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# Technological Determinism and Its Discontents

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# BOOK REVIEW

## TECHNOLOGICAL DETERMINISM AND ITS DISCONTENTS

CAPTIVE AUDIENCE: THE TELECOM INDUSTRY AND MONOPOLY POWER IN THE NEW GILDED AGE. By Susan Crawford. New Haven, Conn.: Yale University Press. 2013. Pp. 360. $30.00.

*Reviewed by Christopher S. Yoo*[*]

### INTRODUCTION

During the period after the Internet first emerged as a mass-market phenomenon, it was almost always discussed in laudatory terms. The shift in focus from manufacturing to technology-oriented industries was creating a "new economy" characterized by higher growth rates than previously thought possible.[1] The Internet provided additional opportunities to create value by enabling companies to reach consumers whose numbers were previously thought to be too small to be served.[2] At the same time, many praised the Internet for providing better access to information and empowering individuals.[3] The Supreme Court joined the chorus in *Reno v. ACLU*,[4] lauding the Internet as "a unique and wholly new medium of worldwide human communication"[5] that took "content . . . as diverse as human thought"[6] and made it "available to anyone, anywhere in the world."[7] Adopting a

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[*] John H. Chestnut Professor of Law, Communication, and Computer & Information Science, University of Pennsylvania Law School. The title is obviously modeled on SIGMUND FREUD, CIVILIZATION AND ITS DISCONTENTS (James Strachey ed. & trans., W.W. Norton 1961) (1930).

[1] For the seminal use of the phrase, see Charles P. Alexander et al., *The New Economy*, TIME, May 30, 1983, at 70. References to the new economy became so entrenched that the Council of Economic Advisers devoted its entire 2001 Annual Report to exploring the underpinnings and implications of this shift. Council of Econ. Advisers, *The Annual Report of the Council of Economic Advisers*, *in* ECONOMIC REPORT OF THE PRESIDENT 7 (2001), *available at* http://www.gpo.gov/fdsys/pkg/ERP-2001/pdf/ERP-2001.pdf.

[2] *See, e.g.*, Erik Brynjolfsson et al., *Consumer Surplus in the Digital Economy: Estimating the Value of Increased Product Variety at Online Booksellers*, 49 MGMT. SCI. 1580, 1581 (2003).

[3] *See, e.g.*, NICHOLAS NEGROPONTE, BEING DIGITAL 153–54 (1995).

[4] 521 U.S. 844 (1997).

[5] *Id.* at 850 (quoting ACLU v. Reno, 929 F. Supp. 824, 844 (E.D. Pa. 1996)) (internal quotation marks omitted).

[6] *Id.* at 852 (quoting *ACLU*, 929 F. Supp. at 842) (internal quotation mark omitted).

[7] *Id.* at 851.

mode of reasoning appropriately called technological determinism,[8] many early commentators argued that technology is a force of nature that can be neither stopped[9] nor controlled.[10]

More recent commentary has continued to exhibit technological determinism, albeit with a more pessimistic attitude. These critics can be organized into two camps.[11] One warns that technology possesses a potential dark side, agonizing over the danger that the Internet may be shortening our attention span,[12] crowding out cultural masterworks,[13] weakening democracy,[14] and undermining our humanity.[15] Another group retains the belief that technology can improve the human condition, while worrying that corporate interests may prevent the Internet from realizing its potential unless the government intervenes.[16]

Professor Susan Crawford's book, *Captive Audience*, adopts the second approach, viewed through the lens of the recent merger between Comcast and NBC Universal. As an initial matter, Crawford is sharply critical of U.S. broadband Internet access, which she considers too expensive and unavailable in many parts of the country (pp. 3, 185–86). In addition, Crawford worries that the market for broadband access is becoming increasingly monopolistic, because cable-modem service is in the best position to provide the 100 megabytes per second (Mbps) or 1 gigabyte per second (Gbps) service needed for high-definition video (pp. 2, 64, 113, 172, 263–64). Although cable-modem service once faced competition from telephone companies offering digital subscriber line (DSL) service (p. 53), she argues that DSL has become obsolete (pp. 64, 161, 225, 251, 259). Fiber-to-the-home (FTTH) services such as Verizon FiOS can compete effectively with cable, but the two companies that could have an effect in this field, AT&T and Verizon, have not made this competition a reality: AT&T never pursued FTTH, and Verizon has stopped expanding its FiOS network (pp. 3, 8, 78, 80, 113, 236). Instead, AT&T and Verizon have focused on wireless broadband (pp. 10, 161, 237), which lacks the bandwidth to compete effectively with cable (pp. 9, 64, 79, 121, 160–61, 234–35,

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[8] Adam Thierer, *The Case for Internet Optimism, Part 1: Saving the Net from Its* Detractors, *in* THE NEXT DIGITAL DECADE 57, 63 (Berin Szoka & Adam Marcus eds., 2010).

[9] *See, e.g.*, NEGROPONTE, *supra* note 3, at 229–31.

[10] *See, e.g.*, John Perry Barlow, *A Declaration of the Independence of Cyberspace*, ELECTRONIC FRONTIER FOUND. (Feb. 8, 1996), https://projects.eff.org/~barlow/Declaration-Final.html.

[11] *See* Thierer, *supra* note 8, at 57–58.

[12] *See, e.g.*, NICHOLAS CARR, THE SHALLOWS 5–10 (2010).

[13] *See, e.g.*, ANDREW KEEN, THE CULT OF THE AMATEUR 27–34 (2007).

[14] *See, e.g.*, LEE SIEGEL, AGAINST THE MACHINE 125–37, 165 (2008).

[15] *See, e.g.*, JARON LANIER, YOU ARE NOT A GADGET 3–5 (Vintage Books 2011) (2010).

[16] *See, e.g.*, BRETT M. FRISCHMANN, INFRASTRUCTURE 317–57 (2012); LAWRENCE LESSIG, THE FUTURE OF IDEAS 262–65 (2001); BARBARA VAN SCHEWICK, INTERNET ARCHITECTURE AND INNOVATION 10 (2010); TIM WU, THE MASTER SWITCH 299–319 (2010); JONATHAN ZITTRAIN, THE FUTURE OF THE INTERNET — AND HOW TO STOP IT 3–5 (2008).

251). Wireless service is thus more properly regarded as a complement rather than a competitor to cable service (pp. 9, 53, 64, 117, 156–157, 160, 251). Crawford concedes that these problems predated the merger and would exist regardless of whether the merger was blocked or permitted to proceed (p. 230).

A concern more closely rooted to the merger is that placing Comcast's network services and NBC Universal's cable networks under the same corporate umbrella will allow the combined entity to stifle emerging online video distributors (OVDs), such as Netflix. The combination of Comcast's supposed monopoly over high-speed Internet (p. 2) with key programming properties controlled by NBC Universal (pp. 132–33) will purportedly allow the merged company to restrict OVDs' access both to last-mile connectivity[17] (pp. 121, 175–85) and to must-have content (pp. 114–20, 174). To Crawford, this outcome seems inevitable. Crawford devotes a chapter to the proposed AT&T and T-Mobile merger, complaining that even though the government blocked the merger, Verizon and AT&T would remain an effective duopoly and would be unlikely to lower prices or improve services any time soon (pp. 235, 251–52). She concludes that the best way to promote faster, cheaper, symmetrical, reliable Internet access would be for the government to subsidize municipal FTTH and turn the Internet into a public utility by bringing back common carriage (pp. 254–58, 264–66).

A brief look at the history of this sector underscores that any such technologically deterministic predictions should be approached with extreme caution. There is good reason to question whether DSL and wireless broadband can no longer compete with cable-modem service. Moreover, previous firms that have attempted to restrict access to applications and content have met with dismal results. Early dial-up access providers, such as CompuServe and Prodigy, pursued this strategy, only to see it fail.[18] Complaints similar to those raised by Crawford were lodged against Excite@Home,[19] a cable company–owned Internet

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[17] Last-mile networks are those which control the last mile of cable before reaching consumers' homes. Thus, even if OVDs transmitted their content over different networks, because Comcast controls access to the end consumers, any traffic to Comcast's end users would pass through its network (pp. 168, 182–85).

[18] *See, e.g.*, Christopher S. Yoo, *Network Neutrality and the Economics of Congestion*, 94 GEO. L.J. 1847, 1849 (2006).

[19] *See, e.g.*, Written Ex Parte of Professor Mark A. Lemley and Professor Lawrence Lessig, Applications for Consent to the Transfer of Control of Licenses and Section 214 Authorizations from MediaOne Group, Inc., Transferor, to AT&T Corp., Transferee, 15 FCC Rcd. 9816 (2000) (No. 99-251), *available at* http://apps.fcc.gov/ecfs/document/view?id=6009850927; Mark A. Lemley & Lawrence Lessig, *The End of End-to-End: Preserving the Architecture of the Internet in the Broadband Era*, 48 UCLA L. REV. 925, 928–29, 932–33 (2001); Lawrence B. Solum & Minn Chung, *The Layers Principle: Internet Architecture and the Law*, 79 NOTRE DAME L. REV. 815, 936–37 (2004).

service provider (ISP) that spectacularly fell into bankruptcy in 2001.[20] Commentators also objected to the integration of video programming and distribution when News Corp. acquired DirecTV in 2003,[21] only to see News Corp. reverse the transaction five short years later.[22] More recently, Time Warner abandoned precisely the strategy that Comcast–NBC Universal is supposedly pursuing when it separated its programming properties from its cable network by spinning off Time Warner Cable.[23] And perhaps most notoriously, commentators protested the combination of content and conduit during America Online's 2001 acquisition of Time Warner,[24] only to see the combination dissolve in 2009 at a loss of approximately $200 billion.[25]

Past failed attempts to combine content and conduit serve as a cautionary note regarding anyone's ability to forecast which business strategies will prove successful and instead counsel in favor of hesitating before basing prescriptive regulatory policies on any such predictions. As the long litany of failed Internet businesses demonstrates, ownership of value-creating technologies is not sufficient to guarantee commercial success, putting the lie to the oft-quoted mantra, "If you build it, they will come."[26] Timing matters, as does the development of complementary technologies and the manner in which technologies are implemented. Instead, history counsels in favor of remaining open-minded about new practices and preserving innovators' ability to experiment with alternative ways of doing business. Moreover, policymakers must keep in mind that the law of unintended consequences means that regulatory interventions can often be counterproductive in surprising ways. The fact that such change is disruptive and inevitably creates winners and losers, however, should not deter policymakers

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[20] *See* Ben Heskett & Rachel Konrad, *Excite@Home Files for Bankruptcy*, CNET NEWS (Oct. 1, 2001, 7:50 AM), http://news.cnet.com/2100-1033-273689.html.

[21] *See* General Motors Corp. and Hughes Electronics Corp., Transferors, and the News Corp. Ltd., Transferee, Memorandum Opinion and Order, 19 FCC Rcd. 473, 476–77 ¶ 4 (2004).

[22] News Corp. and the DirecTV Group, Inc., Transferors, and Liberty Media Corp., Transferee, Memorandum Opinion and Order, 23 FCC Rcd. 3265, 3266 (2008).

[23] Applications for Consent to the Assignment and/or Transfer of Control of Licenses, Time Warner Inc., and Its Subsidiaries, Assignor/Transferor, to Time Warner Cable Inc., and Its Subsidiaries, Assignee/Transferee, Memorandum Opinion and Order, 24 FCC Rcd. 879 (2009).

[24] *See, e.g.*, Daniel L. Rubinfeld & Hal J. Singer, *Open Access to Broadband Networks: A Case Study of the AOL/Time Warner Merger*, 16 BERKELEY TECH. L.J. 631 (2001).

[25] Christopher S. Yoo, *Network Neutrality, Consumers, and Innovation*, 2008 U. CHI. LEGAL F. 179, 258; Press Release, Time Warner, Time Warner Inc. Completes Spin-Off of AOL Inc. (Dec. 10, 2009), *available at* http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MjMzODh8Q2hpbGRJRDotMXxUeXBlPTM=&t=1.

[26] This line is a common misquotation of the line made famous by the movie FIELD OF DREAMS (Universal Pictures 1989). The proper quotation is, "If you build it, *he* will come." *See* Keertana Sastry, *15 Famous Movie Quotes Everyone Gets Wrong*, BUS. INSIDER (Aug. 10, 2012, 10:52 AM), http://www.businessinsider.com/common-movie-misquotes-2012-5?op=1.

from rejecting technological determinism and keeping a watchful eye as events unfold.

Part I of this Book Review examines Crawford's claim that cable-modem service will soon emerge as the dominant platform for broadband Internet access. Part II critiques her arguments that vertical integration of Comcast's distribution infrastructure with NBC Universal's programming properties will harm consumers. Part III explores the potential unintended consequences of regulatory intervention. Part IV assesses Crawford's recommendations in favor of municipal fiber and common carriage.

## I. THE LOOMING CABLE MONOPOLY

One of the book's most recurrent tropes is its warning about the "looming cable monopoly" over high-speed Internet service (p. 17).[27] Even though cable-modem service providers capture only one-third of broadband subscribers in their service areas, Crawford predicts that two dynamics will soon allow cable companies to control somewhere between 70% and 90% of the market (pp. 53, 65, 172), which will be dominated by two companies: Comcast and, to a lesser degree, Time Warner Cable (p. 235). The first is the demise of traditional fixed-line telephone companies as broadband competitors. The second is wireless broadband's inability to provide sufficient bandwidth to support video programming. The one technology that Crawford thinks can compete with cable is FTTH, which I will discuss below.[28]

### *A. Cable vs. DSL*

As Crawford acknowledges, asymmetric DSL (ADSL) and cable-modem service once competed vigorously (p. 53). Early ADSL typically offered download speeds of 1.5 Mbps (with a theoretical maximum of 10 Mbps) at a cost of $600 to $800 per subscriber.[29] This was comparable to cable-modem service under the initial DOCSIS 1.0 standard, which typically offered download speeds of 3 Mbps at a cost of $800 to $1000 per subscriber.[30]

Each technology was subject to a number of technological constraints. Telephone companies could provide ADSL only to customers

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[27] For similar references, see pp. 1, 53, 60, 64, 79, 85, 113, 251.

[28] *See infra* section IV.A, pp. 945–48.

[29] Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, Report, 14 FCC Rcd. 2398, 2431 chart 2, app. A at 2455 (1999) [hereinafter *First Broadband Progress Report*].

[30] *Id.* at 2431 chart 2, app. A at 2456–57.

located within 18,000 feet of a central office or a fiber node.[31] ADSL, moreover, was not a fully Internet-based service; some ADSL providers utilized a legacy circuit-based technology known as asynchronous transfer mode (ATM) to route data transmissions internally.[32] Because cable-modem service shares bandwidth locally, effective quality of service depended on the current usage of immediate neighbors, which made the quality of cable-modem service quite variable.[33]

In 2006, a new standard known as DOCSIS 3.0 enabled cable-modem providers to offer download speeds of 160 Mbps or faster.[34] The industry reports that DOCSIS 3.0 is now available in 85% of U.S. households.[35] The higher speeds made possible by DOCSIS 3.0 rendered DSL obsolete (p. 161). Newer versions of DSL, such as AT&T's U-verse network, deploy additional fiber nodes to shorten the distance between the node and the end user to two to four thousand feet,[36] which increases download speeds to up to 24 Mbps.[37] Crawford discounts U-verse as a competitor because AT&T had stopped its U-verse buildout at 40–45% percent of its footprint and because fiber to the node does not provide sufficient bandwidth to compete with DOCSIS 3.0 (p. 236). Indeed, the bandwidth limitations are so severe that Crawford suggests telephone companies are in the process of abandoning DSL altogether (pp. 161, 259).

Recent history suggests that predictions of DSL's demise may have been premature. On November 7, 2012, AT&T announced Project Velocity IP, which included $6 billion to upgrade its DSL network.[38] Specifically, AT&T plans to expand its U-verse network to approximately 8.5 million additional customer locations by the end of 2015,

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[31] *Id.* at app. A at 2456; Christopher S. Yoo, *Vertical Integration and Media Regulation in the New Economy*, 19 YALE J. ON REG. 171, 255 (2002).

[32] Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd. 14,853, 14,860 n.15 (2005).

[33] *See First Broadband Progress Report*, *supra* note 29, at 2457.

[34] *See* Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, Fifth Report, 23 FCC Rcd. 9615, 9619 ¶ 9 (2008). The 150 Mbps download speed is based on the assumption that firms deploying DOCSIS 3.0 only bond the minimum number of four channels. *See id.* at 9619 n.21. Bonding more channels together should allow DOCSIS 3.0 to deliver speeds in the multiple–gigabyte per second range. *See* Dale N. Hatfield, *The Challenge of Increasing Broadband Capacity*, 63 FED. COMM. L.J. 43, 53–54 (2010).

[35] *Industry Data: Cable HSI DOCSIS 3 Service Availability*, NAT'L CABLE & TELECOMM. ASS'N, http://www.ncta.com/industry-data (last visited Nov. 1, 2013).

[36] *See* Yoo, *supra* note 25, at 201.

[37] *AT&T U-verse High Speed Internet*, AT&T, http://www.att.com/u-verse/explore/internet-landing.jsp (last visited Nov. 1, 2013).

[38] *See* Press Release, AT&T, AT&T to Invest $14 Billion to Significantly Expand Wireless and Wireline Broadband Networks, Support Future IP Data Growth and New Services (Nov. 7, 2012), *available at* http://www.att.com/gen/press-room?pid=23506&cdvn=news&newsarticleid=35661.

increasing its coverage to 33 million consumer and small business locations.[39] This will extend U-verse from 32% to 43% of the households in AT&T's service area.[40] AT&T will deploy technologies known as pair bonding and vectoring to increase speeds still further.[41] AT&T predicts that 90% of U-verse households will receive download speeds of 75 Mbps, and 75% will receive downloads speeds of 100 Mbps.[42]

Furthermore, for an additional 24 million households (or an additional 32% of AT&T's footprint), AT&T plans to upgrade its current ADSL network by replacing conventional DSL Access Multiplexers (DSLAMs), which route data traffic internally using ATM, with new IP DSLAMs, which route traffic internally using the Internet Protocol.[43] Nearly 80% of IP DSLAM customers will receive download speeds of 45 Mbps, and half of those customers will receive download speeds of 75 Mbps.[44] Together, these two expansions will cover 75% of the customer locations in AT&T's service area.[45] Thus, contrary to Crawford's prediction, AT&T is expanding its U-verse offerings and increasing its speeds.

This is not the first time commentators have prematurely attempted to write off DSL. In November 1999, Professors Mark Lemley and Lawrence Lessig noted that cable held an 80% to 20% lead over DSL and predicted that ADSL was unlikely to narrow the gap quickly.[46] The Federal Communications Commission (FCC) saw the situation differently in August 2000, predicting that ADSL would emerge as a competitor to cable-modem service.[47] The D.C. Circuit also noted that

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[39] *Id.*

[40] Alan Weissberger, *AT&T to Expand U-verse & IP-DSLAM; Bring Fiber to Commercial Buildings & Cover 99% of US with LTE!*, VIODI VIEW (Nov. 8, 2012), http://viodi.com/2012/11/08/at-bring-fiber-to-commercial-buildings-cover-99-of-us-with-lte.

[41] Kamalini Ganguly, *AT&T Expands U-verse, Moves Closer to Integrated All-IP Network, Services*, OVUM (Nov. 13, 2012), http://ovum.com/2012/11/13/att-expands-u-verse-moves-closer-to-integrated-all-ip-network-services.

[42] Karl Bode, *Details on Rumored New AT&T U-verse Speeds*, DSL REPORTS (Mar. 21, 2013, 12:22 PM), http://www.dslreports.com/shownews/Details-on-Rumored-New-ATT-UVerse-Speeds-123593 (citing statement from AT&T CEO John Donovan).

[43] *See* Press Release, AT&T, *supra* note 38 (stating that AT&T plans to provide 24 million customer locations with high-speed IP Internet access).

[44] Bode, *supra* note 42. AT&T announced the deployment of 45 Mbps service in forty markets across fifteen states. Press Release, AT&T, 45 Mbps U-verse Internet Service Arrives in 40 Additional Markets (Aug. 26, 2013), *available at* http://www.att.com/gen/press-room?pid=24734&cdvn=news&newsarticleid=36934.

[45] *See* Press Release, AT&T, *supra* note 38.

[46] *See* Written Ex Parte of Professor Mark A. Lemley and Professor Lawrence Lessig, *supra* note 19, at 30 ¶ 81; *see also* Lemley & Lessig, *supra* note 19, at 952 (stating that, as of 2000, cable's market share in the residential broadband market was 70%).

[47] *See* Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, Second Report, 15 FCC

ADSL had emerged as a robust competitor to cable-modem service.[48] History would vindicate the FCC and the D.C. Circuit. ADSL had narrowed the ratio of cable-modem service to ADSL lines from 65% to 35% by the end of 2000[49] and would narrow the gap still further to 55% to 45% by 2007.[50] Since that time, ADSL has declined relative to cable-modem service, but has maintained a roughly 60% to 40% split.[51]

Crawford nonetheless asserts that subscribers require between 50 Mbps and 100 Mbps for video (pp. 2, 60).[52] DSL cannot compete with cable-modem service because it relies on last-mile communications over copper wires that cannot deliver the necessary speeds (p. 236). Indeed, Crawford predicts that end users will soon need gigabit service (pp. 2, 263–64).

The data collected by the federal government fails to bear this out. As of September 2012, the average subscribed speed was only 15.6 Mbps,[53] despite the widespread availability of faster speeds.[54] More-

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Rcd. 20,913, 20,985 ¶ 189, 20,986 ¶ 191, 20,988 ¶ 196 (2000) (predicting that DSL would capture 13 million subscribers by 2004 versus 15.2 million subscribers to cable-modem service).

[48] *See* U.S. Telecom Ass'n v. FCC, 290 F.3d 415, 428–29 (D.C. Cir. 2002) (citing Inquiry Concerning the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of Telecommunications Act of 1996, Third Report, 17 FCC Rcd. 2844, 2864 ¶ 44, 2865 ¶ 48 (2002); *First Broadband Progress Report*, *supra* note 29, at 2423 ¶ 48).

[49] *See* INDUS. ANALYSIS DIV., FED. COMMC'NS COMM'N, HIGH-SPEED SERVICES FOR INTERNET ACCESS: SUBSCRIBERSHIP AS OF DECEMBER 31, 2000, at 6 tbl.1 (2001), *available at* http://www.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/hspd0801.pdf.

[50] *See* INDUS. ANALYSIS & TECH. DIV., FED. COMMC'NS COMM'N, HIGH-SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF DECEMBER 31, 2007, at 6 tbl.1 (2009), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-287962A1.pdf.

[51] *See* INDUS. ANALYSIS & TECH. DIV., FED. COMMC'NS COMM'N, INTERNET ACCESS SERVICES: STATUS AS OF JUNE 30, 2012, at 23 tbl.5 (2013) [hereinafter JUNE 2012 INTERNET ACCESS SERVICES REPORT], *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-321076A1.pdf.

[52] Crawford also argues that broadband service should be symmetrical (pp. 2, 12, 262–64). Symmetrical allocation of bandwidth would make sense if end users upload as frequently as they download, typically associated with peer-to-peer traffic. This claim is undercut by the fact that peer-to-peer traffic has plummeted from a high of over 65% of consumer Internet traffic in 2005 to below 20% in 2013 and is projected to fall still further in years to come. CHRISTOPHER S. YOO, THE DYNAMIC INTERNET 30–31 (2012) [hereinafter YOO, THE DYNAMIC INTERNET]. Although Crawford attempts to justify her call for symmetrical bandwidth based on the needs of businesses (pp. 12, 264), connecting businesses typically requires only laying fiber to a handful of locations, which can be accomplished without incurring the substantial expense of laying fiber networks in residential neighborhoods. Christopher S. Yoo, *Innovations in the Internet's Architecture that Challenge the Status Quo*, 8 J. ON TELECOMM. & HIGH TECH. L. 79, 96 (2010) [hereinafter Yoo, *Innovations in the Internet's Architecture*].

[53] OFFICE OF ENG'G & TECH. & CONSUMER & GOVERNMENTAL AFFAIRS BUREAU, FED. COMMC'NS COMM'N, 2013 MEASURING BROADBAND AMERICA: A REPORT ON CONSUMER WIRELINE BROADBAND PERFORMANCE IN THE U.S. 6 (2013), *available at* http://transition.fcc.gov/cgb/measuringbroadbandreport/2013/Measuring-Broadband-America-feb-2013.pdf.

[54] NAT'L TELECOMMS. & INFO. ADMIN. & FED. COMMC'NS COMM'N, BROADBAND STATISTICS REPORT: ACCESS TO BROADBAND TECHNOLOGY BY SPEED 4 (2013), *available at*

over, as of June 2012, where download speeds of 100 Mbps or more were available, only 0.12% of households subscribed to service of that speed.[55] Where download speeds of 25 Mbps or more were available, only 10.75% of households subscribed.[56] Adoption rates for 100 Mbps service in countries that Crawford views as models for broadband policy are similarly disappointing.[57] Thus, the vast majority of customers with the opportunity to purchase faster service decline to do so. Indeed, Crawford concedes as much when she observes that consumers are only now beginning to purchase higher tiers (p. 182).

In short, telephone companies have been able to wring more bandwidth out of the twisted pair of copper telephone lines than anyone could have imagined. Whether the 45 Mbps to 100 Mbps service that AT&T is able to provide via DSL is sufficient to compete with cable remains to be seen.

### *B. Cable vs. Wireless Broadband*

As noted above, Crawford's argument that cable companies will monopolize Internet access also depends on her assertion that wireless broadband lacks the bandwidth to serve as a substitute for cable (pp. 9, 64, 79, 121, 160–61, 234–35, 251). Wireless service is instead more properly regarded as a complement rather than a competitor to cable service (pp. 9, 53, 64, 117, 156, 157, 160, 251). This claim is quite striking, because wireless broadband represents one of the most successful recent developments in the broadband market. Measured at the lowest-speed tier, as of June 2012 mobile wireless broadband had captured 153 million subscribers, more than triple the number of cable-modem subscribers.[58] Moreover, mobile wireless broadband

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http://www2.ntia.doc.gov/files/broadband-data/Technology%20by%20Speed%20JUN%202012.pdf (reporting that 78% of households had access to 25 Mbps service as of June 2012).

[55] Specifically, the National Telecommunications and Information Administration (NTIA) study indicates that 100 Mbps service was available in 46.37% of 136,714,122 household units, which equals 63.4 million households. *Id.* Only 74,000 households subscribed to 100 Mbps, which equals 0.12% of households with access to it. JUNE 2012 INTERNET ACCESS SERVICES REPORT, *supra* note 51, at 31 tbl.11. Even if one considers all subscribers to 100 Mbps service and not just residential subscribers, 156,000 subscriptions still equals a minuscule take-up rate of 0.25%. *Id.* at 30 tbl.10.

[56] The NTIA study indicates that 25 Mbps service was available in 77.57% of 136,714,122 household units, which equals 106.0 million households. NAT'L TELECOMMS. & INFO. ADMIN. & FED. COMMC'NS COMM'N, *supra* note 54, at 4. Only 11,324,000 households subscribed to 25 Mbps service, which equals 10.68% of households with access to it. JUNE 2012 INTERNET ACCESS SERVICES REPORT, *supra* note 51, at 31 tbl.11.

[57] In Europe, take-up rate for 100 Mbps service is one line per 100 inhabitants, which translates to roughly 2% of households. *Commission Staff Working Document: Digital Agenda Scoreboard 2013*, at 56, SWD (2013) 217 final (June 12, 2013), *available at* https://ec.europa.eu/digital-agenda/sites/digital-agenda/files/DAE%20SCOREBOARD%202013%20-%20SWD%202013%20217%20FINAL.pdf.

[58] *See* JUNE 2012 INTERNET ACCESS SERVICES REPORT, *supra* note 51, at 1, 23 tbl.5.

subscribers increased by 28% over the preceding twelve-month period, as compared with the more modest 6% growth rate for cable modem.[59]

Most of the subscribers in the June 2012 data reportedly subscribed to third-generation (3G) wireless technologies, which provide somewhat limited bandwidth. The ongoing deployment of the fourth-generation (4G) wireless technology known as Long Term Evolution (LTE) promises to make mobile broadband an even more effective competitor to cable-modem service. Although Verizon's LTE service advertises peak download speeds of 25 Mbps and average speeds of 12 Mbps, Crawford expresses doubts as to whether Verizon can actually deliver on those promises (p. 251). She need not have worried. Independent news reports indicate that AT&T, Verizon, and T-Mobile are delivering peak download speeds of between 49 and 66 Mbps and average download speeds of between 12 and 19 Mbps.[60] Sprint advertises and delivers slower rates for its LTE service.[61]

Moreover, mobile broadband providers' expansion plans are extremely aggressive. Verizon began its LTE deployment in December 2010 and covered its entire 3G footprint with LTE by mid-2013,[62] serving 300 million people or 96% of the U.S. population.[63] AT&T, which launched LTE in September 2011,[64] plans to reach 80% of the U.S. population by the end of 2013 and to complete the build-out of its entire network by the end of 2014, at which point it should reach 96% of the U.S. population.[65] Sprint launched LTE in July 2012 and forecasts reaching 200 million people by the end of 2013.[66] T-Mobile be-

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[59] *See id.* at 1, 23 tbl.5.

[60] *See* Patrick Linder, *Lightning-Fast Data Speeds and Expanding Coverage: A 4G LTE Performance Review*, ROOT METRICS (Mar. 11, 2003), http://www.rootmetrics.com/special-reports/lte-performance-review [hereinafter *Root Metrics Study*] (reporting peak and average download speeds of 57.7 Mbps and 18.6 Mbps for AT&T LTE and 49.3 Mbps and 14.3 Mbps for Verizon LTE); Sascha Segan, *Fastest Mobile Networks 2013*, PC MAG. (June 17, 2013), http://www.pcmag.com/article2/0,2817,2420334,00.asp (reporting peak and average download speeds of 66.11 Mbps and 16.65 Mbps for AT&T LTE, 62.03 Mbps and 12.07 Mbps for T-Mobile LTE, and 59.83 Mbps and 11.93 Mbps for Verizon LTE).

[61] *See Root Metrics Study*, *supra* note 60 (reporting peak and average download speeds of 32.7 Mbps and 10.3 Mbps for Sprint LTE); Segan, *supra* note 60 (reporting peak and average download speeds of 32.32 Mbps and 5.55 Mbps for Sprint LTE).

[62] Andy Patrizio, *Verizon's LTE Coverage Will Match 3G Coverage by Mid-2013*, BRIGHTHAND (Nov. 19, 2012), http://www.brighthand.com/default.asp?newsID=19521.

[63] Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Sixteenth Report, 28 FCC Rcd. 3700, 3727 n.51, 3745 tbl.3 (2013) [hereinafter *Sixteenth Annual Mobile Wireless Competition Report*].

[64] *Id.* at 3775 ¶ 96.

[65] *Id.* at 3707.

[66] Phil Goldstein, *Sprint Loses 337,000 Net Subs, Lowers LTE Coverage Goal to 200M by Year-End*, FIERCE WIRELESS (Feb. 7, 2013), http://www.fiercewireless.com/story/sprint-loses-337000-net-subs-lowers-lte-coverage-goal-200m-year-end/2013-02-07.

gan deploying LTE in March 2013[67] and forecasts reaching 200 million people by the end of the year.[68] Smaller providers, such as Leap, U.S. Cellular, and C-Spire, are also deploying LTE.[69]

Crawford nonetheless maintains that wireless broadband cannot compete with cable modem because subscribers will need between 50 Mbps and 100 Mbps for video (pp. 2, 60, 174). It is far from clear that video requires that much bandwidth. Skype recommends 1.5 Mbps for HD video calling and 2–8 Mbps for group video, depending on the number of people involved.[70] Netflix recommends 7 Mbps for Super HD and 12 Mbps for 3D.[71] Given video's relatively modest demand for bandwidth, it comes as no surprise that the vast majority of Americans do not purchase such speeds when they are available.[72]

It is thus plausible that wireless broadband can deliver the broadband speeds that consumers actually demand. Calls for ever-faster service risk running afoul of what Professor Clayton Christensen called the "innovator's dilemma," which provides an explanation for why market-leading firms that pioneer new technologies are often displaced by later arriving firms that are less sophisticated.[73] The innovating firms become preoccupied with pursuing the cutting edge of technology and produce products that exceed what consumers actually need. This in turn creates an opening for new products that are technologically inferior but more in line with what consumers actually want.[74] In contrast to Schumpeterian gales of creative destruction, Christensen's disruptive innovation does not arise from better technology, but from better business models.[75] Rather than becoming caught up in a technophile's affinity for the cutting edge, broadband providers should focus on what consumers actually need.

As the National Broadband Plan notes, whether wireless broadband can serve as an effective competitor to cable thus depends on

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[67] Phil Goldstein, *T-Mobile to Launch LTE in March, Updates Galaxy Note II for LTE*, FIERCE WIRELESS (Mar. 18, 2013), http://www.fiercewireless.com/story/t-mobile-launch-lte-march-updates-galaxy-note-ii-lte/2013-03-18.

[68] *Sixteenth Annual Mobile Wireless Competition Report*, *supra* note 63, at 3707.

[69] *Id.*

[70] *How Much Bandwidth Does Skype Need?*, SKYPE, https://support.skype.com/en/faq/FA1417/how-much-bandwidth-does-skype-need (last visited Nov. 24, 2013).

[71] *Internet Connection Speed Recommendations*, NETFLIX, https://support.netflix.com/en/node/306 (last visited Nov. 24, 2013).

[72] *See supra* notes 53–56 and accompanying text.

[73] CLAYTON M. CHRISTENSEN, THE INNOVATOR'S DILEMMA, at xv (1997).

[74] *Id.* at 165.

[75] CLAYTON M. CHRISTENSEN ET AL., SEEING WHAT'S NEXT: USING THE THEORIES OF INNOVATION TO PREDICT INDUSTRY CHANGE 16 (2004); *see also* Raphael Amit & Christoph Zott, *Creating Value Through Business Model Innovation*, MIT SLOAN MGMT. REV., Spring 2012, at 41; Mark W. Johnson et al., *Reinventing Your Business Model*, HARV. BUS. REV., Dec. 2008, at 50, 52.

how quickly the demand for wireless bandwidth develops.[76] Press reports indicate that some people are beginning to drop their fixed-line broadband connection and rely entirely on their wireless device for their broadband capability.[77] A survey conducted by the British Office of Communications (Ofcom) revealed that 6% of U.S. households relied entirely on mobile broadband for their Internet connectivity as of October 2011.[78] A 2011 Cisco study estimates that 15% of customers may drop wireline broadband in favor of wireless.[79] The Dish Network based its failed bid for Sprint in part on the belief that as many as one third of Americans may prefer to rely exclusively on wireless broadband.[80] Moreover, in May 2012, Verizon began offering a HomeFusion service, which uses LTE to provide fixed wireless broadband to homes.[81] A phone survey conducted in late 2012 indicated that 8% of all U.S. adults and 10% of adult Internet users rely exclusively on their smartphones for their Internet connectivity.[82]

By the time that consumers begin to demand such higher speeds, LTE could well be able to meet that demand. Some operators, such as the United Kingdom's leading wireless provider, EE (formerly known as Everything Everywhere), have assembled sufficient contiguous spectrum to offer LTE service with download speeds of 150 Mbps.[83] The International Telecommunications Union has also issued standards for the next generation of wireless communications, known as LTE Advanced, which is theoretically capable of providing download

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[76] FED. COMMC'NS COMM'N, CONNECTING AMERICA: THE NATIONAL BROADBAND PLAN 40–42 (2010) [hereinafter NATIONAL BROADBAND PLAN], *available at* http://download.broadband.gov/plan/national-broadband-plan.pdf.

[77] Anton Troianovski, *People Are Cutting the Cord — For Web More than TV*, WALL ST. J., May 30, 2013, at B1.

[78] OFCOM, INTERNATIONAL COMMUNICATIONS MARKET REPORT 2011, at 171 fig.5.1, 304 fig.6.77 (2011).

[79] Cisco Internet Bus. Solutions Grp., *To Prevent 15% of Customers from Cord-Cutting, Fixed Broadband SPs Consider WiFi Solutions to Deliver the Mobility Customers Seek*, CISCO (Oct. 2011), http://www.cisco.com/web/about/ac79/docs/FastFacts/FastFacts_WiFi_Defense_against_BB_Cord_Cutting_Oct2011.pdf.

[80] *See* Hal Singer, *Wireless Competition Under the Senate's Microscope*, FORBES (June 4, 2013, 10:01 AM), http://www.forbes.com/sites/halsinger/2013/06/04/wireless-competition-under-the-senates-microscope.

[81] *HomeFusion Broadband From Verizon Now Available Nationwide on America's Largest 4G LTE Network*, VERIZON WIRELESS (May 2, 2012), http://news.verizonwireless.com/news/2012/05/pr2012-05-02.html.

[82] *See* Chris McGovern et al., *Smartphones as a Substitute: Why Some Smartphone Users Aren't Subscribing at Home* 5 (Sept. 13, 2013) (paper presented at the 41st Annual Telecommunications Policy Research Conference), *available at* http://ssrn.com/abstract=2242689.

[83] Kevin Fitchard, *Why Is SK Telecom's LTE Network "Advanced" While EE's Is Not?*, GIGAOM (July 3, 2013, 10:00 AM), http://gigaom.com/2013/07/03/why-is-sk-telecoms-lte-network-advanced-while-ees-is-not.

speeds of 3 Gbps and upload speeds of 1.5 Gbps.[84] South Korea's leading wireless provider, SK Telecom, launched LTE Advanced in June 2013 and has successfully delivered data speeds of up to 150 Mbps.[85] Korean provider LG Uplus[86] and Australian provider Telstra have followed suit, with the latter planning to provide service up to 300 Mbps.[87]

It is at least plausible that wireless broadband might serve as a long-term substitute for wireline broadband. Such a development would undercut claims of a looming cable monopoly. Once wireless broadband is included, the FCC's June 2012 data indicate that 92% of U.S. households resided in census blocks where three or more providers offered service at or near the benchmarks established by the National Broadband Plan.[88] Moreover, 62% of U.S. households resided in census blocks where three or more providers offered 6 Mbps/1.5 Mbps service, and 23% of households resided in census blocks where three or more providers offered 10 Mbps/1.5 Mbps service.[89]

Moreover, as Figure 1 shows, these trends have been steadily improving. Given that LTE averages more than 10 Mbps, the competitiveness in the higher tiers is likely to improve. Indeed, once the major providers finish deploying LTE across their entire footprints, we can expect 97.2% of households to reside in census blocks in which three or more providers have deployed wireless broadband service that exceeds 10 Mbps, and 92.8% will have four such providers.[90] The inclusion of wireless services also has the potential to substantially lessen

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[84] *See* Jeanette Wannstrom, *LTE-Advanced*, 3GPP (May 2012), http://www.3gpp.org/lte-advanced.

[85] Tammy Parker, *SK Telecom: Take a Closer Look at Its LTE Advanced Rollout*, FIERCE BROADBAND WIRELESS (July 11, 2013), http://www.fiercewireless.com/tech/special-reports/sk-telecom-take-closer-look-its-lte-advanced-rollout.

[86] Lance Whitney, *South Korea Launches Second LTE-Advanced Network*, CNET (July 18, 2013, 6:40 AM), http://news.cnet.com/8301-1035_3-57594325-94/south-korea-launches-second-lte-advanced-network.

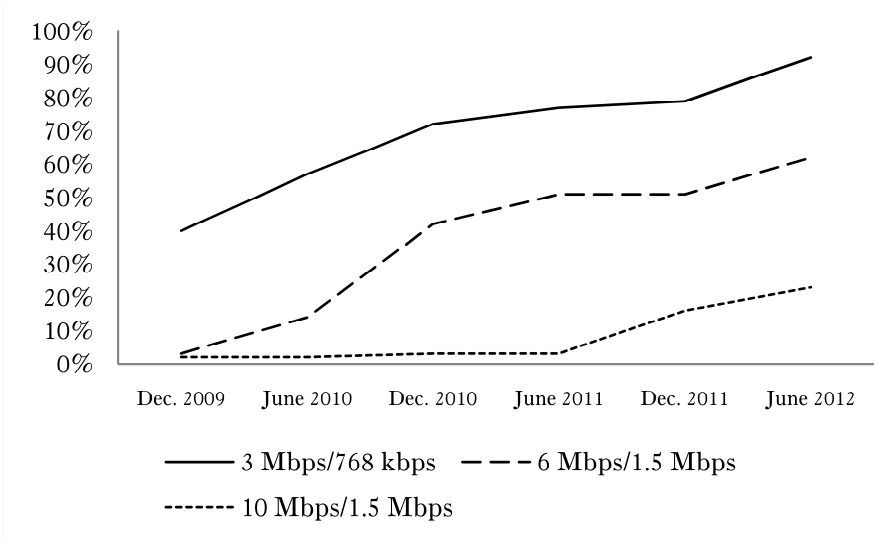
[87] *See* Kevin Fitchard, *Asia's Turbo-Charged LTE Networks Show What's in Store for the U.S., Europe*, GIGAOM (Aug. 12, 2013, 12:44 PM), http://gigaom.com/2013/08/12/asias-turbo-charged-lte-networks-show-whats-in-store-for-the-u-s-europe (reporting Telstra's recent live network trial of LTE Advanced).

[88] *See* JUNE 2012 INTERNET ACCESS SERVICES REPORT, *supra* note 51, at 10 fig.5(b). In 2010, the FCC updated its benchmark for broadband service to 4 Mbps downstream and 1 Mbps upstream. Inquiry Considering the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Improvement Act, Sixth Broadband Deployment Report, 25 FCC Rcd. 9556, 9563 ¶ 11 (2010). The FCC used the closest speed tier available in the existing data, which was 3 Mbps downstream and 768 kbps upstream. *Id.* at 9569 ¶ 20.

[89] JUNE 2012 INTERNET ACCESS SERVICES REPORT, *supra* note 51, at 10 fig.5(b).

[90] *See Sixteenth Annual Mobile Wireless Competition Report*, *supra* note 63, at 3747 tbl.5.

FIGURE 1: PERCENTAGE OF U.S. HOUSEHOLDS LOCATED IN CENSUS BLOCKS WITH THREE OR MORE FIXED-LINE OR WIRELESS BROADBAND PROVIDERS AS OF JUNE 30, 2012[91]




the digital divide, lowering the number of unserved Americans from 19 million (6%) as of June 2011 to 5.5 million (1.7%).[92]

Once this expansion in access to wireless broadband service occurs, the competitive landscape could well look quite different. Empirical studies have shown that "most of the increase in competition comes with the entry of the second and third firms."[93] This insight is reflect-

[91] Sources: *Id.*; INDUS. ANALYSIS & TECH. DIV., FED. COMMC'NS COMM'N, INTERNET ACCESS SERVICES: STATUS AS OF DECEMBER 31, 2011, at 10 fig.5(b) (2013), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-318810A1.pdf; INDUS. ANALYSIS & TECH. DIV., FED. COMMC'NS COMM'N, INTERNET ACCESS SERVICES: STATUS AS OF JUNE 30, 2011, at 9 fig.3(b) (2012), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-314630A1.pdf; INDUS. ANALYSIS & TECH. DIV., FED. COMMC'NS COMM'N, INTERNET ACCESS SERVICES: STATUS AS OF DECEMBER 31, 2010, at 9 fig.3(b) (2011), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-310261A1.pdf; INDUS. ANALYSIS & TECH. DIV., FED. COMMC'NS COMM'N, INTERNET ACCESS SERVICES: STATUS AS OF JUNE 30, 2010, at 8 fig.3(b) (2011), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-305296A1.pdf; INDUS. ANALYSIS & TECH. DIV., FED. COMMC'NS COMM'N, INTERNET ACCESS SERVICES: STATUS AS OF DECEMBER 31, 2009, at 8 fig.3(b) (2010), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-303405A1.pdf.

[92] Inquiry Considering the Deployment of Advanced Telecommunications Capability to All Americans in a Reasonable and Timely Fashion, and Possible Steps to Accelerate Such Deployment Pursuant to Section 706 of the Telecommunications Act of 1996, as Amended by the Broadband Data Improvement Act, Eighth Broadband Progress Report, 27 FCC Rcd. 10,342, 10,384 tbl.15 (2012).

[93] Timothy F. Bresnahan & Peter C. Reiss, *Entry and Competition in Concentrated Markets*, 99 J. POL. ECON. 977, 1007 (1991).

ed in actual antitrust enforcement policy, which has increasingly permitted four-to-three mergers.[94] In addition, policymakers must bear in mind that regulation is neither perfect nor costless. As a result, the decision whether to intervene is inherently an exercise in the comparative second-best. When the comparison is between unregulated and regulated monopoly, the former performs so badly that the balance tips in favor of intervention. By contrast, although an unregulated three-firm oligopoly does not perform as well as perfect competition, it may perform sufficiently well to tip the balance the other way.[95] Moreover, even if wireless broadband is not a substitute for all applications, to the extent that it serves as an alternative platform for email and other, lower-bandwidth applications, it may still exert a degree of price discipline on cable. And for those households that currently do not have access to broadband at all, LTE may represent their best hope.

Past examples provide some encouragement that wireless broadband is or may soon become a substitute for cable. For example, although initially regarded as a complementary technology, wireless telephony is now a substitute for traditional wireline telephony. The number of wireless telephone connections surpassed that of wireline connections in late 2004,[96] and as of the end of 2012, 38% of U.S. households relied entirely on wireless technologies for voice communications, a number that is increasing steadily each year.[97]

Admittedly, many broadband technologies, such as satellite broadband, developed more slowly than many anticipated. Others, such as broadband over powerline, MDS, and WiMax, never fulfilled the promise that many envisioned. In technology-related industries, however, people tend to overestimate what they can accomplish in the short run while underestimating their potential in the long run.[98] As a result, there is reason to maintain an open mind and focus on each technology's long-run potential for success.

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[94] *See* Christopher S. Yoo, *Beyond Network Neutrality*, 19 HARV. J.L. & TECH. 1, 61 & n.233 (2005) (collecting sources).

[95] *See* Howard A. Shelanski, *Adjusting Regulation to Competition: Toward a New Model for U.S. Telecommunications Policy*, 24 YALE J. ON REG. 55, 84–99 (2007).

[96] Daniel F. Spulber & Christopher S. Yoo, Essay, *On the Regulation of Networks as Complex Systems: A Graph Theory Approach*, 99 NW. U. L. REV. 1687, 1688 (2005).

[97] *See* STEPHEN J. BLUMBERG & JULIAN V. LUKE, CTRS. FOR DISEASE CONTROL & PREVENTION, WIRELESS SUBSTITUTION: EARLY RELEASE OF ESTIMATES FROM THE NATIONAL HEALTH INTERVIEW SURVEY, JULY–DECEMBER 2012, at 1 (2013), *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201306.pdf.

[98] *See, e.g.*, J.C.R. LICKLIDER, LIBRARIES OF THE FUTURE 17 n.† (1965).

## II. THE VERTICAL INTEGRATION OF CONTENT AND DISTRIBUTION

Crawford is also concerned that Comcast's market power will be enhanced still further by its merger with NBC Universal.[99] Before the merger, Comcast was almost exclusively a video distribution company that owned only a few minor cable networks that comprised roughly 3% of the programming market revenues.[100] NBC Universal was almost exclusively a programming company, whose only distribution assets were a handful of broadcast television stations[101] that Crawford acknowledges are a dying part of the industry (pp. 128–31).

Because the merger involved companies that, for the most part, did not compete directly with one another, Crawford somewhat grudgingly recognizes that it is properly regarded as a vertical merger (pp. 106–08, 188).[102] As such, section A locates the merger with respect to the primary theories about how vertical integration can harm competition. Section B analyzes the extent to which the merger would allow Comcast to attack the market for video programming and distribution. Section C looks at other actors that are positioned to affect the level of competition.

### *A. Primer on Vertical Integration*

Conventional economic theory identifies two ways that a vertical merger can harm competition.[103] First, a firm with a dominant position in one market (often called the primary market) can attempt to use vertical integration to attack an adjacent market (often called the secondary market).[104] In the context of the Comcast–NBC Universal

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[99] One area where Crawford and I find common ground is our dismay over how regulatory authorities often use the merger clearance process to extract concessions that have nothing to do with the merger (pp. 209–10). For my own views, see Christopher S. Yoo, *Merger Review by the Federal Communications Commission: The Comcast–NBC Universal Merger*, 43 REV. INDUS. ORG. (forthcoming 2014).

[100] *Consumers, Competition, and Consolidation in the Video and Broadband Market: Hearing Before the Subcomm. on Commc'ns, Tech., & the Internet of the S. Comm. on Commerce, Sci., & Transp.*, 111th Cong. 89 (2010) [hereinafter *Senate Hearing*] (statement of Christopher S. Yoo, Professor of Law and Communication, and Founding Director, Center for Technology, Innovation, and Competition, University of Pennsylvania).

[101] *Id.*

[102] At other moments, Crawford signals some ambivalence about characterizing the merger as vertical. For example, in the book's introduction, she offers a subtle gibe by describing Comcast's description of the merger as a vertical one as a "smooth response[]" that Comcast was willing to share with anyone willing to engage them on the substance of the deal (p. 7). She later repeats Senator Al Franken's belief that the merger was not as vertical as Comcast would have the Senate Judiciary Committee believe (p. 87).

[103] The discussion in this section draws heavily on Yoo, *supra* note 31, at 187–206.

[104] *Id.* at 185.

merger, this would amount to the claim that Comcast was using its control over last-mile distribution to render the market for *video programming or Internet content* less competitive. Certain structural preconditions must exist for this theory to have any coherence. As an initial matter, Comcast must have a dominant position in distribution; otherwise it has nothing to use as leverage.[105] In addition, the secondary market must be concentrated and protected by entry barriers; otherwise any attempt to raise prices in the secondary market will simply cause others to turn to unintegrated capacity in the secondary market or will stimulate entry sufficient to dissipate any advantages that the vertically integrated firm may temporarily enjoy.[106] The competitiveness and the ease of entry into the markets for both video programming and Internet content meant that this theory did not play a significant role in the analysis of the merger conducted by the Justice Department or by the FCC.

Second, a firm can attempt to use vertical integration into a secondary market to maintain and protect its dominant position in its primary market.[107] This theory suggests that Comcast's goal was to protect its position in the market for *video distribution*. Tying up key programming properties will force firms who wish to compete with Comcast in video distribution to produce their own sources of programming. Similar structural preconditions apply. Forcing a firm to find alternative sources of programming is unproblematic, however, when unintegrated sources of supply exist or if entry into video programming is easy.[108]

Third, it is widely recognized that vertical integration can create substantial efficiencies.[109] The existence of these efficiencies means that vertical integration may benefit consumers even when the market is structured in a way that makes anticompetitive effects plausible.[110] This is why vertical mergers have long been recognized as being less likely to create competitive problems than horizontal mergers.[111]

The net result is that the economic impact of vertical integration is ambiguous as a theoretical matter and cannot be determined a priori. Whether the law should adopt an accommodating or skeptical stance

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105 *Id.* at 188.

106 *Id.*

107 *Id.* at 186, 191.

108 1984 Merger Guidelines §§ 4.211–.212, 49 Fed. Reg. 26,823, 26,835–36 (June 29, 1984), *available at* http://www.justice.gov/atr/public/guidelines/2614.htm; *see also* 1992 Horizontal Merger Guidelines, 57 Fed. Reg. 41,552, 41,552 (Sept. 10, 1992) (reaffirming section 4 of the 1984 Merger Guidelines governing nonhorizontal mergers).

109 *See, e.g.*, 1984 Merger Guidelines § 4.24, 49 Fed. Reg. at 26,837; Yoo, *supra* note 31, at 192–98.

110 *See, e.g.*, Michael A. Salinger, *Vertical Mergers and Market Foreclosure*, 103 Q.J. ECON. 335, 354–55 (1988).

111 1984 Merger Guidelines § 4.0, 49 Fed. Reg. at 26,834.

toward vertical mergers is thus an empirical question. A recent survey of the empirical literature on vertical integration across a wide range of industries concluded that "under most circumstances, profit-maximizing vertical-integration decisions are efficient, not just from firms' but also from the consumers' points of view."[112] It also found "clear evidence that restrictions on vertical integration that are imposed . . . on owners of retail networks are usually detrimental to consumers."[113] It thus called on "government agencies to reconsider the validity of such restrictions."[114]

The empirical studies on the cable industry in particular support the same conclusion.[115] Most find vertical integration to be welfare enhancing[116] or ambiguous.[117] Only one study found consumer harm, and in that case the size of the welfare loss was so miniscule ($0.60 per subscriber per year)[118] that it was not worth government intervention.

Moreover, the data collected by the FCC belie claims that vertical integration is a growing problem. The FCC data from 1990 and 2006 demonstrate a clear and dramatic reduction in the level of vertical integration in the industry.

The data from 2012 are harder to interpret, because for internal political reasons the FCC did not issue a report covering 2007 to 2011, and when it resumed reporting data, it did so using a different format. As an initial matter, the FCC stopped reporting how many of the top cable networks by subscribership and prime time viewership were vertically integrated with a cable or satellite provider, so other sources had to be used to identify those networks.[119] More importantly, whereas all

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[112] Francine Lafontaine & Margaret Slade, *Vertical Integration and Firm Boundaries: The Evidence*, 45 J. ECON. LITERATURE 629, 680 (2007).

[113] *Id.*

[114] *Id.*; *accord* Michael H. Riordan, *Competitive Effects of Vertical Integration*, *in* HANDBOOK OF ANTITRUST ECONOMICS 145, 169 (Paolo Buccirossi ed., 2008) ("A general presumption that vertical integration is pro-competitive is warranted by a substantial economics literature identifying efficiency benefits of vertical integration, including empirical studies demonstrating positive effects of vertical integration in various industries.").

[115] For a review, see Yoo, *supra* note 31, at 238–41.

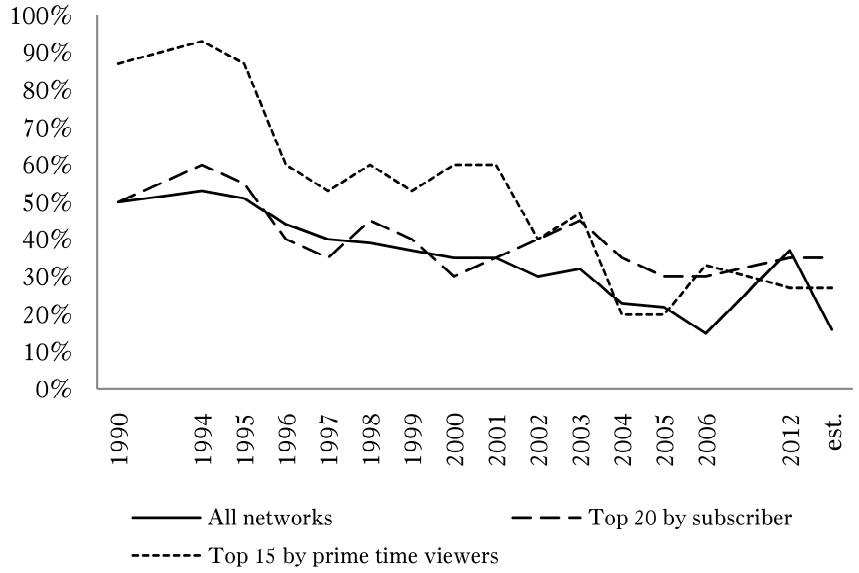
[116] *See, e.g.*, BRUCE M. OWEN & STEVEN S. WILDMAN, VIDEO ECONOMICS 246–50 (1992) (reviewing studies by Benjamin Klein, Robert Crandall, and the National Telecommunications and Information Administration); Tasneem Chipty, *Vertical Integration, Market Foreclosure, and Consumer Welfare in the Cable Television Industry*, 91 AM. ECON. REV. 428 (2001); Michael G. Vita, *Must Carry Regulations for Cable Television Systems: An Empirical Analysis*, 12 J. REG. ECON. 159 (1997).

[117] *See, e.g.*, David Waterman & Andrew A. Weiss, *The Effects of Vertical Integration Between Cable Television Systems and Pay Cable Networks*, 72 J. ECONOMETRICS 357, 391 (1996).

[118] George S. Ford & John D. Jackson, *Horizontal Concentration and Vertical Integration in the Cable Television Industry*, 12 REV. INDUS. ORG. 501, 515 (1997). *See generally* James C. Cooper et al., *Vertical Antitrust Policy as a Problem of Inference*, 23 INT'L J. INDUS. ORG. 639, 648 (2005).

[119] *Compare* Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Thirteenth Annual Report, 24 FCC Rcd. 542, 737–38 tbls.C-5 & C-6 (2009)

FIGURE 2: VERTICAL INTEGRATION IN THE CABLE INDUSTRY, 1990–2012[120]




previous reports distinguished among cable networks that were (1) affiliated with a cable operator, (2) affiliated with another media company, or (3) independent,[121] the 2012 report apparently includes information only on the first two categories.[122] As a result, the 2012 report leaves out independent networks, including such important programming sources as BBC America, Bloomberg Television, the NFL Network, the Outdoor Channel, and the Tennis Channel. By way of comparison, 357 (63%) of the 549 networks listed in the report in 2009 were neither affiliated with a cable operator nor another media company,[123] which suggests that the 2012 report both undercounts the total number of networks and overstates the degree of vertical integration.

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[hereinafter *2009 Video Competition Report*], *with 2012 Video Competition Report*, *supra* note 120 (omitting these tables).

120 Sources: *Senate Hearing*, *supra* note 100, at 93 fig.9; Annual Assessment of the Status of Competition in the Market for the Delivery of Video Programming, Fourteenth Report, 27 FCC Rcd. 8610, app. B at 8796–801 (2012) [hereinafter *2012 Video Competition Report*] (reporting number of vertically integrated programming services); SNL KAGAN, ECONOMICS OF BASIC CABLE NETWORKS 46 (2012); *TV Network Summary*, SNL INTERACTIVE, http://www.snl.com/interactivex/tv_NetworksSummary.aspx (three chosen variables: (1) Network Type: Basic Cable; (2) Financial Item: Subscribers (M); (3) Year: 2009–2016) (last visited June 21, 2013).

121 *See, e.g.*, *2009 Video Competition Report*, *supra* note 119, at 690–710 tbls.C-1 & C-2 (2009).

122 *See 2012 Video Competition Report*, *supra* note 120, app. B at 8796–801 tbl.B-1.

123 *See 2009 Video Competition Report*, *supra* note 119, at 695–710 tbl.C-2.

A review of other sources suggests that the undercounting is significant.[124] If the number of unaffiliated networks is estimated to be in the same proportion as in 2006, the degree of vertical integration drops to 16%, more or less in line with the previous data.

The tendency of vertical integration to benefit consumers makes it appropriate to place the burden on those opposing the merger to demonstrate consumer harm.[125] At a minimum, the models require a number of structural preconditions that must be satisfied before it seems likely that consumers may be harmed.[126]

The empirical data on vertical integration raise doubts as to whether the Comcast–NBC Universal merger is likely to harm consumers. Such claims become even less tenable after one examines the specific mechanisms that the book suggests the merged company would use to harm OVDs and the steps that Netflix is taking to assert its own bargaining power.

### *B. An Evaluation of the Merger*

Crawford argues that the merger of Comcast and NBC Universal will enable the company to favor its own video platform by withholding content from Netflix and other OVDs or by charging OVDs more to deliver their content. Although Comcast was increasingly shifting focus away from video distribution and toward high-speed Internet access (pp. 66, 112, 172–73),[127] Crawford argues that Comcast still sought to slow down the growth of OVDs until it could transition its customers to its own Internet-based video distribution platform (pp. 103–04, 113, 117–19, 165, 173, 228).

This argument is complicated somewhat by the fact that Comcast–NBC Universal holds ownership stakes in two different OVDs. The first is Xfinity Streampix, which is Comcast's version of the TV Everywhere verification system created by the cable companies to authenticate that Internet Protocol television viewers are paying cable subscribers. The second is Hulu, the joint venture that NBC Universal helped launch.

At this writing, neither Xfinity nor Hulu seems like much of a threat to Netflix. Notwithstanding the existence of statements praising the product (p. 166), Comcast chairman and CEO Brian Roberts ad-

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[124] A review of SNL Kagan reveals that the FCC report does not list 68 (34%) of the 198 networks that SNL Kagan tracks. *TV Network Summary*, *supra* note 120.

[125] *2009 Video Competition Report*, *supra* note 119, at 661–62.

[126] Yoo, *supra* note 31, at 200–04.

[127] Indeed, the CEO of Cablevision caused a stir when he candidly acknowledged that the cable industry of the future may cease distributing television programming and instead may simply become a broadband provider. Shalini Ramachandran & Martin Peers, *Future of Cable Might Not Include TV*, WALL ST. J., Aug. 5, 2013, at B1.

mits that Xfinity has made a number of missteps.[128] Hulu is also struggling. After initially relying exclusively on advertising since its launch in 2007, it added a subscription service called Hulu Plus in 2010, which is currently priced at $7.99 per month. During 2012, Hulu garnered $695 million in revenue (an increase of 65%), reached 3 million subscribers (an annual 100% increase), and spent $500 million to acquire content.[129] The venture remained unprofitable, however. Although the company does not report earnings, a recent disclosure in Disney's financial statements indicated that it is losing as much as $30 million per quarter.[130] The saving grace is that Hulu has become an acquisition target, with the bidders including AT&T, Yahoo!, DirecTV, and Time Warner Cable, among others.[131]

While impressive, these numbers pale in comparison to those of Netflix, which captured $3.6 billion in revenue[132] and roughly 30 million subscribers as of September 2013,[133] and committed to spending $2 billion on content in the year beginning in September 2012 with an additional $3.5 billion in future commitments.[134] Netflix's growth continued in the first quarter of 2013, reaching $1 billion in quarterly revenue for the first time.[135] Its market capitalization is roughly $12 billion, fifteen to twenty times larger than the reported purchase price of Hulu. It is easy to see why Crawford was pessimistic about Netflix's fate in 2012 after the Comcast–NBC Universal merger. Netflix's market capitalization reached a high of $15.7 billion in July 2011 only to drop into the $3 billion range in November 2011, before recovering in January 2013 and reaching nearly $20 billion in November 2013.[136] The development of its Open Connect CDN and its sponsorship of original programming are potential game changers. As Crawford rec-

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128 Alex Ben Block, *Comcast's Brian Roberts Talks TV Everywhere, New Entertainment System and the Cloud*, HOLLYWOOD REP. (June 11, 2013, 10:32 AM), http://www.hollywoodreporter.com/news/comcasts-brian-roberts-talks-tv-566200.

129 Matthew Panzarino, *Hulu's 2012: Revenue Up 65% to $695M, Subscribers Double to 3M, 28% More Advertisers*, THE NEXT WEB (Dec. 17, 2012, 6:36 PM), http://thenextweb.com/apple/2012/12/17/hulus-2012-revenue-up-65-to-695m-subscribers-double-to-3m-28-more-advertisers.

130 Christopher S. Stewart & John Jannarone, *Hulu's Fork in the Road*, WALL ST. J., Dec. 21, 2012, at B1.

131 Amol Sharma & Martin Peers, *Corporate Watch: Hulu*, WALL ST. J., June 7, 2013, at B4.

132 *See Netflix Revenue (Quarterly)*, YCHARTS, http://ycharts.com/companies/NFLX/revenues (last visited Nov. 24, 2013).

133 Dawn C. Chmielewski, *Analyst Projects 40 Million Netflix Streaming Subscribers by Late 2015*, L.A. TIMES (Sept. 16, 2013, 9:44 AM), http://www.latimes.com/entertainment/envelope/cotown/la-et-ct-netflix-to-exceed-40-million-subscribers-by-2015-20130916,0,5429456.story.

134 Julianne Pepitone, *Netflix Will Lose Money for All of 2012*, CNN MONEY (Nov. 22, 2011, 4:24 PM), http://money.cnn.com/2011/11/22/technology/netflix_unprofitable/index.htm.

135 *Netflix Revenue (Quarterly)*, *supra* note 132.

136 *See Netflix Market Cap*, YCHARTS, http://ycharts.com/companies/NFLX/market_cap (last visited Nov. 24, 2013).

ognizes, Netflix deserves its reputation for being innovative and nimble (p. 115).

Moreover, it is hard to see how Comcast–NBC Universal could use its control over content to harm competition. To do so would require the merged company to have a dominant position in content and the market to be protected by entry barriers.[137] Although cable networks such as USA Network and SyFy offer excellent programming, there is no reason they cannot be replicated. For most types of programming, NBC Universal is simply one of several movie studios creating long-form video content, and beyond the existing studios, creative talent and the physical equipment necessary to create original programming exist in sufficient amounts to ensure that content will always be available.[138] Indeed, Netflix is developing its own original programming, led by the political drama *House of Cards* and later followed by new episodes of *Arrested Development*.[139] Hulu and Amazon are following Netflix's lead and creating original programming of their own.[140]

Investors' optimism about Netflix is captured by its price-to-earnings (P/E) ratio, which reflects the expected growth rates for each company. Even before 2013, during Netflix's recent doldrums, its P/E ratio was around 100; the recent recovery of its price has caused it to spike to a high of over 600 in February–March of 2013.[141] Comcast's P/E ratio during the same period ranged roughly from 17 to 18.[142]

It is thus unlikely that withholding conventional programming could serve as a basis for anticompetitive behavior. However, there is one type of programming that would be difficult to replicate: live sports, which Crawford characterizes as a programming battering ram (p. 141). In apparent recognition of its unique nature, she devotes an entire chapter to sports programming.

Crawford is correct that sports are unlike other programming properties, in that video distributors are not free to develop their own sources of supply.[143] Although Crawford portrays NBC's sports holdings as extensive (pp. 144–47), on closer inspection it becomes clear that NBC Universal is far from a dominant player in television sports.

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137 Yoo, *supra* note 31, at 230.

138 *Id.*; Christopher S. Yoo, *Rethinking the Commitment to Free, Local Television*, 52 EMORY L.J. 1579, 1634 (2003).

139 *2012 Video Competition Report*, *supra* note 120, at 8728.

140 Geoff Duncan, *Amazon Joins Netflix, Hulu, Google with Original TV Programming*, DIGITAL TRENDS (May 3, 2012), http://www.digitaltrends.com/home-theater/amazon-joins-netflix-hulu-google-with-original-tv-programming.

141 *See Netflix PE Ratio (TTM)*, YCHARTS, http://ycharts.com/companies/NFLX/pe_ratio (last visited Nov. 24, 2013).

142 *See Comcast PE Ratio (TTM)*, YCHARTS, http://ycharts.com/companies/CMCSA/pe_ratio (last visited Nov. 24, 2013).

143 Christopher S. Yoo, *Copyright and Product Differentiation*, 79 N.Y.U. L. REV. 212, 218 n.16 (2004); Yoo, *supra* note 138, at 1634 n.139.

Its expenditures on the four major sports leagues lag far behind Disney and News Corp.'s expenditures. And even though Crawford is correct that the fan base to whom NBC Universal televises NHL hockey is quite loyal (p. 148), the licensing fees for hockey amount to a pittance at $40 million.[144] Finally, while NBC Universal did commit to pay $4.4 billion to televise the Olympics over a twenty-year span, this only amounts to $220 million per year, which is too small to change NBC Universal's position in the rankings.[145]

FIGURE 3: ANNUAL COMMITMENTS TO MAJOR SPORTS LEAGUES ($ MILLIONS)[146]

| OWNER | COMMITMENT |
|---|---|
| Disney (ABC, ESPN) | $1849 |
| News Corp. (Fox) | $1142 |
| Comcast–NBC | $690 |
| CBS | $623 |
| Time Warner (TBS, TNT) | $438 |

When it comes to sports programming, it is far from clear that Comcast holds the upper hand. While Crawford suggests that other companies have little choice but to deal with Comcast on its terms (p. 68), she recognizes that sports properties such as ESPN possess the clout to reverse the tables (p. 119). Recent attempts by sports leagues to set up their own cable channels have altered industry dynamics still further. Nonetheless, Crawford insists on interpreting Comcast's sports deals in a way that raises alarm. When Comcast paid too little, it was a reflection of Comcast's market dominance (p. 147). When Comcast paid too much, Crawford interpreted it as a foreclosure premium (pp. 147–48). An equally likely interpretation is that the disputes simply represent hard, arms-length bargaining and good faith disagreements over the relative value of the property.

Even if Comcast does not deny OVDs access to its content, Crawford warns that Comcast can use usage-based billing and bandwidth caps to make OVD-delivered video more expensive and to discourage its customers from relying on OVDs as their primary source of video programming (pp. 175–82). In addition, Crawford warns that Comcast might charge Netflix exorbitant amounts to terminate its traffic (pp. 182–85).

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144 WR HAMBRECHT + CO, THE U.S. PROFESSIONAL SPORTS MARKET & FRANCHISE VALUE REPORT 19 fig.10 (2012).

145 *Id.*

146 Source: *Id.*

Crawford is correct that monthly bandwidth caps represent an imperfect way to measure the impact that a person's traffic will have on the network. The real issue is how much traffic a person generates during peak periods (p. 176). Thus, a person who consumes a great deal of bandwidth may have no impact on other users if she makes sure to do it when the network is not congested, in which case monthly usage would overstate that person's impact on congestion. Conversely, a person who produces small amounts of traffic during peak periods may be the source of congestion even though the total amount of bandwidth he or she transmits is minimal.[147] The existence of competitive options would limit Comcast's ability to harm OVDs. And although usage caps that are not tied to peak usage are imperfect ways to meter consumption, the problem of network congestion is quite real.

In any event, claims that Comcast will exert bargaining power over Netflix have failed to materialize. Instead, it is Netflix that seems to have the upper hand over network providers. Netflix is asking broadband Internet access providers either to terminate its traffic on a settlement-free basis (through a practice called "peering") or to accept traffic from its new, proprietary content-delivery network, Open Connect. In either case, rather than paying networks to deliver video traffic to individual end users, as Netflix used to do, Netflix is now asking for (and often receiving) that service for free, with Netflix only offering HD and 3D content if the ISP agrees.[148] The insistence on peering is made all the more curious by the fact that networks typically peer only when volumes are symmetrical.[149] In the case of Netflix, the traffic is likely to be radically asymmetrical, with Netflix generating up to one-third of all of the traffic flowing through the Internet during peak times. Yet it has nonetheless been able to induce a large number of ISPs around the world to accept Open Connect. Instead of Netflix being held hostage by the cable companies, it is the cable companies who complain that they are being held hostage by Netflix.[150] Crawford's advice that Netflix avoid controversy until the day comes when the cable operators need Netflix more than Netflix needs them (p. 120) thus appears to have become relevant sooner than she expected. Crawford closes her chapter on "The Biggest Squeeze of All" by asking, "How is Netflix doing today?" (p. 187). The answer appears to be, "Fine, thank you." That said, although this answer seems relatively

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147 Yoo, *supra* note 25, at 206.

148 *See* Leah Powell, *Netflix's SEXY New Technology*, WALL ST. CHEAT SHEET (June 5, 2012), http://wallstcheatsheet.com/stocks/netflixs-sexy-new-technology.html.

149 Yoo, *Innovations in the Internet's Architecture*, *supra* note 52, at 84.

150 Tom Cheredar, *Time Warner Cable Says Netflix Is Holding Super HD & 3D Content Hostage*, VENTUREBEAT (Jan. 17, 2013, 3:02 PM), http://venturebeat.com/2013/01/17/time-warner-cable-says-netflix-is-holding-super-hd-3d-content-hostage.

clear now, it was not so obvious just a few short months ago. My point is not to use hindsight to criticize a prediction that ended up not panning out. The fact that Netflix's share price tumbled once suggests that it could happen again. Instead, my aim is to underscore the importance of being humble about our ability to foresee the future and to highlight the dangers of basing prescriptive regulatory policies on too strong a preconception of the future.

Predicting the future is hard. As the FCC noted in its most recent video competition report, OVD business and revenue models are still in a state of flux.[151] Indeed, the battle for streaming video is just heating up, with Verizon entering into a joint venture with Redbox and YouTube to implement Content ID to facilitate professional content, and services such as Facebook, Mubi, Fandor, Amazon's Video on Demand, and Sony's Crackle pursuing new business models.[152] Moreover, ESPN recently offered to pay wireless ISPs an additional premium if their bandwidth would not count against user bandwidth caps.[153] In an industry undergoing such dynamic change, regulators should think long and hard before intervening prophylactically to protect against some anticipated state of the world that may or may not come to pass.

Crawford's assertion that combining Comcast's cable networks with NBC Universal's programming content will harm consumers thus depends on a series of propositions that all must prove true if the scenario she predicts is to unfold. Cable must hold a monopoly over transmission. NBC Universal must control essential programming without which other firms cannot compete. Moreover, the argument must overcome the large body of empirical evidence showing that vertical integration is unlikely to harm consumers as well as the fact that Netflix seems to be gaining the upper hand in this particular struggle.

In essence, Crawford's primary argument is that AOL's strategy of combining content and conduit was ahead of its time (pp. 102–04) and that Comcast will succeed where AOL failed (pp. 105, 109, 167). History provides ample reason to be skeptical of this claim. The bankruptcy of Excite@Home and the recent divestitures of DirecTV and Time Warner Cable make it as (if not more) likely that AOL's attempt to combine content and conduit was simply a bad idea. If so, that episode stands as a shining example of the benefits of not intervening and instead allowing companies to experiment with different business

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151 *2012 Video Competition Report*, *supra* note 120, at 8738 ¶ 286, 8739 ¶ 290.

152 *Id.* at 8724 ¶ 250, 8726 ¶¶ 254–255, 8734–35 ¶¶ 277–281.

153 Amol Sharma et al., *ESPN Eyes Subsidizing Wireless-Data Plans*, WALL ST. J. (May 9, 2013, 7:31 PM), http://online.wsj.com/article/SB10001424127887324059704578473400083982568.html.

strategies.[154] Although this history suggests that the Comcast–NBC Universal merger may ultimately fare no better than those previous efforts, it is not the province of regulators to protect corporate officers and shareholders from making mistakes, if for no other reason than that it is so difficult to recognize one in advance.

### *C. Nonbarking Dogs*

Another strange aspect of the concerns Crawford raises regarding the merger is that she implicitly treats the struggle between cable companies and OVDs as the central issue in broadband policy. As such, the companies usually identified as the leaders of the Internet industry — Google, Apple, Amazon, Microsoft, Facebook, and Intel — receive just a passing mention and play only a tangential role in the analysis.

The omission is striking. As of October 18, 2013, Apple, Google, and Microsoft are three of the four biggest companies in the world in terms of market capitalization.[155] In fact, both Apple and Google each have market valuations that are three times larger than Comcast's and that exceed the size of the entire cable industry combined. Moreover, Apple and Google (soon to be joined by Intel) both have ongoing set-top box initiatives, and Amazon, Facebook, and Google's YouTube have begun to enter into long-form video distribution.

The addition of these other firms changes the calculus dramatically. Crawford acknowledges that Apple has the clout to keep ISPs in check; indeed, she characterizes the current balance of power as a "standoff of sorts" (p. 163). Moreover, she concedes that the major actors (which include Apple, Google, and Microsoft, as well as AT&T, Verizon, Comcast, and Time Warner Cable) have reached a state of "equipoise" in which each firm is too big for any of the others to absorb or crush (p. 168). The logical implication is that major regulatory intervention is harder to justify.

Additionally, broadening the vision to include more of the value chain reveals a deep tension about where the monopoly problem really lies. In the context of the network neutrality debate, it is the network. In the context of the cable program access rules, it is video content. In the context of the FTC's investigation of Google, it is the search engine. In calls for opening up Apple's App Store, it is the smartphone. Without the discipline of requiring complainants to articulate a specific theory of harm, these arguments become plastic, transforming to fit

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[154] As such, perhaps regulators were not so much haunted by the failure of the AOL merger conditions, as Crawford suggests (pp. 106, 229), as they were edified about the prudence of exercising restraint in the face of uncertainty.

[155] Philip Elmer-DeWitt, *Google's Jumps to No. 3, After Apple and Exxon, in Market Cap*, CNN MONEY (Oct. 19, 2013, 12:37 PM), http://tech.fortune.cnn.com/2013/10/19/google-apple-exxon-microsoft.

the politics of the moment. Indeed, if market power exists in more than one level (such as in both content and conduit as Crawford contends (pp. 88, 216)), consumers may benefit more if the merger is permitted to proceed.[156]

## III. UNINTENDED CONSEQUENCES OF REGULATORY INTERVENTION

Another facet of regulatory interventions that is often overlooked is that they rarely create stable equilibria. Instead, much as squeezing a balloon on one end causes it to expand in some other place, every governmental mandate creates a series of secondary and tertiary consequences that must be explored.

### *A. Impact on Investment Incentives*

One of Crawford's core recommendations is that the government should place restrictions on the prices that network providers can charge (pp. 261, 265). There is an extent to which this recommendation is working at cross purposes with itself. Using regulation to reduce the profitability of an oligopoly can have the perverse impact of locking the oligopoly into place. The problem is well illustrated by the FCC's financing and syndication (finsyn) rules, which Crawford admires (pp. 129–31). Finsyn was designed to restrict the profitability of the big three networks — ABC, CBS, and NBC — by limiting their ability to hold the syndication rights in the programs that they televised. Unfortunately, finsyn also reduced the profitability of potential entrants, which made the emergence of a competitor that would further diversify the market less likely.[157] It is thus no accident that the Fox Network needed to ask for a finsyn waiver before it could enter.[158] Even though breaking up the broadcast triopoly had long been one of the FCC's policy goals, the rules it established to limit the triopoly's market power ran the risk of helping cement the triopoly into place.

Finsyn had another unanticipated consequence. The rules were also supposed to limit the networks' ability to pressure independent program producers into giving up their syndication rights. Unfortunately, the rules had the perverse effect of hurting independent program producers by reducing the value of programming to the networks and thus the amount the networks were willing to pay for it.[159] In the process, the independent program producers were forced to assume the

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156 For a general discussion of double marginalization, see Yoo, *supra* note 25, at 192–93, 260–61.

157 Yoo, *supra* note 94, at 49 n.188.

158 *See* Fox Broadcasting Co. Request for Temporary Waiver of Certain Provisions of 47 C.F.R. § 73.658, Memorandum Opinion and Order, 5 FCC Rcd. 3211 (1990).

159 Schurz Commc'ns, Inc. v. FCC, 982 F.2d 1043, 1046, 1051 (7th Cir. 1992).

long-term risk associated with these programs even though the networks' larger size and greater diversification placed them in a better position to bear it.[160]

The finsyn experience teaches that mandating access and regulating the price of access to a monopoly facility must be undertaken with considerable care. A vertical chain of production is efficient only if each link is competitive. The primary policy goal should be identifying those links that are the most concentrated and protected by entry barriers and promoting competition within them. In the case of the Internet, that link exists where the provider provides connectivity from an interconnection point in the city to individual residences, often called "the last mile." Only if entry into the last mile is impossible does it make sense to pursue secondary goals, such as promoting competition and innovation in other links in the chain. The problem is that once entry into the last mile becomes feasible, regulators must make sure to stop mandating access to the network and to stop regulating rates. The short-run increase in prices provides both the signal to other actors that the market is in disequilibrium and the incentive for potential entrants to start making investments in alternative or additional capacity. Continuing to mandate access would only serve to entrench the monopoly by undermining incentives to invest and depriving would-be entrants of their natural strategic partners.

Indeed, this is the lesson emerging from the European approach, which regulates rates and requires network owners to share their facilities with competitors. Although European Internet users have enjoyed low prices that have in turn caused adoption rates to increase, forcing providers to extend below-cost access to some customers has forestalled investments in FTTH and other next-generation networks.[161] Attempts to use mandated access as stepping stones toward full facilities-based competition have proven unsuccessful.[162] The robust U.S. investments in fiber, advanced generations of DSL, and LTE suggest that entry is indeed feasible. Even if entry were not yet feasible, one would need to have faith that regulators would have the ability to lift regulation swiftly as soon as those circumstances changed.

There is another fundamental irony underlying proposals to mandate access to last-mile broadband facilities. One reason that Crawford favors such proposals is that the Internet generates benefits to others (p.

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[160] *Id.*

[161] *See* Christopher S. Yoo, *Deregulation vs. Reregulation of Telecommunications: A Clash of Regulatory Paradigms*, 36 J. CORP. L. 847, 859–61 & nn.103–04 (2011) (showing that lower prices sometimes have no major effect or a negative effect on last-mile services).

[162] *See id.* at 862–63.

17).[163] This argument taps into the analysis of externalities associated with economist A.C. Pigou and extended by Ronald Coase. Externalities come in two forms. Conduct that generates positive externalities creates benefits that accrue to other people, such as occurs when a person makes home improvements that increase the value of adjacent houses. Conduct that generates negative externalities imposes costs on other people, such as occurs when a factory produces smoke that lessens neighbors' enjoyment of their land.

The problem is that individuals deciding whether to undertake a particular activity consider only their private costs and benefits without taking into account the impact on others. For example, homeowners considering whether to improve their homes would compare the cost of doing so with the increase in the value of their houses while ignoring any increase in the value of nearby houses. The fact that they would not take into account the full social value of the improvement means that they will sometimes fail to make an improvement even when the net social value of doing so exceeds the cost.

The conventional wisdom offers two potential solutions to this problem. First, the government can induce more of those positive externality–generating activities through direct subsidies.[164] But needless to say, the debates in Washington, D.C., are currently focusing on how to reduce, not increase, government spending. Even worse, instead of providing a subsidy, Crawford's proposal to mandate access is better understood as a form of taxation by regulation that would have precisely the opposite effect.[165]

Second, the wedge between private and social benefit can be reduced if firms are permitted to capture more of the positive externalities they generate for others. One logical way to accomplish this is by permitting them to vertically integrate into those complementary activities that benefit from those positive externalities.[166] For example, Internet connectivity creates benefits for consumers by stimulating innovative content and applications. The fact that the network provider does not capture any of those benefits can lead to systematic underinvestment. A straightforward solution would be to allow the network provider to internalize some of the value created by these new forms of content and applications. Unfortunately, the separation of content and

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163 For a more extensive argument for access based on positive spillovers, see generally FRISCHMANN, *supra* note 16.

164 A.C. PIGOU, THE ECONOMICS OF WELFARE 381 (4th ed. 1932).

165 *See* Richard A. Posner, *Taxation by Regulation*, 2 BELL J. ECON. & MGMT. SCI. 22 (1971).

166 *See* Timothy F. Bresnahan & M. Trajtenberg, *General Purpose Technologies: "Engines of Growth"?*, 65 J. ECONOMETRICS 83, 94 (1995) (noting proposals for vertical integration of complementary activities in the technology space).

conduit and the remedy of mandatory access that Crawford proposes would effectively preclude this solution.

### *B. Transfer of Value from the Network's Core to Its Edge*

Another benefit of the Internet's architecture is to allow different aspects of the network to act independently. The networks simply pass along data without knowing anything about the nature of the communications they are carrying. Conversely, so long as content and application providers present their data in accordance with the Internet protocol, they do not need to know anything about the nature of the networks over which their traffic is passing.

This independence yields a number of advantages. Insulating each component from the details of the other components promotes flexibility, improves fault localization, and makes it easier to make changes to components without causing ripples throughout the entire system.[167] Cabining the way components interact with one another radically simplifies the testing that must be conducted.[168] It also speeds innovation by allowing parallel testing of multiple solutions.[169]

At the same time, this architecture carries with it a number of potential drawbacks. Though the architecture creates value by encouraging parallel experimentation with new solutions, it also shifts the value gained from those experiments from the center of the network to the components where the experiments are taking place.[170] Not only does this deprive the last broadband providers of the revenue needed to support the build-out of next-generation networks, it creates a potential perverse incentive for service providers. Each of the complementary service providers has the ability and incentive to maximize its own interests and optimize locally.[171] The problem is that individual optimization decisions may not produce outcomes that maximize glob-

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[167] *See* Christopher S. Yoo, *Modularity Theory and Internet Policy* (Inst. for L. & Econ., Research Paper No. 13-15, 2013) [hereinafter Yoo, *Modularity Theory*], *available at* http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2032221.

[168] *See id.* at 19–20.

[169] *Id.* at 21–22.

[170] *See* 1 CARLISS Y. BALDWIN & KIM B. CLARK, DESIGN RULES 267–68 (2000).

[171] *See* RANDY BUSH & DAVID MEYER, SOME INTERNET ARCHITECTURAL GUIDELINES AND PHILOSOPHY 7–8 (Internet Eng'g Task Force Network Working Grp., Request for Comments No. 3439, 2002), *available at* http://tools.ietf.org/pdf/rfc3439 (describing technical inefficiencies that may arise from vertically separating network functions); Henry W. Chesbrough & David J. Teece, *When Is Virtual Virtuous? Organizing for Innovation*, HARV. BUS. REV., Jan.–Feb. 1996, at 65, 66 (describing local optimization interests of members of a "virtual company" collaboration); Jon Crowcroft et al., *Is Layering Harmful?*, IEEE NETWORK, Jan. 1992, at 20, 23–24.

al value.[172] In addition, no actor is in a natural position to exercise leadership over the platform.[173]

### *C. The Potential Benefits of Nonuniformity*

Finally, Crawford's vision of a world in which all networks are mandated to be open ignores the fact that end users may derive significant benefits from alternative architectures. If everyone wants the same thing from the network, the optimal course is to offer a single network designed to satisfy what end users demand. The engineering community has long recognized, however, that the current architecture is ill suited to support key features such as security, mobility, mass media distribution, quality of service, and multihoming.[174] As the demand for these services increases, the natural course is for network providers to diversify their offerings to meet the growing heterogeneity of consumer demand.

Allowing firms to pursue different strategies can yield real benefits. For example, Apple has always insisted on a relatively closed architecture to help ensure that end users' experiences remain positive.[175] As a simple matter of business strategy, one would expect Google's Android platform to avoid becoming simply a me-too offering by allowing a more open architecture. Permitting heterogeneity also allows consumers to receive the benefits from both approaches, while at the same time enjoying the manner in which the presence of an open platform can serve as a safety valve against any abuses attempted by a closed platform.

Conversely, mandating access to the network could have an adverse effect on innovation. Requiring the network to accept any properly configured data at a particular location effectively locks that interface into place.[176] This requirement can inhibit the network's ability to respond to technological changes that would otherwise push it toward a different architecture.[177]

The fact that end users, applications, technologies, and business relationships on the Internet are becoming more heterogeneous suggests that the natural response is for the network to become more diverse as

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[172] *See* Yoo, *Modularity Theory*, *supra* note 167, at 27, 46.

[173] *See* Chesbrough & Teece, *supra* note 171, at 69–70 (describing how IBM lost its dominance over the decentralized PC market due to its inability to control how other companies developed IBM-compatible products).

[174] *See* Yoo, *Modularity Theory supra* note 167, at 57.

[175] *Id.* at 55; *see also* Peter Decherney et al., *Are Those Who Ignore History Doomed to Repeat It?*, 78 U. CHI. L. REV. 1627, 1676 (2011) (reviewing TIM WU, THE MASTER SWITCH (2010)) (describing Apple as creating a closed, vertically integrated system that "benefit[s] consumers").

[176] *See* Daniel F. Spulber & Christopher S. Yoo, *Mandating Access to Telecom and the Internet: The Hidden Side of* Trinko, 107 COLUM. L. REV. 1822, 1900 (2007).

[177] *See* Yoo, *supra* note 94, at 43–45 (describing how infrastructure and equipment requirements have changed with the transition of Internet services to broadband).

well.[178] Therefore, positing regulatory policy as a choice between open and closed architectures may represent a false dichotomy. End users may be best off with a mixture of both. Not only can the availability of different solutions deliver greater value, but divided technical leadership can also represent an important form of rivalry,[179] and experimentation with new standards may properly be regarded not as pathological, but rather as a sign of innovative health.[180]

## IV. ASSESSING THE POLICY RECOMMENDATIONS

Crawford's concluding chapter offers a series of policy recommendations. Specifically, she calls on the government to support broadscale deployment of municipal FTTH and to mandate the separation of content and conduit. These recommendations, however, each include some fundamental internal tensions that the book does not fully address.

### *A. Subsidize Fiber-to-the-Home*

One of Crawford's core recommendations is that the government subsidize gigabit symmetric FTTH owned and operated by municipalities (pp. 263–65). Capable of delivering download speeds of up to 100,000 Gbps,[181] FTTH possesses sufficient bandwidth to compete with cable.[182] While FTTH has continued to grow, covering approximately 15% of U.S. households in December 2010,[183] 17% of U.S. households in December 2011,[184] and 23% of U.S. households in December 2012,[185] Verizon (the leading provider of FTTH) has stopped expanding its FiOS footprint (pp. 3, 78, 80, 113, 225, 236).

As Crawford recognizes at other points, the primary deterrent to the rollout of fiber is its prohibitive cost (pp. 78–79, 161, 236). A recent published estimate suggests that it costs Verizon FiOS $700 per home

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178 *See generally* YOO, THE DYNAMIC INTERNET, *supra* note 52.

179 Timothy F. Bresnahan, *New Modes of Competition: Implications for the Future Structure of the Computer Industry*, *in* COMPETITION, INNOVATION AND THE MICROSOFT MONOPOLY: ANTITRUST IN THE DIGITAL MARKETPLACE 155, 166–69, 172–73 (Jeffrey A. Eisenach & Thomas M. Lenard eds., 1999).

180 *See* Shane Greenstein, *Glimmers and Signs of Innovative Health in the Commercial Internet*, 8 J. ON TELECOMM. & HIGH TECH. L. 25, 42–55 (2010).

181 Jeff Hecht, *Ultrafast Fibre Optics Set New Speed Record*, NEW SCIENTIST, Apr. 23, 2011, at 24.

182 Shalini Ramachandran, *Speedier Internet Rivals Push Past Cable*, WALL ST. J., Jan. 2, 2013, at B1.

183 NAT'L TELECOMMS. & INFO. ADMIN. & FED. COMMC'NS COMM'N, BROADBAND STATISTICS REPORT: ACCESS TO BROADBAND TECHNOLOGY BY SPEED 3 (2011), *available at* http://www2.ntia.doc.gov/files/broadband-data/Technology%20by%20Speed%20Dec%202010.pdf.

184 NAT'L TELECOMMS. & INFO. ADMIN. & FED. COMMC'NS COMM'N, BROADBAND STATISTICS REPORT: ACCESS TO BROADBAND TECHNOLOGY BY SPEED 3 (2012), *available at* http://www2.ntia.doc.gov/files/broadband-data/Technology%20by%20Speed%20DEC%202011.pdf.

185 NAT'L TELECOMMS. & INFO. ADMIN. & FED. COMMC'NS COMM'N, *supra* note 54, at 3.

to lay the fiber on the utility poles and conduits that pass each home and an additional $650 per household to connect individual houses to that fiber and to install the fiber modem in the house.[186] If every house where FiOS is available purchased the service, it would cost only $1350 per household. But if penetration rates are only fifty percent, Verizon would have to recover twice the cost per home passed from each subscriber ($1400). When combined with the $650 installation cost, the total cost would be $2050 per household. Since actual adoption rates were 37.3% at the end of 2012,[187] FiOS costs $2500 per subscriber without including operating, marketing, and service costs. Costs per home passed for Google Fiber in Kansas City are likely to be similar,[188] and costs for broadscale deployment in Japan are somewhat higher.[189]

Based on these numbers, the cost to offer 100 Mbps service to 100 million households would be roughly $250 billion. Given that Verizon FiOS and Google Fiber are currently deploying in areas of fairly high density, these numbers suggest that the estimate listed in the National Broadband Plan of $350 billion to provide 100 Mbps service to 100 million homes may well be realistic, despite Crawford's skepticism (p. 267). The cost to extend fiber to those areas that are not currently served by broadband is likely to be much higher.

There is thus reason to question whether FTTH would be a good use of limited public resources. And even if it were a foregone conclusion that the entire country would need FTTH, timing matters. When Verizon announced its plans to build FiOS, the capital markets regarded the venture as too risky. Consequently, the bond rating agencies lowered Verizon's bond rating and Wall Street slashed its stock price, thereby raising the cost of both debt and equity capital on all of the company's future projects. It is as if Verizon had borrowed the money and immediately begun to pay interest on it. As the National Broadband Plan noted, whether that ultimately proves to be a good

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186 CALIX, WHY ARE YOU NOT GETTING FIBER? 11 (2010), *available at* http://www.natoa.org/events/NATOAPresentationCalix.pdf.

187 *See* Press Release, Verizon, Verizon Reports Strong Revenue and Customer Growth for Verizon Wireless and FiOS Services in 4Q 2012 (Jan. 22, 2013), *available at* http://www.verizon.com/investor/news_verizon_reports_strong_revenue_and_customer_growth_for_verizon_wireless_and_fios_services_in_4q_2012.htm. These are in line with reports from the Fiber to the Home Council, which reported 9.68 million connections from 25.55 million homes passed for a penetration rate of 37.9%. RVA LLC, FTTH PROGRESS IN NORTH AMERICA 4 (2013), *available at* http://www.ftthcouncil.org/d/do/1136.

188 *See* Ingrid Lundon, *Analyst: Google Will Spend $84M Building Out KC's Fiber Network to 149K Homes; $11B If It Went Nationwide*, TECHCRUNCH (Apr. 8, 2013), http://techcrunch.com/2013/04/08/google-fiber-cost-estimate (reporting a cost of $84 mllion to pass 149,000 homes, which equals $564 per home passed).

189 Japan reaches 92% of roughly 52 million households at a cost of ¥4.9 trillion — $1050 per home passed — and has achieved 43.4% penetration. STATISTICAL BUREAU, MINISTRY OF INTERNAL AFFAIRS & COMMC'NS, STATISTICAL HANDBOOK OF JAPAN 2012, at 21 (2012).

investment depends on how quickly the demand for higher bandwidth services develops.[190] In other words, there is substantial benefit to making sure that investments coincide with demand.

Moreover, there is good reason to question whether government ownership is likely to represent the best institutional form for running fiber. As an initial matter, the empirical literature on government ownership is not encouraging. A recent survey of fifty-two studies comparing publicly and privately owned firms found that only five of the studies concluded that publicly owned firms perform better than privately owned firms.[191] Of the remaining studies, thirty-two found private ownership to be superior, and the results of fifteen were ambiguous or not statistically significant.[192]

To the extent that government ownership has succeeded, it has done so in industries such as water or electric power, in which the transmission technologies are stable and the fact that entry was unlikely obviates concerns about investment incentives.[193] Conversely, the experience with the government's takeover of the telephone system during World War I reveals that government ownership does poorly when the underlying technology is undergoing a period of dynamic change and when the infrastructure needs significant capital investments. In such cases, governments often struggle to make the best technology choices and must finance investments through tax revenues or bond issues rather than risk capital.[194]

More recent history is no more comforting. The collapse of municipal WiFi has generated a wide array of postmortem analyses trying to figure out what went wrong.[195] The burgeoning municipal fiber movement appears to be more hype than substance. The available data suggest that municipal fiber deployments face significantly higher costs compared to private deployments in terms of both cost per home passed and cost per subscriber.[196] As of August 2012, Chattanooga's

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190 *See* NATIONAL BROADBAND PLAN, supra note 76, at 42.

191 Mary M. Shirley & Patrick Walsh, *Public Versus Private Ownership* 50–51 (2000) (unpublished working paper), *available at* http://elibrary.worldbank.org/doi/pdf/10.1596/1813-9450-2420.

192 *Id.*

193 *See, e.g.*, Amendments of Commission's Rules & Policies Governing Pole Attachments, Consolidated Partial Order on Reconsideration, 16 FCC Rcd. 12,103, 12,119 ¶ 25 (2001) (refusing to change method for calculating telephone and electricity pole attachment costs to incentivize investment in the pole network, in part due to low chances of entry).

194 Michael A. Janson & Christopher S. Yoo, *The Wires Go to War: The U.S. Experiment with Government Ownership of the Telephone System During World War I*, 91 TEX. L. REV. 983, 1048 (2013).

195 *See, e.g.*, Eric M. Fraser, *A Postmortem Look at Citywide WiFi*, J. INTERNET L., Aug. 2010, at 1; Sandra Guy, *Big-City Wi-Fi Efforts So Far Have Failed to Make a Connection*, CHI. SUN-TIMES (Sep. 24, 2012, 6:58 PM), http://www.suntimes.com/business/15360160-420/big-city-wi-fi-efforts-so-far-have-failed-to-make-a-connection.html.

196 The cost numbers in a recent study suggest that the cost per home passed in Chattanooga, Tennessee, is $1375, while the cost per home passed in Reedsburg, Wisconsin, is $3450. Roland

much ballyhooed fiber deployment had garnered a grand total of eleven customers for its maximum data rate plan.[197]

### *B. Bring Back Common Carriage*

Crawford's other core recommendation is to return to the regime in which transport was separated from content (pp. 37–38, 45, 264–65). She repeatedly laments the death of common carriage, which historically has mandated nondiscrimination and the regulation of rates (pp. 36, 53–56, 61–62, 94, 121, 160, 162, 186–87, 230, 270).

In so doing, she hearkens back to a longstanding regulatory regime without taking into account the substantial literature exploring its limitations and shortcomings. As I discuss in greater detail elsewhere, as an initial matter, common carriage works best when the product is a commodity that does not vary in terms of quality, firms employ uniform production technologies, and market share is relatively stable.[198] It is ill suited to circumstances in which the quality of service varies along multiple dimensions, production technologies are heterogeneous, and business volumes change rapidly.[199] In addition, a substantial literature exists cataloging how the traditional tools of common carriage regulation reward inefficiency, deter innovation, and facilitate collusion.[200]

Crawford acknowledges that common carriage has historically been hard to enforce (p. 32) and that behavioral remedies do not work particularly well (p. 63). Yet she calls for a return to common carriage without grappling with how to address the recognized shortcomings in the regime.

## CONCLUSION

At the end of the day, we are left with the question of what to make of Crawford's concerns. Certainly, it is possible that cable may end up being the only broadband platform capable of delivering video and that the combination of content and conduit allows it to forestall the development of OVDs like Netflix.

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Montagne & Valérie Chaillou, *Public Funding & FTTx: Assessing the Impact of Public Action*, 80 COMM. & STRATEGIES 153, 156 (2010). A presentation by equipment manufacturer Calix indicates that two providers serving small towns and rural areas in Minnesota had costs per home passed of $1438 and $1871. CALIX, *supra* note 186, at 11. All of these examples are significantly higher than the cost of $700 per home passed incurred by Verizon. *See supra* note 186 and accompanying text.

197 *Municipal Broadband: The Need for Speed*, ECONOMIST, Aug. 11–17, 2012, at 26.

198 Christopher S. Yoo, *Is There a Role for Common Carriage in an Internet-Based World?*, 51 HOUS. L. REV. 541, 568–72, 587–89 (2013).

199 *Id.*

200 *Id.* at 582–84, 589–90, 597–600.

But an examination of the current state of the industry and humility about anyone's ability to predict the future provide reasons to be open minded as to whether competition and scientific progress might lead to a better outcome. The emergence of new technologies has eliminated the market inefficiencies that for decades had been the focus of federal policy: the monopolies over voice telephony and multichannel video distribution and the triopoly over television programming. At the same time, network providers are investing billions of dollars into alternative network capacity.[201] Beyond that, the Internet has provided a host of new services that have revolutionized the way people interact with each other and obtain information.

In short, I look at the same reality as Professor Crawford and see reason for optimism, not pessimism. I believe the technological solutions are reasonably promising and the literature finding that vertical integration generally enhances welfare is sufficiently robust to justify tolerating new business practices until real-world data show them to be harmful. Acting preemptively overestimates our ability to foresee the future and risks depriving potential innovations of the breathing room they need to emerge.

[201] DIANA G. CAREW & MICHAEL MANDEL, PROGRESSIVE POLICY INST., U.S. INVESTMENT HEROES OF 2013: THE COMPANIES BETTING ON AMERICA'S FUTURE 2, 4–5 (2013), *available at* http://www.progressivepolicy.org/wp-content/uploads/2013/09/2013.09-Carew-Mandel_US-Investment-Heroes-of-2013.pdf.