CONVERGENCE AND COMPETITION: WHY A DUOPOLY OF CONVERGENT COMPETITORS MIGHT BE SUFFICIENT TO PROTECT BROADBAND CONSUMERS WITHOUT REGULATION

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INTRODUCTION

Two is company, three is competition – or so conventional wisdom holds. Indeed former Federal Communications Commission Chairman Michael Powell noted that "magical things happen in competitive markets when there are at least three viable . . . competitors."[1] Unfortunately, the broadband access market has only two main competitors – cable and DSL. With perceived shortfalls in the

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1. Michael K. Powell, Chairman, F.C.C., Remarks at the Wireless Communications Association International 1 (June 3, 2004), http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-248003A1.pdf.

availability and quality of broadband service in the United States, the Federal Communications Commission ("FCC") faces pressure to more actively regulate broadband competition.[2]

Because of technological convergence, the assumption that the cable-DSL duopoly is not sufficiently competitive may not be warranted. Technological convergence – the ability for an application to operate over different physical transmission medium – has forced the FCC to rethink many regulatory assumptions that pre-date the digital age. However, the effect of technological convergence on competition in concentrated markets is under-explored. As the FCC develops a regulatory strategy for the concentrated broadband industry, the effects of technological convergence on efficiency and competition cannot be ignored.

FCC regulations were often premised on the assumption that particular services were tied, and would remain tied, to physical transmission mediums.[3] That premise was accurate for much of the last century when consumers made phone calls over copper wires and received television signals over the air, but it has changed with technological convergence.[4] Today, a user can send an email from a computer linked to the Internet over a traditional copper loop, a terrestrial wireless connection, a satellite wireless connection, a coaxial cable connection, or a fiber optic connection. This severing of services from the underlying physical transmission medium continues to challenge the FCC in its regulatory decisions.[5]

The 1996 Telecommunications Act amplified these regulatory challenges by codifying Congress's intent to promote competition and reduce regulation.[6] Specifically, the FCC is authorized to forbear from regulation when existing competition sufficiently protects consumers.[7]

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2. *See, e.g.*, Nate Anderson, *FCC Commissioners: US in Dire Need of "National Broadband Strategy"*, ARS TECHNICA, Sept. 27, 2007, http://arstechnica.com/news.ars/post/20070927-fcc-commissioners-us-in-dire-need-of-national-broadband-strategy.html.

3. The 1934 Communications Act was written with the assumption that point-to-point voice services would use copper lines, and radio and television broadcast services would use the wireless spectrum. JONATHAN E. NEUCHTERLEIN & PHILIP J. WEISER, DIGITAL CROSSROADS 23 (MIT Press 2007) [hereinafter DIGITAL CROSSROADS].

4. *Id.*

5. For example, the FCC has struggled since 2003 over how to regulate Voice-over-Internet-Protocol telephone service. IP-Enabled Services, *Notice of Proposed Rulemaking*, 19 FCC Rcd. 4863, ¶ 2 (2004) (seeking comment on how to distinguish among different IP-enabled services and regulate appropriately).

6. Telecommunications Act of 1996, Pub. L. No. 104-104, 110 Stat. 56 (codified as amended in scattered sections of 47 U.S.C.), *available at* http://www.fcc.gov/Reports/tcom1996.pdf ("An Act to promote competition and reduce regulation in order to secure lower prices and higher quality services for American telecommunications consumers and encourage the rapid deployment of new telecommunications technologies.") [hereinafter Telecommunications Act of 1996].

7. For example, in 1999 the Commission designed a procedure for lifting rate regulation

Thus, the FCC is charged with the unenviable task of determining *a priori* whether sufficient competition exists.

Regulators historically have viewed duopolies with suspicion.[8] However, the effects of technological convergence on competition should mollify this suspicion because, while more competitors are generally preferable, technological convergence affects the form and intensity of competition in a concentrated market.[9] In telecommunications, when technological convergence results in competition over different physical transmission mediums ("convergent competition"), a duopoly may be sufficient for the FCC to deregulate or forbear from regulation.

Section I of this article explores the concept of technological convergence. The effect of technological convergence on competition in concentrated markets is analyzed by studying the early wireless phone industry and early broadband industry in Sections II and III. Section IV explores the likelihood that physical transmission platforms for future broadband access will be a duopoly of cable and fiber optic lines. Section V suggests that, despite this likely duopoly, the FCC can maintain a reactive approach to broadband regulation, provided that convergent competition continues.

I. TECHNOLOGICAL CONVERGENCE

Humans are analog beings. The images we view and sounds we hear are transmitted by continuous waves. Not surprisingly, early telecommunications devices transmitted analog signals from one user to another (or others). For example, Alexander Graham Bell's telephone converted the continuous pressure wave of a speaker's voice into a continuous variation of electrical current.[10] The electrical signal was transmitted to the desired location over a copper wire and then converted back into a continuous pressure wave that reached the listener's ear.[11] In this analog world, the particular telecommunications services were tied to

in the special access line market when competition reached specific "trigger" levels. Scott Wallsten, *Has Deregulation Affected Investment in Special Access?*, THE PROGRESS & FREEDOM FOUND., Progress on Point Release 14.16 (2007), http://www.pff.org/issues-pubs/pops/pop14.16specialaccessempiricalanalysis.pdf.

8. For example, the Federal Trade Commission filed a preliminary injunction to block Heinz's acquisition of Beach Nut over concerns that it would result in a duopoly in the U.S. baby food market. Stephen Labaton, *Merger Blocked for Makers of Baby Food*, N.Y. TIMES, Apr. 28, 2001, at C1. The Justice Department sought to block a merger of Oracle and Peoplesoft because the merger would create a duopoly in the business software market. Steve Lohr & Lorie J. Flynn, *Judge Allows Oracle to Bid for Peoplesoft*, N.Y. TIMES, Sept. 10, 2004, at C1.

9. *See* Section III, *infra*.

10. *See, e.g.*, DIGITAL CROSSROADS, *supra* note 3, at 115-16.

11. *Id.*

a specific physical transmission medium.[12]

This association between application and physical medium began to unravel with the shift from analog to digital technology. In a digital world, all information is broken into binary digits, or bits. For voice-communications, the continuous pressure wave of a speaker's voice is again converted into a continuous electrical signal. Unlike with the early telephone, the signal is further converted into a numerical model and the numbers representing the speaker's voice are transmitted in binary form as bits.[13]

To a physical transmission platform, a bit is a bit regardless of whether it carries information about a telephone call, web-page, or video transmission.[14] As a consequence, any application that converts its content into bits can transmit those bits across any medium capable of digital transmission.[15] The result is technological convergence: the ability of the same application to use different physical transmission media.

Telecommunications systems can be conceptualized as four layers. This note uses a layered concept with the following definitions: [16]

- Physical Layer: The physical transmission medium used to transport information.
- Logical Layer: The addressing protocol that ensures the information is transported over the correct physical path to reach its intended destination.
- Applications Layer: The service used by the end user.
- Content Layer: The individual user's information that is transmitted by the application.

Without technological convergence, the application is tied to the physical layer. For example, with wireless telephone service communication, a user's telephone conversation (content) is spoken into a wireless telephone (application) that uses the appropriate transmissions protocol such as TDMA or CDMA (logic) to transmit the information across the electromagnetic spectrum (physical). Wireless phones cannot currently be connected to physical transmission lines.

Conversely, technological convergence allows the same application

12. *Id.* at 23.

13. *See, e.g.*, Telecommunications – MSN Encarta, http://encarta.msn.com/encyclopedia_761566546/telecommunications.html.

14. *See* DIGITAL CROSSROADS, *supra* note 3, at 25.

15. *See id.*

16. The layers referred to in this note are those defined by Nuchterlein and Weiser in Digital Crossroads. *Id.* at 118-124.

to use a variety of physical transmission mediums. For example, a broadband Internet connection allows a user to type an email (content) using an email service such as Outlook (application) which uses the TCP/IP protocol (logic) to transmit the information across a physical connection. The key difference is that this physical connection can be a copper loop, a coaxial cable, a fiber-optic cable, a power line, a terrestrial wireless signal, or a satellite signal.[17] Technological convergence makes the application much more versatile because it is no longer linked to a specific physical path.

Not every transmission fits neatly into the layer model described above. Many communications can be analytically broken into more than one application. A user watching a YouTube video, for example, views a video (content) using a flash-player plug-in (application) to an Internet browser (application) that utilizes a broadband connection (application) to receive standardized digital packets of information (logic) sent over a coaxial cable (physical). This note refers to both wireless telephone service and broadband Internet access service as applications, even though a primary purpose of broadband Internet access is to provide a conduit for other applications such as email and a web-browser.

II. BACKGROUND OF THE WIRELESS AND BROADBAND INDUSTRIES

Bell Labs invented wireless telephone technology in the 1940s.[18] However, it was not until the 1980s that the FCC decided to grant two spectrum licenses to wireless telephone service providers in each of 734 market areas.[19] The FCC created a regulatory duopoly by granting one license to the incumbent local exchange carrier and the second to a competitor – typically by lottery.[20] However, the FCC's experiment with a regulated duopoly is generally viewed as a failure.[21] In 1992, the General Accounting Office ("GAO") observed that, although not conclusive of market failure, the nominal wireless service price from 1985 to 1991 had remained constant with considerable price uniformity

17. *See* Appropriate Framework for Broadband Access to the Internet over Wireline Facilities, *Report & Order & Notice of Proposed Rulemaking*, 20 FCC Rcd. 14,853, ¶ 50 (2005) [hereinafter *Wireline Facilities Order*].

18. Stephanie N. Mehta, *Cellular Evolution*, FORTUNE, Aug. 23, 2004. For an excellent history of wireless telecommunications, see also HARALD GRUBER, THE ECONOMICS OF MOBILE TELECOMMUNICATIONS 10-18 (Cambridge University Press 2005).

19. DIGITAL CROSSROADS, *supra* note 3, at 268.

20. *Id.*

21. *See* U.S. GEN. ACCOUNTING OFFICE, TELECOMMUNICATIONS: CONCERNS ABOUT COMPETITION IN THE CELLULAR TELEPHONE SERVICE INDUSTRY 41 (1992), *available at* http://archive.gao.gov/d33t10/147125.pdf [hereinafter GAO WIRELESS REPORT].

among competitors.[22] The California Public Utility Commission, which had access to wireless provider cost information, concluded that wireless telephone service prices were much higher than costs.[23] Finally, the GAO concluded that the wireless telephone service provider duopoly did not provide sufficient competition to protect consumers.[24] This same conclusion led the FCC to auction additional spectrum licenses for wireless telephone service providers in 1996.

The influx of new competitors radically changed the wireless telephone industry, and in 2002, the GAO observed healthy competition among the six major wireless telephone service providers.[25] Today, competition among wireless telephone service providers is "fierce: the overwhelming majority of the population lives in a county served by at least four alternative providers of wireless services; customers can and do switch from one carrier to another; and the quality and diversity of wireless services continue to improve."[26] The increase in the quality of wireless service and decrease in price confirms the earlier GAO and FCC judgments that a duopoly in wireless telephone service was insufficiently competitive.

In contrast to the FCC's intentional establishment of wireless telephone service as a duopoly, the duopoly in broadband access service emerged from a competitive landscape.[27] When the Internet first surfaced as a major commercial force in the 1990s, most consumers accessed the Internet via dial-up connections to Internet Service Providers ("ISPs").[28] In fact, in 2000 there were approximately 7,000

22. *Id.* at 22.

23. *Id.* at 29.

24. *Id.* at 41 ("Because the FCC limited the mobile cellular telephone market to two carriers in each geographic area, these markets are highly concentrated and may provide only limited competition.").

25. U.S. GEN. ACCOUNTING OFFICE, TELECOMMUNICATIONS: FCC SHOULD INCLUDE CALL QUALITY IN ITS ANNUAL REPORT ON COMPETITION IN MOBILE PHONE SERVICES 16 (2003), *available at* http://www.gao.gov/new.items/d03501.pdf.

26. DIGITAL CROSSROADS, *supra* note 3, at 261; *see also* U.S. GENERAL ACCOUNTING OFFICE, TELECOMMUNICATIONS: TECHNOLOGICAL AND REGULATORY FACTORS AFFECTING CONSUMER CHOICE OF INTERNET PROVIDERS 29 (2000), *available at* http://www.gao.gov/new.items/d0193.pdf [hereinafter GAO INTERNET REPORT].

27. To define the broadband industry better, one must define broadband service. The FCC defines broadband as a transmission speed of 200 Kbps – a definition almost universally regarded as obsolete. *See, e.g.,* S. DEREK TURNER, BROADBAND REALITY CHECK 2 (2005), http://www.freepress.net/docs/broadband_report.pdf. For purposes of this paper, "broadband" is the transmission speed required to support the highest-bandwidth applications commonly used. This is similar to the mandate in the 1996 Telecommunications act to enable users to "originate and receive high-quality voice, data, graphics and video telecommunications." *See id.* This paper assumes that a "broadband" connection can provide at least 1.5 Mbps download.

28. F.T.C., BROADBAND CONNECTIVITY COMPETITION POLICY, Staff Report 98 (2007), *available at* http://www.ftc.gov/reports/broadband/v070000report.pdf [hereinafter FTC BROADBAND REPORT].

ISPs.[29] As with wireless telephone technology, DSL technology was developed and then shelved for fear of cannibalizing existing services – in this case the lucrative second phone line that customers used to dial their ISPs.[30] The transition to broadband Internet connections was prompted by cable companies upgrading to all-digital networks to compete with satellite television providers.[31] After investing in digital networks to facilitate video distribution, the cable companies began offering broadband Internet connections over cable modems.[32] With competition to dial-up service (and the second lines often ordered to support that service), incumbent telephone providers deployed DSL shortly thereafter.[33]

Today most broadband consumers are served by a duopoly consisting of DSL and cable modem service.[34] While many companies provide cable video service, each particular subscriber is served by the one provider having the local franchise. Until recently, local phone companies were required to lease the copper loop to a subscriber's home to competitive DSL providers.[35] With the FCC's decision to deregulate the DSL market, local phone companies will likely stop leasing lines to competitive DSL providers.[36] Thus, while many cable modem providers and DSL providers exist across the nation, each particular subscriber is served by a duopoly – the local cable company and the local phone company.

While both the wireless and broadband industries began as duopolies, the duopoly among broadband providers is viewed by regulators as sufficiently competitive to preclude FCC regulation.

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29. GAO INTERNET REPORT, *supra* note 26, at 29.

30. DIGITAL CROSSROADS, *supra* note 3, at 143. For an excellent history of DSL technology, see also, John Cioffi, *Bell Labs Managers Laughed at the Idea of Broadband over Phone Lines*, EE TIMES, Dec. 12, 2005, http://www.eetimes.com/disruption/essays/cioffi.jhtml.

31. *Id.*

32. *Id.*

33. *Id.*

34. *The State of Broadband in Arkansas: Hearing Before the S. Comm. on Commerce, Sci., and Transp.*, 110th Cong. 5 (2007) (statement of Jonathan S. Adelstein, Commissioner, F.C.C.) (observing that cable modem and DSL providers control approximately 96% of the residential broadband market), http://commerce.senate.gov/public/_files/2007AugSenateCommerceArkansasAdelsteinfinal0.pdf.

35. *See Wireline Facilities Order*, *supra* note 17, ¶ 86 (

> We eliminate the *Computer Inquiry* obligations as applied to facilities-based providers of wireline broadband Internet access service, and, in particular, the obligation to offer the transmission component of wireline broadband Internet access service on a stand-alone common carrier basis.

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36. *Id.*

Despite criticism of the rate of broadband deployment in the U.S., broadband service in its first three years advanced as much as cellular service in its first five years.[37] Furthermore, the price of broadband service has continued to fall. Figure 1 illustrates the continuing decrease in the price of DSL service. In 2005, the FCC concluded that ". . . many consumers have a competitive choice for broadband Internet access services today."[38] As a result, the FCC deregulated DSL service in 2006.[39] And in 2007, the Federal Trade Commission observed that the broadband industry "is showing signs of robust competition, including fast growth, declining prices for higher-quality service, and the current market-leading technology (*i.e.*, cable modem) losing share to the more recently deregulated major alternative (*i.e.*, DSL)."[40]

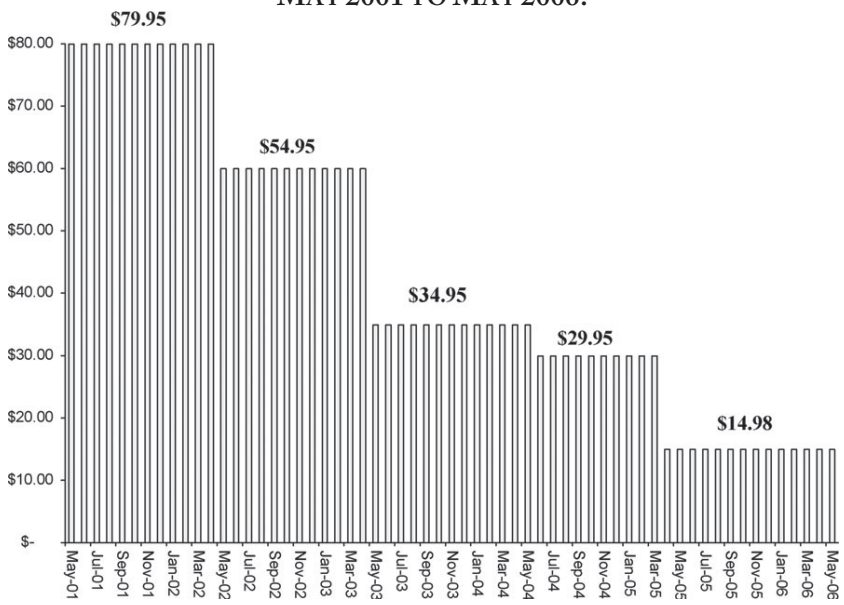
37. Andrew Odlyzko, *The Many Paradoxes of Broadband*, FIRST MONDAY 2, 2003, http://firstmonday.org/htbin/cgiwrap/bin/ojs/index.php/fm/article/view/1072/992.

38. *Wireline Facilities Order*, *supra* note 17, ¶ 47.

39. *Id.* ¶ 86.

40. FTC BROADBAND REPORT, *supra* note 28, at 100-01.

FIGURE 1: VERIZON'S MONTHLY PRICE FOR 1.5 MBPS DSL ACCESS, MAY 2001 TO MAY 2006.[41]



The FTC's and FCC's conclusion that, thus far, a duopoly among broadband providers has provided sufficient competition to protect consumers without additional regulation is not without criticism.[42] Certainly, more competition in the broadband industry would benefit consumers. However, the critical question for regulators is not whether a market has the optimal level of competition, but rather whether a market is sufficiently competitive to forbear from regulation. This note adopts the general conclusion reached by the FTC and the FCC that a duopoly among wireless phone service providers was not sufficiently competitive while a duopoly among broadband Internet service providers is sufficient.

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41. J. Gregory Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet* at 46 (2006), http://papers.ssrn.com/sol3/papers.cfm?abstract_id=928582 (internal citations omitted) ("In April 2005, Verizon began offering 3.0 Mbps DSL access for the same price that it had been offering 1.5 Mbps DSL access, thus doubling the performance of its entry-level DSL product. Figure 1 treats this repricing as halving the price of 1.5 Mbps DSL access."), *reprinted in modified form in* J. Gregory Sidak, *A Consumer-Welfare Approach to Network Neutrality Regulation of the Internet*, 2 J. OF COMPETITION L. & ECON. 349, 399 (2006).

42. This conclusion is subject to some criticism from groups such as FreePress, Consumers Union, and Consumer Federation of America who argue that broadband access is not competitive and that the government should build a fiber optic infrastructure much as the government built a transportation infrastructure. S. DEREK TURNER, BROADBAND REALITY CHECK II (2006), www.freepress.net/docs/bbrc2-final.pdf.

Today, renewed interest exists in whether the competition in the broadband duopoly is sufficient to forbear from regulation. Comcast's degradation of the BitTorrent file-sharing service has fueled interest in regulatory oversight of broadband providers.[43] As the FCC re-evaluates whether regulation is required, it must decide if the future broadband market will behave more like the wireless duopoly or the early broadband duopoly. The disparate outcomes between the wireless and broadband duopolies are best explained by analyzing the effects of technological convergence on competition.

III. EFFECT OF CONVERGENT COMPETITION ON DUOPOLIES

Companies will always compete. However, that competition may not always benefit consumers. For example, even a monopolist will compete to prevent entrants from gaining a foothold in the market. This competition is beneficial if the monopolist produces more efficiently and prices its products lower than any potential competitor. However, the competition is not beneficial if it involves efforts to capture regulators who can ensure a monopoly through regulation.[44] The critical task for the FCC is not simply to decide if a concentrated market is competitive, but whether the resulting competition is sufficient to substitute for regulation. To make this decision, the FCC must predict the form and intensity of competition in a given market. As illustrated by the wireless phone and broadband industries, technological convergence affects both of these areas.

A. Form of Convergent Competition

Competition between companies may take many forms.[45] Some of these forms benefit consumers – price reduction, quality improvement, and innovation.[46] Some of these forms do not benefit consumers – political lobbying, over-investment in resources, and premature market entry.[47] The underlying theory of why companies choose one form of competition over another is not well-developed.[48] As demonstrated in

43. *See, e.g.,* Eric Bangeman, *FCC Officially Opens Proceeding on Comcast's P2P Throttling*, ARS TECHNICA, Jan. 14, 2008, http://arstechnica.com/news.ars/post/20080114-fcc-officially-opens-proceeding-on-comcasts-p2p-throttling.html?rel.

44. *See, e.g.,* DIGITAL CROSSROADS, *supra* note 3, at 58 (Prior to the *Hush-A-Phone* decision the FCC regulators "absurdly agreed" that attaching foreign devices to the telephone threatened the integrity of the phone system, even when the device simply muffled voices).

45. HAL R. VARIAN, THE ECONOMICS OF INFORMATION TECHNOLOGY 30 (Cambridge University Press 2004).

46. *Id.*

47. *Id.*

48. *Id.*

the early wireless phone and broadband industries, technological convergence reduces the incentive to engage in political lobbying for regulatory capture and over-investment to prevent entry by competitors.

i. Effect of Technological Convergence on Political Lobbying to Capture a Regulatory Agency

When analyzing competition in concentrated markets, regulators should assume that the existing companies will seek to prevent entry by outside competitors. In telecommunications, one historic form of competition is political lobbying seeking to "capture" the FCC. In the past, these efforts were particularly effective because the FCC presumed that regulation should protect an efficient natural monopoly.[49] While the natural monopoly justification has fallen out of favor, strategic use of the regulatory process has not. Indeed, the "strategic use of the regulatory process is at least as important to many industries as the traditional decision variables: prices, entry, and innovation."[50] This competition to capture the FCC to ensure favorable regulation does not benefit consumers.

Technological convergence reduces the incentives to engage in regulatory capture. The bureaucratic structure of the FCC was premised on the pre-convergence assumption that applications were tied to physical platforms.[51] The FCC was not created as an application-centric organization with a voice-communications bureau, data-communications bureau, and video-distribution bureau. Instead, the FCC was created as a platform-centric organization with a wireline competition bureau, a wireless communications bureau, and a cable bureau.[52] In a pre-convergence era, companies seeking regulatory capture could focus lobbying efforts on the single bureau that controlled the physical platform critical to their industry.[53] In a post-convergence era, companies seeking regulatory capture must focus political lobbying efforts on several relevant bureaus.[54] As the number of regulators in need of influencing

49. DIGITAL CROSSROADS, *supra* note 3, at 55.

50. BRUCE M. OWEN & RONALD R. BRAEUTIGAM, THE REGULATION GAME: STRATEGIC USE OF THE ADMINISTRATIVE PROCESS 2 (1978).

51. DIGITAL CROSSROADS, *supra* note 3, at 23.

52. *See* Federal Communications Commission (FCC) Home Page, http://www.fcc.gov. The Cable Bureau no longer exists. The Media Bureau is responsible for the cable and broadcast industries. *Id.*

53. For example, a wireless provider interested in precluding entry by a competitor could focus on lobbying the wireless communications bureau. *See id.*

54. For example, a broadband provider interested in precluding entry by a competitor must focus on lobbying the wireline bureau for DSL and fiber-to-the-premises, the wireless bureau for terrestrial wireless, the media bureau for cable, and the international bureau for satellite wireless. *See id.*

increases, so too does the cost of regulatory capture. Therefore, while technological convergence does not necessarily make regulatory capture an ineffective strategy, it certainly raises the costs.

In the early wireless industry, competition to maintain the duopoly involved the non-beneficial form of political lobbying seeking regulatory capture. As noted above, regulation of the early wireless duopoly provided only two spectrum licenses being issued for each market.[55] Unless the FCC granted additional licenses, outside competition was effectively precluded.[56] Thus, little incentive existed to prevent future market entry by focusing on price, quality of service, or innovation, because regulatory capture guaranteed duopoly control of the market.

Not only was preclusion of competition guaranteed through regulatory capture, but the FCC's regulatory history suggested that such capture was possible. The voice telephone market began as a regulated monopoly with AT&T providing long distance service and the local Bell operating company or another state-sanctioned monopoly providing local phone service.[57] At the behest of the incumbent telephone companies, the FCC barred entry into the consumer premises equipment (CPE) market until essentially forced to do so by the *Hush-a-Phone* decision.[58] In addition, the FCC allowed AT&T to leverage its control of the local exchange facilities to discriminate against MCI's long distance service until the historic 1984 consent decree.[59]

Against this backdrop, duopoly wireless telephone service providers acted reasonably when they focused efforts on political lobbying to prevent the FCC from granting additional wireless licenses. This lobbying was apparent in the FCC's proceedings leading up to the Personal Communications System (PCS) auction in 1994. Initially, incumbent wireless providers argued that there was no need to grant additional licenses because they would soon provide the same perceived benefits of digital service.[60] One report observed that "various organizations that have a vested interest. . .have recently flooded the commission with documents and letters attempting to shape the soon to be determined [PCS] policy."[61] Ultimately, the wireless incumbents were

55. DIGITAL CROSSROADS, *supra* note 3, at 268.

56. Mobile voice telephone service via satellite was first commercially available from Iridium in 1998. History of the Handheld Satellite Phone, Globalcom, http://www.globalcomsatphone.com/articles/history.html.

57. DIGITAL CROSSROADS, *supra* note 3, at 55.

58. Hush-A-Phone Corp. v. United States, 238 F.2d 266, 269 (D.C. Cir. 1956).

59. *See* DIGITAL CROSSROADS, *supra* note 3, at 62.

60. Amendment of the Commission's Rules to Establish New Personal Communications Services, *Notice of Inquiry*, 5 FCC Rcd. 3995, ¶ 10 (1990).

61. Paul Rubin, *FCC Flooded with Opinions on PCS as Rulemaking Approaches*, FCC REPORT, Sept. 8, 1993, at 8.

unsuccessful with their strategy as evidenced by the limitations and spectrum caps placed on incumbent providers in the 1994 auction.[62]

In contrast, the early broadband industry displayed little evidence of political lobbying seeking regulatory capture. Although cable modem and DSL providers control the broadband Internet access market, a wide range of potential competitors exist. The FCC concluded that future broadband service will "not be limited to cable modem and DSL service" because of other broadband platforms "such as satellite and wireless, and even broadband over power line in certain locations."[63] Because these potential convergent competitors for broadband Internet access rely on dissimilar physical transmission platforms, and because the FCC is still structured according to physical transmission platforms, the existing broadband duopoly would need to capture many more regulatory bureaus to hinder entry by competitors.

Technological convergence, combined with the FCC's platform-centric structure, has limited the effectiveness of political lobbying by one industry segment and dissuaded this non-beneficial form of competition. However, the FCC has begun to move away from a platform-centric structure. For example, the bureaus of public safety and homeland security, enforcement, and consumer and governmental affairs theoretically have jurisdiction limited by subject matter instead of physical platform.[64] If fully implemented, this change to an application-centric bureaucratic structure may eventually lead to resurgence in efforts to "capture" regulators at the FCC.

ii. Effect of Technological Convergence on Over-Investment

Technological convergence may also reduce the incentive to over-invest in necessary resources. Over-investment in resources is a rational strategy if one company can drive up a competitor's costs by "cornering the market" for a critical resource.[65] Technological convergence reduces the attractiveness of the over-investment strategy because a company would have to not only purchase extra resources necessary for its own physical platform, but also purchase resources necessary for all other

62. 700 MHz Spectrum Auction, Public Knowledge, http://www.publicknowledge.org/issues/spectrum-reform.

63. *Wireline Facilities Order*, *supra* note 17, ¶ 50.

64. FCC Home Page, *supra* note 52.

65. *See, e.g.,* John R. Wilke, *U.S. Accuses BP of Manipulating the Price of Propane*, THE WALL ST. J. ONLINE, June 29, 2006, http://online.wsj.com/article/SB115152494243093324.html (The Commodities Futures Trading Commission charged traders at British Petroleum with cornering the market for propane thereby driving up heating and cooking costs for rural Americans).

transmission platforms where competitors might make entry. While this extra investment does not completely eliminate the incentive for over-investment, it makes the strategy less attractive by raising the cost of success.

When the application was tied to the physical platform in the early wireless phone industry, over-investment was an attractive strategy. The FCC was worried that providers would purchase spectrum licenses simply to prevent competitors from gaining a foothold in the market.[66] Because of this, the FCC now conditions each spectrum license with build-out requirements that specify the levels of infrastructure and use required to keep the license.[67] Companies that do not meet the build-out requirements may lose their licenses.[68]

Unfortunately, because the build-out periods are relatively long and companies may obtain waivers, some experts fear that major providers still engage in over-investment to prevent competitors from gaining a foothold. In fact, some had even advocated for a requirement that the winner of the recent 700 Mhz spectrum auction be required to offer wholesale service to independent wireless service providers over fears that Verizon or AT&T would purchase the spectrum even though they did not need it to provide their services.[69]

Because of technological convergence, the early broadband industry did not exhibit signs of over-investment as a means of preventing entry by competitors, nor have they since. DSL providers have not purchased satellite licenses. Cable companies have not purchased wireless spectrum licenses. Instead, the trend is to improve the existing physical platforms. For example, Verizon is replacing its copper loops with fiber-to-the-premises (FTTP), and cable companies are starting to upgrade their infrastructure to support DOCSIS 3.0. If anything, the broadband industry has been criticized for under-investing in infrastructure, as evidenced by the level of broadband penetration.

In summary, competition in the broadband industry took forms that benefited consumers while competition in the wireless industry took forms that did not. This difference was controlled by technological convergence. Because applications are no longer tied to a physical platform, capturing the regulators that control that physical platform or capturing the resources that the physical platform requires are less attractive strategies.

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66. *See* FCC: Wireless Telecomm. Bureau: Construction /Coverage Requirements, http://wireless.fcc.gov/licensing/index.htm?job=const_req_home.

67. *Id.*

68. *Id.*

69. *See, e.g.*, 700 MHz Spectrum Auction, *supra* note 62.

B. Intensity of Convergent Competition

The intensity of competition in a concentrated market is distinct from the form of competition. For example, a firm that has competed heavily in political lobbying to guarantee a share of a concentrated market may avoid price competition within that market.[70] If technological convergence promotes beneficial forms of competition, it does not automatically follow that the competition is sufficiently intense to forbear from regulation. Indeed, a common concern is that companies who compete in price (a beneficial form of competition) will collude to minimize the intensity of this competition. For example, telecommunications rate tariffing could enable competitors to signal price changes and thereby minimizing price competition.[71] However, technological convergence affects the intensity of competition in duopoly markets by increasing substitute services and decreasing customer switching costs.

i. Effect of Technological Convergence on Substitute Services

Convergent competition increases the likelihood that substitute services are available. Economic theory suggests that a lack of substitute service enables companies to maintain prices above competitive levels.[72] When few good substitutes exist, "price becomes less important in the buying decision."[73] Without convergence, an application is tied to its physical transmission platform. As a result, a substitute, by definition, involves a different application. For example, the closest substitute to early wireless telephone service was a pager signal directing the recipient to call over the nearest land-line. This different application is also, by definition, sub-optimal (otherwise it would be the desired application).

With convergent competition, a substitute may involve the same application offered over a different physical platform. For example, both dial-up and broadband Internet services support the same Internet browser or email client. This alternate physical platform may have limitations that reduce the attractiveness of the substitute, but the

70. When SBC acquired Ameritech, the FCC required that SBC agree to compete by entering thirty local markets outside of its own operating area. After the acquisition, SBC engaged in legal and regulatory efforts to lower the standard by which its competition would be judged. As of 2002, SBC had fewer than 5,000 local customers outside of its 70 million customer traditional operating area. CHARLES H. FERGUSON, THE BROADBAND PROBLEM 107 (Brookings Institution Press 2004).

71. Gruber, *supra* note 18, at 183-84 (tariffing allows competitors to detect deviation from agreed pricing systems).

72. GAO WIRELESS REPORT, *supra* note 21, at 21.

73. *Id.*

application is the same. Thus, technological convergence improves the likelihood of substitutes by increasing the number of platforms over which an application can be offered.

In the early wireless industry, the intensity of competition for consumers was limited by the lack of competition from substitute mobile-telephone products.[74] Substitute service involved using sub-optimal applications to create a mobile-telephone equivalent.[75] The GAO concluded that "landline telephone, pagers, [and] two-way mobile dispatch service . . . are generally not very close substitutes for cellular service."[76] This lack of good substitutes insulated the wireless duopoly from market competition.[77]

In contrast, because of technological convergence, broadband Internet access providers faced competition from substitute providers – dial-up ISPs. In fact, in 2001 only 12% of Internet subscribers purchased a broadband connection even though 56% had the option. The remaining 88% chose to remain with a dial-up provider. In a 2008 survey, 35% of dial-up users identified price as their reason for not upgrading to broadband while 19% said that nothing would convince them to upgrade to broadband.[78] This result is a function both of convergence and of the evolution of Internet services. Because dial-up access existed first, most applications were optimized for the slow transmission rates of dial-up connections. Many argue that as applications need ever increasing amounts of bandwidth for an enjoyable customer experience, dial-up ISPs will no longer serve as substitutes in this convergent market.[79] In 2006, 75% of U.S. Internet users utilized a broadband connection implying that dial-up is losing attractiveness as a substitute.[80] However, some users still primarily use only low-bandwidth applications such as e-mail.[81] The Federal Trade Commission concluded that dial-up service continues to be "an acceptable substitute for broadband for some consumers" and even today appears to "retain some constraining influence on broadband prices."[82]

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74. *Id.* at 20-21.
75. *Id.*
76. *Id.*
77. *Id.*
78. *See* Press Release, Pew Internet & American Life Project, 55% of Adult Americans Have Home Broadband Connections (July 2, 2008), http://www.pewinternet.org/press_release.asp?r=305.
79. *See*, *e.g.*, Harold Feld, Senior Vice President, Media Access Project, FTC Broadband Connectivity and Competition Policy Task Force Presentation (Feb. 14, 2007), http://www.ftc.gov/opp/workshops/broadband/presentations/feld.pdf.
80. Carol Wilson, *Nielsen: Broadband Use Nears 75% in U.S.*, TELEPHONY ONLINE, June 22, 2006, http://telephonyonline.com/broadband/news/Nielsen_broadband_Internet_062206/.
81. *See* FTC BROADBAND REPORT, *supra* note 28, at 99.
82. *Id.*

In the near future, if not already, dial-up will cease to be an acceptable broadband substitute and will no longer constrain broadband prices. However, as discussed in Section IV, other forms of broadband service may emerge. As discussed in Section V, these substitutes may not offer the same transmission speed as FTTP or DOCSIS 3.0, but like dial-up, they may be sufficient to constrain prices in the future broadband market.

Technological convergence tends to increase the intensity of competition because of the increased possibilities of substitute services. In the early wireless industry where the application (mobile voice communication) was tied to the platform (wireless signals) there was limited competition from inferior substitutes. In the broadband industry, the application (Internet access) is not tied to a particular platform.

Most importantly, in convergent markets, when one substitute fades another may take its place. Indeed the broadband duopoly will likely face additional competition from service offered over satellite, wireless, power-line, or fiber-to-the-premises.[83] The FTC and the Department of Justice Antitrust Division consider potential entrants to be capable of influencing business decisions of current service providers.[84] So long as the threat of another provider exists, it will increase the intensity of competition in the future broadband market.

ii. Effect of Technological Convergence on Customer Switching Costs

In addition to increasing the likelihood of substitute services, technological convergence lowers customer switching costs, thereby intensifying efforts to lure consumers from a competitor. Economists have observed that high switching costs often lead to customer lock-in. Lock-in occurs when it becomes economically irrational to incur a high fixed switching cost to take advantage of a marginally lower price or marginally higher quality of service.[85] The resulting lock-in tends to raise prices over the lifetime of a product, create deadweight loss, and reduce market entry.[86] Convergence reduces switching costs by freeing the

83. The FCC estimates that 87% of all U.S. zip codes now have access to three or more broadband service providers, and 63% of zip codes are served by five broadband providers. F.C.C., INDUS. ANALYSIS AND TECH. DIV., WIRELINE COMPETITION BUREAU: HIGH SPEED SERVICES FOR INTERNET ACCESS: STATUS AS OF JUNE 30, 2006 21 tbl.15 (2007), http://hraunfoss.fcc.gov/edocs_public/attachmatch/DOC-270128A1.doc.

84. FTC BROADBAND REPORT, *supra* note 28, at 105.

85. Varian, *supra* note 45, at 22. Examples of industries with high switching costs are the printer industry where replacement cartridges are often priced at half of the price of a new printer and the disposable razor industry where razors are given away to ensure future sales of high priced replacement blades.

86. *Id.* at 23.

application from the physical platform so that consumers can change platforms without losing any investment in the application.

In the early wireless industry, customers faced high economic and non-economic switching costs.[87] For example, customers desiring to switch wireless telephone providers often had to pay a termination fee and purchase an expensive telephone to work with the competitor's network.[88] Today's wireless customers still face equipment lock-in and high termination costs. This illustrates that although low switching costs can promote competition, competition does not necessarily eliminate high switching costs.

Early wireless customers faced high non-economic switching costs as well. In the early 1990s, customers changing wireless phone providers had to manually transfer the addresses stored in their phones, and, more importantly, faced the hassle of establishing a new telephone number. The effects of these non-economic switching costs are verified by the computer software that soon emerged to ease the portability of stored phonebooks,[89] and the FCC's repeated emphasis on the importance of wireless telephone number portability to increase competition and improve consumer choice in the wireless telephone service market.[90] Because the application (mobile telephone service) is tied to the physical medium (the provider's network), consumers were locked-in to their initial provider by the high switching costs. This lock-in may increase competition to acquire new customers, but is generally viewed as "bad for consumer welfare."[91]

As with the wireless telephone industry, broadband consumers still face economic switching costs. Many broadband plans require payment of an early termination fee or significantly reduce prices for long-term service contracts, and customers must purchase or lease a new modem.[92]

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87. *See* THE ECONOMICS OF MOBILE TELECOMMUNICATIONS, *supra* note 18, at 181-82.

88. These switching costs were sometimes mitigated by competitors offering cheap phones in return for customers agreeing to pay high early termination fees. *Id.*

89. Today a wide variety of devices exist to backup cellular phone address books. Most wireless service providers also offer backup services. Grace Aquino, *Dialed In: Back Up Your Cell Phone's Address Book*, PCWORLD, Apr. 27, 2006, http://www.pcworld.com/article/125519/dialed_in_back_up_your_cell_phones_address_book.html.

90. The Commission has repeatedly emphasized its view that local number portability is "an important tool for enhancing competition, promoting numbering resource optimization, and giving consumers greater choice." Numbering Resource Optimization, *Fourth Report & Order & Fourth Further Notice of Proposed Rulemaking*, 18 FCC Rcd. 12,472, ¶ 9 (2003), *available at* http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-03-126A1.pdf.

91. Varian, *supra* note 45, at 23.

92. For example, if a customer does not agree to a two-year service commitment, Qwest's monthly service prices increase from $29.99 to $39.99 for its Silver service and from $36.99 to $49.99 for its Platinum service. Qwest Home Page, http://www.qwest.com, *visited* Oct. 30,

However, as a result of technological convergence, consumers are not locked-in by an investment in applications. For example, from the average consumer's perspective Internet browsers used to surf the Web work equally well over cable modem connections and DSL connections. Moreover, none of the consumer's stored browser information is lost when service is transferred.

The effect of convergence on switching costs is perhaps best illustrated by the use of third-party email providers. Initially consumers faced a non-economic switching cost because their email addresses were hosted by the broadband (or dial-up) service provider.[93] On switching providers, customers had to download or forward all of their stored emails and email addresses.[94] Today, many consumers use third-party email service such as Yahoo Mail, Hotmail, or G-mail, thereby avoiding this switching cost.[95] Unlike wireless telephone number portability where regulatory action was required to reduce switching costs, email portability is largely a non-issue because convergence enables third-parties to separate the application from the physical transmission medium. Because convergence lowers these switching costs, competition for customers between duopoly competitors is likely more intense where convergent competition exists.

Technological convergence, and the resulting convergent competition, was a driving force in the disparate outcomes of the early wireless duopoly and the broadband duopoly. Convergent competition discourages non-beneficial forms of competition by increasing the cost of regulatory capture and overinvestment to capture resources. At the same time, convergent competition promotes beneficial forms of competition by increasing the availability (or threat) of substitute services and lowering customer switching costs.

IV. THE SHAPE OF THE FUTURE BROADBAND INDUSTRY

Despite frequent calls for a third broadband platform to compete

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2008. Comcast's terms of service reference its "minimum term" customers. Comcast requires that customers have either purchased a modem, or lease a modem for $3 per month. Comcast Home Page, http://www.comcast.net, *visited* Oct. 30, 2008.

93. *See, e.g.*, Gail Mortenson, Email Address Portability, *Petition for Rulemaking* (July 20, 2007) (petition to the Commission to mandate e-mail portability to avoid consumer lock-in and abuse for consumers changing service providers), http://fjallfoss.fcc.gov/prod/ecfs/retrieve.cgi?native_or_pdf=pdf&id_document=6519560444.

94. *Id.*

95. *See* CARL SHAPIRO & HAL R. VARIAN, INFORMATION RULES 109 (Harvard Business School Press 1999) (observing that the Hotmail business model is successful because of the switching costs associated with ISP provided email accounts). The official Yahoo blog cites a Comscore study indicating that there are 543 million people with webmail accounts. Happy 10th Birthday, Yahoo! Mail, YODEL ANECDOTAL, Oct. 8, 2007, http://yodel.yahoo.com/2007/10/08/happy-10th-birthday-yahoo-mail.

with cable and DSL (the "third-pipe"), the future broadband market may remain a duopoly. This paper defines "broadband" by the transmission speed needed to support the highest bandwidth applications commonly used.[96] Assuming that common applications will eventually expand to take advantage of excess transmission speeds, the future broadband market can be crudely defined by the highest transmission speed offered in major markets.

Of course, just as dial-up can serve as a substitute for broadband, slower broadband connections may serve as a substitute for future broadband service (as defined purely by maximum transmission speeds). Thus, this paper will define the "future broadband" market as those providers able to offer the highest transmission speeds, but the paper will also address slower connections that can offer substitute services.

Transmission speeds differ depending on whether users download from the Internet or upload to the Internet.[97] For example, because of the network architecture, cable modem service typically provides download speeds on the order of 2-3 Mbps, but upload speeds on the order of 256-384 Kbps.[98] Moreover, quoted transmission speeds are often the maximum theoretical speed that a network can support.[99] The actual speed experienced by users varies depending on factors such as the number of other users on the network, the user's distance to the provider's equipment, and the user's own networking equipment.[100] Thus, this paper will use expected transmission speeds only to define the broadband market, not as an actual measurement of service.

A. Wireless Broadband as a Third Pipe

With today's broadband speeds, terrestrial wireless (as distinguished from satellite wireless) may offer a competitive third pipe for broadband. Both DSL and cable modem service provide transmission speeds around 1-3 Mbps.[101] Sprint committed to investing five billion dollars over the next three years to build a wireless broadband network.[102] Sprint predicted that its network would offer transmission speeds between 2-4 Mbps,[103] and early tests confirm actual service speeds between 3-5

96. *See* Turner, *supra* note 27.

97. *Id.* at 5.

98. *Id.*

99. Jacqui Cheng, *FTC to Investigate Broadband Speed Claims*, ARS TECHNICA, Feb. 12, 2007, http://arstechnica.com/news.ars/post/20070212-8822.html.

100. *Id.*

101. Turner, *supra* note 27, at 5.

102. Marguerite Reardon, *Sprint's WiMax Dilemma*, CNET NEWS, Dec. 20, 2007, http://www.news.com/Sprints-WiMax-dilemma/2100-1039_3-6212618.html.

103. Kitty Weldon & Brian Washburn, *Sprint and Clearwire Team for WiMax Rollout*, CURRENT ANALYSIS, July 23, 2007, http://www.currentanalysis.com/h/2007/SprintNextel-

Mbps.[104] If Sprint could deploy its network today, many consumers would have a choice between three broadband service providers.

Unfortunately for Sprint, as it builds its wireless network, Verizon is investing in a fiber optic network. With FTTP, Verizon advertises that consumers will see transmission speeds of 50 Mbps.[105] Not to be outdone, the cable industry announced deployment of DOCSIS 3.0 with transmission speeds of up to 160 Mbps.[106] If Verizon and the cable industry deploy advanced networks at the same rate as Sprint is building its wireless network, Sprint's network will no longer be a competitive third pipe (as defined purely by transmission speed). However, as discussed in Section V, Sprint's network may compete as a substitute for broadband service.

Just because Sprint's wireless network cannot compete with FTTP or DOCSIS 3.0 service on the basis of transmission speed does not necessarily mean that another wireless platform cannot provide a third pipe. Laboratory tests claim to have achieved wireless transmission speeds up to 50 Mbps using 4G technology based on Orthogonal Frequency Division Multiple Access technology.[107] However, to achieve these speeds, the network operators must optimize the networks to offer transmission speed over mobility. Figure 2 illustrates this trade-off by plotting the theoretical transmission speeds against the amount of mobility a network can support.

Clearwire-wimax.asp.

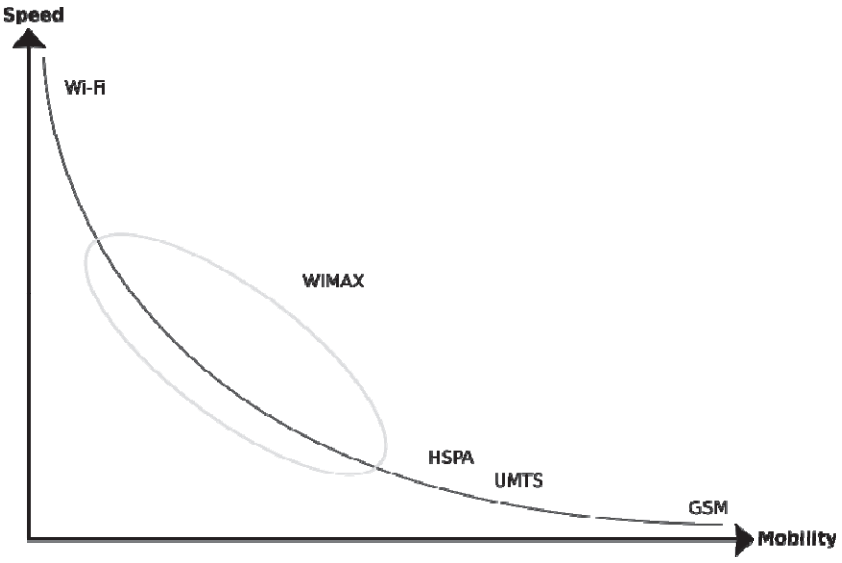
104. Jeff Orr, *Sprint Sees 5 Mbps Xohm Performance in First Markets*, MOBILE BROADBAND NEWS, Jan. 30, 2008, http://mobilebroadbandnews.com/2008/01/30/sprint-sees-5-mbps-xohm-performance-in-first-markets/.

105. Press Release, Verizon, Verizon Widens its Broadband Speed Advantage on the Company's Industry-Leading Fiber-to-the-Premises Network (July 27, 2006), http://newscenter.verizon.com/press-releases/verizon/2006/page.jsp?itemID=30078536.

106. Press Release, CableLab, CableLabs Issues DOCSIS 3.0 Specifications Enabling 160 Mbps (Aug. 7, 2006), http://www.cablelabs.com/news/pr/2006/06_pr_docsis30_080706.html.

107. CISCO SYSTEMS, RISE OF THE 4G NETWORK ENABLING THE INTERNET EVERYWHERE EXPERIENCE (2007), http://www.cisco.com/en/US/solutions/collateral/ns341/ns523/ns177/net_implementation_white_paper0900aecd805c247c.pdf.

FIGURE 2: WIMAX[108]



One of the advantages of wireless service is the mobility it allows. Because FTTP and DOCSIS 3.0 can never offer mobility, wireless providers should hesitate before sacrificing mobility to compete on the basis of transmission speed. Just as cell phone service providers have focused on mobility and convenience over voice quality, wireless broadband providers will likely not invest in systems optimized to maximize transmission speed. Even though it is unlikely that wireless broadband will ever provide the third pipe (as measured by transmission speed), wireless will almost certainly provide a competing substitute service.

B. Broadband-over-Power-Line as a Third Pipe

Wireless broadband access will likely not offer a competitive third pipe but a wired platform may. Broadband-over-Power-Line ("BPL") has shown promising results in laboratory tests. Current generation equipment offers 3 Mbps transmission speeds.[109] Experts predict that the next-generation equipment will offer speeds comparable to FTTP or DOCSIS 3.0.[110] With much of the infrastructure already in place, BPL

108. Wikipedia, WiMax, http://en.wikipedia.org/wiki/WiMax.

109. Marguerite Reardon, *Broadband's Power-line Push*, CNET NEWS, July 11, 2005, http://www.news.com/Broadbands-power-line-push/2100-1034_3-5780316.html.

110. *See, e.g.*, Internet over Powerline / BPL, CYBERTELECOM,

appears to offer promise as a competitive broadband platform.

This begs the question of why providers have not already deployed BPL service given the ability to offer competitive broadband speed today. The National Telecommunications Cooperative Association reported that only 10% of its member companies viewed BPL as a potential competitor for broadband service.[111] One reason is the great technological challenge of modifying an existing infrastructure to support another use. Companies experimenting with BPL have experienced problems from the transformers in power lines and from unauthorized radiation (unshielded power-lines radiate like antennas when an electrical signal is passed through them).[112] Thus, while BPL holds theoretical promise, the costs associated with deploying the infrastructure may be prohibitive.

Given the technology currently available, the future broadband market (defined purely by maximum theoretical transmission speed) will likely remain a duopoly. From a competition standpoint, this duopoly is the worst case scenario for the FCC. However, that does not mean that the FCC must regulate to increase competition. The technological convergence that spurred competition in the early broadband industry should affect the form and intensity of competition in the future broadband industry.

V. MODELS FOR BROADBAND REGULATION

As discussed in Section II above, the broadband industry has developed relatively free of regulation. In fact, in 2006 the FCC ruled that phone companies no longer had to offer unbundled phone line access to competitors offering DSL service.[113] Several trends have renewed calls for increased regulation of the broadband industry. First, critics point out that United States lags behind many other nations in broadband deployment (the percentage of citizens with access to broadband service).[114] Second, critics highlight the relatively high cost of broadband service in the United States.[115] Finally, and perhaps most

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http://www.cybertelecom.org/broadband/power.htm (predicting that BPL will offer transmission speeds in excess of 100 Mbps).

111. NAT'L TELECOMM. COOP. ASS'N, NTCA 2007 BROADBAND/INTERNET AVAILABILITY SURVEY REPORT, Sept. 2007, http://www.usdoj.gov/atr/public/workshops/telecom2007/submissions/228008.htm.

112. Joe Barr, *Flawed BPL is No Broadband Panacea*, LINUX, May 17, 2007, http://www.linux.com/feature/44975.

113. *Wireline Facilities Order*, *supra* note 17, ¶ 86.

114. Turner, *supra* note 27, at 3 (observing that the United States places 16th worldwide for the net change in broadband penetration and number of broadband subscribers per 100 inhabitants).

115. *Id.* at 2 (Broadband in the United States costs 10-25% more on a per megabit basis

importantly, Comcast's decision to degrade the peer-to-peer file sharing service BitTorrent has renewed calls for regulation, or legislation, mandating "network neutrality."[116]

The FCC faces a choice over its future broadband policy. In broad terms, the FCC has two models to choose from. The proactive regulatory approach acts in advance to promote competition and prevent market failure. In contrast, the reactive antitrust approach allows competitive markets to function and regulate in response to market failures. The 1996 Telecommunications Act signals a preference for the antitrust model by allowing the FCC to forbear from regulating competitive markets. However, the shift to the antitrust model requires a sufficiently competitive market.

A. The Proactive Regulatory Approach

For most of its existence, the FCC regulated industries to actively manage competition in the communications market.[117] Although the 1996 Act allowed the FCC to forbear from regulation, there is temptation "to micromanage the process of deregulation itself."[118] The FCC faces the difficult task of transitioning from regulation designed to dictate an outcome to regulation designed to allow competition to dictate an outcome.[119] The FCC's recent open-access decision illustrates this difficult transition.

After the failure of the early wireless duopoly, the FCC made more wireless spectrum available to wireless phone service providers. Although most experts agree that the cellular phone service market is competitive, consumers in the United States are usually still "locked-in" by their phones that operate only on one carrier's network.[120] In addition, applications that can run on cellular handsets are strictly controlled by the cell phone service provider.[121] In response to calls to increase competition, the FCC required that a portion of the spectrum included in the recent 700 MHz auction be open to all equipment and

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than broadband in Japan).

116. *See, e.g.*, Eric Bangeman, *FCC Officially Opens Proceeding on Comcast's P2P Throttling*, ARS TECHNICA, Jan. 14, 2008, http://arstechnica.com/news.ars/post/20080114-fcc-officially-opens-proceeding-on-comcasts-p2p-throttling.html?rel.

117. *See* DIGITAL CROSSROADS, *supra* note 3, at 408.

118. *Id.*

119. *Id.*

120. *See* Ben Charny, *Cell Phone Lockdown*, CNET NEWS, Dec. 3, 2003, http://www.news.com/2100-1039_3-5112883.html.

121. *See* Bruce Meyerson, *Why Wireless Isn't Wide Open*, BUSINESSWEEK, Dec. 11, 2007, http://www.businessweek.com/technology/content/dec2007/tc20071210_625653.htm?chan=top+news_top+news+index_businessweek+exclusiv.

applications.[122] The winner of the open-access license will have to allow any qualified device onto its network and cannot degrade Internet content from competitors.[123] The FCC has tried to strike a delicate balance between active regulation to introduce competition in the handset market and generally reactive regulation of competitive wireless market.

The FCC may apply this proactive regulatory approach in its future broadband decisions. For example, to increase competition among the two competing physical platforms, the FCC could again require that phone companies provide unbundled phone line access to competitors offering DSL service. To maintain regulatory parity, the FCC could require similar unbundling of cable-modem service.

B. The Reactive Antitrust Approach

In contrast to the regulatory approach, the FCC could shape its future broadband policy on a reactive antitrust model. Interestingly, while there are calls for increased regulation of the broadband industry in the United States, the European Union blessed a United Kingdom plan to begin deregulating its broadband industry.[124] In the United Kingdom, broadband providers were required to provide wholesale access to broadband infrastructure.[125] In 2007, the United Kingdom's Office of Communications ("OFCOM") found that 65% of consumers had a choice of up to four broadband providers.[126] However, OFCOM also found that almost 20% of consumers had access to only a single provider.[127] OFCOM decided to break the United Kingdom into four regulatory sub-markets.[128] In the competitive markets, OFCOM will no longer require that broadband providers offer wholesale access.[129] Instead, OFCOM will monitor the progress of competition and regulate in response to market failures.[130] Similarly, in the United States, the FCC could continue to regulate reactively.

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122. Grant Gross, *FCC Embraces Open Access for 700 MHz Auction*, PCWORLD, July 31, 2007, http://www.pcworld.com/article/id,135294-c,techindustrytrends/article.html.

123. *Id.*

124. Press Release, Europa, Commission Approves OFCOM Proposal to De-regulate Part of UK Broadband Market (Feb. 14, 2008), http://europa.eu/rapid/pressReleasesAction.do?reference=IP/08/232 [hereinafter OFCOM PROPOSAL].

125. *See id.*

126. *Id.*

127. *Id.*

128. *Id.*

129. *Id.*

130. OFCOM PROPOSAL, *supra* note 124.

C. *The Effect of Technological Convergence on Future Broadband Policy*

The antitrust model of regulation requires a competitive market. To predict whether the future broadband market will be competitive enough to support an antitrust approach, the FCC must predict whether the effects of convergent competition will continue to affect the market.

Barring further changes in the regulatory structure on the FCC, the form of competition in the broadband industry will likely remain beneficial to consumers. As illustrated in Section III, so long as the broadband providers are from different industry segments, the problems of regulatory capture are minimized by the FCC's platform-centric organization. If the FCC continues to restructure in an application-centric model, the FCC should be more concerned that broadband providers will compete to capture the regulators instead of capturing customers. In addition, as long as convergent competition exists, broadband providers are unlikely to over-invest to prevent entry by competitors.

Even without increased regulation, the intensity of competition in the future broadband industry will likely protect consumer interests. An important driver of competition intensity is the availability of substitute service. As noted in Section IV, wireless broadband service will likely never meet the transmission speed offered over FTTP or DOCSIS 3.0. That does not mean that wireless broadband access is not a broadband substitute. For several years, dial-up Internet service competed with broadband Internet service even though dial-up's transmission speeds were much slower. So long as the critical "killer applications" can run over a slower wireless connection, wireless broadband can provide a substitute service even though it is not a competitive "third pipe."

Perhaps more importantly, a slower mobile connection may be preferred to a faster wired connection. Traditional phone service providers are struggling with this preference today as more and more consumers "cut the cord" and cancel traditional phone service.[131] While wired phone calls offer superior voice quality, many customers find the voice quality of cellular phone service sufficient, and are drawn by the mobility of cellular phone service.

Using today's MPEG-2 compression technology, streaming video requires a connection speed of at least 7 Mbps.[132] Using the latest

131. The Pew Research Center estimates that 7-9% of the population uses only cell phones. PEW Research Center, *The Cell Phone Challenge to Survey Research*, May 15, 2006, http://people-press.org/reports/display.php3?ReportID=276.

132. HAIVISION, MPEG-4 AVC (H.264) AND WHY, ONLY NOW, IT CAN SAVE 60% OF THE NETWORK VIDEO BANDWIDTH AND STORAGE REQUIREMENTS, http://www.infocomm.org/cps/rde/xbcr/infocomm/Video_Compression_-_MPEG-

MPEG-4 technology, the required connection speed drops to 3 Mbps.[133] Assuming that video communication is a "killer application" of the future broadband industry, a wireless connection providing under 10 Mbps (well within the limits of today's technology) could substitute for the faster, physically-connected networks. Thus, while a "third pipe" may not exist as measured purely by speed, wireless connections may provide a substitute, or even superior, service that drives competition in a concentrated broadband market.

Finally, the FCC must be concerned about customers being locked-in to a single broadband provider. Currently, thanks to technological convergence, customers can switch broadband providers with little cost. That may change as broadband providers take a more active role in network management. Much of the network neutrality debate revolves around service tiers. As Stanford Professor Lawrence Lessig observed in testimony before Congress, "there's nothing wrong with network owners saying 'we'll guarantee fast video service on your broadband account.' There is something wrong with network owners saying 'we'll guarantee fast video service from NBC on your broadband account.'"[134] If broadband providers are able to offer exclusive deals to content producers, then customers may be locked-in to a single provider not because of the link to the physical platform, but by virtue of the user's preferred content. While lock-in is an issue often overlooked in the current network neutrality debate, the FCC must be aware that some neutrality regulation may be required to keep consumer switching costs low.

Critics of the proactive regulatory model highlight the difficulty in predicting the future of competitive markets. However, the FCC must make some predictions to set its policy course. The FCC could continue the trend from the open-access decision and adopt a more active regulatory approach to broadband competition. The 1996 Telecommunications Act implies a preference for the reactive antitrust model that United Kingdom broadband regulators are now adopting.[135] While traditional theorists dismiss duopolies as insufficiently competitive, technological convergence has changed this analysis. Given the effects of convergent competition as demonstrated by the early

4_AVC_(H.264).pdf.

133. *Id*.

134. *Network Neutrality: Hearing Before the Senate Comm. on Commerce, Sci. and Transp*. 109th Cong. 3 (Feb. 7, 2006) (testimony of Lawrence Lessig), http://www.lessig.org/blog/archives/Lessig_Testimony_2.pdf.

135. An act designed to "promote competition and reduce regulation" implies a shift to allowing market competition to govern and regulating only in market failure. This reactive regulatory approach is the traditional antitrust approach. *See* Telecommunications Act of 1996, *supra* note 6.

broadband industry, a future broadband duopoly will likely be sufficiently competitive to allow the FCC to forbear from regulation

CONCLUSION

The FCC faces the daunting task of determining when sufficient competition exists such that the FCC can deregulate or forbear from regulation. Technological convergence in telecommunications presents an ongoing challenge for regulators at the FCC. These challenges are amplified by the 1996 Telecommunication Act's focus on promoting competition and reducing regulation.

Traditionally, duopolies were viewed as providing insufficient competition to protect consumer interests without strict oversight. However, when convergent competition exists, a duopoly may be sufficient. As illustrated by a comparison of competition in the wireless and broadband duopolies, convergent competition tends to shape the form and intensity of competition by impeding regulatory capture, reducing the incentive for over-investment, increasing the likelihood of substitute service, and reducing customer switching costs.

Despite calls for a third pipe for broadband competition, the future broadband industry (as measured purely by transmission speed) could very well consist of the current duopoly of providers. For the FCC, this duopoly represents a "worst case" for competition. However, because of the effects of convergent competition, the FCC should adopt the reactive antitrust model that United Kingdom regulators have embraced. Regulation should focus not on directly promoting competition, but rather on maintaining the benefits of technological convergence. While magical things happen with three competitors, when there is convergent competition, two competitors is good enough.