and content providers, while content providers would have opportunities to better serve their customers by using the network operators' new services. Most importantly, so long as no content is harmed by these new services, consumers and other users would realize the benefits of service improvements from broadband Internet access service providers.

Ex Parte Letter from Paul Misener, Vice President, Amazon, to Marlene Dortch, Secretary, FCC (Jan. 14, 2010).

[58] Friedrich A. Hayek, *The Use of Knowledge in Society*, 35 AM. ECON. REV. 519 (1945).

adjust to reflect the social marginal cost of prioritization. Optional business-to-business transactions for QoS ensure that content and applications providers do not have the incentive to consume excessive amounts of bandwidth, as would occur in a zero-price regime artificially enforced by regulation. When a market for QoS is permitted to function, market-determined prices force suppliers of content and applications to internalize the full economic costs of network access.

Proponents of the proposed nondiscrimination rule attempt to discount the value of optional broadband ISP QoS offerings, noting that broadband ISPs have not historically offered enhanced delivery options for a fee. This argument is misconceived on two levels. First, broadband ISPs have long offered enhanced delivery options to content providers in a variety of contexts.[59] The question here is whether the Commission should impose particularly destructive limitations on the types of QoS enhancements that those ISPs should be able to offer, such as end-to-end QoS enhancements for performance-sensitive Internet content.

Second, it is ironic that the proposed nondiscrimination rule is justified as *preserving* the *status quo* in a high-technology sector. Adapting business models to technological change is a common and essential market practice. For example, with old-technology electricity usage meters, it was not feasible to charge consumers based on the time of day that electricity was used; the only feasible system was to charge based on the total amount of electricity used over the billing cycle. With the development of time-of-service meters, it became feasible to charge based, not only on total usage, but also on time-of-day considerations. The resulting possibilities have significantly enhanced economic efficiency relative to the old system, even though the transition involved costs (namely, the cost of developing and manufacturing more complex meters and retrofitting them) and had the prospect of making some consumers (namely, those who continued to use electricity at high-demand peak periods) pay more than they would have under the old system. Market reaction to evolving uses of broadband Internet services and widening variation in the QoS needs of traditional applications and new real-time applications increasingly demanded by consumers holds even greater promise for advances in social welfare and economic efficiency.

B. Product Differentiation

Optional business-to-business transactions for QoS are fundamentally a form of product differentiation. Such transactions increase economic

[59] One example of enhanced end-to-end delivery is virtual private networks (VPN) service, which businesses commonly use to enable employees to connect to the enterprise's network from offsite. *See, e.g.*, Connect:Direct® Over a VPN Connection, http://www22.verizon.com/wholesale/lsp/connguide/1,5133,4-East-Billing-dialup,00.html; AT&T Virtual Private Networks, http://www.business.att.com/enterprise/Portfolio/vpn-services-enterprise/.

welfare because they increase choice. Moreover, such optional transactions for QoS will foster product differentiation on both the production and consumption sides of the market for content and applications, thereby increasing welfare both for consumers and for producers of content and applications.

Consider first the producer side of the market. Enabling a supplier of content or applications to choose from a range of QoS tiers, based on the specific requirements of its product, enhances producer welfare. Increased producer welfare translates into increased investment and innovation in the production of content and in the development of applications. Enhanced innovation and investment result in increased diversity and quality of content and applications, enabling consumers to enjoy the benefits of product differentiation—which enhances consumer welfare. For those producers whose content depends on the quality of delivery—such as producers of real-time video applications—QoS transactions help to ensure high product quality and continuing viability in the market. In contrast, a content provider whose product exhibits high tolerance for latency and jitter may choose to continue to rely upon best-effort delivery.

Quality-of-service offerings also result in product differentiation for consumers—who should be the primary focus of this regulatory debate. Allowing content and applications providers to contract for priority delivery ensures continued innovation in real-time and other QoS-dependent applications. Moreover, the fact that one content provider does not contract for priority delivery, and thereby "suffers" a competitive disadvantage vis-à-vis some other content provider who opts for priority delivery, does not imply any reduction in consumer welfare. Indeed, consumers will be unequivocally better off as a result of greater choices in real-time applications on the Internet.[60]

Even proponents of regulation concede that QoS tiers are beneficial forms of product differentiation. Chettiar and Holladay, for example, acknowledge that product differentiation is beneficial "because it allows buyers to choose among different options and it increases the chance of consumers finding a good that more accurately meets their needs."[61] Nonetheless, Chettiar and Holladay oppose optional business-to-business QoS transactions, evidently in the belief that *some* network operators *might* behave anticompetitively—perhaps, for example, by promising to deliver a certain level of service but then actually delivering a lower quality. However, these speculative fears cannot justify the overbroad prohibition embodied in the FCC's proposed nondiscrimination rule.

[60] Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, *supra* note 6, at 442.

[61] Chettiar & Holladay, *supra* note 49, at 40.

C. Investment and Innovation

Technical progress within the network supports innovation at the network's edges, and vice versa. The positive network externalities associated with the Internet ensure that the benefits of innovation at any point in the network redound in varying degrees to users at all levels—network operators, applications providers, and customers alike. Innovation within the network encourages and facilitates innovation at the edges,[62] a fact largely ignored by the proponents of network neutrality regulation. The availability of QoS transactions makes it feasible for firms to invest in technologies that require prioritized delivery. When network operators can differentiate QoS to meet the needs of differentiated content and applications, they give the suppliers of such QoS-dependent content and applications the assurance that the quality of their products will not suffer from latency and jitter.

Currently, a number of firms, including Akamai, BitGravity, Level 3, and Limelight, provide CDN services to enhance the delivery of packets over the Internet in exchange for a fee paid by those content providers that elect to use their services. Other content providers self-provide similar capabilities. We know of no sound reason why ISPs should be barred from providing competing services to those offered by CDN suppliers, in the form of enhanced or prioritized delivery to the ISPs' customers in exchange for a fee.[63] From an efficiency perspective, it makes sense to allow the market to determine what mix of QoS services is provided by which suppliers, including ISPs. The FCC's proposed nondiscrimination rule would interfere with the efficient operation of such markets for QoS by artificially foreclosing some prospective suppliers—namely ISPs—from competing in that market.

Permitting optional business-to-business QoS transactions also encourages network operators to invest in QoS functionality enhancements, both as a general matter and to make service-specific investments designed to improve the performance of particular types of traffic. In this regard, QoS enhancements will offer another dimension over which network operators can compete in their supply of broadband access.

[62] *See* FCC, CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN 15 (2010) [hereinafter NATIONAL BROADBAND PLAN] ("Networks, devices and applications drive each other in a virtuous cycle. If networks are fast, reliable and widely available, companies produce more powerful, more capable devices to connect to those networks. These devices, in turn, encourage innovators and entrepreneurs to develop exciting applications and content. These new applications draw interest among end users, bring new users online and increase use among those who already subscribe to broadband services. This growth in the broadband ecosystem reinforces the cycle, encouraging service providers to boost the speed, functionality and reach of their networks.").

[63] We are aware that the FCC proposes to differentiate between "broadband Internet access services" and "managed or specialized services." *Network Neutrality NPRM*, *supra* note 11, ¶¶ 148–53. The FCC may be proposing to allow ISPs to provide CDN-like QoS services to content providers. If so, clarification of that policy, together with a clear explanation of why prioritized or enhanced delivery by an ISP should be treated differently, would be welcome.

If network operators are prohibited from offering paid prioritization choices, then the performance of latency-sensitive applications could deteriorate, customer satisfaction could decline, end users' demand for those applications could decline, and the viability of innovative business models used by both incumbents and new entrants could be jeopardized. Consequently, content and applications providers would have reduced incentives to produce new applications.

The real-world Internet examples provided in the comments of the Association for Competitive Technology (ACT), a trade group for software and application developers, illustrate how the FCC's proposed nondiscrimination rule would harm innovation at the edge of the network.[64] As an organization for developers of software applications and information technology (IT) services, ACT represents small and mid-size IT firms worldwide, the firms that are the claimed beneficiaries of network neutrality regulation.[65] ACT's comments, which reflect the membership's technical expertise and business concerns, explain that, far from benefitting from the proposed regulation, these firms would be hurt by it. ACT stresses that application developers often use a business model that includes a free product as well as a "premium product,"[66] and that the option to purchase QoS enhancements is essential for some content and applications.[67] ACT provides case studies demonstrating how the FCC's proposed nondiscrimination rule would deter innovation in emergency information delivery services, hospital medical data banks, text-to-speech applications for the blind, virtual blackboards, video conferencing, and online gaming.[68] A P2P file transfer could potentially significantly slow delivery of data packets for those highly valued, latency-sensitive applications. QoS enhancements make latency-sensitive content and applications *possible* to offer.[69] It will not be the FCC's proposed nondiscrimination rule but rather the availability of optional business-to-business QoS transactions and pricing flexibility that will help content and application developers "innovate without permission."

[64] Comments of the Ass'n for Competitive Tech., In the Matter of Preserving the Open Internet, Broadband Industry Practices, GN Dkt. No. 09-191, WC Dkt. No. 07-52, at 13–20 (filed with the FCC Jan. 14, 2010) [hereinafter *ACT Comments*].

[65] About ACT, ACT, http://www.actonline.org/na/about/.

[66] These business models are often called "freemium business models." *See* David J. Teece, *Business Models, Business Strategy and Innovation*, 43 LONG RANGE PLANNING 172, 178 (2010).

[67] *ACT Comments*, *supra* note 64, at 3.

[68] *Id.* at 13–20.

[69] Although large content and applications developers can purchase local caching services such as those provided by Akamai to enhance their applications' QoS, many small developers may lack the scale to purchase such services efficiently or may prefer the functionalities that ISPs could offer. *See* Morgan Reed, Executive Director, Ass'n for Competitive Tech., Statements at the Information Technology & Innovation Foundation Panel Discussion, Preserving the Open Internet: Is a Consensus Emerging? (Feb. 23, 2010), *available at* http://www.itif.org/index.php?id=335.

Optional business-to-business QoS transactions between ISPs and content providers will also encourage innovation by increasing content and application heterogeneity—in the same way that optional business-to-business QoS transactions between content providers and CDNs have done so. Particularly in dynamic markets like the Internet, innovation is greater under conditions of heterogeneous production choices and heterogeneous consumer tastes than under uniform production choices and uniform consumer tastes.[70] Put differently, there is more technical and business innovation when business models and consumer preferences are diverse.

Consumer preferences for Internet content and applications are naturally diverse. In general, heterogeneous demand both requires and enables innovation.[71] Diverse consumer demand in content and applications fosters innovation of differentiated products as content and applications providers seek to tailor their products to various consumer tastes.[72] The genius of the Internet is that it requires and allows "long tails" with respect to the distribution of tastes.[73] By prohibiting optional business-to-business QoS transactions, however, the FCC's proposed nondiscrimination rule would discourage content and applications providers from offering products with real-time applications that would benefit from ISP offerings of QoS enhancements.

Within a heterogeneous setting, business opportunities abound; many participants compete for a multitude of customer segments. New entry is facilitated. With less product heterogeneity, there is greater likelihood of the winner-take-all outcomes that proponents of network neutrality regulation claim to fear. Thus, the FCC's proposed nondiscrimination rule would actually increase the likelihood of sustained monopolistic or oligopolistic outcomes in the supply of content and applications. Innovation enhances rivalry, and rivalry enhances innovation. The converse of this virtuous cycle is also true—by reducing heterogeneity, the proposed nondiscrimination rule would perpetuate a cycle of weakening competition, limited entry, and diminishing innovation.

[70] *See, e.g.*, Anne Marie Knott, *Persistent Heterogeneity and Sustainable Innovation*, 24 STRATEGIC MGMT. J. 687 (2003).

[71] *See, e.g.*, Ron Adner & Daniel Levinthal, *Demand Heterogeneity and Technology Evolution: Implications for Product and Process Innovation*, 47 MGMT. SCI. 611, 612 (2001) (concluding that "[i]n a heterogeneous demand environment, early technological development is motivated by the drive to meet market requirements").

[72] *See* SPULBER & YOO, *supra* note 30, at 376.

[73] The "long tail" is the concept that businesses target multiple niche markets instead of trying to achieve a few mass-market hits. *See* CHRIS ANDERSON, THE LONG TAIL: WHY THE FUTURE OF BUSINESS IS SELLING LESS FOR MORE (2006); Erik Brynjolfsson, Yu Jeffrey Hu & Michael D. Smith, *From Niches to Riches: Anatomy of the Long Tail*, 47 MIT SLOAN MGMT. REV. 66 (2006).

D. Expanding Broadband Access by Reducing End User Charges

Another substantial benefit from permitting optional business-to-business transactions of QoS is that they encourage reduced end user charges, all else being equal. In broadband service markets, both content providers and end users benefit from, and thus have complementary demand for, the use of the network. When a consumer uses broadband access to search on Google, the search is valued by both the user, who gains information, and Google, which earns advertising revenues.

In such a two-sided market, the platform operator can affect the volume of transactions by charging more to one side of the market and reducing the price paid by the other side. Over-the-air television programs are free to the viewer because advertisers pay broadcasters to assemble audiences to receive advertisements. Google searches are free to Internet users because Google sells highly focused advertising that responds to the interests revealed by the Internet user's search request. If content and applications providers have the opportunity to purchase QoS enhancements from broadband ISPs to ensure priority delivery in congestion situations, end users will pay less, thereby increasing broadband penetration and the value of the platform to all. To deny broadband access to the marginal consumers (by prohibiting voluntary business-to-business transactions for enhanced QoS) is to pursue an anti-Pareto principle.[74] Increased broadband subscribership increases the value of the network to each user of the network—both end users and content providers—as a result of network effects.

The economic literature on two-sided markets recognizes that increasing the overall level of charges to one side results in rate reductions on the other side, regardless of the competitiveness of the market.[75] That is, even a monopolist network operator would reduce rates to one side of the market

[74] A Pareto efficient outcome is one resulting in an "[a]llocation of goods in which no one can be made better off unless someone else is made worse off." ROBERT S. PINDYCK & DANIEL L. RUBINFELD, MICROECONOMICS 584 (6th ed. 2005). Sidak defines the anti-Pareto principle present in the network neutrality debate as follows:

> [P]roponents of network neutrality regulation build their arguments on what might be called an "anti-Pareto principle." They claim that no one should be able to receive faster delivery paid by the supplier of content or applications unless everyone does—federal law should prohibit it. This justification is akin to Aesop's fable of "The Dog in the Manger," in which a dog prevents an ox from eating its hay simply because the dog cannot eat the hay himself. The dog-in-the-manger response to access-tiering is intended to prevent a voluntary transaction (which causes no negative externality) from occurring.

Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, *supra* note 6, at 93.

[75] *See, e.g.*, David S. Evans, *The Antitrust Economics of Multi-Sided Platform Markets*, 20 YALE J. on REG. 325 (2003); Jean-Charles Rochet & Jean Tirole, *Platform Competition in Two-Sided Markets*, 4 J. EUR. ECON. ASS'N 990 (2003). The seminal article on two-sided markets is William F. Baxter, *Bank Interchange of Transactional Paper: Legal and Economic Perspectives*, 26 J.L. & ECON. 541 (1983).

if, concomitantly, it charged higher rates to the other. Moreover, marginal customers tend be minorities with lower incomes and less education, relative to the overall population.[76] Thus, the FCC's proposed nondiscrimination rule contradicts the FCC's vision of promoting the Internet as a means for "the voice of every single citizen—whether in the form of a blog post, online video, or tweet—to influence world events."[77]

E. Preserving Opportunities for Entry and Competition in the Supply of Content and Applications

The reasons why the FCC's so-called nondiscrimination rule has been so urgently proclaimed as necessary to protect the future of the Internet most plausibly lie with the business strategies of the content and applications providers that have been the proposed rule's greatest supporters. The fact that Google continues to call for the implementation of a nondiscrimination rule, notwithstanding the substantial benefit that users derive from the intelligent—rather than "dumb pipe"—delivery of content by network operators, suggests that the motivation behind the support of established content providers for a ban on optional business-to-business QoS transactions likely is strategic.

Google, for example, has a dominant share of Internet searches and search-related advertising, the gateway to Internet browsing.[78] Entry is difficult because Google has built an enormous infrastructure of algorithmic, CDN, and other costly assets that have attracted a critical mass of users and advertisers. To entice customers and advertisers away from the incumbents, an entrant needs to offer a differentiated and superior Internet experience. A ban on optional business-to-business QoS enhancements would make the production of such differentiated offerings more difficult.

One way for competing providers to differentiate their offerings is to offer consumers and advertisers new or better performing real-time applications (for example, improved video search capabilities). As explained above, a ban on contracting between content providers (including entrants) and network operators for higher quality delivery would thwart innovation and related

[76] Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, *supra* note 6, at 467. *See also* NATIONAL BROADBAND PLAN, *supra* note 62, at 5.

[77] *Network Neutrality NPRM*, *supra* note 11, ¶ 1.

[78] *See* Press Release, Dep't of Justice, Yahoo! Inc. and Google Inc. Abandon Their Advertising Agreement (Nov. 5, 2008), http://www.justice.gov/opa/pr/2008/November/08-at-981.html (reporting Google's 70 percent market share in both the Internet search advertising and Internet search syndication markets); Press Release, Yahoo!, Yahoo! and Microsoft to Implement Search Alliance (Feb. 18, 2010), http://finance.yahoo.com/news/Yahoo-and-Microsoft-to-bw-2356666634.html?x=0. As of December 2009, Google had 67.3 percent of the Internet search market, compared with 65.4 percent in November 2009. Don Reisinger, *Google Rules Search in December; Bing Drops*, CNET NEWS, Jan. 13, 2010, http://news.cnet.com/8301-13506_3-10434099-17.html (citing The Nielson Company).

product differentiation. If an entrant that developed a real-time application could not reduce uncertainty over the application's delivery status by contracting directly with a network operator for enhanced QoS, the entrant would divert its resources to the next-best alternative activity. If the alternative activity affords the entrant a lesser ability to differentiate its product from that of Google, which can continue to rely upon its existing CDN investments and arrangements to promote its own services (like YouTube), Google would face less competition. The proposed ban on optional business-to-business transactions for QoS would thus serve as an entry barrier. It would deny consumers the benefits of greater dynamic competition among content and applications providers.

Given the substantial benefits that would be foreclosed by a ban on optional carrier-content provider QoS arrangements, we believe that the burden should be on the proponents of the FCC's proposed nondiscrimination rule to show that enough benefits would result from preventing the harms that they hypothesize to compensate for sacrificing the substantial benefits of preserving the option for voluntary business-to-business transactions for QoS. They have not done so. In the following sections, we explain that those hypothesized harms are not likely to exist at all, much less outweigh the substantial benefits of preserving the option for business-to-business arrangements for enhanced QoS.

III. SPILLOVERS

Economides, Hogendorn, and other proponents of network neutrality regulation wrap their arguments for a ban on optional business-to-business transactions for QoS in the vestments of network externalities, or "spillovers."[79] They recognize that the Internet—comprised of content and the networks that deliver that content—generates extensive positive externalities for society.[80] When a consumer does not pay for a benefit received, a positive spillover is said to exist.[81] Investments and innovation by both content and applications providers and network operators plainly do yield consumer surplus that neither the content and applications providers nor the network operators fully capture through their charges. According to proponents of

[79] *See, e.g.*, Chettiar & Holladay, *supra* note 49, at vii, 7–8; Hogendorn, *supra* note 48, at 5, 7–12, 14–17.

[80] *See id.*

[81] Spillovers, known more generally in economics as externalities, are benefits (or detriments) that accrue as unpriced side effects of other actions of an individual or firm. Spillovers are ubiquitous. For example, a beekeeper who keeps bees for their honey confers an external benefit on nearby farmers because the bees pollinate the surrounding crops. The farmer does not pay the beekeeper, but nonetheless benefits from the presence of his bees—thus, the beekeeper is the source of a positive spillover. *See, e.g.*, PINDYCK & RUBINFELD, *supra* note 74, at 641; MICHAEL L. KATZ & HARVEY S. ROSEN, MICROECONOMICS 398 (3d, The McGraw Hill Companies, Inc., 1998).

network neutrality regulation, the existence of these spillovers is a "market failure" that reduces investment and innovation in content and applications below "optimal" levels[82]—apparently "suboptimal" relative to some (never fully articulated) "first best" or "ideal" world in which firms *were* somehow able to fully capture and thus internalize those spillover benefits. Proponents argue that because the option to purchase performance-enhancing QoS service offerings from network operators would raise content and applications providers' costs, they would further discourage investment and innovation in content and applications, regardless of the market-determined prices.[83] Proponents further speculate that network operators would not internalize the spillover benefits of content creation, and they would thus set paid prioritization prices above "optimal" levels.[84] Proponents of network neutrality regulation thus conclude that society would be better off if the FCC banned optional business-to-business QoS transactions altogether.

Although it is true that the Internet creates positive externalities, the remainder of the "logic" chain posited by the proponents of network neutrality regulation does not hold together. At each step, their arguments exaggerate the extent and relevance of positive spillovers and assume harms that more careful analysis suggests may not exist at all. Proponents of network neutrality regulation also do not discuss countervailing externalities—spillover *benefits* from optional business-to-business transactions for QoS—and negative consequences and spillovers from the proposed ban on optional business-to-business QoS transactions.[85] Finally, the logic of the spillover argument is backward: if the private returns to investment to content providers are too *low* to generate the socially optimal level of investment in Internet content, then the policy prescription for stimulating more private investment in content cannot be to reduce or constrain the private returns to investment to network operators and potentially content providers as well through policies that thwart investment in networks, such as the proposed ban on optional business-to-business transactions for QoS.

A. Does the Presence of Spillovers Lead to Suboptimal Investment and Innovation in Internet Content?

Proponents of network neutrality regulation argue that the existence of positive externalities, or spillover effects, necessarily causes suboptimal levels of investment and innovation in content and applications. Economides argues that the market will "underprovision Internet content because it exhibits the

[82] *See, e.g.*, Chettiar & Holladay, *supra* note 49, at 9–10.
[83] *See, e.g.*, *id.* at 28–30.
[84] *See, e.g.*, Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 3, 11; Hogendorn, *supra* note 48, at 12–13.
[85] *See, e.g.*, Chettiar & Holladay, *supra* note 49, at 30.

characteristics of a public good."[86] Similarly, Chettiar and Holladay claim that the presence of informational externalities as well as network effects necessitates a "well-designed government policy . . . to correct this market failure."[87] Hogendorn asserts that network operators' attempts to "appropriate" surpluses will lead them to "block or degrade applications that generate them without regard to the inframarginal surplus being lost."[88]

Spillovers, however, are an irreducible feature in many competitive markets and in all network industries. The presence of externalities alone cannot justify regulation. There has been no showing that content-related spillovers actually cause suboptimal content funding or that allowing optional business-to-business transactions for QoS would somehow exacerbate that "problem." The proponents of network neutrality regulation ignore substantial empirical and theoretical evidence to the contrary. Moreover, if the concern underlying the proposed ban on optional business-to-business QoS transactions is insufficient funding for Internet content and applications, existing and effective market mechanisms to fund Internet content innovation obviate government intervention.

1. Existing Financing Mechanisms for Funding Creativity

Proponents of network neutrality regulation argue that the existence of spillovers signals suboptimal investment. But that argument could be true only if there are insufficient returns (due to the absence of appropriability mechanisms) to provide proper incentives to invest in content and applications. Clearly, investors need a return for their investment in risky activities such as R&D and content development.

But even assuming a legitimate basis for concern about funding early-stage investment in innovation at the edges of the network, a ban on optional business-to-business transactions for QoS would be, at best, an exceedingly blunt policy instrument. It is also likely to be counterproductive, because reducing the private returns to investment in broadband networks by imposing zero-price regulation for business-to-business QoS transactions would reduce network investment that would itself promote investment and innovation in edge applications and content. But we will set that larger point to one side for the moment so that we can explain why the spillover argument is not logically coherent even under its own implausible assumptions.

Broadly speaking, the funding needed to develop new Internet content and applications can come from any one of four alternative sources, or from any combination of them. First, it can be generated by the internal cash flow of existing suppliers of such services. A startup company, however, may have negative cash flow. Second, funding can come from taxpayers in the form of

[86] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 3.
[87] Chettiar & Holladay, *supra* note 49, at 9–10.
[88] Hogendorn, *supra* note 48, at 12–13.

direct or indirect government subsidies for innovative activities. Chettiar and Holladay recognize the value of government subsidies for broadband Internet networks but discard the idea of funding innovation in Internet content as "controversial,"[89] citing the National Endowment of the Arts and the Public Broadcasting Service as examples of contentious government subsidization of art content.[90]

Third, funding can come from a government-mandated redistribution of payment responsibilities away from content providers and their customers and to broadband networks and their customers. That is what the proposed nondiscrimination rule would do: beyond standard network management practices, it would force network providers to operate inefficiently "dumb" networks incapable of distinguishing between delay-sensitive and non-delay-sensitive traffic, thereby inflicting greater costs on those networks (in the form of wasteful overcapacity) and ultimately on their ordinary residential subscribers. Proponents of network neutrality regulation, such as Lee and Wu,[91] implicitly argue that this third method of funding the creation of Internet applications and content is both desirable and necessary to insulate content providers from paying ISPs for QoS enhancements. We do not agree. The proponents of imposing a zero-price ceiling on optional business-to-business transactions for QoS have not established that this is the preferred way of providing funding, or that no alternative source of funding exists.[92] Indeed, they ignore entirely the fourth and most important source of funding for Internet content.

Funding by the capital markets or by other firms (including those above or below in the vertical chain of production and distribution) provides a fourth—and patently obvious—source of investment. There is no indication of market failure in the funding of new Internet content and applications, let alone a market failure emanating from the inability of suppliers of content and applications to afford the cost of QoS enhancements.

To the contrary, Internet ventures have proven remarkably adept and resilient at raising funds for innovative content and applications. In predicting that offering content and application providers the opportunity to buy priority delivery will price small developers out of the market, proponents of the FCC's nondiscrimination rule conspicuously neglect the function of capital markets in supporting innovation. The zero-price argument proceeds

[89] Chettiar & Holladay, *supra* note 49, at 33, 37–38.

[90] *Id.*

[91] Lee & Wu, *supra* note 41, at 73.

[92] We note also that the redistribution alternative is a taking of private property for what is ostensibly, but not obviously, a public purpose. Consequently, it raises a Fifth Amendment question of whether the taking is made with or without just compensation. *See* U.S. CONST., amend. V. *See generally* J. GREGORY SIDAK & DANIEL F. SPULBER, DEREGULATORY TAKINGS AND THE REGULATORY CONTRACT: THE COMPETITIVE TRANSFORMATION OF NETWORK INDUSTRIES IN THE UNITED STATES 118 (Cambridge Univ. Press 1997).

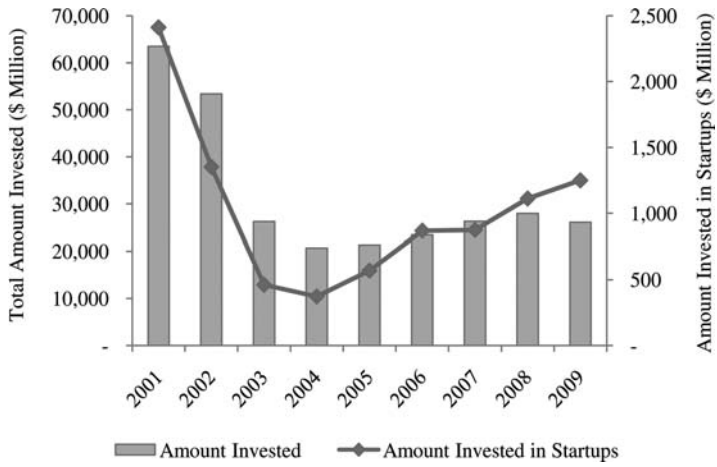

Figure 2. U.S. Venture Capital Investment In All Companies and In Startups, 2001–2009. *Source*: PricewaterhouseCoopers/National Venture Capital Ass'n, *Investment by Stage of Development Q1 1995–Q4 2009*, MoneyTree™ Report, Data: Thomson Reuters (Jan. 22, 2010), *available at* http://www.nvca.org/index.php?option=com_docman&task=cat_view&gid=57&Itemid=317.

as though venture capitalists and other financiers of high-tech companies do not exist. Cash flow is a challenge for any startup. It is not unique to Internet applications and content providers. Venture capitalists specialize in funding innovative startups and in assessing their risk-return characteristics. For example, almost immediately after Apple opened its iPhone App Store, a wave of funding was directed to iPhone application developers.[93] Another example is Facebook. In the summer following its 2004 launch, Facebook raised $500,000 in venture capital, followed by $12.7 million in 2005 and $27.5 million in 2006.[94] With 400 million active users and more than 1,000 employees,[95] Facebook is now worth billions of dollars.

Figure 2 shows the amount of venture capital raised in the United States after the Internet bubble. Although the investment activities were impaired by the bursting of Internet bubble in the early 2000s and the financial crisis from 2007 to 2009, in recent years, investment in startups has outpaced the total investment in companies in all stages of development.[96] Empirical evidence also suggests that increases in venture capital activity are significantly

[93] *See, e.g.*, Erick Schonfeld, *Kleiner Perkins Announces $100 million iFund for iPhone Applications*, TechCrunch, Mar. 6, 2008, http://www.techcrunch.com/2008/03/06/kleiner-perkins-anounces-100-millioin-ifund-for-iphone-applications/.

[94] Press Room, Facebook Factsheet, Facebook, http://www.facebook.com/press/info.php?timeline#!/press/info.php?factsheet (last visited Feb. 16, 2010).

[95] *Id.*

[96] PricewaterhouseCoopers/National Venture Capital Ass'n, *Investment by Stage of Development Q1 1995–Q4 2009*, MoneyTree™ Report, Data: Thomson Reuters (Jan. 22, 2010),

associated with higher patenting rates, which are a proxy for the level of innovation.[97] In 2009, more than 30 percent of total venture capital investments were allocated to software, IT services, or computers and peripherals.[98] This significant level of investment refutes the lack-of-cash-flow arguments made by the proponents of a ban on optional business-to-business QoS transactions.[99]

Thus, if the purported inability of startup content and applications providers to pay for prioritized delivery (assuming they need it at all) is a cash-flow problem, then the justification offered (in the network neutrality literature) for imposing regulation is a trivial and overbroad complaint. All startups experience this initial challenge, for capital markets ration venture capital funding appropriately. Indeed, start-ups already must obtain financing to purchase high-quality network services and CDN services to the extent that they seek superior performance. None of this functionality is cheap; companies that get the funding needed to pay for it, all else equal, will prevail over companies that do not. Adopting the proposed nondiscrimination rule would simply foreclose a competitive option for start-ups that seek alternatives (or supplements) to existing CDN offerings, which may not be economic or sufficient for all startups. If non-zero prices for QoS enhancement render a startup incapable of covering the marginal cost of production or obtaining financing to do so, its entry is likely inefficient and undesirable. Society does not benefit from the subsidization of all startups, both those able to draw forth venture capital on their own and those not so able. The rationing of capital is desirable and not something one should try to overcome by clumsy regulation of complements.

But even if that were not the case—that is, even if there was a legitimate public interest concern that optional business-to-business QoS transactions that increase costs for content providers will discourage socially valuable applications and content—then why single out network operators to be the providers of a subsidy for content innovation? Why cap, by regulatory fiat, the network operator's price for enhanced delivery at zero? Many inputs are essential to the development of new Internet content—programmers, computers, electricity. Why not force programmers to work for free? Or bar Dell from charging software developers for computers and servers? Why not impose new rent controls within a 50-mile radius of Palo Alto? Or

available at http://www.nvca.org/index.php?option=com_docman&task=cat_view&gid=57&Itemid=317.

[97] Samuel Kortum & Josh Lerner, *Assessing the Contribution of Venture Capital to Innovation*, 31 RAND J. ECON. 674 (2000).

[98] PricewaterhouseCoopers/National Venture Capital Ass'n, *Investment by Industry Q1 1995–Q4 2009*, MONEYTREE™ REPORT, DATA: THOMSON REUTERS (Jan. 22, 2010), *available at* http://www.nvca.org/index.php?option=com_docman&task=cat_view&gid=57&Itemid=317.

[99] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 6.

require Chevron to sell gasoline at a zero price to employees of content providers who live too far away to bicycle to work? The ease with which one can generate such absurd but logically equivalent proposals is a testament to the degree to which the proposed ban on voluntary business-to-business QoS transactions stands naked as an exercise in special pleading. Moreover, one does not fix one market failure (if one exists) by creating another.[100]

Ultimately, however, there is simply no theoretical or empirical support for the assumption by proponents of network neutrality regulation that the presence of spillovers leads to suboptimal content investment and innovation that would be exacerbated by optional ISP-paid QoS offerings, much less that this concern could justify a ban on whole categories of QoS enhancements between ISPs and content providers. Indeed, some scholars have observed that such spillovers are frequently an *indicator* of the robust climate of innovation among content and applications. In a 2007 article, Brett Frischmann and Mark Lemley, who advocate network neutrality regulation, state: "Spillovers do not always interfere with incentives to invest; in some cases, spillovers actually drive further investment."[101] In describing the benefits of spillovers, they observe that "[s]tatistical evidence repeatedly demonstrates that innovators capture only a small proportion of the social value of the inventions."[102] They further explain:

> Some of these spillovers accrue to passive consumers in the form of consumer surplus. But more importantly, spillovers also benefit third parties .... Far from interfering with incentives, these spillovers *actually drive further innovation.* Industries with significant spillovers generally experience more and faster innovation than industries with fewer spillovers.[103]

In this regard, it is especially puzzling that support for the spillover justification for regulating optional ISP-paid QoS offerings out of existence comes principally from Google. Google has pursued a business model that seeks to remedy, through private action, various purported externality problems concerning information. Chettiar and Holladay claim that "[b]ecause information providers are not fully compensated for the value of the information they provide, the free market tends to undersupply information."[104] Yet,

[100] *See* R.G. Lipsey & Kelvin Lancaster, *The General Theory of the Second Best*, 24 REV. ECON. STUD. 11 (1956).

[101] Brett M. Frischmann & Mark A. Lemley, *Spillovers*, 101 COLUM. L. REV. 257, 258 (2007).

[102] *Id.* at 111.

[103] *Id.* (emphasis added). Although the authors have attempted to excuse network neutrality from the implications of their findings, their arguments are unpersuasive. *Id.* at 139–41 (dismissing spillover benefits from network infrastructure innovation as "not known or even knowable," and claiming that optional QoS transactions would reduce innovation on the content side and that "application-level innovation may be more important than encouraging additional innovation in the network itself.").

[104] Chettiar & Holladay, *supra* note 49, at 14.

despite generating positive spillovers—"free" search is arguably the largest positive spillover of the Internet—Google remains highly successful. Google generates billions of dollars in advertising revenues,[105] and it has continued to invest heavily to develop the technology and attract and retain the talent required to upgrade and innovate its products and services.[106] Moreover, it continually introduces new free web tools that it expects (indeed, intends) to generate positive spillovers.[107] Given this history of building business models on the private solution to information externalities, it is curious that Google, through Economides and Hogendorn, now asserts that spillover effects are so paralyzing to innovation[108] that they require heavy-handed regulation of related activities.

2. *The Absence of an Appropriation Problem*

Because positive externalities from innovation in content and applications accrue to network operators as well—in the form of increased demand for broadband Internet access services—broadband operators, too, have an incentive to encourage further activity and concomitant positive spillovers in content and applications. Put differently, broadband operators benefit from innovation in content and applications, and vice versa. There is no generalized incentive for broadband operators to block innovation in content and applications.

Proponents of network neutrality regulation assert that an "appropriation" problem exists that is addressed by network neutrality regulation. Hogendorn claims that, because "there are small benefits distributed

[105] *See* GOOGLE INC., ANNUAL REPORT (FORM 10-K), at 35 item 6 (Feb. 12, 2010), *available at* http://www.sec.gov/Archives/edgar/data/1288776/000119312510030774/d10k.htm [hereinafter GOOGLE FORM 10-K 2009] (reporting $23.7 billion in revenues for the year ending December 31, 2009). Advertising revenues constituted 99 percent of Google's revenues in 2007, and 97 percent in 2008 and 2009. *Id.* at 37.

[106] *See id.* (reporting $2.8 billion in R&D costs in 2009, up from $0.6 billion in 2005); GOOGLE INC., REGISTRATION STATEMENT (FORM S-1), at 64 (Apr. 29, 2004), *available at* http://www.sec.gov/Archives/edgar/data/1288776/000119312504073639/ds1.htm (last visited Feb. 22, 2010) ("We strive to hire the best computer scientists and engineers to help us solve very significant challenges across systems design, artificial intelligence, machine learning, data mining, networking, software engineering, testing, distributed systems, cluster design and other areas. We work hard to provide an environment where these talented people can have fulfilling jobs.... We employ technology whenever possible to increase the efficiency of our business and to improve the experience we offer our users.").

[107] *Compare* GOOGLE FORM 10-K 2009, *supra* note 105, at 3 *with* GOOGLE INC., ANNUAL REPORT (FORM 10-K), at 6 (Mar. 16, 2006), *available at* http://www.sec.gov/Archives/edgar/data/1288776/000119312506056598/d10k.htm (last visited Feb. 22, 2010) [hereinafter GOOGLE FORM 10-K 2005] (web search tools added since 2005 include the search options panel, Rich Snippets, music search, real-time search, Google Suggest, and search personalization).

[108] *See* Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 3–4; Hogendorn, *supra* note 48.

broadly across a large number of users," "[i]f an ISP cannot appropriate these surpluses to itself, it may block or degrade applications that generate them without regard to the inframarginal surplus being lost."[109] This makes no sense. There is no economic theory that suggests that spite is a good predictor of business behavior. There is no reason to block content merely to prevent an upstream or downstream firm from gaining profit. Frischmann's and Lemley's analysis in their 2007 article also disputes Hogendorn's appropriation theory. They argue that investors and producers "do not need to capture the full social value of their inventions in order to have sufficient incentive to create."[110] Rather, "[s]ociety needs merely to give them enough incentive to cover the fixed costs of creation that their imitators will not face."[111] The Frischmann–Lemley framework implies that, as long as both broadband network operators and content and applications providers are permitted the opportunity to recover the fixed costs of creating their products, they will have sufficient incentive to invest and innovate.

Hogendorn also claims, without basis, that network operators will "base its preferred services and fees on what it can *privately appropriate from* the content provider's *current* (i.e. *static*) revenue from its content."[112] Such a "static" approach makes no economic sense. A rational, profit-maximizing ISP is concerned not merely about short-run—static—profits, but also about the discounted net present value of future profits. If an ISP believes that it can improve the net present value by pursuing a *non*-static—dynamic—strategy, it presumably will have an incentive to do so.

Moreover, a similar appropriability argument can be made with respect to content providers. Rational content providers, too, are not able to capture the full (social) benefits of their products and will rationally focus only on what they can "privately appropriate" from their innovations. The proponents of network neutrality regulation give no explanation why "appropriability" or "spillover" concerns merit a zero-price regulation banning optional business-to-business QoS transactions between ISPs and content providers but do not merit similar regulations on the offerings by content providers themselves. Put differently, the concern about "positive spillovers" and the claim that such "spillovers" result in "suboptimal investment" applies to *all* suppliers whose conduct generates such spillovers, not merely to ISPs. The spillovers argument is not a justification for singling out ISPs and preventing them from charging fees to content providers that benefit from their QoS enhancement services.

[109] Hogendorn, *supra* note 48, at 12–13.
[110] Frischmann & Lemley, *supra* note 101, at 276.
[111] *Id.*
[112] Hogendorn, *supra* note 48, at 1–2 (emphasis in original).

B. How the Option of Purchasing Enhanced QoS Promotes Innovation and Investment by Both Content Providers and Network Operators

Proponents of network neutrality regulation argue, as Economides puts it, that an "imposed" QoS fee would "diminish adoption and the virtuous cycle of network effects and spillovers."[113] In reality, the *option* of business-to-business QoS transactions would foster investment and innovation in Internet content by promoting network efficiency, product differentiation, competitive entry, and broadband penetration. In particular, the option of purchasing QoS enhancements would promote the development of new applications that otherwise might not be viable in industries such as telemedicine, online gaming, and e-learning, as the ACT recognizes.[114]

In their March 2010 paper, Jan Krämer and Lukas Wiewiorra develop a rigorous theoretical framework addressing the effect of optional business-to-business transactions for QoS on innovation and investment in the broadband market.[115] Krämer and Wiewiorra adopt a two-sided market model with a monopolist network operator, which is similar to Economides' own model.[116] In contrast to Economides' assumption that a positive priority fee applies to *all* content providers,[117] Krämer and Wiewiorra consider a differential regime: because different content providers supply different types of products with different latency needs, in equilibrium, certain content (particularly content that needs faster delivery) will be prioritized over other (less time-sensitive) content. Under this model, Krämer and Wiewiorra determine that differential pricing of traffic prioritization leads to infrastructure investments in transmission capacity and encourages innovation on the content provider side in the long-run.

Krämer and Wiewiorra's model finds that those benefits of optional business-to-business QoS transactions outweigh the drawbacks of permitting price differences in QoS tiers. The first derived loss is that in the short-run, the level of innovation is unchanged, whereas the content providers who do not purchase enhanced QoS are worse off, given the fixed transmission capacity.[118] However, the market reality is that the speed of best-effort delivery has constantly improved; therefore, the short-run model does not fit

[113] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 3.
[114] *ACT Comments*, *supra* note 64, at 13–20.
[115] Jan Krämer & Lukas Wiewiorra, *Network Neutrality and Congestion-Sensitive Content Providers: Implications for Service Innovation, Broadband Investment and Regulation* (Mar. 15, 2010), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1444423 (last visited Mar. 25, 2010).
[116] Nicholas Economides & Jaocim Tåg, *Net Neutrality on the Internet: A Two-Sided Market Analysis* (NET Institute Working Paper No. 07-45, May 2009), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1019121.
[117] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 3.
[118] Krämer & Wiewiorra, *supra* note 115, at 17.

real-world conditions. The other derived drawback of the model is that although the long-run social welfare is enhanced, a concern arises that most of the welfare gain is appropriated by the monopolist ISP.[119] Rivalry among ISPs in the real world mitigates this potential welfare loss; the actual price of the prioritized transactions will be lower than the derived price level from the monopoly model. Therefore, applied to real-world market conditions, Krämer and Wiewiorra's model predicts that, with optional business-to-business transactions for QoS, content providers will be better off as well as network operators. This theoretical finding contradicts Economides' theoretical finding. Moreover, it bears emphasis that Krämer and Wiewiorra's finding of short-term welfare losses to content providers is predicated on several additional restrictive assumptions that are unlikely to hold in the real world: consumers are assumed to be homogeneous, and charging content providers for optional QoS is assumed not to lead to reductions in consumer prices for broadband Internet access. Also, Krämer and Wiewiorra define the "short run" in the model in terms of how long broadband transmission capacity is fixed. With real-world broadband speeds increasing 20 percent annually for the past ten years, the short run is quite short. Consequently, the short-run reduction in content provider welfare that Krämer and Wiewiorra find is likely to be small or nonexistent.

Because ISP-content provider QoS transactions will be voluntary, both content providers and network operators will benefit.[120] The content provider benefits from enhanced QoS for its product, which increases consumer demand for it. The network operator benefits by receiving payment for delivering enhanced QoS service. In addition, the increase in consumer demand for the QoS-enhanced content increases the demand for broadband access on the network operator's network. Clearly, network operators have a great incentive to attract new, innovative content and applications to their networks and therefore to set QoS prices at levels that reflect the complementarity of demand. In other words, network operators have the incentive—without regulation—to try to internalize the positive externalities that accrue from innovations in content and applications, even if they cannot fully do so.

Moreover, for content and applications providers who do not purchase enhanced QoS, it is implausible that having the *option* of purchasing QoS enhancements would deter them from producing new products. First, concerns that the voluntary nature of transactions might lead to discriminatory, anticompetitive pricing—negotiating different prices for the same QoS service to different content providers—are unfounded and provide no basis, in all events, for completely banning entire categories of remunerative QoS arrangements.

[119] *Id.* at 21.
[120] *See, e.g.*, PINDYCK & RUBINFELD, *supra* note 74, at 584.

Second, permitting network operators to offer content providers a menu of priority classes and fees for different classes (with a higher fee for higher priority treatment), and permitting different content providers to choose the combination that they prefer, is not discriminatory in an economic sense. Content providers who sufficiently value enhanced QoS will willingly pay for it at privately negotiated prices and benefit from enhanced product quality, as described above. For many, if not most, content providers, QoS enhancements will be unnecessary, because their applications do not require such enhancements to perform well, and the availability of those enhancements to others who do value them is simply irrelevant.[121] Here again, support for a ban on such enhancements founders on its false "zero sum" premise. If a content or applications provider chooses not to purchase QoS enhancements, end users will still be able to access its product. The positive spillovers will still accrue. Under the FCC's proposed nondiscrimination regime, however, a producer demanding only best-effort delivery today would lose the option of purchasing QoS enhancement through voluntary business-to-business transactions in the future—the value of which, given the recent rapid innovations in content and applications, may well be substantial.

C. Externalities at All Levels of the Internet Value Chain

Proponents of network neutrality regulation have designated—arbitrarily—innovation in content and applications to be more virtuous than infrastructure innovation. In focusing entirely on spillovers from content and applications, proponents ignore not only the interests of content providers that wish to (but would be forbidden to) purchase efficient QoS enhancements for their performance-sensitive content, but also the positive spillovers that arise from investment and innovation in network infrastructure and increased consumer broadband adoption. However, any meaningful analysis of externalities must account for all spillovers. Moreover, banning optional business-to-business QoS transactions would deter innovation in both Internet infrastructure and content. Indeed, infrastructure innovation can best be regarded as "enabling" content innovation. To cripple it with network neutrality regulation would have ripple effects that would reduce innovation throughout the Internet ecosystem. In this regard, proponents of network neutrality regulation are fundamentally at war with the voluminous literature on innovation economics and policy, and it is notable that one finds no references to that literature in their writings.

[121] *See* David D. Haddock, *Irrelevant Internalities, Irrelevant Externalities, and Irrelevant Anxieties* 1, 20 (Northwestern Law & Economics Research Paper No. 03-16, 2003) ("those with the most extensive demands will if necessary pay for so much of it that those with less extensive demands lose interest in having more. Those with inframarginal demands value the good—perhaps they enjoy few things more keenly—but they are satiated before their preferences have any impact on optimal provision.") (citations omitted).

1. *Positive Network and Consumer Spillovers Enhanced By Optional Business-to-Business QoS Transactions*

Investments and innovation in content produce spillovers, but so do infrastructure innovations and broadband adoption by end users. In particular, when a network operator makes investments in bandwidth, capacity, or efficient routing to improve its services, those investments benefit not only its subscribers and non-subscriber end users whose messages may be routed through the network operator's system, but also content providers that supply content to such subscribers. Both ISP subscribers and content providers that send their data over the network operator's equipment typically receive "spillover" benefits, in that the value that they receive exceeds the price that they pay. Investment by network operators thus creates spillover benefits that the network operators do not capture entirely.

All of these spillovers, not only the spillovers on which proponents of network neutrality regulation focus, should be considered in assessing the social welfare impacts of any proposed regulation. Optional business-to-business QoS transactions encourage innovations in network functionality that increase the efficiency of packet delivery. By ignoring positive spillovers from infrastructure investment, proponents of regulation fail to recognize that such enabling innovation encourages and facilitates innovation in real time and other latency-sensitive content and applications. Proponents of network neutrality regulation have provided no explanation as to why it is necessary or desirable to subsidize content providers whose offerings yield spillover benefits without it being similarly desirable to subsidize ISPs whose offerings likewise yield such benefits. In particular, they have provided no explanation for why the proposed nondiscrimination rule is an appropriate response to the presence of spillovers generally.

Economides, Hogendorn, and Chettiar and Holladay acknowledge the existence of infrastructure-related spillovers, but they simply assume, without any serious analysis, that they will be less important than spillovers from innovations in content and applications.[122] Chettiar and Holladay propose that the government "correct the externalities by instituting network neutrality—a pricing policy that incentivizes market players to invest in content—and then directly subsidizing investments in infrastructure."[123] This proposal assumes that congestion is best solved simply by continuously adding capacity. In reality, adding network capacity alone would be highly inefficient and costly, because it fails to account for the

[122] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 4 (listing "benefits of innovation at the edge of the network" but not benefits of innovation within the network core as one of the four benefits to society from changes in Internet pricing); Hogendorn, *supra* note 48, at 15.

[123] Chettiar & Holladay, *supra* note 49, at 38.

varied QoS needs of different types of traffic.[124] To avoid debilitating congestion in times of peak demand, the government would need to supply an enormous amount of bandwidth—which would lie unused during off-peak times. Moreover, there is no such *quid pro quo* (imposing network neutrality rules on network operators in exchange for providing governmental subsidies for infrastructure investment by network operators) in the FCC's proposed rules. Even if Chettiar and Holladay were correct as to the optimal policy (which we dispute), there is no reason to believe that implementing only *half* of their proposal is desirable. In contrast, permitting network operators to engage in optional business-to-business QoS transactions would encourage investment in developing efficient, "lowest cost architectures that deliver the levels of network capacity and reliability that customers demand."[125]

Furthermore, proponents of network neutrality regulation place surprisingly little emphasis on increasing consumer-based spillovers, or network effects, through greater broadband penetration. Chettiar and Holladay claim that "the debate about network neutrality revolves around how the benefits of Internet access should be allocated between consumers (here content providers who consume access to Internet end users) and producers (ISPs that generate access to Internet end users)."[126] They disregard broadband *end users* in this calculus. The omission is particularly significant not only because consumer welfare should be the principal focus of any FCC regulation, but also because end user demand plays a significant role in driving content innovation. As explained in Section II, in a two-sided market, an increase in the price charged to one side of the market generally leads to a reduction in the price charged to the other side. By lowering prices to end users, optional transactions for QoS between network operators and content and applications providers will result in greater broadband adoption, which, in turn, will *promote* innovation in content and applications.

Proponents of network neutrality regulation incorrectly suggest that optional business-to-business QoS transactions decrease network effects. Hogendorn asserts that "[i]f a user is prevented or dissuaded from being part of the system due to certain types of traffic being prohibited or delayed, then the effect spills over into less new product development, hurting both the business of the developers and the value of other users."[127] Although

[124] *See, e.g.*, *Schwartz Declaration*, *supra* note 28, at 11; Faulhaber & Farber, *supra* note 16, at 25–26; George S. Ford, Thomas Koutsky & Lawrence J. Spiwak, *The Efficiency Risks of Network Neutrality Rules* 4 (Phoenix Center Policy Bull. No. 16, 2006), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=925347&download=yes (last visited Mar. 25, 2010).

[125] Daniel F. Spulber & Christopher S. Yoo, *Rethinking Broadband Internet Access*, 22 HARV. J.L. & TECH. 1, 52 (2008).

[126] Chettiar & Holladay, *supra* note 49, at 10.

[127] Hogendorn, *supra* note 48, at 11.

Hogendorn is correct that diminished network effects could result in decreased investment in content and applications, an end user is more likely to be "prevented or dissuaded from being part of the system" by higher Internet prices[128] than by any other factor. Permitting broadband ISPs to charge willing content and applications providers for QoS enhancements would increase broadband adoption, enhance network effects, and foster content innovation.[129]

2. *Negative Externalities Worsened By Banning Optional Business-to-Business QoS Transactions*

While emphasizing positive network externalities, Economides, Hogendorn, and other proponents of network neutrality regulation ignore negative network externalities, especially those relating to congestion. Network capacity is a limited resource. For that reason, correct price signals must be used at every possible point in the network so that users who create congestion internalize the social cost of their behavior.[130] Proponents of network neutrality regulation seem to argue that allowing "voluntary" bilateral or multilateral charges for enhanced delivery creates a "negative externality" among the parties involved in the QoS transaction and other content providers. But, from an economic perspective, this externality is a "pecuniary externality," with inherent efficiencies, not a "technological externality." By way of analogy, if there is perfectly inelastic supply of some commodity, the market-clearing price depends on the level of demand; additional demand increases the market-clearing price. But this is the way that markets are *supposed* to work in allocating resources across competing potential uses.

Suppose that the FCC did adopt its proposed "nondiscrimination" rule, under which content providers would be forbidden to pay broadband ISPs for prioritization of the performance-sensitive content they send to the ISPs' other customers. In the unlikely event that network operators agreed to prioritize certain traffic anyway at the behest of particular content providers, *all* such providers would have powerful incentives to "overconsume" prioritization resources by always signaling to the ISP that *their* traffic is performance-sensitive and should therefore be prioritized. In other words, they would disregard the costs to the network of supplying pervasive

[128] *See* John Horrigan, *Home Broadband Adoption 2009*, PEW INTERNET & AMERICAN LIFE PROJECT 7 (32 percent of American dial-up users said that broadband prices would have to fall for them to switch to broadband; 20 percent said nothing would get them to switch; 17 percent cited availability as the obstacle to switching, 16 percent said they did not know what would get them to switch; and 13 percent cited some other reason).

[129] *See also Schwartz Declaration*, *supra* note 28, at 18.

[130] *See* Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, *supra* note 5; J. Gregory Sidak & Daniel F. Spulber, *Cyberjam: The Law and Economics of Internet Congestion of the Telephone Network*, 21 HARV. J.L. & PUB. POL'Y 327 (1998).

prioritization, including the opportunity costs of reducing shared bandwidth available for *other* content that may have a greater need for prioritization to create greater social value—as price signals would have shown, had they been allowed. At a price of zero, what provider of content or applications would *not* demand prioritized delivery? The only economically efficient way to allocate finite QoS resources to content that needs them in the manner that consumers value most is to allow the market to attach prices to them to signal scarcity and cost to market participants.

D. Internalization of Content-Related Spillovers

The conjecture that network operators will disregard positive content-related externalities entirely in setting prices for enhanced QoS services is also unsupported. *Because* such positive externalities exist, network operators have the incentive to internalize positive spillovers in optional business-to-business transactions for QoS. This logic, formalized by Joseph Farrell and Philip Weiser in their development of the concept of ICE, holds even in a market with a monopolist network operator.[131] Rivalry between network operators—cable broadband and telephone DSL providers, for instance—further enhances this incentive. Each network operator competes for the other's customers by striving to offer a better quality experience to consumers. In other words, they have no incentive to degrade their services or induce quality-adjusted price increases that could diminish the supply of Internet content.

The incentive to internalize positive spillovers is not unique to broadband Internet access services. In markets with network effects and demand complementarities, firms typically have incentives to internalize complementary externalities. One such example is the wireless industry, where providers attract customers to their networks by promoting the latest technology in wireless devices and compatible applications. Although wireless carriers typically do not produce these devices and applications themselves, they nonetheless promote them because wireless access and wireless phones and applications are complements. As a result, the number of applications available to wireless service customers—offered by handset manufacturers, wireless service providers, and third-party operators—has increased dramatically over the last decade, notwithstanding the absence of legally binding and enforceable price regulation on wireless network operators. For example, Figure 3 shows the growth in the number of applications available for download on Apple's iPhone App Store. Apple launched its application store in July 2008 with 500 third-party applications available for download.[132] By the end of July 2009,

[131] Farrell & Weiser, *supra* note 40, at 89. We discuss the application of ICE in more detail in Part IV.

[132] Press Release, Apple Inc., iPhone 3G on Sale Tomorrow (July 10, 2008), http://www.apple.com/pr/library/2008/07/10iphone.html (last visited Mar. 26, 2010).

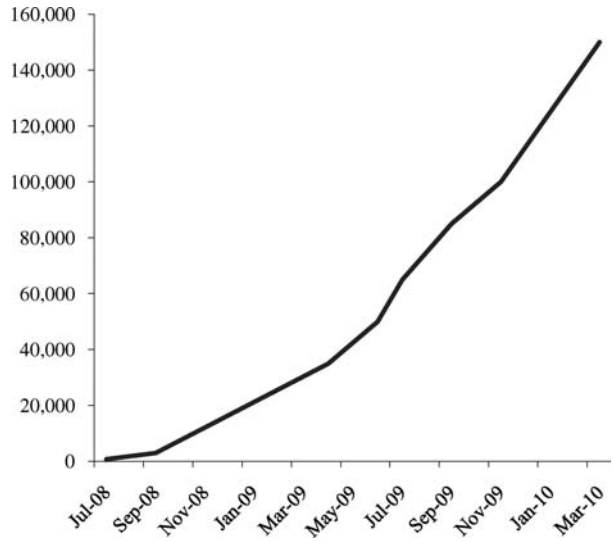

Figure 3. iPhone applications available for download, July 2008–March 2010.
Source: Press Release Library, Apple Inc., http://www.apple.com/pr/library.

Apple's App Store offered more than 65,000 applications.[133] As of March 2010, the App Store included more than 150,000 applications.[134]

Hogendorn concedes that given the clear complementarities that "one might ask whether ISPs would do everything they could to stimulate the [content related] spillovers in hopes of capturing at least some of the surplus to themselves."[135] Nonetheless, Hogendorn dismisses the notion that broadband providers would internalize the value of content innovation by claiming that exceptions to the theory of ICE "may" give a broadband provider reasons to "block or degrade certain services in violation of ICE."[136] Yet, Hogendorn fails to explain why any of the exceptions that he listed is relevant to a broadband provider's incentives to offer optional business-to-business transactions for QoS, rather than to block or degrade certain services. We address ICE and its recognized exceptions in detail in the vertical foreclosure section that

[133] Press Release, Apple Inc., Apple's App Store Downloads Top 1.5 Billion in First Year (July 14, 2008), http://www.apple.com/pr/library/2009/07/14apps.html.

[134] *See* Press Release, Apple Inc., iPad Available in U.S. on April 3 (Mar. 5, 2010), http://www.apple.com/pr/library/2010/03/05ipad.html (last visited Mar. 22, 2010).

[135] Hogendorn, *supra* note 48, at 9.

[136] Hogendorn argues that network operators would "block or degrade certain services in violation of ICE" because: (1) they seek to "charge different prices to different customers in order to increase profits;" (2) they want to "make it harder for other firms to enter the market;" (3) "there may be bargaining problems that prevent internalization;" (4) "firms may not fully realize the benefits of all externalities;" or (5) "if Internet applications have other spillover benefits, it may make it easier to capture (but in the process reduce) those spillovers." *Id.*

follows. On spillover specific concerns, Hogendorn does not even establish that any of the supposed ICE exceptions that he lists exist in this context, much less that they could operate to kill broadband providers' incentive to promote innovation in a complementary product that has strong impacts on the value of the broadband operators' own services. Moreover, Hogendorn's "exception" analysis is flawed even on its own terms.

His first "reason" that an ISP might "violate" ICE—that the ISP "might charge different prices to different customers in order to increase profits"—states neither an ICE violation nor a consumer welfare harm. Differential pricing can increase economic welfare because it enables a firm to lower the price to consumers—or, in this case, to content and applications providers—that would otherwise be priced out of the market if the firm were constrained to charge a higher uniform price.[137] Differential pricing is commonplace in competitive markets, such as airlines, hotels, retailing, package delivery, personal computers, and book publishing. William Baumol and Daniel Swanson argue that price discrimination is ubiquitous and that "it is competition, rather than its absence, that in many cases serves to impose discriminatory pricing."[138] In the context of business-to-business transactions for QoS, differential pricing for QoS—as opposed to a zero-price rule—could *increase* output, which is particularly crucial to raising a network operator's total profits, given the high ratio between the fixed and marginal costs in providing broadband Internet access, and *facilitate* entry by content providers. Again, it bears emphasis that an ISP (or any other market actor) also does not necessarily engage in discrimination in the first place—even economically efficient discrimination—simply by offering different tiers of service at different prices, just as Honda does not discriminate among its customers by charging more for an Accord than for a Civic.

Hogendorn's second exception to ICE is a restatement of the vertical foreclosure argument of anticompetitive discrimination, which we refute in Part IV. Regarding Hogendorn's third exception, if bargaining problems indeed were to occur between network operators and content and applications providers, even Farrell and Weiser posit that, "in the longer term, ICE suggests a possible self-correcting dynamic," in which the network operators would "implement modularity" to facilitate entry by unaffiliated content and applications

[137] *See, e.g.*, JEAN-JACQUES LAFFONT & JEAN TIROLE, A THEORY OF INCENTIVES IN PROCUREMENT AND REGULATION 172–73 (MIT Press 1993).

[138] *See* William J. Baumol & Daniel G. Swanson, *The New Economy and Ubiquitous Competitive Price Discrimination: Identifying Defensible Criteria of Market Power*, 70 ANTITRUST L.J. 661, 662 (2003). *See also* Hal R. Varian, *Price Discrimination and Social Welfare*, 75 AM. ECON. REV. 870 (1985); Hal R. Varian, *Price Discrimination*, in HANDBOOK OF INDUSTRIAL ORGANIZATION 597, 599 (Richard Schmalensee & Robert Willig, eds., Elsevier Science Publishers B.V. 1989). *See also* Richard Schmalensee, *Output and Welfare Implications of Monopolistic Third-Degree Price Discrimination*, 71 AM. ECON. REV. 242 (1981); Marius Schwartz, *Third-Degree Price Discrimination and Output: Generalizing a Welfare Result*, 80 AM. ECON. REV. 1259 (1990).

providers.[139] Finally, regarding Hogendorn's fourth and fifth exceptions, as explained above, firms do not need to appropriate *all* the benefits of all externalities to have incentives to internalize them. Moreover, Hogendorn's invocation of Farrell and Weiser's last exception—that broadband access and content are not strict complements—is incorrect. Not only are Internet access and Internet content complementary, but broadband access is an input for Internet content—access makes content delivery viable, and the option of purchasing enhanced QoS makes latency-sensitive applications possible.

E. Is a Zero-Price Rule Justified?

Whatever the "right" price for enhanced QoS offerings by network operators—who have much stronger incentives to internalize spillovers than those other suppliers whose businesses are less dependent on good Internet content—it is certainly not zero. The proponents of regulation do not provide any basis—theoretical or otherwise—for selecting *zero* as the right price. It is arbitrary and capricious. One does not fix one market failure (if one exists) by creating another. A price cap set at zero would induce an inadequate supply of QoS at the very time when quality-of-service needs for real-time applications that are gaining favor with consumers are rapidly growing. Mandating zero would forgo all of the benefits described above and likely would stifle investment in network infrastructure, content, and applications.[140] In considering the need for regulation, it is important to bear in mind:

> The distinction between ideal and optimal often is forgotten. Chronic externalities often are less than *ideal*, but may well be *optimal*. Ideal (or Nirvana efficient) requires perfection while optimal merely requires beating realistic alternatives, and though externality-riddled markets are less than perfect so too are norms and laws. Well-informed people would prefer to live with an externality rather than bear more serious consequences attending misguided "corrective" intervention.[141]

To date, the proponents of network neutrality regulation have failed to provide empirical evidence that the proposed nondiscrimination rule would actually succeed in enhancing the effects of positive spillovers and thereby improving efficiency in the broadband marketplace.

IV. FORECLOSURE

Economides and other proponents of network neutrality regulation claim that permitting optional business-to-business transactions for QoS would allow

[139] Farrell and Weiser cite Microsoft—which "exposes many of its application programming interfaces (APIs) to independent developers, spending money and resources to cooperate with complementary (applications) providers"—and Intel as examples. Farrell & Weiser, *supra* note 40, at 30 (citations omitted).

[140] *See, e.g.*, SPULBER & YOO, *supra* note 30, at 369–72 (arguing in favor of market-based pricing of access to broadband inputs).

[141] Haddock, *supra* note 121, at 26 (emphasis in original).

vertically integrated broadband network operators to drive competing content and applications producers from the market or, at least, to seriously hamper such offerings.[142] Even under the assumption that such a scenario could occur, the FCC's proposed nondiscrimination rule is an overbroad remedy for the posited harm. Moreover, an absence of monopoly power in both the broadband access market and the content and applications market would preclude successful foreclosure even if all network operators were, as Economides and others erroneously assume, significantly vertically integrated.

A. Summary of Proponents' Vertical Foreclosure Argument

The vertical foreclosure theory advanced by proponents of network neutrality regulation predicts that a vertically integrated broadband operator with monopoly power over broadband access will block or degrade competing content on its network, ostensibly to the point that competing content providers will be driven from the market entirely. Dennis Carlton provides a stylistic example of vertical foreclosure in a 2001 article, in which Firm 1 is a monopolist in the market for product A and competes with Firm 2 in the market for a complementary product B:

> Suppose Firm 1 refuses to sell product A to any customer who purchases product B from Firm 2. This causes Firm 2's scale to drop below an economically efficient scale, and Firm 2 leaves the market for product B. This means that customers that want *only* product B now face a monopolist (Firm 1) and they suffer a harm from the reduced competition.[143]

Van Schewick cites this passage from Carlton's article to justify regulatory intervention.[144] Economides implicitly adopts the same framework when he asserts that, "broadband providers have the incentive to deliberately give their own services favored treatment and withhold that from competitors."[145] This model is not, however, applicable to broadband Internet access services.

B. Existing Regulatory and Antitrust Remedies for Vertical Foreclosure and the Absence of Empirical Evidence of Such Conduct by Broadband ISPs

Even if the theory of vertical foreclosure were applicable to the broadband marketplace—which, as we will show in subsequent sections, it is not—it is a theory of anticompetitive harm already addressed by antitrust law. Accordingly, any call for regulation on this ground must first demonstrate some reason why the posited harm will not be sufficiently deterred by antitrust law remedies. Proponents of network neutrality regulation have not done

[142] *See* Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 5.
[143] Dennis W. Carlton, *A General Analysis of Exclusionary Conduct and Refusal to Deal—Why* Aspen *and* Kodak *Are Misguided*, 68 ANTITRUST L.J. 659, 667 (2001).
[144] van Schewick, *supra* note 4, at 353.
[145] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 5.

so. Nor have they explained why this ostensible risk could justify the across-the-board ban on all optional business-to-business QoS arrangements.

The overbroad nature of the proposed regulation is particularly acute because vertical integration by ISPs is relatively limited. Although Economides characterizes all broadband network operators equally as "vertically integrated entities,"[146] broadband network operators differ substantially in the degree to which they are vertically integrated into the production of content or applications. Indeed, two of the largest network operators, AT&T and Verizon, currently have little vertical integration into content or applications production beyond voice-over-Internet-protocol (VoIP) service. In this respect, the status of AT&T and Verizon (as well as that of the various wireless providers of broadband Internet access) differs from that of the two major vertically integrated cable companies, Comcast and Time-Warner, which have programming assets that include motion pictures, cable channels, sports, and local television broadcasts. Notably, the proposed "nondiscrimination" rule would apply *whether or not* a network operator is vertically integrated into providing competing content. Such an overbroad regulation is not tailored to fit the supposed problem.

Certainly, the conduct of network operators to date provides no justification for the proposed ban on optional QoS arrangements. In over a decade of experience, there have been only two recorded incidents of alleged ISP hostility to unaffiliated content: *Madison River*[147] and *Comcast*.[148] However, both cases were resolved quickly, and neither example involved QoS, in any event. On the basis of only two isolated incidents, and in the absence of strong empirical evidence of market failure, there is no demonstrated need for any regulatory overlay,[149] much less a prophylactic ban on *all* optional paid QoS-enhancement offerings by broadband ISPs.[150]

[146] *Id.* at 5.

[147] *In re* Madison River Commc'n, L.L.C. and Affiliated Companies, 20 F.C.C. Rcd. 4,295 (Enforcement Bureau, Mar. 3, 2005).

[148] *In re* Formal Complaint of Free Press and Public Knowledge Against Comcast Corporation for Secretly Degrading Peer-to-Peer Applications, Broadband Industry Practices Petition of Free Press et al. for Declaratory Ruling that Degrading an Internet Application Violates the FCC's Internet Policy Statement and Does Not Meet an Exception for "Reasonable Network Management," 23 F.C.C. Rcd. 13,028 (2008), *vacated*, Comcast Corp. v. FCC, No. 08-1291 (D.C. Cir. Apr. 6, 2010).

[149] It is important to recognize that all regulation is costly—both in terms of the direct costs of enforcement and in terms of the potentially damaging effects on incentives to invest and innovate. Daniel Spulber and Christopher Yoo observe that government-imposed solutions often fall short of efficient outcomes, even when they are implemented to correct a market failure. Not only can a regulatory access regime harm allocative efficiency if access prices are set at inefficient levels, regulation can also harm dynamic efficiency by causing investment incentives to fall below efficient levels and by creating *de facto* entry barriers. Daniel F. Spulber & Christopher S. Yoo, *Network Regulation: The Many Faces of Access*, 1 J. COMPETITION L. & ECON. 635, 675 (2005).

[150] Fox TV Stations, Inc. v. FCC, 280 F.3d 1027, 1051 (D.C. Cir. 2002), in which it addressed the FCC's proposal to institute new nondiscrimination regulation for cable, the D.C. Circuit Court said: "[T]he Commission has not shown a substantial enough

C. The Irrelevance of the Vertical Foreclosure Theory to Broadband Markets

Apart from the problem that the proposed "nondiscrimination" rule is an overbroad remedy for the posited harm, the vertical foreclosure argument is flawed in several other respects. In brief, the posited problem does not exist. Even proponents of network neutrality regulation have acknowledged that vertical foreclosure theories can justify a policy response only where an upstream monopoly gives the ability (and incentive) to foreclose rival downstream providers. Van Schewick, for example, observes that "most of the literature on vertical exclusionary conduct in complementary markets focuses on exclusionary conduct by monopolists: after all, the same conduct *is unlikely to pose any significant anti-competitive threat*, if the firm faces competition in the primary market."[151] In the context of broadband markets, all necessary criteria for the vertical foreclosure construct are missing.

1. Broadband Internet Access Service Competition

Rivalry between cable broadband and telephone DSL, as well as the increasingly important intermodal competition fostered by wireless broadband (including Clearwire), provides broadband ISPs strong incentives to improve service quality and expand the uses to which their Internet access service can be put as they strive to attract and retain subscribers. The FCC reported in March 2010 in its National Broadband Plan that U.S. broadband subscribers "have benefited from the presence of multiple providers,"[152] and that "typical advertised download speeds to which consumers subscribe have grown at approximately 20% annually for the last 10 years."[153] Competitive forces will only intensify as wireless carriers deploy faster 3G and 4G technologies. This competition prevents network operators from sustaining any attempt at exerting monopoly power—if a particular network provider attempted to degrade the quality of its offering by foreclosing access to content that subscribers value, subscribers could and would simply switch to another broadband provider. Although Economides and van Schewick assert that consumers face high switching costs[154] to suggest that network

probability of discrimination to deem reasonable a prophylactic rule as broad as the cross-ownership ban, especially in light of the already extant conduct rules. A single incident since the must-carry rules were promulgated—and one that seems to have been dealt with adequately under those rules—is just not enough to suggest an otherwise significant problem."

[151] *See, e.g.*, van Schewick, *supra* note 4, at 369 (citation omitted) (emphasis added).

[152] NATIONAL BROADBAND PLAN, *supra* note 62, at 37.

[153] *Id.* at 38.

[154] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at i; van Schewick, *supra* note 4, at 371.

operators possess monopoly power, empirical evidence indicates that annualized churn rates for certain providers are between 28.8 and 36 percent.[155] Such high rates confirm that, although there are some costs associated with switching suppliers, consumers do not face switching costs high enough to prevent them from switching to another broadband operator's network.

These economic effects of rivalry and demand complementarities are exacerbated by high average cost-to-marginal cost ratios, which further reduce the incentives of network operators to foreclose unaffiliated content and applications.[156] To recover their substantial fixed costs, broadband network operators must charge prices that exceed marginal cost. Put differently, broadband network providers have high price-cost ratios. Under high price-cost ratios, the relative losses that a network operator would incur if it degraded QoS, which is equivalent to a quality-adjusted increase in price, and induced subscribers to switch to other networks would be greater than losses under marginal cost pricing. Because a large proportion of the network operator's costs are fixed or sunk—and consequently unavoidable—if it loses subscribers, its costs do not decrease proportionally. As Dennis Weisman explains in a 2006 article,

> price increases that produce even small reductions in demand can generate large losses in contribution to joint and common costs because the firm's revenues decline much more than the costs it can avoid. It is in this manner that high margins can serve to discipline the (de)regulated firm's pricing behavior.[157]

High price-cost ratios, in combination with the high degree of rivalry and effective (even if not perfect) competition among providers, ensure that

[155] Craig Moffett et al., Bernstein Research, *Broadband: Are We Reaching Saturation?*, at 4, at exhibit 2 (reporting monthly churn rates for cable broadband at 2.4 to 3 percent).

[156] Contrary to the claims of some, in industries with a large proportion of fixed costs, supramarginal cost pricing does not indicate any market failure or the presence of market power. Although Economides states in *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 2 that "there is significant concentration in the market... and thus there are concerns about inefficient pricing there," absent empirical evidence of monopoly power, the high price-cost margins are merely an indicator of the economies of scale and scope that are characteristic of broadband networks. Thomas W. Hazlett & Dennis L. Weisman, *Market Power in U.S. Broadband Services* 8 (Geo. Mason U. Law and Econ. Research Paper Series No. 09-69, Nov. 2009); *see also* David J. Teece & Christopher Pleatsikas, *Economic Fallacies Encountered in the Law of Antitrust: Illustrations from Australia and New Zealand*, 9 TRADE PRAC. L.J. 73 (2001). The FCC acknowledged this point in its recently released National Broadband Plan: "Building broadband networks—especially wireline—requires large fixed and sunk investments. Consequently, the industry will probably always have a relatively small number of facilities-based carriers, at least for wireline service." NATIONAL BROADBAND PLAN, *supra* note 62, at 36–37. However, the FCC continued, "the lack of a large number of wireline, facilities-based providers does not necessarily mean competition among broadband providers is inadequate."

[157] Dennis L. Weisman, *When Can Regulation Defer to Competition for Constraining Market Power?: Complements and Critical Elasticities*, 2 J. COMPETITION L. & ECON. 101, 102 (2006).

broadband network operators cannot degrade QoS while holding price constant without risking an unsustainable loss in subscribership. Because variable costs are relatively low in the broadband industry, "a relatively small percentage of 'marginal customers' willing to discontinue service or switch to alternative providers in the face of a price increase may [be] sufficient to defeat a price increase."[158]

2. Internet Content and Applications Competition

Another reason why broadband ISPs would not rationally attempt to foreclose content competition is that no broadband network operator has any plausible ability to foreclose content in any economically meaningful sense. Both the production and distribution of Internet content are global in nature, and no wireline broadband network operator possesses more than a 22 percent share of broadband subscribers nationally, nor more than a 3 percent share globally.[159] Absent compelling evidence that content development is not viable unless a provider has immediate access to virtually every user, the theory of vertical foreclosure has no relevance. Moreover, U.S. consumers are not single-homed in the sense that they get content from only one ISP; rather, they have home, work, and mobile broadband connections. As noted, U.S. customers easily can and frequently do switch ISPs if they are dissatisfied with a current provider's offerings or practices. Thus, no ISP is capable of foreclosing content to even a small fraction of end users.

Consequently, Google is incorrect in relying upon a 2007 article by Sidak and a co-author as evidence that broadband service providers have an incentive to engage in vertical foreclosure of unaffiliated Internet content or applications.[160] Google cites this article as support for its statement, "when cable operators control both the programming and the physical distribution network, they have strong incentives to discriminate, block access, adjust prices and otherwise engage in anticompetitive practices."[161] Google extrapolates from the economic reasons for regulating cable television service providers, such as the need to prohibit monopolistic "exclusive dealing by programming networks vertically integrated with cable operators,"[162] to justify regulating broadband network providers. Although Google cites such reasons as "instructive" in the context of broadband access, Sidak and his co-author specifically reject that proposition in the paper that Google cites:

[158] Hazlett & Weisman, *supra* note 156, at 13.

[159] Moffett et al., *supra* note 155, at 118 (citing Comments of Verizon and Verizon Wireless, In the Matter of Preserving the Open Internet, Broadband Industry Practices, GN Dkt. No. 09-191, WC Dkt. No. 07-52, at 51 (filed with the FCC Jan. 14, 2010) [hereinafter *Verizon Comments*]; Alex Goldman, *Top 23 U.S. ISPs by Subscriber: Q2 2008*, ISP PLANET, Dec. 2, 2008, http://www.isp-planet.com/research/rankings/usa.html).

[160] Hal J. Singer & J. Gregory Sidak, *Vertical Foreclosure in Video Programming Markets: Implications for Cable Operators*, 6 REV. NETWORK ECON. 348 (2007).

[161] *Google Comments*, *supra* note 55, at 30.

[162] *Id.* at 31 (citations omitted).

> Vertical foreclosure theories depend critically on the relevant geographic market. A local downstream access provider—whether it is a cable television operator or a cable modem provider—lacks the ability to foreclose an upstream content provider that generates content with nationwide appeal. . . . Theories of vertical foreclosure have been cited for support of this proposition in the net neutrality debate (van Schewick). However, this application of the theory of vertical foreclosure assumes incorrectly that a content provider is offering content that is particular to a given locality and therefore requires access to a single broadband provider's subscribers. The vast majority of Internet content appeals to all U.S. residents, not just the residents of a particular locality.[163]

No vertically integrated broadband network operator could rationally engage in vertical foreclosure because all lack the monopoly power requisite for profitably excluding rival content. Exceptions to this condition are likely to be rare and cannot justify a broad-scale policy response.

3. *Why Even a Monopoly Broadband Network Operator Would Not Have the Incentive to Foreclose Content and Applications*

As noted, broadband Internet access and content or applications are complementary services. Network operators increase network value in part by ensuring that customers who purchase their services can access a wide variety of content and applications, recognizing that consumers value not only quality but also choice. If a network operator were to foreclose all unaffiliated content or applications that competed with its own affiliated content or applications, it would reduce consumer choice, thereby diminishing the value of its network.

Mainstream economic theory, confirmed by examples throughout technology markets, suggests that even vertically integrated *monopolies* generally will account efficiently for demand complementarities. First, ICE induces network operators to refrain from anticompetitive discrimination against unaffiliated content and applications. Indeed, the principle of ICE recognizes that network operators "often take pains 'not to compete with customers' so as to minimize any ill effects of integration on independent applications."[164] Thus, even if a network operator is a monopolist, it "will remain focused on serving the needs of independent developers."[165] In other words, the network operator "would prefer that applications—the complements to its product—be cheaply, innovatively, and efficiently supplied."[166] So, even a monopoly network operator generally has no incentive to deter innovation and market entry of independent content and application developers. Economides' prediction that network operators will set prioritization prices at levels that fail to account for spillovers is thus incorrect.

[163] Singer & Sidak, *supra* note 160, at 367–68.
[164] Farrell & Weiser, *supra* note 40, at 100. *See also* John M. de Figueredo & David J. Teece, *Mitigating Procurement Hazards in the Context of Innovation*, 5 INDUS. & CORP. CHANGE 537 (1996).
[165] Farrell & Weiser, *supra* note 40, at 100.
[166] *Id.* at 101.

Second, even where a hypothetical broadband monopolist is significantly vertically integrated into the content and applications market, ICE maintains that the network operator still typically will have no incentive to hinder the innovation and entry of independent content and application developers. Under standard economic theory dating back to Augustin Cournot,[167] any platform monopolist is constrained to one monopoly profit, and it will seek to earn that profit in the sale of the platform product itself. The monopolist cannot increase its overall profit by excluding complementary applications; indeed, it may well *reduce* that profit if it pursues that strategy because it would thereby devalue the platform itself.[168] In contrast, a monopolist would benefit financially by attracting cheap and popular applications to its platform, maximizing the value to its network. So even a vertically integrated monopolist normally has little or no incentive to extract monopoly rents or to deter competing services in the downstream market. A vertically integrated network operator "will still welcome value-added innovations by independent firms. Thus, according to this form of ICE, such close vertical relationships *do not raise economic policy concerns*."[169]

If vertical integration of network operators does not justify regulation, then optional business-to-business transactions for QoS—a less closed form of vertical relationships than vertical integration—could not possibly warrant the FCC's expansive nondiscrimination rule. Due to ICE, it is unlikely that network operators would find it profitable to unilaterally charge exorbitant "tolls" for priority delivery or degrade the performance of best-efforts delivery.[170]

The proponents of the nondiscrimination rule have attempted to identify exceptions to these well-established economic principles and marketplace facts. Those attempts are unpersuasive. Economides and Hogendorn[171] rely upon a theory of vertical foreclosure articulated previously in the analysis of van Schewick, who proposes three new ICE exceptions that she claims "may" give broadband network operators the incentive to discriminate against or exclude competing content and applications. Van Schewick does not specify an economic model at any point in her analysis. Although she presents various sets of scenarios, conditions, and possible conclusions, she does not formalize her analysis in the framework of a testable model.

[167] *See* AUGUSTIN COURNOT, RESEARCHES INTO THE MATHEMATICAL PRINCIPLES OF THE THEORY OF WEALTH 99–116 (Nathaniel T. Bacon trans. 1971) (1838); DENNIS W. CARLTON & JEFFREY M. PERLOFF, MODERN INDUSTRIAL ORGANIZATION 238–42, 526 (2d ed. 1994); Guiseppe Dari-Mattiacci & Francesco Parisi, *Substituting Complements*, 2 J. COMPETITION L. & ECON. 333 (2006).

[168] Farrell & Weiser, *supra* note 40, at 103.

[169] *Id.* at 102 (emphasis added).

[170] *See, e.g.*, Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 3.

[171] Although Hogendorn does not discuss explicitly the vertical foreclosure argument, his second proposed exception to ICE is a vertical foreclosure argument, as explained in Part III.

It follows that she never formally *proves* her "model." Moreover, the scenarios that van Schewick specifies are poorly defined—for example, she does not specify whether a complementary product is used in fixed proportions with the monopoly good,[172] whether the cost and demand relationships are linear, or whether there is perfect or imperfect competition in the complementary market. It would be remarkable under any circumstances to base public policy on such an underdeveloped and empirically unsubstantiated "model." Nonetheless, for the sake of argument, we will overlook these shortcomings in van Schewick's analysis to address each of her three new exceptions.

In the first of two configurations of her so-called model, van Schewick assumes the existence of a broadband operator that possesses a monopoly over local Internet access and that is vertically integrated into the production of the complementary product of Internet content and applications. (Again, broadband providers are generally *not* monopolists, as the FCC itself has repeatedly found, but we will place that threshold problem with her analysis to one side.) In her first new exception, "the complementary product is a source of outside revenues that the monopolist cannot extract in the primary market."[173] She posits that a network operator would have an incentive to exclude content and applications providers that produced profitable products so as to capture those revenues for itself. In van Schewick's second exception to ICE, "only the monopolist's complementary product is a source of outside revenue which is lost when rival producers of the product make the sales."[174] Van Schewick highlights VoIP as a competing product that network operators might have an incentive to foreclose to protect their proprietary voice services.[175] In van Schewick's third exception, "the exclusionary conduct in the complementary market preserves a legally acquired monopoly in the complementary market."[176] She gives AOL's instant messaging service as an example of the type of application that a vertically integrated network operator might seek to protect.[177] Van Schewick concludes in each of these cases that the network operator would have the incentive to exclude rival content producers if the gains from exclusion—that is, the increase in revenues for its complementary product—outweighed the costs of exclusion—the loss of subscribership in the Internet access market.[178]

[172] *See, e.g.*, Janusz A. Ordover, Alan O. Sykes & Robert D. Willig, *Nonprice Anticompetitive Behavior by Dominant Firms Toward the Producers of Complementary Products*, *in* ANTITRUST AND REGULATION: ESSAYS IN MEMORY OF JOHN J. MCGOWAN 119 (Franklin M. Fisher ed., 1985).

[173] van Schewick, *supra* note 4, at 342.

[174] *Id.*

[175] *Id.* at 345–46.

[176] *Id.* at 342.

[177] *Id.* at 352.

[178] *See id.* at 344, 345, 349.

As van Schewick correctly notes early in her paper, under the one-monopoly-rent theory, "a monopolist has no incentive to monopolize a complementary product market, if the complementary product is used in fixed proportions with the monopoly good and is competitively supplied."[179] Thus, a necessary but not sufficient condition for foreclosure to occur is the existence of economies of scale in the complementary goods market.[180] Van Schewick is again correct in asserting that the content and applications market generally exhibits economies of scale in the form of large R&D expenditures and network effects, which raise the value of content and applications that attract more subscribers.[181] However, van Schewick fails to recognize that the firms that control the greatest economies of scale in the production of most content and applications are independent content providers—such as Google, Yahoo, Facebook, and YouTube—*not* network operators. Her prediction that "the monopolist will have an incentive to exclude its rivals from the complementary market" is only valid if the monopolist could introduce content and applications that were competitive with the content produced by incumbents like Google.[182] Is it reasonable to believe that AT&T or Comcast could compete with Google in Internet search? The answer is most likely no, for the reason stated above: the economies of scale on which van Schewick places such great emphasis typically are captured by the incumbent independent content producers, not the incumbent network operators.

Moreover, given the existence of vigorous rivalry and effective (even if not perfect) competition in the Internet access market, which van Schewick allows in her second model, it is likely that enough consumers would switch to other networks if a network operator attempted to foreclose rival content from its network to make such a strategy unprofitable. Although van Schewick speculates that, even under competition, "a network operator *may* have the ability and incentive to exclude rival content,"[183] and that "the exclusion of rivals *may* lead to gains that are significantly higher than in traditional markets,"[184] her hypothetical scenarios in which foreclosure does occur all ultimately hinge on the "exact size of economies of scale with respect to the product in question, on the strength of any potential network effects and on the size of both the monopolist's network and the remaining network."[185] The foreclosure of Google, Yahoo, YouTube, or Facebook from a broadband provider's network, either through direct exclusion or through quality degradation, would devalue the network's Internet platform to

[179] *Id.* at 340 (citations omitted). *See also* Michael D. Whinston, *Tying, Foreclosure, and Exclusion*, 80 AM. ECON. REV. 837, 838 (1990).
[180] *Id.*; *see also* Carlton, *supra* note 143, at 667.
[181] van Schewick, *supra* note 4, at 352.
[182] *Id.* at 344.
[183] *Id.* at 370 (emphasis added).
[184] *Id.* at 378 (emphasis added).
[185] *Id.* at 356.

such a degree that enough consumers would switch networks that such a strategy would be unprofitable. Given the high price-to-marginal-cost ratios discussed above, even small losses in subscribership would be unprofitable for network operators. In any event, what van Schewick appears to describe in these passages is not properly conceptualized as an ICE "exception" in particular or as anticompetitive conduct in general. She is instead describing mere *product differentiation*, which is often highly precompetitive and certainly *not* presumptively anticompetitive.

Fundamentally, van Schewick's analysis is invalid because it lacks a foundation in either theory or empirical evidence. As other scholars have pointed out,[186] van Schewick's article includes no theoretical model or analysis to support her conclusions. Moreover, her predictions are manifestly contrary to observed market conditions. The few pieces of anecdotal evidence that she includes, presumably as empirical evidence, also fail to support her conclusion that foreclosure will occur. There has been only one recorded instance of VoIP blocking,[187] and her citation of AOL is outdated at best.[188] Another example typical of van Schewick's attempts to support her conjectures is the statement: "There might not be enough independent applications or content that are adapted to the specific limitations associated with using the Internet from mobile phones."[189] This statement starkly conflicts with Apple's announcement on January 5, 2010, that its App Store, to which independent content and applications producers contribute,[190] had exceeded three billion downloads by consumers.[191] Although van Schewick posits many scenarios in which foreclosure might occur, she fails to provide any basis for answering the question of whether a broadband provider would have a net *incentive* to engage in a strategy of anticompetitive exclusion, given the presence of countervailing incentives. As van Schewick herself states: "Whether the conditions giving rise to such an incentive are present in a real life situation, is in an empirical question."[192] We agree, but we would take that argument a step further. Until empirical evidence is presented that network providers, in fact, have a substantial—and not merely theoretical—incentive to foreclose competing content and applications and

[186] For a further critique of van Schewick's exceptions, see Testimony of George S. Ford, Ph.D., Chief Economist, Phoenix Center for Advanced Legal & Economic Public Policy Studies, Before the Federal Communications Commission Open Meeting on Network Neutrality and Broadband Network Management, Stanford University, at 19–20 (Apr. 17, 2008).

[187] van Schewick, *supra* note 4, at 345–46.

[188] *Id.* at 352.

[189] *Id.* at 361 (citations omitted).

[190] *See, e.g.*, iPhone Dev. Center, http://developer.apple.com/iphone/index.action (last visited Mar. 11, 2010).

[191] Apple's App Store Downloads Top Three Billion, Apple, (Jan. 5, 2010), *available at* http://www.apple.com/pr/library/2010/01/05appstore.html.

[192] van Schewick, *supra* note 4, at 377.

that this incentive is likely to outweigh *countervailing* incentives, we believe that the proposed justification for the nondiscrimination rule is overstated and that the appropriate support for such regulation is lacking.

In short, van Schewick's "exceptions" to ICE fail to establish that a network operator has either the *ability* to (completely) exclude a rival content provider from the market or the overall *incentive* to exclude competitive producers of complementary products from its own network. If van Schewick's framework were correct, it would appear to imply that such foreclosure would occur both when there is and when there is not monopoly power in the upstream and downstream markets, and we would observe it occurring in all vertical markets all of the time. But, of course, we observe no such thing, and van Schewick's framework is thus untenable.

More generally, at heart, Economides', Hogendorn's, and van Schewick's predictions of vertical foreclosure rest on a static view of competition and innovation that fails to account for the dynamic nature of competition and innovation in broadband markets. Although this static framework has theoretical simplicity and analytic tractability, it overlooks pertinent industrial dynamics. In a framework of static competition, new entry is unlikely without innovation. If incumbents can satisfy demand, new entrants are not needed. Absent scale economies, no firm is likely to become dominant, and the ecology of firms does not change. In a static setting, if an integrated network operator rolled out a successful application, it could obtain a temporary competitive advantage by giving its affiliated application preferential treatment and foreclosing competing applications.

However, real markets typically do not follow this model of static competition, particularly those that experience such rapid change as Internet technologies. In contrast to static competition, dynamic competition is powered by the creation and commercialization of new products, new processes, and new business models. Under dynamic competition, new entrants and incumbents alike engage in new product and process development and other adjustments to change. Frequent new product introductions followed by rapid price declines are commonplace. The success of one competitor begets further investment and innovation by a wave of new competitors, which cause, as Joseph Schumpeter famously penned in 1942, "perennial gales of creative destruction."[193] Gales come and go and lead to entry and exit. William J. Abernathy and James M. Utterback refined this paradigm of industrial change and postulated an innovation cycle.[194] Considerable evidence now supports this paradigm over a range of technologies.[195] Dynamic

[193] JOSEPH A. SCHUMPETER, CAPITALISM, SOCIALISM and DEMOCRACY 83 (1942).

[194] *See* William J. Abernathy & James M. Utterback, *Patterns of Industrial Innovation*, 80 TECH. REV. 40 (1978).

[195] *See, e.g.*, Steven Klepper & Elizabeth Grady, *The Evolution of New Industries and the Determinants of Market Structure*, 21 RAND J. ECON. 27 (1990); James M. Utterback & Fernando Suarez, *Innovation, Competition, and Industry Structure*, 22 RES. POL'Y 1 (1993);

(innovation-driven) competition is considerably more powerful and effective than the kind of competition encountered in industries not experiencing technical change. It almost always requires investment in new technology.

Economides' and van Schewick's foreclosure arguments epitomize this misplaced reliance on a static framework. For example, van Schewick claims that so long as vertical foreclosure "enables the network provider to increase the number of sales of its complementary product and the additional profits resulting from more sales at the market price are larger than the costs of exclusion, exclusion will be a profitable strategy."[196] But this statement is little more than a tautology. In a static setting, the increase in sales from exclusion might outweigh the costs; but in a dynamic framework, the fear of future obsolescence in the dynamically competitive market for Internet content and applications overrules any incentive a network operator might have to engage in such foreclosure. For van Schewick's scenarios to hold, vertically integrated network operators would need to be sure that they could successfully generate their own *successive* waves of content or applications—successful in the sense that on the basis of quality, price, and consumer preference, they would surpass the performance of *all* rival content or applications. This assumption fails to account for the dynamic nature of competition and innovation in broadband markets. Given the inevitable advent of new, improved services, it is extremely unlikely that a network operator would foreclose its network to unaffiliated content and application providers—and risk losing future subscribers who would choose to switch to broadband networks supporting the next generation of content or applications—in the hope of extracting monopoly rents in the present.

V. THE DIRT ROAD METAPHOR

A common variant of the network neutrality regulation proponents' arguments is the so-called dirt road metaphor coined by Lessig and a co-author. Lessig claimed that the broadband ISP would "force" content and applications providers to purchase enhanced QoS delivery by threatening to intentionally degrade the delivery of their packets if they did not do so, effectively relegating them to an Internet "slow lane," which would be the equivalent of a winding dirt road.[197] The dirt road argument is not an independent economic theory of harm. Rather, it is the mechanism that proponents of a ban on optional business-to-business QoS transactions hypothesize that network operators would use to achieve vertical foreclosure,

Franco Malerba & Luigi Orsenigo, *The Dynamics and Evolution of Industries*, 5 INDUS. & CORP. CHANGE 51 (1996).

[196] van Schewick, *supra* note 4, at 366.

[197] Lessig & McChesney, *supra* note 2, at A23.

excessive pricing, or other misconduct that they claim network operators may have the incentive to pursue. Thus, it could advance their case with respect to any such theory of harm only if network operators actually have the posited incentives to degrade content. As noted, there is no empirical evidence or support in economic theory that such incentives exist or are sufficiently strong as to outweigh countervailing incentives.

Moreover, as we will show, the dirt road hypothesis is implausible on its own terms. At the outset, it is important to recognize that if broadband providers truly had incentives to degrade their best-effort offerings to a dirt road to extract greater profits from QoS-enhanced offerings, we presumably would see regular instances of such behavior after more than a decade of broadband experience, particularly since many broadband providers use the same physical transmission facilities to provide both best-effort Internet access and "prioritized" voice and video services. Instead, we observe broadband providers continually investing billions of dollars in upgrades to their best-effort platform—leading, as the FCC recently recognized in its National Broadband Plan, to 20 percent *annual* increases in download speeds *for the last ten years*. The mismatch between theory and observation is unsurprising because the dirt road theory is built on numerous obviously false premises. For example, the theory wrongly assumes: (1) that each broadband provider has a "terminating access monopoly" when, in fact, it plainly does not, because each provider generally must accept incoming traffic and has no right unilaterally to tariff QoS enhancement or other offerings, and (2) that all packets are homogenous and thus equally latency-sensitive and jitter-sensitive, when, in fact, there is wide variation in QoS needs and much traffic would be unaffected by most forms of a degraded best-effort offering. Economides ignores these fatal problems with his analysis and instead resorts to a non-rigorous discussion of "prisoners' dilemmas," nineteenth century railroads, and a damaged goods theory. As we explain, however, these detours provide no support for his conclusions.

A. Summary of the Proponents' Dirt Road Argument

Supporters of network neutrality regulation have not provided empirical evidence to support the ubiquitous dirt road argument of the early network neutrality advocacy.[198] Nonetheless, this concept persists in network neutrality advocacy. In recent literature denouncing optional business-to-business QoS transactions, proponents of network neutrality regulation claim that prioritization of traffic will create "perverse incentives" among network operators to create a dirt road for best-effort content delivery.[199] This argument relies on the mischaracterization of the Internet as split

[198] *Id.*

[199] *See, e.g.*, Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 8.

between a "fast lane" reserved for enhanced QoS delivery and a "slow lane" for best-effort delivery. Chettiar and Holladay argue that network operators will seek to "maximize their revenue from the fast lane," because they "gain no revenue from content providers in the slow lane."[200] Network operators will either "pric[e] fast lanes above marginal costs . . . . Or, ISPs could attempt to push as many content providers into the fast lane as possible; and to incentivize more content providers to move into the fast lane, ISPs may compromise the quality of the slow lane."[201]

Economides similarly posits that the network operator will have "an incentive to create artificial congestion in the 'slow lane' that will make consumers value more the prioritized information packets (in the 'fast lane')."[202] Economides cites examples from management strategy literature of firms degrading the value of their products to implement price discrimination as evidence of the "perverse incentives" that firms that are able to product differentiate face.[203] Further, Economides predicts that the option to engage in optional business-to-business QoS transactions will lead to a "prisoner's dilemma" in the content and applications market in which real-time content providers are "forced" to purchase unwanted QoS enhancements to keep up with their real-time content peers.[204]

Although Economides' "perverse incentives" and "prisoner's dilemma" theories are framed as familiar economic concepts, he and other adherents of the dirt road theory base their arguments on incorrect assumptions about the Internet's architecture and the competitive environment in broadband markets.

B. The Dirt Road Theory's Misunderstanding of Internet Architecture

If taken literally to imply that there would, in fact, be separate "lanes" for Internet traffic, the dirt road theory is based on a representation of the Internet's architecture that, as we understand it, is stylized and inaccurate. It incorrectly implies that broadband networks contain two discrete sets of last-mile Internet infrastructure—a "slow lane" best-effort network subject to targeted degrading and a "fast lane" superhighway. The idea seems to be

[200] Chettiar & Holladay, *supra* note 49, at 44.

[201] *Id.*

[202] *Id.* at 8.

[203] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 8 (citing Raymond J. Deneckere & R. Preston McAfee, *Damaged Goods*, 5 J. ECON. & MGMT. STRATEGY 149 (1996); Michael Mussa & Sherwin Rosen, *Monopoly and Product Quality*, 18 J. ECON. THEORY 301 (1978); Eric Maskin & John Riley, *Monopoly with Incomplete Information*, 15 RAND J. ECON 171 (1984); JEAN TIROLE, THE THEORY of INDUSTRIAL ORGANIZATION 149–50 (1988); Hal Varian, *Price Discrimination and Social Welfare*, 75 AM. ECON. REV. 870 (1985)).

[204] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 7.

that a network operator could degrade or refuse to invest in QoS in the "slow lane" to induce content and applications providers to purchase access to its "fast lane" and that such conduct would have no impact on the traffic in the "fast lane." Of course, if "lanes" refer to separate treatment of data packets, then the Internet as a whole has *always* had many different "lanes," in the limited sense that some content providers have paid much more (to CDNs and other providers) to give their end users far better Internet experiences than otherwise. No one has ever suggested that this sort of division of the Internet into "lanes" is problematic. There is no greater reason to fear such traffic differentiation on broadband access and aggregation networks—particularly since, as we understand it, a variety of providers, including AT&T, *already* divide the IP packets traversing their shared access infrastructure into different "lanes" depending on whether the packets are associated with (for example) the providers' IPTV services or their best-effort Internet access services.[205]

A network operator may use priority routing to address performance needs of different types of traffic—that is, to prioritize certain tiers of traffic (generally latency-sensitive) over other tiers (generally latency-insensitive). The FCC's focus should not be on whether permitting charging for optional QoS enhancement is a "zero-sum game" for content providers, but whether doing so is a "positive-sum game" for social welfare. Moreover, contrary to the beliefs of proponents of network neutrality, prioritization will not likely adversely affect performance of lower-tier traffic, as addressing congestion issues can benefit *all* traffic on an operator's network. Although proponents of the nondiscrimination rule argue that a content provider that chooses best-effort service will be relatively worse off than a content provider that chooses to purchase priority delivery, best-effort service will not vary in an absolute sense in the presence of packet prioritization. As discussed, market realities substantiate this point: the best-effort Internet access service offered on today's state-of-the-art broadband infrastructure—which is shared between prioritized voice and video traffic and non-prioritized Internet traffic—is typically *much* faster and more robust than it was in the past, when it was offered on an unshared basis over unshared facilities. In any case, lower priority tier traffic will consist primarily of content that does not have latency or jitter issues. Thus, best-effort service easily satisfies the QoS needs for latency-tolerant traffic, as evidenced by content providers' successful use of it today.

C. The Dirt Road Theory's Economic Fallacies

Regardless of whether network operators have the ability to degrade last-mile service to end users, they have no net incentive to do so. The dirt road

[205] *See, e.g.*, AT&T Virtual Private Networks, *supra* note 59.

theory and Economides' predictions about the degradation of best-effort delivery rest on numerous incorrect assumptions.

1. The Dirt Road Theory Deviates from Observed Experience

If broadband providers had incentives to intentionally reduce best-effort Internet access to a dirt road in order to extract greater profits from their prioritized voice and video services, one would expect that there would already be a pattern of such actions. In reality, network operators have invested tens of billions of dollars in upgrades to the best-effort platform.[206] The dirt road theory is thus inconsistent with observed experience of real-world investment in fat and fast pipes, fiber, DOCSIS, and other recent network innovations that network operators have undertaken to improve QoS on their networks. The hundreds of billions of dollars invested in the past decade to improve Internet connection speeds[207]—which both opponents and advocates of network neutrality regulation recognize[208]—are powerful empirical evidence that there is no real threat of broadband operators purposely degrading the quality of their best-effort services.

Advertising among network operators affirms that they compete largely on Internet delivery speeds and other service quality characteristics. Indeed, broadband providers' advertising is heavily focused on the benefits they claim to offer in terms of speed and reliability. Network operators also frequently use comparative advertising to highlight the superiority of their service offerings over those of their competitors.[209] For example, beginning in 2006, Comcast launched an advertising campaign in which two turtles are devoted to DSL, because they feel that "cable-modem service is just too fast."[210] More recently, Verizon and Comcast have engaged in an advertising

[206] *See, e.g.*, Press Release, AT&T, AT&T to Invest More Than $17 Billion in 2009 to Drive Economic Growth (Mar. 10, 2009), *available at* http://www.att.com/gen/press-room?pid=4800&cdvn=news&newsarticleid=26597&mapcode=; Press Release, Verizon, Verizon's $17 Billion Network Investment in 2009 Pays Off (Dec. 29, 2009), *available at* http://newscenter.verizon.com/press-releases/verizon/2009/verizons-17-billion-network.html. In addition, AT&T's triple-play platform is all-IP and already involves prioritization of voice and video packets.

[207] *See, e.g.*, FCC Fifth Report, Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, 23 F.C.C. Rcd. 9,651 ¶ 74 (2008) (telecommunications industry planned to spend $50 billion in capital expenditures in 2008 and 2009); NCTA, Industry Data, http://www.ncta.com/Statistics.aspx (citing that more than 120 million homes have access to cable broadband service and industry capital investments of $161.2 billion since 1996).

[208] *See, e.g.*, *Google Comments*, *supra* note 55, at n.120 (citing that AT&T has invested $38 billion over the past two years and plans on investing $17 to $18 billion in 2009 to enhance its wireline and wireless networks, with approximately two-thirds of the additional investment allocated to supporting broadband.).

[209] *Schwartz Declaration*, *supra* note 28, at 32.

[210] *See* Linda Haugsted, *Turtles that Win the Race: Comcast's 'Slowskys' Back Cable Modems Via TV Spots*, MULTICHANNEL NEWS, June 22, 2006, *available at* http://www.multichannel.com/article/ CA6336326.html.

battle that, on Verizon's side, pits a smart, likeable FiOS installer against a dull and lazy cable installer.[211] Comcast's response was a campaign headed by the slogan, "Don't fall for FiOS."[212]

Those advertising campaigns highlight the significant improvements that network operators have made and continue to make to their broadband service offerings. According to a survey released in February 2010, average broadband download speeds rose 28 percent in the United States in 2009 compared with 2008, with cable offering slightly less than 10 Mbps on average.[213] As of February 2010, Verizon offered connection speeds via FiOS of 15, 25, and 50 Mbps,[214] and AT&T offered connection speeds at 24 Mbps. Cable companies too have invested in higher speeds. Even cable companies with core video businesses—those with the most incentive to relegate content to a hypothetical dirt road—have invested in improved best-effort delivery. Comcast has released its XFINITY offerings with Internet speeds of 50 to 100 Mbps.[215]

Why have we not seen a real manifestation of the dirt road? High churn rates suggest that network operators would not be able to profit from a strategy of degrading the quality of delivery for content and applications. Increasing network congestion would, in fact, induce more consumers to switch networks. Comcast would not create service quality-impairing congestion on its best-effort platform because its end users would notice that they have impaired access not just to this one content provider, but to the countless other content providers worldwide who choose to rely on the best-effort platform. Those end users would then abandon Comcast for, say, Verizon. Thus, Comcast would likely lose a significant share of the market if it attempted to force content providers to purchase additional QoS by intentionally degrading service or intentionally increasing network congestion. Put differently, network operators could not credibly threaten to intentionally degrade their services if content providers were not willing to pay for higher QoS.

2. *Incorrect Assumptions Underlying Economides' Stylized Model for the Dirt Road Theory*

Economides' argument that network operators would degrade best-effort delivery and the dirt road theory in general rest on several economic fallacies. First, Economides' model explicitly assumes that broadband providers

[211] *Schwartz Declaration*, *supra* note 28, at 32.

[212] *Id.* (citing Johnny Diaz, *Comcast, Verizon Duke It Out; Ad Blitz Gets Personal as Firms Spar for Cable Customers*, BOSTON GLOBE, Sept. 1, 2009).

[213] Lance Whitney, *U.S. Broadband Speeds Rise in 2009*, CNET NEWS, Feb. 10, 2010, http://news.cnet.com/8301-1023_3-10450784-93.html?tag=mncol.

[214] Verizon, FiOS Internet, Plans, http://www22.verizon.com/Residential/FiOSInternet/Plans/Plans.htm (last visited Feb. 18, 2010).

[215] *See* Chloe Albanesius, *Comcast Rolling Out 'Xfinity' Brand to 11 Markets*, PCMAG.COM, Feb. 4, 2010, http://www.pcmag.com/article2/0,2817,2358807,00.asp.

are "monopolists," but again they are not. To patch this hole, he assumes that ISPs could exercise a "terminating access monopoly," even if they face competition in the retail market. But this premise too is false, because it does not fit the institutional framework in which broadband providers operate. Unlike terminating local exchange carriers on the public telephone network, broadband providers cannot file tariffs.[216] Nor can they generally assess unilateral fees on content providers on the threat of refusing to terminate their packets. Economides' misplaced reliance on that concept undermines much of his analysis. Any attempt at "extortion" of the type that Economides posits would be impossible because a network operator could not credibly threaten to exclude a content or applications provider from the market.

Second, analogizing best-effort delivery to a dirt road assumes that all packets require QoS enhancements. That is, the model implicitly assumes that all packets are homogenous and thus that their associated applications are all equally sensitive to latency and jitter. Put differently, Economides' model and the dirt road theory in general falsely assume a zero-sum game among identically situated packets. But, of course, packets are not identically situated at all: they vary enormously in the sensitivity of their associated content and applications to latency and jitter.

Third, the dirt road theory incorrectly assumes that network operators can actually foreclose content and applications providers; otherwise, degrading lower QoS traffic would be unprofitable. This assumption is also incorrect as a matter of economic theory because, as noted, the geographic market for Internet content is not local or even national, but global. Moreover, consumers are not "single-homed"—rather, many of them have home, work, and mobile broadband connections. Consequently, no broadband network operator can foreclose content to even a small fraction of end users. Absent evidence that content development is not viable unless a provider has immediate access to virtually *every* user, the dirt road theory conflicts with economic theories of vertical foreclosure.[217] Moreover, network operators surely know that "content is king" and that any network operator that did degrade the delivery of content that consumers value would suffer defections in a marketplace—in which some broadband network operators already lose nearly a third of their customers annually.[218]

[216] ISPs are not entitled, under Title II of the Communications Act or other law, to file tariffs for delivering packets over their broadband networks. Consequently, ISPs have no ability to act like a "terminating access monopoly" that threatens not to deliver traffic to its customers unless its posted price is paid. To the contrary, ISPs exchange broadband Internet traffic through peering and transiting agreements that are voluntarily negotiated on commercial terms.

[217] *See, e.g.*, Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47; van Schewick, *supra* note 4.

[218] Moffett et al., *supra* note 155.

3. Economides' Erroneous Prisoner's Dilemma Argument

Economides argues that, because of the hypothetical creation of the Internet dirt road, QoS transactions would lead to "allocative inefficiency" or market failure in the form of a prisoner's dilemma:

> Suppose that a broadband provider offers prioritization guaranteeing that, for example, video content providers in the "priority lane" arrives a few second before all other providers in the standard lane. . . . Given the prospect of losing almost all their customers if they stay in the slow lane, every video content provider that can afford it will choose to pay to be in the "priority lane." What is the result? The video content for the remaining firms would all arrive at the same speed as before, competition would remain the same among the firms that can afford the payment, but all these firms would pay a higher price to broadband providers. The companies that cannot afford to pay die. Both surviving and foreclosed firms are worse off.[219]

Both empirical evidence of the content and applications market and economic theory indicate that this prisoner's dilemma prediction is baseless. Moreover, adapting the proposed nondiscrimination rule as a solution to this purported market failure would only distort competition.

a. The Implausibility of Content Providers Losing All Their Customers

Economides' premise that video providers face the "prospect of losing almost all their customers"[220] is unrealistic. Again, the content distribution business is global in nature, and no broadband ISP has the ability to deny a content provider access to all, or even a substantial fraction, of its customers. The video market is also highly diverse. The "long tail" market structure of Internet content and applications has created a wide array of video content designed to appeal to varying consumer tastes and usages, not all of which requires enhanced QoS. Economides, however, fails to account for this diversity among video content offerings. For example, he does not distinguish between real-time and buffered video. Real-time video content such as that transmitted over video conferencing services is sensitive to latency and jitter, which can be disruptive. It is for this reason that businesses often hire expensive video conferencing services rather than use freely available Skype software. In contrast, video content consisting primarily of movies and television shows provided over popular sites like Hulu and Megavideo are frequently buffered, which implies that the quality of this type of content does not suffer dramatically from a certain degree of latency. Thus, contrary to Economides' conjecture, not all video providers will feel forced to purchase high levels of QoS with the option of business-to-business transactions for QoS.

[219] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 7.
[220] *Id.*

b. Ignoring the Implications of ICE

On a related point, Economides' prisoner's dilemma assumes erroneously that the performance of all content and applications delivered by best-effort service would be so inferior in quality compared with that of traffic delivered with QoS enhancements that demand for any content or application using best-effort service would shrink to zero. In fact, operators devote ample resources to ensure that their networks satisfy the performance requirements for latency-sensitive and non-latency-sensitive packets. The principle of ICE also ensures that network operators have the incentive to continue to upgrade their networks so that complementary content and application services can be "cheaply, innovatively, and efficiently supplied."[221] There is, thus, no sound reason to expect video providers to make business decisions based on an irrational fear that they could actually lose their entire customer base if they did not purchase QoS enhancement for all their content. The market harm posited by Economides' prisoner's dilemma is purely speculative.

c. Ignoring Gains in Consumer Welfare from Faster Delivery

Furthermore, Economides' prisoner's dilemma theory does not account for increases in consumer welfare that result from improved delivery speeds. Economides predicts that all content and applications providers would be forced to pay for priority delivery, and that those who could not would be foreclosed from the market. He then posits that "[c]onsumers are worse off as they now have fewer choices on the content and applications side of the market."[222] However, Economides fails to acknowledge that consumers derive benefit from the faster delivery of content and applications. Even if all remaining video providers do not gain a competitive advantage over one another because they all purchase QoS enhancements, consumers benefit from the improved QoS of all video content. The improved quality of all video content also promotes positive spillovers in the form of increased innovation in technologies such as e-learning.

d. Ignoring the Repeated Game Solution to the Prisoner's Dilemma

Although Economides appropriates the language of game theory to present his prediction of a prisoner's dilemma, he ignores the foundational assumptions that underlie the prediction that this worst-case scenario will likely occur—or, in the language of game theory, that it will be an equilibrium outcome. The discovery of the prisoner's dilemma theory arose within the context of a two-player game, where each player has two options, an option that is individually in his interest and one that is not. A player thus has the choice between acting selfishly and acting selflessly. There are three possible

[221] Farrell & Weiser, *supra* note 40, at 101.
[222] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 7.

outcomes. The first is that both players choose to maximize their own welfare, in which case both will be made worse off. In this case, the collective welfare (measured as the net sum of the two players' individual welfares) is at a minimum. In the second possible outcome, one player acts selfishly, maximizing his own welfare, and the other player acts selflessly. In this case, the selfish player will be made better off, and the selfless player will be made worse off. In this scenario, the collective welfare is between the maximum and the minimum. In the third scenario, both players act selflessly, and their collective welfare is maximized.

In a single-round game, game theory predicts that both players will choose to maximize their own self-interest, the worst outcome will ensue, and they will both be made worse off. This outcome is what Economides predicts for ISPs and content and applications providers if the FCC does not introduce its "nondiscrimination" regulation. However, Economides neglects a basic premise of game theory in making this prediction: the prisoner's dilemma is an equilibrium outcome only under the assumption that there is only *one* round of play. If there is repeated play, the players will face consequences for their actions in subsequent rounds of play and therefore have less incentive to behave selfishly. Consequently, when there are multiple rounds of play, players will choose to cooperate with each other, benefiting both players and maximizing collective welfare, because if one behaves selfishly, the other will punish that player in later rounds. This outcome corresponds to the second of the three scenarios described above.[223] There is no reason to believe that the purchase of enhanced QoS is a single-round game. Contracts for optional QoS need not be uniformly of long duration—let alone perpetual duration, as Economides implicitly assumes in his single-round prisoner's dilemma.

More significantly, Economides' prisoner's dilemma theory considers only the welfare of the content providers (the prisoners) themselves[224] and ignores the welfare of network operators, consumers, and other interested

[223] *See* DAVID M. KREPS, A COURSE in MICROECONOMIC THEORY 503–05 (Princeton Univ. Press 1990); HAL R. VARIAN, MICROECONOMIC ANALYSIS 269–71 (W.W. Norton 3d ed. 1992); Anatol Rapoport, *Prisoner's Dilemma*, *in* 3 THE NEW PALGRAVE DICTIONARY of ECONOMICS 973, 974 (John Eatwell, Murray Milgate & Peter Newman, eds., Macmillan 1987) ("Perhaps the most interesting result of Prisoner's Dilemma experiments with iterated play is that even if the number of iterations to be played is known to both subjects, nevertheless a tacit agreement to cooperate is often achieved.").

[224] In a traditional prisoner's dilemma framework, prosecutors offer two prisoners the option of confessing to a crime (defecting) or staying silent (cooperating with the other prisoner), offering leniency if a prisoner "turns state's evidence" by confessing and implicating his colleague, and threatening to "throw the book" at a prisoner if he stays silent while his partner confesses. Each prisoner finds it worthwhile to confess, which makes the prisoners *themselves* worse off than they would have been if both had remained silent. But to say that such an outcome is "inefficient" ignores the interests of *society* in inducing criminals to confess to (and pay for) their crimes.

parties (for example, advertisers who pay content providers). Economides' own formal model shows that *consumers* are better off under a regime that allows even duopoly ISPs to provide priority delivery for a fee than under the proposed network neutrality regulations.[225] Similarly, in their 2010 article, Krämer and Wiewiorra show that permitting ISPs to provide priority delivery for a fee increases social welfare, as it leads ISPs to allocate capacity to those packets that suffer most from congestion-induced delay.

e. The Overbreadth of the Zero-Price Rule as a Response to Concerns About a Prisoner's Dilemma

Even if one were to assume that Economides' prisoner's dilemma scenario were plausible, we believe that the zero-price rule is an overbroad remedy for the posited harm, and it would instead create significant allocative inefficiency. Just as some traffic is latency-sensitive, other forms of traffic are latency-*tolerant*; not all traffic benefits significantly from enhanced QoS. If an application does not need enhanced QoS to function properly, such as the background downloading of a music file, providers of that content probably would not purchase QoS enhancements. The "competitive advantage" that a music file provider would gain from enhanced QoS may not be worth the cost, because end users would not sufficiently value the marginally faster download time.

However, enforcing a zero-price rule on QoS enhancements would induce all content and applications providers to consume additional QoS, even if their content and applications do not need it, because it is free. For providers of latency-tolerant content and applications, consuming enhanced QoS would result in inefficient allocation of bandwidth. The zero-price rule would lead to overconsumption of bandwidth, and the quality of both best-effort and priority-delivery services would deteriorate. The only content and applications that could achieve significantly superior quality would be those using CDNs.

f. The Erroneous Equating of Competitor Harm to Market Failure

Even if the option of purchasing QoS leads to an outcome in which competitors either exit the market or pay for QoS but fail to gain a competitive advantage over one another, there is no reason to believe this outcome is a market failure, reduces competition, or harms social welfare. Economides argues that competition would be reduced if content providers that need but cannot afford priority delivery were "foreclosed" from the market. If a provider of such latency-sensitive content and applications cannot afford the essential input of QoS enhancements, then it should exit the market for that content or application. An innate part of the competitive process—particularly in dynamic markets—is the weeding out of inefficient firms so that

[225] *See* Economides & Tåg, *supra* note 116.

efficient firms prevail,[226] which increases consumer welfare through lower prices, greater choice, and higher product or service quality. Capital markets already provide funding to startup companies that have good ideas but are lacking cash flow. Contrary to Economides' prisoner's dilemma argument, *banning* optional business-to-business QoS transactions for positive prices would distort competition. However, as Dennis Weisman observes, "[i]t is accepted doctrine that regulation and competition policy should serve to protect the integrity of the competitive process rather than the financial viability of individual competitors."[227] Forcing a "level" playing field through a zero-price rule would allow inefficient firms to remain in the market. Moreover, it would force network operators to allocate bandwidth to those inefficient content providers, exacerbating the negative externality of excessive bandwidth consumption.

Economides further argues that those remaining competitors who can afford enhanced QoS are also worse off, because "[t]he video content of the remaining active firms would all arrive at the same speed as before, competition would remain the same among the firms that can afford payment, but all these firms would pay a higher price to broadband providers."[228] However, there is no basis for the argument that competitors are worse off merely because they pay for a service that improves the quality of their products. Does the option for businesses to pay more to ensure overnight delivery of packages make them worse off? The answer is, of course, no. Moreover, content and applications providers who currently demand and can afford QoS enhancements are *already* paying for priority delivery through CDNs. Akamai's increasing market value[229] reflects that forward-looking investors continue to recognize the value of the priority delivery—the market expects Akamai's revenues to grow as the demand for optional priority delivery grows. Yet, this practice is not debated as a market failure. If anything, the zero-price rule would harm smaller content and applications developers by excluding a rival—and potentially more affordable—service to CDNs. In contrast, the option to purchase a service that will improve the quality of content and applications will enhance competition, as content and application developers innovate new business models and production processes enabling them to purchase higher tiers of QoS.

[226] *See, e.g.*, J. Gregory Sidak & David J. Teece, *Dynamic Competition in Antitrust Law*, 5 J. COMPETITION L. & ECON. 581 (2009).

[227] Dennis L. Weisman, *A "Principled" Approach to the Design of Telecommunications Policy*, 6 J. COMPETITION L. & ECON. (forthcoming 2010).

[228] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 7.

[229] During 2009, Akamai's share price increased almost 70 percent, or more than double the increase of the market index. *See* Yahoo! Finance, Akamai Technologies Inc. (AKAM): Historical Prices, http://finance.yahoo.com/q/hp?s=AKAM (last visited Mar. 25, 2010). At the same time, Akamai achieved a 31.9 percent share of professional video views. *See* AccuStream Research, *CDN Account Growth at 23.3% in 2009*, WIRELESS NEWS, 2009.

D. The Implausible Conjecture That Network Operators Would Encourage Network Congestion

On the basis of the dirt road conjecture, Economides and other proponents of network neutrality regulation conclude that preserving the freedom to engage in optional business-to-business QoS transactions for network operators would create a perverse incentive for those firms to tolerate or even promote congestion in their respective networks as a means of forcing content and application providers to purchase priority delivery. Economides' predicted outcome incorrectly presumes that the revenues network operators would gain from QoS enhancements would far surpass gains from investing in improving network capacity and functionality.[230] Economides reasons that content providers "will only be willing to pay for prioritization if there is a meaningful difference between the 'fast' and the 'slow' lanes" so that "broadband providers would have an incentive to avoid investing in capacity and solving congestion problems."[231]

Economides gives no evidence to support this prediction. It is not realistic to believe that any firm operating in a competitive market would expect to benefit by degrading the quality of its product or service. First, the theoretical foundation for this claim is weak, if not incorrect. We are aware of two academic papers[232] cited by Economides[233] that contain formal models that predict that ISPs would rationally invest less in capacity when permitted to sell enhanced QoS to content providers than under a nondiscrimination regime. However, a more recent paper by Krämer and Wiewiorra reaches the opposite conclusion.[234]

All formal models abstract to a greater or lesser degree from the real world. The relevance of the formal results yielded by the model to the real

[230] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 8.

[231] *Id.* at 8.

[232] Jay Pil Choi & Byung-Cheol Kim, *Net Neutrality and Investment Incentives* (NET Institute, Working Paper No. 08-03, Sept. 2008), *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=1285639##; Economides & Tåg, *supra* note 116.

[233] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 8, 12. Economides actually cites the Choi–Kim article for this point (he lists the Economides–Tåg article in his bibliography, but does not cite it for this point), as well as two other articles, by Lee and Wu and Peha. A review of the last two papers shows that Economides has seriously mischaracterized their results. Contrary to Economides' contention, Lee and Wu assert that "the impact [of allowing termination fees] on the marginal incentive to invest is indeterminate." Lee & Wu, *supra* note 41, at 72. A careful reading of Peha indicates that he does not express any opinion as to whether total ISP investment would be greater or less with the option of business-to-business transactions for QoS than under a "nondiscrimination" regime. He does not develop any formal model and does not make any predictions, other than to say that "if network operators were prohibited from this practice [of 'intentionally degrad[ing] QOS for some traffic, even when there is excess capacity to provide excellent QOS'], they *might* have incentive not to increase the capacity of the network." Peha, *supra* note 40, at 18–19 (emphasis added).

[234] Krämer & Wiewiorra, *supra* note 115.

world depends on the assumptions being made by the authors and on how well the model's underlying assumptions capture important features of the real world. We believe that Krämer-Wiewiorra model's assumptions—which explicitly assume that different content providers supply products having different latency needs[235]—are more realistic than those of the earlier models on which Economides relies.[236] The economic intuition underlying Krämer and Wiewiorra's results can be briefly summarized as follows. Adding capacity is costly to ISPs. They will be willing to incur those costs only if they receive benefits from doing so, in the form of higher willingness to pay. The willingness to pay for additional capacity in turn depends the value added by that additional capacity, which in turn depends on how that capacity is used. If that capacity is disproportionately allocated to high-priority or high-value uses, the value added and willingness to pay by additional capacity are higher than they would be under a system in which that capacity is allocated to lower priority or low-value uses.

Under the proposed nondiscrimination rule, it is likely that additional capacity will be allocated equally (in a nondiscriminatory fashion) across all classes of traffic, both high value and low value. Thus, the value added of additional capacity will, on average, equal the value added to the "average" message. In contrast, with optional business-to-business transactions for QoS, additional capacity will be disproportionately allocated to traffic for which content providers are willing to pay prioritization fees for delivering packets for which low latency and low jitter are important—that is, to traffic for which additional capacity adds greater value. Because the willingness to pay of certain content providers will be higher, the ISPs will receive a greater return on their investment in capacity than their likely return under the proposed nondiscrimination rule. Thus, the economic incentive for ISPs to invest in additional capacity is *greater* with the option of business-to-business QoS transactions.

In any case, the fact that different formal models reach diametrically opposite conclusions about the incentives of ISPs to invest in capacity means that it is not possible on purely theoretical grounds to conclude, as Economides does, that ISPs' incentives to invest are higher under the proposed ban on business-to-business transactions for QoS. Instead, it is an

[235] It may well be true that different content providers who offer similar types of offerings (for example, different Internet search providers) may have similar QoS needs, though that is itself open to question (for example, some content providers may have self-provided enhanced delivery or contracted with CDN providers, although their competitors may not have). But that would not eliminate the fact that the Internet involves many different types of packets with very different QoS needs.

[236] Economides and Tåg initially assume that there is a single "monopoly" ISP (they then extend the model to a "duopoly" model), that there are two content providers who "are independent monopolists, each in its own markets, and therefore do not compete with one another", and that ISPs charge content providers a "lump sum fee... to gain access to users." Economides & Tåg, *supra* note 116, at 7–8.

empirical question as to which regime would result in higher overall investment.[237]

Second, the perverse-incentives claim ignores a countervailing consideration that the demand for an ISP's service by potential subscribers is affected by the perceived quality of that service, and that reduced capacity and increased congestion reduce consumer demand and thus the ISP's revenues from its subscriber base. In both static and dynamic settings, a strategy of artificially encouraging network congestion would drive content providers and consumers to another network operator that would seize the opportunity to capture demand by guaranteeing *less* congestion to its subscribers. In a static setting, a strategy of encouraging congestion would amount to a quality-adjusted price increase—a recipe for alienating customers. In a dynamic setting, a strategy of encouraging congestion would amount to selling an outdated product while competing broadband access providers upgrade and while the QoS needs of new content and applications grow. That strategy is a recipe for bankruptcy.

Third and most significantly, merely showing that total capacity will be greater (or less) under one regime than under another does not establish harm to competition and consumer welfare. Capacity is not free. One must weigh the costs of additional capacity against the benefits associated with providing that capacity. Moreover, content providers have the option of self-providing higher quality delivery by purchasing CDN-like enhancements (for example, Google's "server farms") or of purchasing CDN services from third parties like Akamai.

1. *Economides' Analytical and Historical Misapplication of Dupuit's Description of Price Discrimination by French Railways in the 1840s*

Economides' rendition of the dirt road conjecture is entirely without empirical foundation. It is particularly telling that Economides cites, as real-world support for his theoretical conjecture, the discussion of price differences among different classes of French railway carriages that Jules Dupuit described in 1849 in his famous paper, *On Tolls and Transport Charges*:

> It is not because of the few thousand francs which would have to be spent to put a roof over the third-class carriages or to upholster the third-class seats that some company or other has open carriages with wooden benches. What the company is trying to do is to prevent the passenger who can pay the second class fare from traveling third class; it hits the poor, not because it wants to hurt them, but to frighten the rich.

[237] Moreover, the level of investment *per se* is economically less significant than the effect of the *combination* of investment and prioritization rules on the effective delivery speed of different classes of traffic. Suppose, for example, that with the option of business-to-business QoS transactions, ISPs have an incentive to allocate resources to packets that are more valuable and/or more time-sensitive and away from packets that are less valuable and/or less time sensitive. Holding total resources constant, such a resource allocation rule will increase in consumer welfare relative to an alternative allocation rule that treats all packets equally.

> And it is again for the same reason that the companies, having proved almost cruel to the third-class passengers and mean to the second-class ones, become lavish in dealing with first-class passenger. Having refused the poor what is necessary, they give the rich what is superfluous.[238]

Although Dupuit's paper on the pricing of infrastructure, published a year after the Revolution of 1848 in France, occupies a respected place in the history of price theory, it did not earn that spot on the basis of Dupuit's theory of the use of differential pricing as an instrument of class warfare. For numerous reasons rooted dispassionately in price theory or historical fact, Economides' reliance on this passage by Dupuit is misplaced.

First, Dupuit was making a point about the income elasticity of demand of groups of consumers segregated by wealth or income, not the price elasticity of demand of these or other groups of consumers. He spoke of "rich" and "poor." The pricing of seats in railway carriages relates to transactions between companies and consumers (end users), whereas QoS transactions at issue here occur between firms. In transactions between companies and end users, purchasing decisions—which is to say, consumer demand—reflect the end users' income elasticities of demand and price elasticities of demand, as summarized in the Slutsky equation.[239] But a firm does not have an income elasticity of demand. In optional business-to-business transactions, the purchasing decisions of firms depend only on price elasticities of demand. That is, the relevant question for a content or applications provider deciding whether to purchase QoS enhancements is not whether it is "rich" or "poor," in the words of Dupuit, but whether the use of funds is sufficiently justified on economic grounds to elicit their supply from the source of funds. In Dupuit's railway example, second-class citizens pay for second-class carriages because they can afford it (income elasticity), and because relative prices make the alternative unappealing (cross-price elasticity). A firm's expenditure on an input, however, finds its justification solely in how that input will advance the firm's profitability; the demand for an input is determined by the value of the input's use, not by whether the firm can "afford" the input. In terms of profits or free cash flow, Google is a "rich" firm and General Motors is a "poor" firm. But it would be a waste of corporate assets for Google to pay more for toner cartridges than General

[238] *Id.* at 8 n.16 (citing Jules Dupuit, *De la Mesure de L'Utilité des Travaux Publics*, ANNALES DES PONTS ET CHAUSSÉES (2d Ser.) 8 (1844), *translated as* Jules Dupuit, *On the Measurement of the Utility of Public Works*, 2 INT'L ECON. PAPERS 83 (1952) (trans. R.H. Barback). The correct citation for this quote is Jules Dupuit, *De l'Influence des Péages sur l'Utilitié des Voies de Communication*, ANNALES DES PONTS ET CHAUSSÉES (2d Ser.) 17 (1849), *translated as* Jules Dupuit, *On Tolls and Transport Charges*, 11 INT'L ECON. PAPERS 7 (1962) (trans. Elizabeth Henderson)).

[239] *See, e.g.*, VARIAN, *supra* note 223, at 119–22; KREPS, *supra* note 223, at 58–59; JAMES M. HENDERSON & RICHARD E. QUANDT, MICROECONOMIC THEORY 25–35 (McGraw-Hill 3d ed. 1980).

Motors. The profits or free cash flow of a firm does not dictate the price that it will pay for its inputs.[240]

Second, if a network operator degraded best-effort delivery by increasing congestion, the quality-adjusted price for enhanced QoS would be considered excessively high to content and applications providers. In a voluntary optional business-to-business negotiation, if the content provider views the network operator's offered QoS enhancements as amounting to nothing more than a tolerable alternative to shoddy service—the second-class carriage in Dupuit's French railway—the content provider would negotiate the price down to a level that is unlikely to be profitable for the network operator. Selling high quantities of QoS enhancements for a low price is not necessarily more profitable than selling fewer QoS enhancements for a higher price.

Third, although a page of history is worth a volume of logic,[241] one is not excused from getting the facts straight when invoking historical arguments. There is no historical currency to Economides' *snapshot* of the history of French railways. The building of the French railways began in 1842, when the rail system was legalized.[242] Dupuit's article, published in 1849, was written when the French railway system was still in its infancy. It would be as if Dupuit were writing about residential broadband in the United States in the late 1990s. In the 1840s, Dupuit was writing about a brand-new technology having the potential to unleash profound network effects. Companies were still at an early stage of experimenting with business models for exploiting that technology to provide services that consumers would value. Dupuit decried that at least some companies had open third-class carriages with wooden benches. The pertinent question is not whether this practice existed in the 1840s, but whether it lasted as passenger transportation by rail matured. By 1880, if not sooner, railways were seating third-class passengers in coaches instead of open-air cars.[243] Whatever its purpose in the 1840s, the strategy described by Dupuit of hauling third-class passengers like livestock did not prevail. For purposes of the current debate over network neutrality regulation, the appropriate parallel to draw from the historical evolution of business models for passenger rail service in the nineteenth century is that the basic speed of broadband connection has improved over time, even though some consumers choose to pay more for superior service at any given snapshot in time. Under the same logic, there is no reason to believe that network operators would degrade best-effort delivery merely

[240] In addition, capital markets are available to place cash-poor companies with good business plans on a par with cash-rich companies.

[241] New York Trust Co. v. Eisner, 256 U.S. 345, 349 (1921) (Holmes, J.).

[242] *See* FRANK DOBBIN, FORGING INDUSTRIAL POLICY: THE UNITED STATES, BRITAIN, AND FRANCE in the RAILWAY AGE 114 (Cambridge Univ. Press 1994).

[243] *See, e.g.*, The Development of the British Railway Carriage, Bluebell Railway Preservation Society, http://www.bluebell-railway.co.uk/~zhaa009/bb/car_fs1.html.

because some content and applications providers are willing to pay for enhanced QoS.

Fourth, the historical evidence contradicts the conjecture of Economides (and Dupuit) that it would be a profitable strategy for a firm to "hurt" one class of customers so as to "frighten" another class into paying a higher price for the services it consumes. In the context of French railways in the 1840s, river and canal transport and coastal shipping served as close substitutes to French railways.[244] Consequently, consumers who did not want to pay for second-class carriages and did not want to sit on hard benches in open carriages could have easily switched to canal transport. The available substitute would have posed a competitive threat to any railways using the hurt-and-frighten strategy. A necessary condition for this strategy to work would be that the railways have a monopoly over not only passenger rail lines, but also all long-distance modes of passenger transportation. The absence of monopoly power in the broadband access market renders the hurt-and-frighten theory of monopoly exploitation unsuitable for predicting the behavior of network operators.

Fifth, another piece of historical evidence demolishes Economides' reliance on Dupuit's conjecture that a combination of quality degradation and differential pricing is a plausible means to extract consumer surplus. In the 1840s, France lagged far behind other European powers in the development of a rail network. In 1842, France had 885 km of rail, whereas Britain had 3,000 km and Germany had 2,800 km.[245] By 1850, French rail lines were controlled by about a half-dozen regional monopolies.[246] Consequently, French consumers in the 1840s lacked the ability to switch to other railways with differentiated services. Seventeen decades later, in contrast, consumers in the United States do have alternative suppliers of broadband access and may avail themselves of those choices at relatively low switching costs.

Sixth, network operators have an incentive to make best-effort delivery appealing to attract the millions of consumers who have yet to subscribe to any form of broadband access. Those consumers may not care about high-end streaming video; they may be satisfied to have basic Internet access. Dupuit in 1849, and Economides in 2010, evidently did not consider that the Spartan third-class carriages of monopoly-run French railways of the 1840s made the poor better off, for they entered into voluntary transactions to purchase tickets to use the new service. If, counterfactually,

[244] *See, e.g.*, ROGER PRICE, THE ECONOMIC MODERNISATION OF FRANCE, 1730–1880 36 (1975).

[245] *See* W. O. HENDERSON, THE INDUSTRIAL REVOLUTION ON THE CONTINENT: GERMANY, FRANCE, RUSSIA 1800–1914 113 (1961).

[246] Frank Dobbin, *Why the Economy Reflects the Polity: Early Rail Policy in Britain, France, and the United States*, *in* 2 THE SOCIOLOGY of ECONOMIC LIFE 401, 413 (Mark Granovetter & Richard Swedberg eds., Westview Press 2001).

regulation had denied the French railways of the 1840s the ability to offer different levels of quality for passenger transportation over a given route, what assurance is there that the homogeneous product offering that would have resulted would not price the poor out of the market? As Jerry Hausman has explained, the loss of consumer surplus from denying any class of consumer access to a new product is substantial.[247] For these reasons, Economides' application of Dupuit's French railway theory not only is factually and analytically inapt, but also it undercuts his prediction that network operators would degrade the quality of best-effort delivery.

2. *Economides' Misapplication of the Damaged Goods Theory*

Economides' dirt road conjecture does not become any more plausible when he attempts to support it with contemporary research by theoretical economists. In asserting that firms have incentive to degrade their products to implement price discrimination, Economides cites a 1996 article in which Raymond Deneckere and Preston McAfee theorize why firms might elect to "damage" their high-quality products to produce inferior products, instead of directly manufacturing a low-quality product at a lower cost.[248] Deneckere and McAfee posit that the lower quality, lower priced products are more costly to produce.[249] The damaged-goods strategy allows the firm to sell products to customers who value the superior product less.[250] Economides implies that the "damaged good" corresponds to the supposed dirt road of Internet access without QoS. However, a closer examination of Deneckere and McAfee demonstrates that their theoretical insights do not apply to optional business-to-business QoS transactions.

Several key assumptions in Deneckere and McAfee's model either do not apply to the broadband access market or contradict the outcome of the dirt road scenario. Each of the two variants of their model—the "dual use" case (with two types of consumers) and the "single use" case (with a continuum as the consumer universe)—explicitly assumes a monopoly producer,[251] which is contrary to the facts of the broadband access market.

[247] *See* Jerry A. Hausman, *Valuing the Effect of Regulation on New Services in Telecommunications*, 1997 BROOKINGS PAPERS ON ECON. ACTIVITY: MICROECONOMICS 1.

[248] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 8 (citing Deneckere & McAfee, *supra* note 203, at 150).

[249] Deneckere & McAfee, *supra* note 203, at 162, equation 1. We believe that this assumption makes it unlikely that the Deneckere-McAfee damaged-goods model is particularly relevant to the Internet, as typically one would expect that it would be *more* costly for an ISP to supply higher QoS to a content provider than it would be to supply a lower QoS, especially if one measures cost in terms of opportunity cost rather than only out-of-pocket cost. Moreover, the proposition that firms generally charge higher prices for products that are more costly to supply than for products that are less costly to supply is both uncontroversial and not a cause for policy concern.

[250] *Id.* at 149.

[251] *Id.* at 161, 164.

More importantly, the Deneckere-McAfee model would correspond to the *converse* of the sale of higher quality of delivery. In the model, firms degrade superior goods to offer inferior goods to consumers who are less willing to pay for high-quality goods:

> [The] assumption . . . says that whenever consumer X *weakly* prefers purchasing [the high-quality good] to purchasing [the low-quality good], consumer Y *strictly* prefers purchasing [the high-quality good]. This ensures that if the low quality good is introduced, it will be targeted towards the X segment of the market.[252]

The intuition underlying the Deneckere-McAfee model is that a firm may intentionally scratch the paint on a product and present it as a "return" or a "factory second" so that the firm can offer the good to consumers who are less willing to pay. By this strategy, firms can implement price discrimination from which all categories of consumers strictly benefit; the aggregate demand of the inferior-quality goods over all the possible pricing strategies is strictly positive.[253] The firm thus engages in price discrimination to move farther down the demand curve. However, by offering two different products—prioritized and best-efforts delivery—rather than one same level of best-efforts service to all, business-to-business QoS transactions will allow for two interrelated demand curves for the two service quality tiers, with two market-clearing prices (one possibly fixed at zero) and two quantities demanded. The effect of permitting business-to-business transactions for QoS on the quantity and QoS supplied is not a matter of moving along a single-demand curve, but of product differentiation. With product differentiation, it makes no economic sense to talk about moving up and down the demand curve. In an optional business-to-business QoS transaction, the network operator is not degrading delivery services, but rather *adding* value to delivery in the form of QoS enhancements. By offering enhanced QoS, network operators are able to sell a quality-differentiated product to customers having a high willingness to pay. Thus, the Deneckere–McAfee model does not apply to optional business-to-business QoS transactions. It follows that, notwithstanding the interpretation given it by Economides, the Deneckere–McAfee model does not support a ban on optional business-to-business QoS transactions.

Finally, Economides cites the Deneckere-McAfee article as supposedly proving the purportedly harmful effects of price discrimination.[254] Yet, Economides fails to acknowledge that the market outcome derived from the Deneckere-McAfee model is a strict Pareto improvement—the price discrimination resulting from product differentiation is beneficial.[255] That

[252] *Id.* at 162–63 (emphasis added).
[253] *Id.* at 162, equation 3.
[254] Economides, *Imposing New Tolls on Third-Party Content*, *supra* note 47, at 8 (citing Deneckere & McAfee, *supra* note 203, at 149).
[255] *See, e.g.*, PINDYCK & RUBINFELD, *supra* note 74, at 584.

result explains why we do not observe pervasive regulation to prevent the "damaging" of goods, even though costly inferior goods exist in many product markets. Deneckere and McAfee provide numerous examples in their article of product markets that sell inferior goods, including microprocessors, laser printers, recording disks, pocket calculators, and VCRs.[256] Therefore, even if one considered optional business-to-business QoS transactions to be comparable with the product differentiation strategy studied by Deneckere and McAfee, there is no empirical evidence suggesting that these QoS transaction would harm consumers and necessitate regulation.

VI. CONCLUSION

The economic arguments by which proponents of network neutrality regulation attempt to justify the adoption of the FCC's proposed nondiscrimination rule are unrealistic, at best. Although the FCC premised its NPRM on the goal of preserving the openness of the Internet, in our opinion and that of many leading economists who have considered the issue, it is more likely that the proposed nondiscrimination rule would reduce openness and innovation.

The current unregulated regime supports a climate conducive to investment that has spawned a decade of innovation in content and infrastructure. Restricting the right of broadband network operators to manage traffic through optional business-to-business QoS transactions would sap the incentive to invest for both content providers and network operators. Moreover, congestion is a growing concern as innovative new content and applications require greater QoS assurance for optimal performance. To maintain the current quality of experience that end users expect will likely necessitate the use of sophisticated traffic-management techniques. Lacking in-depth knowledge of each network operator's particular network, it is unlikely that, in implementing its proposed nondiscrimination rule, the FCC would be successful in outlining sufficiently flexible and narrow prescriptions that would continue to permit operators to manage congestion effectively. Consequently, network efficiency would suffer under a nondiscrimination rule.

Optional business-to-business QoS transactions enable network operators to offer more choices to content providers and their end user customers through product differentiation. Greater product variety always increases consumer welfare, all else the same. Moreover, permitting network operators to contract with content and applications providers allows broadband operators to lower subscription prices for end users. Lower prices facilitate greater broadband penetration, which benefits consumers and increases the positive spillovers that proponents of network neutrality regulation purport to protect. Simply put, optional business-to-business QoS transactions

[256] Deneckere & McAfee, *supra* note 203, at 151–61.

promote not only network efficiency, but also the expansion of broadband access.

The argument that Economides and others have made—that regulation is necessary to preserve positive spillovers—lacks economic rigor. It ignores the negative externalities that arise from congestion in broadband networks. Further, the undeniably robust innovation and investment that have occurred without regulation—and despite the presence of externalities—call into question the empirical *relevance* of the positive spillovers. Spillovers are present in many, if not most, competitive markets, and it is likely that network operators will seek to internalize positive externalities, even if they cannot fully do so, because empirical evidence suggests that the market functions efficiently without regulation. If the FCC were to implement its proposed nondiscrimination rule, it would more likely reduce network efficiency, reduce innovation among content and applications providers, and ultimately reduce consumer welfare.

Similarly, invocations of Lessig's dirt road metaphor and the related theory of vertical foreclosure are rhetorically powerful but economically irrelevant, as neither theory accords with the factual realities of the broadband marketplace. The assumption of monopoly in the provision of broadband access—on which both the dirt road and the vertical foreclosure conjectures hinge—is incorrect.

Regulation of broadband Internet access services through the FCC's overbroad nondiscrimination rule would increase uncertainty and reduce incentives for broadband network operators to invest and to innovate. Content and applications providers would have fewer means to guarantee QoS for newer, more latency-sensitive products, and the market for content and applications would suffer a decline in investment and innovation as well. Consumer welfare would suffer profoundly.