REDACTED – FOR PUBLIC INSPECTION

October 6, 2014

Marlene H. Dortch
Secretary
Federal Communications Commission
445 12th Street, SW
Washington, DC 20554

Re: *Petition of USTelecom for Forbearance Pursuant to 47 U.S.C. §160(c) from Obsolete ILEC Regulatory Obligations that Inhibit Deployment of Next-Generation Networks*, WC Dkt. No. 14-___

Dear Ms. Dortch:

United States Telecom Association ("USTelecom") hereby files the following documents:

- CONFIDENTIAL version of USTelecom's Petition for Forbearance Pursuant to 47 U.S.C. §160(c) from Obsolete ILEC Regulatory Obligations that Inhibit Deployment of Next-Generation Networks, and associated Appendices (original only); and

- REDACTED PUBLIC version of USTelecom's Petition for Forbearance Pursuant to 47 U.S.C. §160(c) from Obsolete ILEC Regulatory Obligations that Inhibit Deployment of Next-Generation Networks, and associated Appendices (original and four copies).

USTelecom is also submitting a request for confidentiality with regard to the Confidential version of the Petition for Forbearance and its Appendices.

Please contact the undersigned if you have any questions.

Sincerely,

/s/ *Jonathan Banks*
Senior Vice President,
Law and Policy
United States Telecom Association

cc: forbearance@fcc.gov (redacted)
fcc@bcpiweb.com (redacted)

Encl.

USTELECOM
THE BROADBAND ASSOCIATION

October 6, 2014

The Honorable Tom Wheeler
Chairman
Federal Communications Commission
445 12th Street, S.W.
Washington, DC 20554

Dear Mr. Chairman:

In furtherance of the Commission's interest, and that of the Administration, in advancing 21st Century policy reforms that will promote innovation, investment and consumer choice in high-speed broadband, the United States Telecom Association today respectfully files this petition. It identifies specific barriers to investment in advanced telecommunications technology, impediments to more robust broadband competition, and disincentives to deployment of new Internet infrastructure that the Commission can eliminate through regulatory forbearance – in precisely the way Congress intended by enacting Section 706 as a tool for accelerating the availability of advanced telecommunications capability to all Americans.[1]

As you pointed out in your speech earlier this month at 1776, "competition is the most effective tool for driving innovation, investment and consumer and economic benefits."[2] But, as you have rightly observed, the place where competition is most needed is in fiber-based broadband, yet "[d]ue in part to outdated rules, the majority of capital investments made by U.S. telephone companies from 2006 to 2011 went toward maintaining the declining telephone network, despite the fact that only one-third of U.S. households use it at all."[3] More than four years ago, the Administration's *National Broadband Plan* warned of the adverse impact of carryover regulations from the 20th Century that require telephone companies, and telephone companies alone, to continue to invest in antiquated services and technology:

> "Regulations require certain carriers to maintain POTS – a requirement that is not sustainable – and lead to investments that could be stranded. These regulations can have a number of unintended consequences, including siphoning investments away from new networks and services."[4]

Today, the application of discriminatory regulation to some but not all similarly situated providers of broadband service places a thumb on the competitive scale and distorts the market, ultimately to the detriment of consumers. For legacy telephone companies, resources that could be invested in expanding broadband infrastructure and improving broadband speed are instead diverted to maintaining equipment and records whose only purpose is to ensure compliance with obsolete regulatory requirements. As one industry analyst has written, "the least-regulated

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[1] "The Commission . . . shall encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans . . . by utilizing . . . regulatory forbearance, measures that promote competition in the local telecommunications market, or other regulating methods that remove barriers to infrastructure investment." Section 706(a).
[2] *The Facts and Future of Broadband Competition,* Prepared Remarks of FCC Chairman Tom Wheeler, 1776 Headquarters, Washington, DC, September 4, 2014. Page 1.
[3] *Silicon Flatirons Address,* Prepared Remarks for FCC Chairman Tom Wheeler, Silicon Flatirons, University of Colorado Law School, Boulder, Colorado, February 10, 2014.
[4] *Connecting America: The National Broadband Plan,* March 17, 2014, Page 59.

platforms – Internet, cable, and wireless – are the most successful, because they have been free to innovate and to invest their capital efficiently." In your 1776 competition speech, you noted that "only fiber gives the local cable company a run for its money."[5] Therefore, in reliance on your commitment to encourage greater competition where it can exist, we ask the Commission to update its 20th Century regulatory framework to reflect 21st Century realities, forbear from regulations that prevent telephone companies from being equal competitors, and eliminate antiquated requirements that siphon investment from fiber.

Such reform is consistent with your goals for competition, for consumers, and for economic growth. As you know, America's broadband future is tied to investment in fixed networks. Data consumption in the U.S. is growing rapidly, with traffic expected to double over the new few years. Today, nearly all data traffic moves over fixed networks, either via a direct wired connection, WiFi, or cellular backhaul.[6] Although much attention has been focused on the explosive growth in cellular data, the fact is that cellular carries only 2% of data traffic today, and is expected to grow to only 7% by 2018.[7] Advanced, terrestrial, fixed fiber networks are critical to supporting not only this cellular growth, but the growth in traffic that will be occasioned by the Internet-of-things. It is a dynamic market, and we agree that "a dynamic market deserves dynamic decision making."[8]

Telephone companies across the country are demonstrating their commitment to investment and innovation. In many places, despite regulatory handicaps, our industry is setting the pace on fiber deployments. Verizon FiOS led the way as a prime mover in this field. AT&T is the nation's leader when it comes to expansion of Gigibit networks, with current plans to cover up to 100 cities and municipalities. CenturyLink has announced it is going to make Gigibit service available in 16 cities, and virtually every telephone company, large and small, urban and rural, is engaged in fiber upgrades. But we all recognize that more needs to be done. So, today, we invite the Commission to innovate with us. We offer a set of reforms that will establish an improved policy environment for innovation, investment, competition, and consumer choice.

We appreciate your consideration, and look forward to working with you in the weeks ahead.

Sincerely,

R. Steven Davis
Chairman of the Board

Walter B. McCormick, Jr.
President & CEO

Cc: Commissioner Mignon Clyburn
Commissioner Jessica Rosenworcel
Commissioner Ajit Pai
Commissioner Michael O'Rielly
Ruth Milkman
Jonathan Sallet
Daniel Alvarez
Rebekah Goodheart
Nick Degani
Priscilla Argeris
Patrick Halley
Amy Bender
Julie Veach

[5] *Ibid*, Page 5.
[6] *USTelecom Broadband Industry Stats: U.S. IP Traffic, 2013-18,* at http://www.ustelecom.org/broadband-industry/broadband-industry-stats/internet-usage/us-ip-traffic (visited September 18, 2014) and *Cisco Visual Networking Index* at http://www.ciscovni.com/forecast-widget/advanced.html (visited September 18, 2014).
[7] *Ibid.*
[8] *Net Effects: The Past, Present, and Future Impact of Our Networks,* FCC Chairman Tom Wheeler, December 2, 2013, Page 26.

REDACTED – FOR PUBLIC INSPECTION

Before the
FEDERAL COMMUNICATIONS COMMISSION
Washington, D.C. 20554

In the Matter of	)	
	)	
Petition of USTelecom for Forbearance Pursuant	)	WC Docket No. _____
to 47 U.S.C. § 160(c) from Obsolete ILEC	)	
Regulatory Obligations that Inhibit Deployment of	)	
Next-Generation Networks	)	

PETITION FOR FORBEARANCE OF THE UNITED STATES TELECOM ASSOCIATION

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October 6, 2014

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Before the
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PETITION FOR FORBEARANCE OF THE UNITED STATES TELECOM ASSOCIATION

Pursuant to Section 10 of the Communications Act of 1934 and Sections 1.53 and 1.54 of the Commission's rules,[1] the United States Telecom Association ("USTelecom") petitions the Commission for forbearance from various outdated regulatory requirements applicable to incumbent local exchange carriers ("ILECs"), as detailed below.[2] The relief requested will

[1] 47 U.S.C. § 160 ("Section 10"); 47 C.F.R. §§ 1.53, 1.54.

[2] Pursuant to Section 1.54 of the Commission's rules, 47 C.F.R. § 1.54, the specific requirements from which USTelecom seeks forbearance, as well as a list of pending proceedings in which USTelecom has taken a position regarding relief that is identical to, or comparable to, the relief sought in this Petition, are set forth in Appendix A. As noted in Appendix A and as discussed below, in some cases forbearance is requested for all ILECs subject to the rules, while in other cases, forbearance is requested only for: (1) those ILECs operating under price cap regulation at the federal level; (2) those ILECs operating under rate-of-return regulation at the federal level; or (3) those ILECs that are Bell Operating Companies (also referred to throughout as Regional Bell Operating Companies, or "RBOCs"), that have not previously been granted forbearance. Granting forbearance relief to broad classes of carriers is expressly contemplated by Section 10 and is consistent with Commission precedent. *See* 47 U.S.C. § 160(a) (providing for forbearance from "applying any regulation or any provision of the Act to a . . . class of telecommunications carriers or telecommunications services"); *United States Telecom Ass'n Petition for Forbearance Under 47 U.S.C. § 160(c) from Enforcement of Certain Legacy Telecommunications Regulations*, Order, 28 FCC Rcd 2605, 2608 ¶ 7 (2013) ("Where the section 10 forbearance criteria are met based on factors common to an entire class, it would be less consistent with the goal of establishing a 'a pro-competitive, deregulatory *national* policy framework' and would place a greater burden on both the industry and on agency resources to . . . require individual

promote the deployment of next-generation high-speed networks and fulfill the Commission's core goals of expanding infrastructure investment and increasing competition for services that have become central to Americans' daily lives.

I. INTRODUCTION AND EXECUTIVE SUMMARY

USTelecom is pleased to file this Petition, which offers the Commission a unique opportunity to make significant strides toward its goal of promoting the deployment of, and competition among, next-generation networks.

A. Forbearance From Outdated ILEC-Specific Legacy Regulation Would Promote Broadband Deployment and Competition

Several weeks ago, in remarks delivered at "1776: Where Revolutions Begin," Chairman Wheeler emphasized that "high-speed connections are crucial not only for the kind of innovation that will educate our children and deliver quality health care, but also improve energy efficiency, fill the employment ranks, and maintain the United States as the world's innovation leader for the 21st Century."[3] He further noted that "competition is the most effective tool for driving innovation, investment, and consumer and economic benefits," and lamented the lack of extensive competition for the provision of broadband service at high speed tiers.[4] He noted that cable companies provide "the overwhelming percentage" of higher-speed connections, and

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carriers within a class . . . to . . . file their own petitions seeking identical relief for identical reasons.").

[3] Tom Wheeler, Chairman, FCC, Prepared Remarks at 1776 Headquarters, Washington, D.C., *The Facts and Future of Broadband Competition* at 2 (Sept. 4, 2014), *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0904/DOC-329161A1.pdf.

[4] *Id.* at 1.

asserted that "only fiber gives the local cable company a competitive run for its money."[5] Cable companies are also successful competitors for voice services. For example, the combined Comcast and Time Warner Cable would be the second largest voice service provider in the United States upon completion of their merger. Finally, Chairman Wheeler emphasized the Commission's commitment to promoting additional competition, stating that "where greater competition can exist, [the Commission] will encourage it."[6]

One key barrier to the deployment of new fiber facilities – and thus to the rise of competition in the provision of service at the speeds the Chairman discussed in his 1776 speech – is the continued application of legacy regulatory requirements to a subset of wireline telecommunications providers, the ILECs, that divert substantial resources away from such next-generation networks. While cable, wireless, and competitive fiber providers are free to focus their expenditures on next-generation networks suited to delivering higher-speed services, ILECs must direct a substantial portion of their expenditures to maintaining legacy networks and fulfilling regulatory mandates whose costs far exceed any benefits. Indeed, the Chairman stated in February that, "[d]ue in part to outdated rules, the majority of the capital investments made by U.S. telephone companies from 2006 to 2011 went toward maintaining the declining telephone network, despite the fact that only one-third of U.S. households use it at all."[7] And more than four years ago, the Administration's *National Broadband Plan* warned of the adverse impact of

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[5] *Id.* at 3, 5.

[6] *Id.* at 6.

[7] Tom Wheeler, Chairman, FCC, Prepared Remarks at Silicon Flatirons, University of Colorado Law School, Boulder, Colorado at 5 (Feb. 10, 2014) ("Silicon Flatirons Address"), *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2014/db0210/DOC-325531A1.pdf.

carryover regulations from the 20th Century that require telephone companies, and telephone companies alone, to continue to invest in antiquated services and technology:

> Regulations require certain carriers to maintain POTS – a requirement that is not sustainable – and lead to investments in assets that could be stranded. These regulations can have a number of unintended consequences, including siphoning investments away from new networks and services.[8]

As one industry analyst has written, "[t]he least-regulated platforms – Internet, cable, and wireless – are the most successful, because they have been free to innovate and to invest their capital efficiently."[9] In short, investment resources are finite, and continuing to require irrational expenditures in legacy networks will lead to stranded investment at the expense of new technologies.

This Petition is intended to present the Commission with a concrete agenda for allowing ILEC investment to be redirected away from legacy, narrowband, copper-based telephone networks and toward the deployment of next-generation facilities, thereby enhancing competition in the provision of truly high-capacity services and enhancing the nation's communications infrastructure. USTelecom respectfully asks the Commission to forbear, under Section 10 of the Communications Act,[10] from applying a collection of badly outdated provisions

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[8] FCC, *Connecting America: The National Broadband Plan* at 59 (Mar. 2010), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-296935A1.pdf ("*National Broadband Plan*").

[9] Anna-Maria Kovacs, *Telecommunications Competition: The Infrastructure-Investment Race*, at 1 (Oct. 8, 2013), ("*Kovacs 2013 Telecommunications Competition Paper*"), attached to letter from Rick Boucher, Hon. Chairman, Internet Innovation Alliance, to Marlene H. Dortch, Secretary, FCC, GN Dkt. 12-353 *et al.* (Nov. 29, 2013), *available at* http://internetinnovation.org/images/misc_content/study-telecommunications-competition-09072013.pdf.

[10] 47 U.S.C. § 160.

that apply only to wireline ILECs, even though these providers now serve a small minority of all lines in service. These requirements drain resources and no longer do anything to promote competition or protect consumers. They force ILECs to dedicate resources to the configuration of their legacy telephone networks rather than investing those resources in the high-speed networks Chairman Wheeler discussed at the 1776 conference. Relief from these obligations will free resources to be used in ways that promote real competition and advance the public interest.

Forbearance is one of the key tools Congress provided the Commission to promote broadband deployment. Section 706(a) of the Telecommunications Act of 1996, for example, directs the Commission to "encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans … by utilizing … [*inter alia*] regulatory forbearance … or other regulating methods that remove barriers to infrastructure investment."[11] Last year, moreover, the Commission endorsed the principle "that eliminating unnecessary regulation will generally reduce providers' costs and, in turn, benefit consumers through lower rates and/or more vibrant competitive offerings."[12] Here, the Commission should

[11] 47 U.S.C. § 1302(a). *See also Framework for Broadband Internet Service*, Notice of Inquiry, 25 FCC Rcd 7866, 7895 ¶ 69 (2010) ("In recognition of the need to tailor the Commission's policies to evolving markets and technologies, Congress gave the Commission in 1996 the authority and responsibility to forbear from applying provisions of the Communications Act when certain criteria are met, and specifically directed the Commission to use this new power to 'encourage the deployment on a reasonable and timely basis of advanced telecommunications capability to all Americans.'").

[12] *Petition of USTelecom for Forbearance Under 47 U.S.C. § 160(c) from Enforcement of Certain Legacy Telecommunications Regulations*, Memorandum Opinion and Order and Report and Order and Further Notice of Proposed Rulemaking and Second Further Notice of Proposed Rulemaking, 28 FCC Rcd 7627, 7651 ¶ 41 (2013). The portion of this order resolving USTelecom's forbearance petition will be cited throughout as *USTelecom Forbearance Order*,

use its broad forbearance authority as Congress intended, in furtherance of Chairman Wheeler's stated goal of reforming "the regulatory model that developed around the realities of the 20th Century" to meet the needs of "a marketplace [that is] far different from that" – the one that exists today.[13]

B. The Requirements From Which this Petition Seeks Forbearance Are Just Some of the Many Outdated Regulations that Should be Updated

This Petition addresses just a subset of the disparate regulations that apply only to ILECs and impede infrastructure investment and competition. Forbearance from those obsolete regulations would eliminate some of these legacy impediments. But either through additional proceedings or, in the longer term, through an update of the Communications Act, further regulatory parity is warranted and necessary to reflect today's realities. The requirements this Petition addresses include:

- Outdated provisions in Sections 271 and 272, and the related equal access rules;
- Rule 64.1903 structural separation requirements;
- The requirement that an ILEC provide an unbundled 64 kbps voice channel where it has replaced a copper loop with fiber;
- Section 214(e)(1) eligible telecommunications carrier ("ETC") requirements where a price cap carrier does not receive high-cost universal service support;
- The remaining *Computer Inquiry* rules;

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28 FCC Rcd at 7630-7709 ¶¶ 1-187. The portion requesting comments on possible revisions to Section 64.1903 of the Commission's rules will be cited *Second FNPRM*, 28 FCC Rcd at 7720-36 ¶¶ 211-43.

[13] Tom Wheeler, *Net Effects: The Past, Present and Future Impact of our Networks*, at 20 (Nov. 26, 2013) ("*Net Effects*"), *available at* http://transition.fcc.gov/net-effects-2013/NET_EFFECTS_The-Past-Present-and-Future-Impact-of-Our-Networks.pdf.

- The Section 224 and 251(b)(4) requirement that ILECs share newly deployed entrance conduit; and
- Rules prohibiting the use of contract tariffs to offer special access and high capacity data services in the absence of pricing flexibility.

Forbearance from these requirements will in each case satisfy the specific statutory criteria. Section 10(a) directs the Commission to forbear from applying a statutory provision or regulation to a telecommunications carrier or telecommunications service if "(1) enforcement of such regulation or provision is not necessary to ensure that the charges, practices, classifications, or regulations by, for, or in connection with that telecommunications carrier or telecommunications service are just and reasonable and are not unjustly or unreasonably discriminatory; (2) enforcement of such regulation or provision is not necessary for the protection of consumers; and (3) forbearance from applying such provision or regulation is consistent with the public interest."[14]

Section 10(b) further requires that in determining whether forbearance is "consistent with the public interest," the Commission "shall consider whether forbearance from enforcing the provision or regulation will promote competitive market conditions, including the extent to which such forbearance will enhance competition among [telecommunications] providers."[15] These conditions are satisfied for each of the above requirements, and forbearance will affirmatively benefit consumers by promoting competition and deployment of the next-generation network facilities that are most essential to our nation's continued economic growth and prosperity.

[14] 47 U.S.C. § 160(a).

[15] *Id.* § 160(a)(3), (b).

C. The Marketplace Has Shifted Away From the 20th Century Regulatory Model, and the ILECs' Role in the 21st Century is Far Different

Forbearance here will unleash many benefits for the American public, and there is no reason to believe that forbearance will impose any corresponding harms. The regulations at issue were designed for a one-wire, fixed, narrowband world, in which ILECs were presumed to exercise exclusive control over bottleneck facilities and in which regulators, in turn, were compelled to implement and enforce a web of mandates designed to curb ILEC power. That marketplace no longer exists. Communications have shifted decisively away from fixed, narrowband connections and toward new technologies, including mobile wireless service, Voice over Internet Protocol ("VoIP"), and multi-functional broadband offerings that render voice service just one application among many.

Fixed broadband subscriptions from telecommunications, cable, satellite, and fixed wireless providers have grown from seven million at the end of 2000 to 94 million as of mid-2013.[16] Mobile broadband subscriptions from multiple national and regional wireless providers have grown from three million at the end of 2005 to 181 million as of mid-2013.[17] From 2000 to 2013, U.S. IP traffic has grown by a factor of 420 from 432 petabytes per year, or the equivalent

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[16] *Compare* Industry Analysis Div., FCC, *High Speed Services for Internet Access: Status as of December 31, 2000* at Table 1 (Aug. 2001), *available at* http://transition.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/hspd0801.pdf, *with* Industry Analysis and Technology Div., FCC, *Internet Access Services: Status as of June 30, 2013* at Table 1 (June 2014) ("*Mid-2013 Internet Access Report*"), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-327830A1.pdf.

[17] *Compare* Industry Analysis and Technology Div., FCC, *Internet Access Services: Status as of December 31, 2009* at Table 1 (Dec. 2010), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-303405A1.pdf, *with Mid-2013 Internet Access Report* at Table 1.

of 100 million DVDs, to 182 exabytes per year, or the equivalent of 42 billion DVDs.[18] Internet traffic is expected to grow another two and a half times by 2018 to 444 exabytes per year, or the equivalent of approximately 100 billion DVDs.[19] Rather than having a single "network of record" – the PSTN – the 21st Century's communications infrastructure is a "network of networks."

Amidst this sea change, ILEC voice market shares have fallen precipitously. As of June 2013, ILECs served a total of about 78.5 million switched and VoIP access lines – *just 44 percent* of the 178 million they served at the end of 2000.[20] Traditional switched lines had fallen to 70.5 million by June 2013, or only 40 percent of lines served at the end of 2000.[21] By the end of 2012, virtually 100 percent of all U.S. households were located in Zip Codes with at least one non-ILEC interconnected VoIP provider, and 92 percent were in Zip Codes with ten or more

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[18] USTelecom, *Estimated Internet Protocol Traffic 1990-2013 available at* http://www.ustelecom.org/broadband-industry/broadband-industry-stats/internet-usage/estimated-us-ip-traffic (last visited Sept. 30, 2014) (citing Cisco Visual Networking Index).

[19] Cisco Visual Networking Index (VNI), *VNI Forecast Widget Advanced Editor, available at* http://www.ciscovni.com/forecast-widget/advanced.html (last visited Sept. 30, 2014). Cisco data show 15,162 petabytes per month in 2013 growing to a projected 37,018 petabytes per month in 2018. We convert to exabytes per year by dividing by 1,000 and multiplying by 12.

[20] *Compare* Industry Analysis and Technology Div., FCC, *Local Telephone Competition: Status as of June 30, 2009* at 12, Table 1 (Sept. 2010) ("*2009 Local Telephone Competition Report*"), *available at* https://prodnet.www.neca.org/publicationsdocs/wwpdf/9310fccreport.pdf, *with* Industry Analysis and Technology Div., FCC, *Local Telephone Competition: Status as of June 30, 2013* at 12, Table 1 (June 2014) ("*Mid-2013 Local Telephone Competition Report"*), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-327830A1.pdf.

[21] *Compare 2009 Local Telephone Competition Report* at 12, Table 1, *with Mid-2013 Local Telephone Competition Report* at 5, Figure 4.

such providers.[22] The Commission's most recent local telephone competition report found that, as of June 30, 2013, there were 45 million interconnected VoIP subscriptions, including more than 36 million residential interconnected VoIP subscriptions.[23] Interconnected VoIP accounted for 47 percent of residential fixed voice connections, with non-ILEC VoIP lines accounting for 38 percent and ILEC VoIP accounting for 9 percent.[24] From the end of 2008 to mid-2013, non-ILEC VoIP lines grew by 16 million, from 21 million to 37 million.[25]

That report also found that there were eight states where non-ILECs had more wired telephone lines (switched access or VoIP) than ILECs.[26] In an additional 10 states, non-ILECs had 45 percent to 50 percent of the wired voice connections.[27] Moreover, ILECs continue to lose access lines and associated revenues overall, even after accounting for customers who migrate to their IP-based offerings.[28] And even this data does not account for non-interconnected VoIP services such as Skype, which reported approximately 25 million connected U.S. users as of

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[22] Industry Analysis and Technology Div., FCC, *Local Telephone Competition: Status as of December 30, 2012* at 30, Table 20 (Nov. 2013), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-324413A1.pdf. The most recent Commission report, the *Mid-2013 Local Telephone Competition Report*, does not include the corresponding tables describing non-ILEC availability by zip code.

[23] *See Mid-2013 Local Telephone Competition Report* at 5, Figure 4.

[24] *Id.*

[25] *Id.* at 15, Table 4.

[26] *Id.* at 20, Table 9.

[27] *Id.*

[28] *See, e.g.*, *Grading the Top 13 Wireline Service Providers in Q3 2013*, FierceTelecom, (Nov. 14, 2013), *available at* http://www.fiercetelecom.com/special-reports/grading-top-13-wireline-service-providers-q3-2013.

December 2010,[29] or for the ability to communicate over long distances via text messaging, e-mail, or social networks, or the emergence of other converged communications services offering various combinations of voice, text, and video, such as iMessage, Snapchat, Viber, and WhatsApp.[30]

The rise of mobile communications has had perhaps an even greater impact than the advent of interconnected VoIP. According to the Commission's most recent wireless competition report, "approximately 97 percent of the U.S. population is covered by the networks of at least three mobile voice providers, close to 93 percent is covered by the networks of at least four mobile voice providers, and about 80 percent is covered by five."[31] The FCC reports that there were 305,742,000 wireless voice connections in the U.S. as of mid-2013. This figure is more than double the number of in-service access lines as of mid-2013.[32]

As Dr. Kevin Caves observes in his attached Declaration, "[m]easured as a proportion of end-user switched access lines, interconnected VoIP subscriptions, and mobile wireless subscriptions, ILECs' aggregate market share fell from 60.5 percent to 18.5 percent" from 2000 to 2012,[33] and ILEC fixed access lines accounted for *less than 18 percent* of the voice market as

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[29] *See* Declaration of Dr. Kevin Caves ¶ 13 (Oct. 6, 2014), attached as Appendix B ("Caves Decl.").

[30] *See id.*

[31] *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993*, Sixteenth Report, 28 FCC Rcd 3700, 3747 ¶ 45 (2013).

[32] *See Mid-2013 Local Telephone Competition Report* at 3, Figure 2 (reporting 135,127 retail access lines in service, including interconnected VoIP lines).

[33] Caves Decl. ¶ 12, attached as Appendix B.

of mid-2013.[34] Moreover, National Health Interview Survey data show that the proportion of U.S. households using wireless voice service in lieu of a landline connection reached 41 percent by the second half of 2013,[35] and about 34 percent of all households with both landline and wireless connections mostly relied on their wireless service.[36] The cut-the-cord phenomenon is prominent across geographic areas and demographic groups.[37] Even the poor and elderly – traditionally presumed to be particularly dependent on land lines – have been transitioning to mobile service.[38]

As Professor John Mayo concludes in his attached Declaration, "[t]he past ten years have witnessed a complete dismantling of one-hundred years of loyalty by Americans to wireline voice telephone service."[39] This shift has dramatically reshaped the competitive landscape. Professor Mayo notes that "[t]oday . . . a plethora of data and analysis reveal that wireless

[34] This figure reflects the 78,537,000 ILEC access lines and VoIP connections listed in the *Mid-2013 Local Telephone Competition Report* at 12, Table 1, the 56,590,000 non-ILEC access lines listed in that report, and the 305,742,000 wireless accounts reported by FCC as of mid-2013. *See also* Caves Declaration ¶¶ 10, 12.

[35] *See* Caves Decl. ¶ 26. *See also* Declaration of Professor John Mayo at ¶ 16 (Oct. 6, 2014) ("Mayo Decl.") (reporting cut-the-cord rate of almost 42 percent based on independent research), attached as Appendix C.

[36] *See* Caves Decl. ¶ 28.

[37] *See id.* ¶ 22.

[38] *See* Mayo Decl. ¶¶ 17-26.

[39] *Id.* ¶ 6.

services present a substantive, viable and economically constraining influence on the behavior of wireline telephone providers."[40]

When taking into account both cord-cutting and landline alternatives, just one-third of U.S. households rely on switched or VoIP service from an ILEC[41] and barely one-quarter rely on traditional switched service from an ILEC.[42] As Dr. Caves concludes, wireless voice service has evolved into a competitive alternative to wireline service, and ILEC wireline voice prices are disciplined by a range of competitive alternatives, including wireless telephony, cable voice, over-the-top VoIP, and offerings from competitive local exchange carriers ("CLECs").[43]

The market for high-capacity dedicated "Business Data Services" – defined here as tariffed TDM special access (DS0 and above) and enterprise broadband services – also is strongly competitive, with the rise of cable, CLECs, and other alternative providers driven by burgeoning demand for Internet-based and higher capacity wireless services. ILECs hold no privileged position in this market, and they face stiff competition from cable MSOs, wireless providers, CLECs and others. According to the Commission's latest *Local Competition Report*, from December 2008 through June 2013, ILEC business line counts declined by approximately

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[40] *Id.* ¶ 36.

[41] *See* Caves Decl. ¶ 27.

[42] Patrick Brogan, USTelecom, *Growing Voice Competition Spotlights Urgency of IP Transition*, Research Brief, at 1-3 (Nov. 22, 2013) (26 percent of U.S. households projected to be served by ILEC switched landline voice service by the end of 2013), *available at* http://www.ustelecom.org/sites/default/files/documents/111813-voice-comp-research-brief.pdf ("*Research Brief*"); Letter from Jonathan Banks, Sr. VP, Law & Policy, USTelecom, to Marlene Dortch, Secretary, FCC, at 1, WC Dkt. No. 10-90 (filed Dec. 5, 2013) (same) ("*Banks Letter*").

[43] *See* Caves Decl. at ¶ 2.

12.5 million, for a loss of 27 percent.[44] Over this same interval, non-ILEC business line counts grew by approximately 5.4 million.[45] In all, more than 30 providers – most of them non-ILECs – offer enterprise broadband services nationally or to large areas of the country. Indeed, as of mid-2013, the third-largest provider of U.S. business Ethernet services was a CLEC, tw telecom.[46]

Cable providers are particularly well poised to win increasing shares of the Business Data Services market.[47] In their most recent earnings reports, for example, Comcast reported 22.4 percent year-over-year growth in its quarterly business service revenues,[48] Time Warner Cable reported 22.3 percent growth,[49] and Charter reported 19.0 percent growth.[50] Cable's strength in this sector will only be enhanced by developments such as the proposed Comcast/Time Warner Cable merger. In the Application the companies filed with the Commission, they highlighted the ways in which the combined company's greater geographic scale and other benefits stemming

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[44] *Id.* ¶ 15.

[45] *Id*.

[46] Press Release, Vertical Systems Group, *Mid-Year 2013 U.S. Carrier Ethernet Leaderboard* (Aug. 20, 2013).

[47] Caves Decl. ¶¶ 16-18.

[48] *See* Comcast, *Comcast Reports 2nd Quarter 2014 Results* (July 22, 2014), *available at* http://www.cmcsa.com/releasedetail.cfm?ReleaseID=861091.

[49] *See* Press Release, Time Warner Cable, *Time Warner Cable Reports Second Quarter 2014 Results* at 2 (July 31, 2014), *available at* http://ir.timewarnercable.com/files/2014%20Earnings/2Q14/Q2%202014%20TWC%20Earnings%20Release%20FINAL.pdf.

[50] *See* News Release, Charter Communications, *Charter Announces Second Quarter 2014 Results: Strategic Initiatives and Investment Delivering Intended Results*, at 1 (July 31, 2014), *available at* http://phx.corporate-ir.net/External.File?item=UGFyZW50SUQ9MjQ0OTY0fENoaWxkSUQ9LTF8VHlwZT0z&t=1

from the merger will make it a stronger competitor in the provision of high-capacity Business Data Services.[51]

Likewise, ILECs are not dominant in the provision of long-distance service, leaving aside whether that is even still a meaningful way to classify services in today's all-distance world. The Commission declared legacy AT&T non-dominant in the long-distance market decades ago, and the Commission has since confirmed that no provider is dominant in the provision of long-distance service.[52] Indeed, the stand-alone market for long-distance service has collapsed, with customers taking long-distance service that comes bundled with their local telephone service in the vast majority of cases.[53] As noted in the Caves Declaration, "[c]ompetition from wireless carriers, VoIP operators, and other sources have rendered the distinction between local and long distance calling increasingly obsolete."[54]

Under these circumstances, there is no reason for the Commission to short-change its pro-deployment, pro-competition goals by declining to forbear from the regulations at issue here. As Chairman Wheeler observed earlier this year, "the elimination of circuit-switched monopoly markets certainly obviates the need for old monopoly-based regulation of that technology."[55]

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[51] *See* Comcast/Time Warner Cable Public Interest Statement at 90-97, MB Dkt. No. 14-57 (Apr. 9, 2014).

[52] *See Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements*, Report and Order and Memorandum Opinion and Order, 22 FCC Rcd 16440 (2007) ("*Section 272 Sunset Order*").

[53] *See* Caves Decl. ¶¶ 91-93.

[54] *Id.* ¶ 91.

[55] *Net Effects* at 20.

The forbearance sought herein promises to direct additional resources toward the high-speed networks of tomorrow, heralding an era of further increases in competition for truly high-speed broadband services. This result will further the core objectives articulated by Chairman Wheeler and the Commission. USTelecom is pleased to play a role in ensuring the further development of robust broadband competition, and looks forward to working with the Commission on these issues.

II. THE COMMISSION SHOULD FORBEAR FROM ENFORCING OUTDATED PROVISIONS IN SECTIONS 271 AND 272 AND RELATED OBLIGATIONS, AS WELL AS THE LEGACY EQUAL ACCESS RULES

The remaining obligations of Sections 271 and 272, as well as the Commission's equal access rules, are either moot or irrelevant to today's marketplace. Section 271 has been fully implemented in every RBOC region, Section 272 has largely sunset, and the market-opening mission of those provisions has been accomplished. But the Performance Assurance Plans ("PAPs") that Section 271 spawned remain a costly burden unnecessary in today's marketplace. The local markets that Section 271 and those Plans were designed to open to competition have long been open to competition, and those provisions have lost their relevance. In order to eliminate barriers to infrastructure investment and competition, the Commission should forbear from applying Sections 271 and 272 and should send a strong signal that the PAPs are no longer needed. Similarly the Commission should forbear from applying the equal access requirements, which predated the 1996 Act but were preserved by Section 251(g). Equal access requirements are irrelevant to today's highly competitive, bundled, all-distance services.

A. The World Contemplated in Sections 271 and 272 Has Disappeared

The regime established for RBOC entry into long distance services under Sections 271 and 272 of the Act rests on presumptions regarding market structure that no longer reflect

realities, and imposes archaic, irrelevant obligations. Under Sections 271 and 272, enacted as part of the Telecommunications Act of 1996, an RBOC could enter the long distance market in its home region only if the RBOC could demonstrate that its local markets were sufficiently "open to competition,"[56] under criteria set forth in Section 271, and only through a structurally separate affiliate meeting the requirements of Section 272.[57] Although Section 271's local market-opening mission has been accomplished, its remaining requirements are embodied in the statutory "competitive checklist" set out in Section 271(c)(2)(B), much of which is duplicative of other provisions of the Act.

Section 272 was intended to protect the emerging competitive long distance market by erecting safeguards separating the RBOCs' in-region interLATA services from their local exchange and access operations.[58] Although most of the provisions of Section 272 have sunset,[59] there remain obligations originally intended to protect long distance competition from supposed RBOC "market power with respect to in-region, long distance services."[60] The sole purpose of these requirements was to protect long distance competition in a world that assumed the need for separate local and long distance services and providers.

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[56] *Application by Qwest Communications International Inc., for Authorization To Provide In-Region, InterLATA Services in Minnesota*, Memorandum Opinion and Order, 18 FCC Rcd 13323, 13359 ¶ 67 (2003) ("*Qwest Minn. Section 271 Order*").

[57] 47 U.S.C. §§ 271, 272; *Application by Bell Atl. N.Y. for Authorization under Section 271 of the Communications Act to Provide In-Region, InterLATA Serv. in the State of N.Y.*, Memorandum Opinion and Order, FCC Rcd 3953, 3956 ¶ 3 (1999) ("*Bell Atlantic NY Section 271 Order*").

[58] *See Section 272 Sunset Order*, 22 FCC Rcd at 16444-45 ¶¶ 7-8.

[59] *See id.* at 16447 ¶12.

[60] *Id.* at 16450 ¶19.

Today's voice communications marketplace bears little resemblance to the market that existed when Congress enacted Sections 271 and 272. As discussed above, the market for voice services has been blown wide "open to competition" – the standard for entry under Section 271[61] – and has expanded beyond traditional wireline services. To the extent consumers seek voice alternatives to ILEC services, they look completely outside of ILEC telecommunications networks – to wireless service providers that serve nearly 90 percent of all households[62] and invariably treat each minute of service the same way irrespective of the distance the call travels, to cable companies and other non-ILEC providers that in many states have now surpassed ILEC voice subscriber counts for the remaining households that still purchase landlines,[63] and to over-the-top broadband applications, many of which impose only minimal charges (if any) for providing long distance voice service.

In 2007, the Commission recognized that "intermodal competition between wireline services and services provided on alternative service platforms, such as facilities-based VoIP and mobile wireless, has been increasing and is likely to continue to increase."[64] As discussed above,

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[61] *Qwest Minn. Section 271 Order*, 18 FCC Rcd at 13359 ¶ 67.

[62] Stephen J. Blumberg and Julian V. Luke, Centers for Disease Control (CDC), *Wireless Substitution: Early Release of Estimates from the National Health Interview Survey, July–December 2013*, at 5, Table 1 (July 2014), *available at* http://www.cdc.gov/nchs/data/nhis/earlyrelease/wireless201407.pdf ("*CDC Second Half 2013 Wireless Report*").

[63] According to the FCC's *Mid-2013 Local Competition Report*, as of mid-2013, non-ILECs served more than 50 percent of landlines in eight states representing about 17 percent of all landlines in the U.S. In an additional ten states, non-ILECs served between 45 and 50 percent of all landlines. Non-ILECs served more than 40 percent of landlines in 27 states representing 55 percent of all landlines in the U.S.

[64] *Section 272 Sunset Order*, 22 FCC Rcd at 16455-56 ¶ 27.

subsequent data has borne out the Commission's prediction. The impact of this competition on the ILECs cannot be overstated. Today, RBOC access line counts continue to shrink along with long-distance minutes of use placed from landlines, while the line counts of other providers continue to grow. Total ILEC retail switched access lines have fallen by 60 percent since the year 2000, from 178 million to 71 million.[65] From the end of 2007 to mid-2013, there were almost 60 million retail switched access lines lost, and the rate of decline was still around 9.5 million per year as of mid-2013.[66]

Interstate switched access minutes of use, the most readily available proxy for interstate long distance traffic, declined from 567 billion in 2000 to 161 billion in 2013, a drop of 72 percent.[67] Interstate switched access minutes declined by 188 billion minutes from 2007 to 2013, and were falling at a rate of 24 billion minutes per year in 2013.[68]

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[65] *Compare 2009 Local Telephone Competition Report* at 12, Table 1, *with Mid-2013 Local Telephone Competition Report* at 16, Table 5. Data reflect all ILECs industry-wide, not just the RBOCs to whom the requested relief would apply. RBOC-specific data are not available consistently over time. Nonetheless, RBOCs trends are likely similar to the industry-wide trends, since they represent the vast majority of lines. In fact, it is likely that RBOCs have seen greater proportionate line losses than the industry as a whole, since the RBOCs on average have experienced a greater degree of competitive entry.

[66] *Compare 2009 Local Telephone Competition Report* at 12, Table 1, *with Mid-2013 Local Telephone Competition Report* at 16, Table 5 (from more than 129,600,000 lines to roughly 80,000,000 lines by mid-2012, and to slightly over 70,500,000 lines by mid-2013.

[67] NECA & USAC Data, Network Usage by Carrier Section, *1999 through 2003*, at Summary Tab, http://transition.fcc.gov/wcb/iatd/neca.html (Year 2000 data); NECA & USAC Data, Network Usage by Carrier Section, *2009 through 2013*, at Tab 1, http://transition.fcc.gov/wcb/iatd/neca.html (Year 2013 data) ("NECA 2013 Data"). This data provides a reasonable proxy for the proportionate change in long distance traffic because long distance providers must purchase switched access to originate and terminate long distance calls. Of course, interstate access minutes only reflect a subset of long distance minutes since some calls are intrastate long distance. Unfortunately, intrastate long distance usage data are not readily available. Like access line data, these minutes of use data reflect industry-wide ILEC

Moreover, the separate local and long distance marketplaces envisioned in Sections 271 and 272 have largely disappeared. As the Commission recognized almost a decade ago, "long distance service purchased on a stand-alone basis is becoming a fringe market."[69] Ubiquitous, distance-agnostic voice services are widely available, and customers have shifted to a wide variety of all-distance alternatives. From the consumer's perspective, a minute of service is a minute of service, regardless of the technology platform used by the provider. In 2007, the Commission found that "a majority of consumers purchase local and long distance services from a single provider today," and that "this percentage has been increasing over time."[70] Recognizing the explosion of intermodal options, the Commission noted at that time that "competition is increasingly occurring between bundled offerings, rather than between a bundled package offered by an intermodal competitor and stand-alone local and long distance services offered by incumbent LECs."[71]

These trends have only continued since then. The notion of separate ILEC customer local and long distance voice markets is obsolete. As of June 30, 2013, ILEC lines represented

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totals, since it was not possible to isolate RBOC data consistently over time. Also, unlike the access line data, these are full-year data, rather than mid-year. To make a year-end comparison, one could estimate year-end access lines, based on recent trends, in which case ILEC access lines would have fallen by more than 4.5 million to about 66 million, or approximately 63 percent of year-end 2000 levels by year-end 2013.

[68] NECA 2013 Data at Tab 1; NECA & USAC Data, Network Usage by Carrier Section, *2006 through 2010*, at Tab 1, http://transition.fcc.gov/wcb/iatd/neca.html.

[69] *SBC Communications Inc. and AT&T Corp. Applications for Approval of Transfer of Control*, Memorandum Opinion and Order, 20 FCC Rcd 18290, 18342 ¶ 91 (2005) ("*SBC-AT&T Order*").

[70] *Section 272 Sunset Order*, 22 FCC Rcd at 16455 ¶ 26.

[71] *Id.* at 16455-56 ¶ 27.

only 18 percent of voice connections – 16 percent switched and 2 percent interconnected VoIP.[72] Because of these trends, it is necessarily true that a vast majority of voice customers do not presubscribe to a stand-alone long distance service.[73] For example, in 2013 **[BEGIN CONFIDENTIAL]** ■ **[END CONFIDENTIAL]** percent of RBOC lines were presubscribed to a long distance provider and, among those presubscribed lines, only about **[BEGIN CONFIDENTIAL]** ■ **[END CONFIDENTIAL]** percent were presubscribed to an independent long distance provider.[74] As Dr. Caves explains, because "ILEC lines accounted for only about 18 percent of voice connections in 2013, the overall share of voice connections that were ILEC lines presubscribed to stand-alone long distance carriers can be estimated at approximately . . .**[BEGIN CONFIDENTIAL]** ■ **[END CONFIDENTIAL]** percent."[75]

Thus, the closed local markets that Section 271 was designed to open have long been open, and the competition in the long distance marketplace that Sections 271 and 272 were designed to encourage has exploded. Today, the separate local and long distance marketplaces have all but disappeared and have been replaced by a multi-technology, bundled, all-distance competitive free-for-all.[76] The vast expansion in competitive alternatives to ILEC services has

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[72] *Mid-2013 Local Telephone Competition Report* at 5, Figure 4, and 29, Table 18. Sixty-nine percent of connections were wireless, and the rest were interconnected VoIP. For purposes of this analysis, ILEC interconnected VoIP connections are treated as "presubscribed" to the ILEC.

[73] Caves Decl. ¶ 92.

[74] *Id*. For purposes of this analysis, the term "RBOC lines" includes all of the lines of independent ILECs affiliated with RBOCs.

[75] *Id.*

[76] *Id.* ¶ 93.

brought with it intense competition in the all-distance market that is rapidly replacing the stand-alone local and long distance markets. All of the alternative technologies – wireless, VoIP and cable – provide bundled all-distance service packages that do not rely in any way on ILEC local facilities.

Notwithstanding drastic changes in the marketplace, ILECs alone – the RBOCs, in the case of the Section 271/272 requirements, and all ILECs, in the case of the legacy equal access rules – remain subject to various requirements designed to preserve markets that existed 20 years ago but that have long since moved beyond requiring such protections. These include costly obligations to maintain network configurations and access offerings that permit other carriers to originate long distance calls from ILEC customers, as well as redundant obligations aimed at ensuring that ILECs maintain openness in their local markets as a condition for participating in the long-distance market. Given the marginal relevance of stand-alone long-distance service and the widespread competition for all-distance services in today's marketplace, as well as the concomitant irrelevance of ILEC facilities to the vast majority of all-distance competitors and their customers, the Commission should forbear from these redundant and unnecessary requirements.

In today's marketplace, the remaining requirements of Section 271 are either moot or redundant. But the burden of the outdated interconnection and access requirements imposed by these legacy requirements are amplified by the PAPs that the Commission "strongly encourage[d]" states to adopt when RBOCs sought Section 271 authority over a decade ago.[77] These PAPs, which address a dwindling segment of the communications market, impose

[77] *See Bell Atlantic NY Section 271 Order*, 15 FCC Rcd at 4164-65 ¶¶ 429-30.

burdensome recordkeeping and reporting requirements on RBOCs that divert investment away from next-generation network development and product development.

Similarly, the nondiscrimination and imputation requirements of Section 272(e), and related obligations imposed on the RBOCs in the *Section 272 Sunset Order*, no longer serve any purpose. There is no basis for a policy goal of "protecting" the wide-open all-distance marketplace from one set of competitors – RBOCs – simply because of their historical position when any advantage they might have once enjoyed no longer exists. The Commission thus should forbear from enforcing the remaining Section 271 and 272 obligations on RBOCs, as they either are duplicative of other requirements in the Act or are entirely irrelevant to today's competitive market.

The Commission also should forbear from enforcing its legacy equal access requirements, which arose out of the AT&T breakup 30 years ago as a means of counteracting AT&T's pre-existing advantages in providing long distance service through the RBOCs.[78] These requirements, which apply to all ILECs,[79] serve no meaningful purpose in today's market, in which a wide variety of all-distance communications options exist independent of any need for providers to rely on ILEC facilities.

These requirements impose a substantial economic drag on legacy networks without producing commensurate competitive benefits for future networks or consumers. They divert

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[78] *United States v. American Tel. & Tel. Co.*, 552 F. Supp. 131, 195-96 (D.D.C. 1982) ("MFJ"), *aff'd sub nom. Maryland v. United States*, 460 U.S. 1001 (1983).

[79] *MTS and WATS Market Structure Phase III: Establishment of Physical Connections and Through Routes among Carriers*, Report and Order, 100 FCC2d 860, 861 (1985) ("*MTS and WATS*") (subsequent history omitted).

crucial investment dollars from the build out of important next-generation networks, while cable, wireless, over-the-top VoIP and other providers continue to grab market share and invest their resources in next-generation networks and services without similar encumbrances.

B. The Commission Should Forbear From Applying the Remaining Section 271 Obligations

Section 271 is a carrot-and-stick provision designed to provide an incentive for the RBOCs to open their local markets to competition in exchange for permission to offer in-region long distance service.[80] The market-opening stick long ago did its work, but the carrot has shriveled, as competition for all-distance voice service from providers across many platforms has rendered Section 271 itself as anachronistic as stand-alone long distance. With the RBOCs and other ILECs barely hanging on to a small fraction of the total voice marketplace[81] and competitive alternatives similarly taking over the all-distance market, the marketplace that motivated the enactment of Section 271 has disappeared. Indeed, Section 271 has long since outlived its usefulness, the Commission having granted its "last Section 271 application" over a decade ago.[82]

Section 271's remaining requirements are redundant, moot, or unnecessary. But Section 271 remains the underpinning of the state-approved PAPs, which likewise are unnecessary today. The Section 271(c) checklist also imposes burdensome interconnection and access requirements

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[80] *Bell Atlantic NY Section 271 Order*, 15 FCC Rcd at 3956 ¶ 3.

[81] *See Mid-2013 Local Telephone Competition Report* at 5, Figure 4, and 29, Table 18.

[82] *Application by Qwest Communications International Inc. for Authorization To Provide In-Region, InterLATA Services in Arizona*, 18 FCC Rcd 25504, 25505 ¶ 2 (2003). *See also Section 272 Sunset Order*, 22 FCC Rcd at 16447 ¶ 12 (RBOCs have obtained in-region interLATA service authority in all of their regions).

that were intended to open local markets but have been superseded by competitive developments in the marketplace. Forbearance from Section 271 is warranted under the Section 10 standard, and such forbearance from the federal impetus for the PAPs will signal that is also time for them to fade into history.

1. The Remaining Requirements of Section 271 Are Not Necessary to Ensure Just and Reasonable Rates and Practices or to Protect Consumers

When Congress enacted Sections 271 and 272, for most consumers, local voice service was virtually synonymous with traditional, incumbent-provided wireline service. As discussed above, today's voice communications marketplace bears little resemblance to the market Congress designed Section 271 to open up. The robust set of facilities-based competitors renders the Section 271(c) checklist and PAP requirements unnecessary to protect consumers or ensure reasonable local or long distance charges and practices.[83] Because the RBOCs have met the competitive checklist in Section 271(c) and obtained in-region interLATA authority in all of their regions, Section 271(c) has been "fully implemented" "throughout the United States."[84] There is thus no barrier under Section 10(d) of the Act to granting the forbearance requested herein.[85]

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[83] *See* 47 U.S.C. § 160(a)(1), (2).

[84] *Petition for Forbearance of the Verizon Tel. Cos. Pursuant to 47 U.S.C. § 160(c)*, 19 FCC Rcd 21496, 21503 ¶ 15 (2004), *aff'd sub nom., Earthlink, Inc. v. FCC*, 462 F.3d 1 (D.C. Cir. 2006). There are no provisions in Section 271 that currently impose obligations independently of the checklist and other requirements of Section 271(c). *See* 47 U.S.C. § 271(d)(6) (authorizing the Commission to initiate enforcement actions in the case of an RBOC that "has ceased to meet any of the conditions required for . . . approval" under Section 271).

[85] *See* 47 U.S.C. § 160(d) (prohibiting forbearance from Section 271 until it has been "fully implemented").

Moreover, the Section 271(c)(2)(B) competitive checklist items generally consist of redundant requirements that qualifying RBOCs already comply with under various other provisions of the Act, including provisions in Sections 224, 251, and 252, as well as with Commission rules governing number administration and portability. In addition, RBOCs would remain subject to the continuing general obligation to provide service at just, reasonable, and not unreasonably discriminatory rates, terms, and conditions pursuant to sections 201 and 202 of the Act. Those provisions are sufficient to ensure just, reasonable and nondiscriminatory rates and practices and to protect consumers.[86]

2. Forbearance Will Serve the Public Interest by Eliminating Costs and Allowing RBOCs to More Efficiently Invest Their Resources in Modern Networks and Services

Although the Section 271 checklist requirements have been overtaken by events and no longer provide any significant benefits to consumers, they continue to impose significant compliance costs on RBOCs, in particular, the compliance costs associated with the PAPs and the underlying Section 271(c) obligations. The PAPs – which were adopted at the Commission's strong urging[87] – were designed to ensure that RBOCs continued to comply with the Section 271 competitive checklist requirements after receiving authority to provide in-region long distance service. These PAPs remain in effect and contain detailed information collection and reporting requirements on a wide variety of performance metrics, as well as audit and accounting

[86] *See id.* § 160(a)(1), (2).

[87] *See Bell Atlantic NY Section 271 Order* 15 FCC Rcd at 4164-65 ¶¶ 429-30.

requirements and self-executing remedies carrying significant penalties for performance shortfalls.[88]

While USTelecom is not directly seeking forbearance from the PAPs, this Commission should encourage the states to terminate the PAPs once it grants forbearance from Section 271. The PAPs were designed to ensure that an RBOC's "local market will remain open" after the RBOC obtains Section 271 authority and thus "would continue to satisfy the requirements of section 271."[89] If the Commission grants forbearance from the requirements of Section 271, PAPs could no longer be justified as supporting those requirements. Because forbearance from Section 271 would provide a strong basis for relief from the PAPs, the costs of compliance with the PAPs thus support the conclusion that forbearance from the application of the Section 271 checklist requirements would promote competition and further the public interest.

AT&T, Verizon, and CenturyLink estimate that they spend a combined total of over **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** each year on PAP compliance, in addition to millions of additional dollars spent complying with the checklist obligations of Sections 271. These resources could be far more effectively spent on transitioning to modern IP networks and expanding broadband access in the companies' service areas. Focusing these resources on broadband expansion would, among other things, provide consumers with increased access to the variety of over-the-top communications options available in today's marketplace, which would better serve the goal of preserving robust competition than

[88] *See, e.g., Qwest Minn. Section 271 Order*, 18 FCC Rcd at 13361 ¶ 71.

[89] *Bell Atlantic NY Section 271 Order* 15 FCC Rcd at 4164 ¶ 429.

devoting these resources to outdated compliance obligations geared toward preserving a business model customers have rejected.

As the Commission noted in the *USTelecom Forbearance Order*, it has an "obligation to remove costly, overly broad, and outmoded requirements and burdens in response to changes in markets and regulatory needs."[90] In granting conditional forbearance from the cost assignment rules, the Commission found that forbearance would promote competition and thus be consistent with the public interest, explaining that "eliminating unnecessary regulation will generally reduce providers' costs and, in turn, benefit consumers through lower rates and/or more vibrant competitive offerings."[91] Forbearance from the unnecessary and obsolete checklist requirements of Section 271(c) similarly would "enhance competition" by reducing costs,[92] both directly and by providing a basis to eliminate state PAP compliance costs, thereby furthering the public interest.[93]

C. The Commission Should Forbear From Applying the Remaining Section 272 Obligations

As noted above, the Commission recognized almost a decade ago that "long distance service purchased on a stand-alone basis is becoming a fringe market."[94] Also as discussed above, given the large portion of subscribers using intermodal alternatives, only an estimated

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[90] *USTelecom Forbearance Order*, 28 FCC Rcd at 7656 ¶ 55.

[91] *Id*. at 7651 ¶ 41.

[92] *Id.* at 7650 ¶ 41.

[93] *See* 47 U.S.C. § 160(a)(3), (b).

[94] *SBC-AT&T Order*, 20 FCC Rcd at 18342 ¶ 91.

[BEGIN CONFIDENTIAL] ■ **[END CONFIDENTIAL]** percent of all voice connections were ILEC lines presubscribed to an independent long distance provider in 2013. Yet the Section 272 requirements are aimed at preserving this infinitesimal and rapidly declining, anachronistic stand-alone long distance market.

The Commission has determined that RBOCs lack classic market power in the mass-market, enterprise, and wholesale long distance markets.[95] In the *Section 272 Sunset Order*, the Commission nonetheless found that the RBOCs had "failed to present persuasive evidence that they no longer possess exclusionary market power within their regions as a result of their control over ubiquitous telephone exchange service and exchange access networks."[96] Whatever merit that position might have had in 2007, it is clear today that an RBOC cannot exercise exclusionary market power in the face of competition from wireless and VoIP services (including both VoIP services provided by cable companies and over the top VoIP) that do not depend on RBOC facilities. Intermodal competition means that an RBOC cannot "indirectly raise prices of [long distance] services by increasing the price of essential inputs that its rivals need to offer their services."[97]

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[95] *See Section 272 Sunset Order*, 22 FCC Rcd at 16449-51 ¶¶ 17-21, 16465 ¶¶ 47, 49, 16469-70 ¶ 59.

[96] *Id*. at 16473 ¶ 64. *See also id.* at 16487-94 ¶¶ 95-108.

[97] *See id*. at 16446 ¶ 10.

1. The Section 272(e) Obligations Are Not Necessary to Ensure Just, Reasonable and Nondiscriminatory Rates and Practices or to Protect Consumers

A robust set of competitors to the RBOCs renders the remaining Section 272(e) requirements unnecessary to protect consumers or ensure reasonable long distance charges and practices.[98] Most of the Section 272 requirements already have sunset, leaving in place only the requirements of Section 272(e)(1) and (e)(3).[99] These provisions, however, like the Section 271 requirements discussed above, are also in place solely for the purpose of protecting competition in a stand-alone long distance market that no longer exists, and they are no longer relevant given the prevalence of bundled all-distance services. Specifically, Section 272(e)(1) requires that an RBOC "fulfill any requests from an unaffiliated entity for telephone exchange service and exchange access within a period no longer than the period in which it provides such . . . service . . . to itself or to its affiliates," and Section 272(e)(3) requires, in part, that an RBOC "impute to itself . . . an amount for access . . . that is no less than the amount charged to any unaffiliated" long distance carriers "for such service."[100]

RBOCs also remain subject to the special access performance metrics and imputation obligations that the Commission, in the *Section 272 Sunset Order*, imposed as conditions for relief from the previous requirement that RBOC in-region interLATA services be subject to

[98] *See* 47 U.S.C. § 160(a)(1), (2).

[99] *Section 272 Sunset Order*, 22 FCC Rcd at 16444-45 ¶ 8, 16447 ¶ 12.

[100] 47 U.S.C. § 272(e)(1), (3).

dominant carrier regulation unless they were offered through a Section 272 separate affiliate.[101] Those conditions relate closely to Sections 272(e)(1) and (3).[102]

Enforcement of these Section 272(e) obligations and related additional conditions is not necessary for just, reasonable and nondiscriminatory rates and practices or to protect consumers. First, robust competition protects against the potential for unjust or unreasonable discrimination. RBOCs are not in a position to slow roll services needed by other providers, in violation of Section 272(e)(1), or charge other providers more than the RBOCs impute to themselves for the same service, in violation of Section 272(e)(3), because the intense competition in every segment of the marketplace precludes such discrimination. If a provider does not receive good service from an RBOC at competitive rates, the provider simply moves to one of the many alternative sources, or self-provisions, as cable and other competitors have done so effectively.

Second, these provisions are based on separate local and long distance service silos, and they essentially attempt to control transactions between different entities in these different silos. But today's all-distance marketplace has moved far beyond those 20th Century silos. Consumers

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[101] *Section 272 Sunset Order*, 22 FCC Rcd at 16450 ¶ 18, 16476 ¶ 72, 16487-94 ¶¶ 95-108.

[102] For example, the special access performance metrics include data measuring whether an RBOC "provisions these special access services to itself and its competitors in nondiscriminatory time frames and with nondiscriminatory levels of quality." *Id.* at 16488 ¶ 97 n.284. That measure addresses part of the Section 272(e)(1) obligation to fulfill other carriers' requests for access "within a period no longer than the period in which [an RBOC] provides such . . . service . . . to itself or to its affiliates." 47 U.S.C. § 272(e)(1).

The imputation condition requires RBOCs and their ILEC affiliates "to continue to impute to" themselves their "highest tariffed rate[s] for access" and "to charge any non-section 272 affiliate through which they provide in-region, long distance services the same amount for access that they would have charged a section 272 separate affiliate." *Section 272 Sunset Order*, 22 FCC Rcd at 16490 ¶ 100.

today demand all-distance service from a single provider, and they have many providers from which to choose. Section 272(e) is no longer necessary because consumers do not demand stand-alone long distance service today, and because robust competition protects against the potential for unjust or unreasonable discrimination. As with the Equal Access Scripting Requirements from which the Commission granted forbearance in 2013, the Section 272(e)(1) and (e)(3) requirements and related conditions "only address[] . . . stand-alone long distance service, which has become a fringe market" and thus are "unlikely to ensure" just, reasonable and nondiscriminatory rates and practices or to protect consumers.[103]

In addition, RBOCs also remain subject to other provisions of the Act and the Commission's regulations, including Section 251 obligations and the "continuing general obligation to provide service at just, reasonable, and not unreasonably discriminatory rates, terms, and conditions pursuant to sections 201 and 202 of the Act."[104] Because of increased competition, the prevalence of bundled, all-distance voice services, and these continuing requirements and statutory provisions, the Section 272(e) requirements and related additional conditions are irrelevant to maintaining just, reasonable and nondiscriminatory rates and practices or protecting consumers.[105]

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[103] *US Telecom Forbearance Order*, 28 FCC Rcd at 7637 ¶ 16.

[104] *Section 272 Sunset Order*, 22 FCC Rcd at 16484-85 ¶ 90.

[105] *See* 47 U.S.C. § 160(a)(1), (2).

2. Forbearance From Applying the Section 272(e) Obligations Will Further the Public Interest

Although the Section 272(e) requirements and related additional conditions no longer provide any significant benefits to consumers, they continue to impose significant compliance costs on RBOCs and consumers. To begin with, by attempting to govern transactions between local and long distance providers, these requirements force RBOCs to maintain services and features only useful to a carrier class that is quickly disappearing.

Additionally, AT&T, Verizon, and CenturyLink spend hundreds of thousands of dollars each year on Section 272(e) access reporting, imputation and related compliance efforts. These resources could be far more effectively spent on transitioning to modern IP networks and expanding broadband access for the benefit of consumers. Because they provide little or no benefit and add unnecessary costs, forbearance from the Section 272(e) requirements and related conditions imposed in the *Section 272 Sunset Order* would further the public interest.[106] Forbearance would allow the RBOCs to focus their resources on upgrading and expanding the modern communications networks and services consumers are demanding. Accordingly, forbearance from those obligations meets all of the Section 10 criteria and should be granted.

D. The Commission Should Forbear From its Section 251(g) Legacy Equal Access Requirements

The same market conditions that render Sections 271 and 272 obsolete also make the decades-old equal access obligations imposed on all ILECs unnecessary. Like Sections 271 and 272, the equal access obligations rely on the outdated assumptions that stand-alone long distance services provided over traditional landlines constitute the primary forum for long distance

[106] *US Telecom Forbearance Order*, 28 FCC Rcd at 7637-38 ¶ 17. *See* 47 U.S.C. § 160(a)(3).

competition, and that these long distance services are dependent upon gaining direct, equitable access to ILEC facilities in order to compete. As detailed above, neither of these assumptions obtains today, and these obligations are inefficient and unnecessary. Accordingly, forbearance is appropriate because such requirements are "unlikely to ensure" just, reasonable and nondiscriminatory rates and practices or to protect consumers,[107] and elimination of the burdens of these rules also would further the public interest.[108]

Prior to the Telecommunications Act of 1996, the RBOCs were required to provide equal access to competing interexchange carriers in accordance with the 1982 Modification of Final Judgment ("MFJ") in the federal antitrust case against AT&T.[109] These equal access requirements were considered necessary at the time because competing long distance providers seeking to offer voice service comparable to the pre-breakup AT&T service depended on access to a variety of facilities and services under the control of local exchange carriers, and because the court feared that the RBOCs would give AT&T preferential treatment over its long-distance competitors.

Similar equal access requirements were imposed on GTE companies and (to a more limited extent) independent LECs under a separate consent decree and FCC orders, respectively.[110] The Commission accordingly "look[ed] to federal court decisions and to its own

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[107] *US Telecom Forbearance Order*, 28 FCC Rcd at 7637 ¶ 16. *See* 47 U.S.C. § 160(a)(1), (2).

[108] *US Telecom Forbearance Order*, 28 FCC Rcd at 7637-38 ¶ 17. *See* 47 U.S.C. § 160(a)(3).

[109] *See Allnet Comm'cns Servs., Inc*., Mem. Op. & Order on Recon., 11 FCC Rcd 8519, 8526-27 ¶ 14 (1996) (summarizing equal access history) ("*Allnet Recon Order*"); MFJ, 552 F. Supp. at 226-28, 232-34 App B.

[110] *Allnet Recon Order*, 11 FCC Rcd at 8526-27 ¶ 14.

orders," rather than to a codified set of regulations, "to determine what constitutes the provision of equal access."[111] Section 251(g) of the Act, added as part of the Telecommunications Act of 1996, "imports the obligations of the [MFJ] . . . as well as Commission equal access requirements" "imposed on LECs prior to passage of the 1996 Act."[112]

The 1996 Act also added a requirement for all LECs to provide "dialing parity to competing providers of telephone exchange service and telephone toll service."[113] Although "dialing parity" and "equal access" overlap to a large extent with respect to telephone toll service, Section 251(b)(3)'s dialing-parity requirement is a broader provision that also requires carriers to provide dialing parity for local calls. This Petition does not request any forbearance from the requirement that LECs provide dialing parity for local calls. However, forbearance from this requirement, as it is applied to interexchange service, would follow from the requested relief – *i.e.*, to the extent it codifies the equal-access obligations for interexchange service, forbearance from those obligations would also lift the dialing parity requirement.

This history demonstrates that the equal access obligations rely on the same outdated assumptions as Sections 271 and 272: that stand-alone long distance services are dependent upon

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[111] *Id*.

[112] *Notice of Inquiry Concerning a Review of the Equal Access and Nondiscrimination Obligations Applicable to Local Exchange Carriers*, 17 FCC Rcd 4015, 4016 ¶¶ 3-4 (2002). *See also Section 272 Sunset Order*, 22 FCC Rcd at 16484 ¶ 90 & n.261 (noting that equal access obligations arise "under longstanding Commission precedent and section 251(g) of the Act," citing 47 U.S.C. § 251(g); *MTS and WATS Market Structure, Phase III*, Report and Order, 100 FCC 2d 860 (1985) (subsequent history omitted); and *Investigation into the Quality of Equal Access Services*, Memorandum Opinion and Order, 60 Rad. Reg. 2d (P&F) 417, 419, 1986 WL 291752 (1986)).

[113] 47 U.S.C. § 251(b)(3).

access to ILEC facilities in order to compete. These obligations require ILECs to invest in compliance with a regulatory framework that serves a dwindling market while their cable, wireless, and over-the-top VoIP, and other competitors are subject to no such constraints. Today, competition is primarily inter-modal and involves bundled services offerings. Companies seeking to offer long distance voice service today can offer it through a variety of means that do not involve equal access, including through mobile wireless, broadband, and prepaid platforms. The equal access obligations thus serve no further purpose in protecting consumers or ensuring just and reasonable long distance charges and practices.

At the same time, the equal access obligations continue to impose significant compliance costs and constrain the ability of ILECs to design their networks efficiently. AT&T, Verizon and CenturyLink estimate that they spend a combined total of more than **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** annually on third-party validation activities, in addition to considerable sums on processing presubscription changes. These sums would be better spent on network upgrades and broadband deployment.

In the *USTelecom Forbearance Order*, the Commission granted forbearance from one of the equal access requirements, the Equal Access ("EA") Scripting Requirement.[114] That requirement, which also grew out of the MFJ and was applied by the Commission to all ILECs in 1985, "is preserved by § 251(g) of the Act."[115] The Commission's rationale for relief is directly applicable to this request:

[114] *USTelecom Forbearance Order*, 28 FCC Rcd at 7634-38 ¶¶ 11-17.

[115] *Id.* at 7635 ¶ 12 & n.36 (citing *Investigation of Access and Divestiture Related Tariffs*, 101 FCC2d 911, 928, App. B, ¶ 1 (1985)).

> While the EA Scripting Requirement originally served an important purpose in . . . fostering the development of nascent competition in the provision of pre-subscribed stand-alone long distance service, we find that it is no longer necessary. First, the market has changed dramatically in the more than 25 years since the requirement was established. When the Commission granted forbearance from the EA Scripting Requirement for the BOCs in 2007, it stated that stand-alone long distance service was becoming a fringe market, adding that stand-alone long distance competition had largely given way to competition between service bundles. . . . These trends appear to have continued in the intervening years.[116]

Accordingly, the Commission held that continued application of the EA Scripting Requirement is not necessary to ensure just, reasonable and nondiscriminatory ILEC mass market long distance service charges and practices or to protect consumers under the first two Section 10 criteria.[117] The Commission also concluded that forbearance met the public interest prong of the Section 10 criteria because "the costs associated with this requirement exceed the benefits," which are "*de minimis*, if any."[118]

The same rationale applies to the remaining equal access requirements. As the Commission held in *USTelecom Forbearance Order*, such requirements "only address[] . . . stand-alone long distance service, which has become a fringe market" and thus are "unlikely to ensure" just, reasonable and nondiscriminatory rates and practices or to protect consumers.[119] Because the costs of those requirements far outweigh the benefits, forbearance also would further

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[116] *Id.* at 7636 ¶ 14.

[117] *Id.* at 7637 ¶ 16.

[118] *Id.* at 7637-38 ¶ 17.

[119] *Id.* at 7637 ¶ 16. *See* 47 U.S.C. § 160(a)(1), (2).

the public interest.[120] Forbearance from the obsolete equal access requirements therefore would meet all of the Section 10 criteria.

III. THE COMMISSION SHOULD FORBEAR FROM ENFORCEMENT OF THE RULE 64.1903 STRUCTURAL SEPARATION REQUIREMENTS

In order to eliminate barriers to infrastructure investment and competition, the Commission should forbear from applying the structural separation requirements of Section 64.1903 of the Commission's rules to independent ILECs – RLECs and price cap ILECs alike – with no conditions.[121] The structural separation requirements of Section 64.1903 are as irrelevant in the current all-distance marketplace as the remaining requirements of Section 272, and for many of the same reasons. The Commission previously concluded that such rules should not apply to price cap carriers that agreed to the same conditions that were applied to the RBOCs and their independent ILEC affiliates in the *Section 272 Sunset Order*,[122] but declined at the time to provide similar relief to RLECs offering facilities-based in-region, interexchange, and interstate long distance services.[123]

The Commission asserted that "cost misallocation is still a concern for independent ILECs that operate under rate-of-return cost regulation," even while acknowledging that (1) long distance service, while "at one time an expensive service," today frequently is "offered on an

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[120] *USTelecom Forbearance Order*, 28 FCC Rcd at 7637-38 ¶ 17. *See* 47 U.S.C. § 160(a)(3).

[121] 47 C.F.R. § 64.1903.

[122] *USTelecom Forbearance Order*, 28 FCC Rcd at 7691-93 ¶¶ 142-48 (citing *Section 272 Sunset Order*, 22 FCC Rcd at 16488-90 ¶¶ 97-100).

[123] *Id.* at 7693 ¶ 149.

unlimited basis by numerous facilities-based providers";[124] (2) the *Transformation Order*'s capping and phase-out of interstate switched access rates reduce the incentives for cost misallocation;[125] (3) these concerns are further attenuated for companies receiving NECA pool access rates, which are based on the average costs for all companies that participate in the NECA pools;[126] and (4) average schedule companies have "limited incentives to misallocate costs as long as they continue to use the average schedules for access compensation."[127]

The Commission sought further comment on this issue in the *Second FNPRM*. As USTelecom discussed at length in comments in response to that notice, there is no basis for continued application of structural separation requirements to rate-of-return companies. Such requirements do nothing to promote the public interest, but they do subject the affected carriers – and hence their customers – to unnecessary costs.[128] Moreover, as USTelecom explained, the concerns regarding cost-shifting that led the Commission to defer action on this issue are unwarranted.[129]

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[124] *Second FNPRM*, 28 FCC Rcd at 7721 ¶ 211.

[125] *USTelecom Forbearance Order*, 28 FCC Rcd at 7694 ¶ 151 (citing *Connect America Fund*, Report and Order and Further Notice of Proposed Rulemaking, 26 FCC Rcd 17663, 17936 ¶ 804 (2011) ("*Transformation Order*"), *second order on recon.*, 27 FCC Rcd 4648 (2012), *aff'd sub nom. In re: FCC 11-161*, 753 F.3d 1015 (10th Cir. 2014)).

[126] *Id*. at 7694 ¶ 152.

[127] *Second FNPRM*, 28 FCC Rcd at 7734 ¶ 153 n.425.

[128] *See generally* Comments of the United States Telecom Association, CC Docket No. 00-175, at 4-9 (filed July 12, 2013), available at http://apps.fcc.gov/ecfs/document/view?id=7520930209 ("Section 64.1903 Comments").

[129] *See generally id.* at 13-15.

Today, as the industry transitions to an all-IP environment in which the distinction between local and long distance service is technologically and economically irrelevant, the structural separation requirement presents a substantial barrier to smaller carriers' deployment of IP technologies. Accordingly, the Commission should eliminate this outdated and unnecessary rule, either by concluding the still-open proceeding or granting forbearance relief in response to this petition. Forbearance from enforcement of Rule 64.1903 against RLECs would satisfy each of the Section 10 criteria.

There is no basis for applying structural separation requirements to rate-of-return companies. As a threshold matter, the Commission has never found that independent ILECs are dominant in the provision of in-region, interexchange services.[130] In the *LEC Classification Order*, after analyzing "traditional market power factors – market share, supply and demand substitutability, cost structure, size, and resources" – the Commission concluded that, with regard to interstate long distance services, "independent LECs do not have the ability to raise prices by restricting their own output."[131] More recently, in the *Section 272 Sunset Order*, the Commission found vibrant competition for the provision of such services to both mass market and enterprise customers.[132]

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[130] *See id.* at 4-5 (discussing *Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor*, First Report and Order, 85 FCC 2d 1 (1980); *Policy and Rules Concerning Rates for Competitive Common Carrier Services and Facilities Authorizations Therefor*, Fifth Report and Order, 98 FCC 2d 1191 (1984)).

[131] *Regulatory Treatment of LEC Provision of Interexchange Services Originating in the LEC's Local Exchange Area and Policy and Rules Concerning the Interstate, Interexchange Marketplace*, Second Report and Order in CC Docket No. 96-149 and Third Report and Order in CC Docket No. 96-61, 12 FCC Rcd 15756, 15847 ¶ 157 (1997).

[132] *Section 272 Sunset Order*, 22 FCC Rcd at 16460 ¶¶ 36-37.

As noted above, when it relieved price-cap independent ILECs of the Section 64.1903 structural separation requirement but declined to forbear in the context of RLECs, the Commission cited "the continuing potential for cost misallocation" by rate-of-return carriers – specifically, incentives to "misallocate costs from their long distance operations to their access services, to increase rates for access services that are not capped or being phased down, and to engage in price squeezes."[133] Because RLEC interstate switched access rates have been capped by intercarrier compensation reforms, the Commission's concerns focused on special access and common line rates.[134]

In fact, however, rate-of-return carriers are not in a position to shift costs in order to increase common line or special access rates (or universal service recovery associated with common line cost levels), or to effectuate a price squeeze in the rapidly disappearing long distance marketplace or any other market. In any event, the Commission should grant forbearance as to RLECs that participate in the NECA pool, especially in the case of average schedule companies, because they lack any meaningful ability to engage in cost-shifting at all. Finally, for the reasons set forth above, and as further explained below, the irrelevant conditions imposed on RBOCs in the *Section 272 Sunset Order* are no more appropriate for price cap ILECs than they are for RBOCs. The costs of those burdensome conditions far outweigh any benefits they could possibly provide to competition or consumers in today's all-distance marketplace.

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[133] *USTelecom Forbearance Order*, 28 FCC Rcd at 7695 ¶ 153.

[134] *See id.* at 7694 ¶ 151 (observing that recent intercarrier compensation reforms still allow increases in common line and special access rates). Because rule 64.1903 governs only "in-region, interstate" and "in-region, international" services, 47 C.F.R. § 64.1903(a), this request is limited to interstate and international services.

A. The Structural Separation Requirements of Rule 64.1903 Restrain Competition by Adding Unnecessary Costs to RLEC Services

Small, rural, rate-of-return carriers are significantly burdened by the structural separation requirements. These carriers must maintain duplicative switching and transmission equipment and separate management structures – precisely the type of costs the Commission has attempted to reduce with various mechanisms in the universal service high-cost context. And when these carriers deploy new services, they must design these services in a manner consistent with the requirements, adding avoidable costs and diverting resources from efforts such as rural broadband deployment.[135]

To the extent that structural separation ever was justified for rate-of-return carriers, it no longer can be based on today's market circumstances. Today, as discussed above with regard to the remaining obligations imposed by Sections 271 and 272, consumers increasingly choose alternatives to ILEC PSTN connectivity, instead relying on voice services offered by wireless providers, cable operators, and VoIP providers. These alternatives generally make no distinction between local and long-distance calls. Rate-of-return carriers subject to structural separation face pressure from these providers, as well as regional and national providers many times larger than the typical RLEC, which are not subject to the same onerous regulations.[136] In response to the competitive pressures RLECs face from these alternative providers, RLECs have been

[135] *See* Section 64.1903 Comments at 7. In addition, the structural separation requirement imposes unnecessary costs on rural LECs at a time when the Commission is working to limit such costs. *See id.* at 7-8.

[136] *See id.* at 12.

offering voice bundles that include all-distance service, and an increasing number of RLEC voice customers subscribe to, and expect, an all-distance bundle.[137]

Thus, the Commission's distinctive regulatory approach to rate-of-return carriers with respect to the structural separation requirement is no longer relevant in the current marketplace. It serves only to unfairly and arbitrarily impose costs, and a competitive disadvantage, on independent RLECs. Indeed, the Commission has acknowledged that the Section 64.1903 structural separation safeguards "lead to costs . . . that make the [ILECs] less effective marketplace competitors" and place "constraints on the ability of [ILECs] to respond to technological and marketplace developments."[138]

This extra challenge faced by rate-of-return carriers also threatens their ability to transition to and deploy IP technologies, which are entirely indifferent to distinctions between local and long distance calls. As the Commission has recognized, "[m]odernizing communication networks can dramatically reduce network costs, allowing providers to serve customers with increased efficiencies that can lead to improved and innovative product offerings and lower prices."[139] Indeed, the Commission launched its landmark technology transitions

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[137] *See, e.g.*, Industry Analysis and Technology Division, FCC, *Local Telephone Competition: Status as of December 31, 2010*, at 17, Table 6 and 18, Table 7 (Oct. 2011) (showing that the share of switched access lines presubscribed to a non-RBOC ILEC or its affiliated long distance provider at the end of 2010 was 62 percent, on a par with the 61 percent of RBOC switched access lines presubscribed to the RBOC or an affiliated long distance provider), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-310264A1.pdf.

[138] *Section 272 Sunset Order*, 22 FCC Rcd at 16482 ¶ 85, 16494 ¶ 109.

[139] *Technology Transitions*, Order, Report and Order and Further Notice of Proposed Rulemaking, Report and Order, Order and Further Notice of Proposed Rulemaking, Proposal for Ongoing Data Initiative, 29 FCC Rcd 1433, 1435 ¶ 2 (2014).

proceeding with the goal "to position all the players – innovators (including those in existing lines of business), legacy service providers and manufacturers, government regulators and the general public – to prepare for, maintain, and facilitate the momentum of technological advances that are already occurring."[140]

The structural separation requirements, however, impose a cost and competitive disadvantage on rate-of-return carriers that is technologically inconsistent with the emerging IP environment. This cost serves as a barrier and challenge to the deployment of IP technology. Eliminating the requirements is a simple and appropriate way to enable rate-of-return carriers to "prepare for, maintain, and facilitate the momentum of technological advances that are already occurring."

B. The Commission Should Forbear Unconditionally From Enforcing Rule 64.1903 Against RLECs

1. RLECs Have Little or no Ability or Incentive to Raise Access Rates Through Cost Misallocation

RLECs have no incentive or ability to misallocate costs in a way that materially affects either their regulated access services or long-distance competition. Other safeguards and marketplace developments preclude manipulation of the only access service elements that might be affected by RLEC cost shifting – common line and special access services.[141] Given these existing safeguards – and the option of applying less onerous conduct-based restrictions in the

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[140] *Id.*

[141] *See USTelecom Forbearance Order*, 28 FCC Rcd at 7694 ¶ 151. *See also Second FNPRM*, 28 FCC Rcd at 7733-34 ¶ 238 (requesting comments on possible non-average schedule RLEC overallocation of costs to common line and special access services).

event they are necessary – there is no reason to continue applying draconian structural separation requirements that have long outlived their utility.

Both market conditions and the *Transformation Order* discourage rate-of-return companies from shifting costs to common line services. Increased common-line costs are reflected in subscriber rates for voice service through increased subscriber line charges, rather than being passed through to other carriers, making an RLEC's retail offering less competitive with other providers' services. As discussed above, RLECs are already losing an enormous amount of market share to CLECs, wireless and VoIP providers. Thus, passing misallocated costs on in the form of increased retail voice service rates would result in a net *loss* of revenue by the RLEC.

Moreover, there is no basis for fearing that costs improperly shifted to common line services will end up compensated through the universal service high-cost mechanisms currently available to rate-of-return companies. The High Cost Loop Support ("HCLS") fund is subject to a cap, so any cost-shifting merely rearranges support among RLECs within the fund without increasing its overall size. Similarly, while Interstate Common Line Support ("ICLS") is not capped, the overall amount of high-cost support for rate-of-return carriers is subject to a budget, and therefore, as in the case of HCLS, cost-shifting would merely rearrange support among rate-of-return carriers within that budget.[142]

RLECs thus have little incentive or ability to raise common line rates through cost shifting. The same is true for special access rates, given that an RLEC's special access rate increases would "squeeze" the rates of its own competitive services, for which special access is an input, as much as or more than any competitors' rates. RLECs thus will not be able to engage

[142] Although some RLECs might attempt to gain an advantage over other RLECs in this regard, on balance, there would be little or no net shifting of RLEC costs to common line services.

in the "price squeeze" behavior that concerned the Commission in the *USTelecom Forbearance Order*.[143]

Finally, the Commission has a plethora of rules concerning RLEC accounting for regulated and deregulated activities – such as the allocation rules in Part 64, Subpart I[144] – and NECA and the Commission regularly audit RLECs. As noted in the *USTelecom Forbearance Order*, ILECs remain subject to rate regulation, Section 251 obligations, and the continuing general obligation to provide service at just, reasonable, and not unreasonably discriminatory rates, terms and conditions under Sections 201 and 202 of the Act.[145] These rules effectively address potential cost-shifting involving other, potentially more significant, unregulated operations of RLECs, such as the offering of video services. No one has suggested that those RLEC unregulated services should be subjected to structural separation.

2. Unconditional Forbearance From Application of Rule 64.1903 to RLECs Meets the Section 10 Criteria

Rather than continuing to maintain an oppressive requirement in order to remedy a theoretical and, at the very least, outdated problem, the Commission should expeditiously eliminate structural separation for rate-of-return companies unconditionally. Given RLECs' lack of incentives and ability to raise common line and special access rates through cost misallocation and the effectiveness of the Commission's continuing rules, forbearance from enforcement of Rule 64.1903 would easily meet the Section 10 criteria. In light of these marketplace and

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[143] *USTelecom Forbearance Order*, 28 FCC Rcd at 7694 ¶ 151.

[144] *See* 47 C.F.R. § 64.901 *et seq*.

[145] *USTelecom Forbearance Order*, 28 FCC Rcd at 7691 ¶ 142.

regulatory safeguards, the Rule 64.1903 structural separation requirements are not necessary to ensure that RLEC access or long distance charges or practices are just and reasonable and not unjustly or unreasonably discriminatory or to protect consumers.[146] Moreover, because forbearance would free RLECs from restrictions that hobble them in competing with other carriers and competitive service providers, as discussed above, forbearance would promote competitive conditions and thereby further the public interest.[147]

Furthermore, such forbearance should not be conditioned on the special access performance metrics and imputation requirements imposed on price cap ILECs as a condition of relief from Rule 64.1903 in the *USTelecom Forbearance Order*.[148] As explained above with regard to the same requirements imposed on the RBOCs as a condition of relief in the *Section 272 Sunset Order*, those additional requirements impose costs on carriers without meaningful countervailing benefits to consumers or competition. Like the Section 272 separate affiliate and Section 272(e) provisions and the Rule 64.1903 structural separation rules, those additional obligations are based on arcane notions about separate local and long distance services and providers. They are no longer relevant, given the prevalence of bundled, all-distance services. ILECs are providing local access largely to themselves.[149]

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[146] 47 U.S.C. § 160(a)(1), (2).

[147] *Id.* § 160(a)(3), (b).

[148] *USTelecom Forbearance Order*, 28 FCC Rcd at 7691-93 ¶¶ 142-48 (citing *Section 272 Sunset Order*, 22 FCC Rcd at 16488-90 ¶¶ 97-100).

[149] *See* discussions of the tiny share of all voice connections that are ILEC lines presubscribed to stand-alone long distance providers in Parts III.A and C, *supra*.

As explained with regard to the same conditions imposed on the RBOCs, there is little opportunity in this bundled marketplace to provide access to other long distance providers on a delayed or otherwise discriminatory basis or to charge other long distance providers more than ILECs impute to themselves. Because the Rule 64.1903 structural separation rules and related conditions "only address[] . . . stand-alone long distance service, which has become a fringe market" they are "unlikely to ensure" just, reasonable and nondiscriminatory rates and practices or to protect consumers.[150] Moreover, because those requirements provide little or no benefit and add unnecessary costs, forbearance also would further the public interest.[151] Unconditional forbearance from the obsolete structural separation rules therefore would meet all of the Section 10 criteria. Accordingly, for all of the same reasons that the Commission should forbear from continuing to apply the special access performance metrics and imputation conditions to the RBOCs, the forbearance relief sought here for RLECs should be granted without any conditions.

C. The Commission Should At a Minimum Forbear From Enforcing Rule 64.1903 Against RLECs Participating in NECA Pools, Especially in the Case of Average Schedule Companies

At a minimum, the Commission should eliminate the structural separation requirements – and not impose any special access performance metrics or imputation conditions – on RLECs that participate in the NECA pooling process, especially those that utilize average schedules. As the Commission has observed, these carriers' ability to misallocate their costs is limited.[152] In the *USTelecom Forbearance Order*, the Commission conceded that "average schedule companies

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[150] *USTelecom Forbearance Order*, 28 FCC Rcd at 7637 ¶ 16.

[151] *Id.* at 7637-38 ¶ 17. *See* 47 U.S.C. § 160(a)(3).

[152] *USTelecom Forbearance Order*, 28 FCC Rcd at 7694-95 ¶¶ 152-53 & n.425.

appear to have limited incentives to misallocate costs as long as they continue to use the average schedules for access compensation," but denied relief as to these companies because they can convert to cost-based regulation without Commission approval.[153] That theoretical possibility, however, could easily be avoided by requiring that any average schedule company with a facilities-based long distance operation that wishes to convert to cost-based regulation seek Commission approval. Conditions could be imposed on any such approval to negate the possible cost misallocation that might arise.

With such conditions imposed on average schedule companies seeking to convert to cost-based regulation, forbearance from enforcement of Rule 64.1903 for RLECs participating in NECA pools, particularly in the case of average schedule companies, would easily meet the Section 10 criteria. Given the minimal or nonexistent incentive and ability of such carriers to misallocate costs, the Rule 64.1903 structural separation requirements are not necessary to ensure that RLEC access or long distance charges or practices are just and reasonable and not unjustly or unreasonable discriminatory or to protect consumers.[154] Moreover, because forbearance would free RLECs from restrictions that hobble them in competing with other carriers and competitive service providers, as discussed above, forbearance would promote competitive conditions and thereby further the public interest.[155]

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[153] *Id.* at 7694 ¶ 153 n.425.

[154] 47 U.S.C. § 160(a)(1), (2).

[155] *Id.* § 160(a)(3), (b).

D. Forbearance From Rule 64.1903 Should be Unconditional for all ILECs

Price cap ILECs also should be relieved of the special access performance metrics and imputation requirements imposed on them as a condition of forbearance relief from Rule 64.1903 in the *USTelecom Forbearance Order*. All of the reasons set forth above for eliminating those additional requirements for the RBOCs in the context of Section 272 and for granting the RLECs unconditional forbearance relief from Rule 64.1903 apply equally, if not even more strongly, to the price cap ILECs.[156] Costs, imputed or otherwise, are much less relevant to price cap ILECs than they are to RLECs. Because of the irrelevance of costs, combined with the irrelevance of requirements based on the assumption of separate local and long distance services and markets, elimination of these additional requirements for price cap ILECs would easily meet the first two prongs of the Section 10 standard.[157] Moreover, because they provide little or no benefit and add unnecessary costs, elimination also would further the public interest.[158] Accordingly, for all of the same reasons that the Commission should forbear from continuing to apply the special access performance metrics and imputation conditions to the RBOCs, and that forbearance relief from Rule 64.1903 for the RLECs should be unconditional, the Commission similarly should forbear from continuing to apply those conditions to price cap ILECs.

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[156] *See USTelecom Forbearance Order*, 28 FCC Rcd at 7691-93 ¶¶ 142-48 (citing *Section 272 Sunset Order*, 22 FCC Rcd at 16488-89 ¶¶ 97-98).

[157] Because the structural separation rules and related conditions, like the equal access requirement forborne in the *USTelecom Forbearance Order*, "only address[] . . . stand-alone long distance service, which has become a fringe market," 28 FCC Rcd at 7637 ¶ 16, they are "unlikely to ensure" just, reasonable and nondiscriminatory rates and practices or to protect consumers. *Id.*

[158] *See id.* at 7637-38 ¶ 17. *See* 47 U.S.C. § 160(a)(3).

IV. THE COMMISSION SHOULD FORBEAR FROM APPLICATION OF THE REQUIREMENT TO PROVIDE AN UNBUNDLED 64 KBPS VOICE CHANNEL IN CASES WHERE THE ILEC HAS REPLACED A COPPER LOOP WITH FIBER AND RETIRED THE COPPER LOOP

In the *Triennial Review Order*,[159] the Commission correctly concluded that requiring ILECs to provide unbundled access to newly deployed fiber-to-the-home loops would deter fiber investment, and thus declined to mandate such unbundling. The Commission held, however, that "in fiber loop overbuild situations where the incumbent LEC elects to retire existing copper loops," the ILEC has a limited requirement to provide competing carriers access to a 64 kbps voice-grade channel over the fiber so that such providers can compete for narrowband services.[160]

Regardless of whether this 64 kbps requirement made sense in 2003, its continued existence results in unnecessary burdens for one set of providers and undermines the broader shift to next-generation fiber facilities while providing no meaningful offsetting benefits to consumers. In order to eliminate barriers to infrastructure investment and competition, the Commission should now forbear from applying the requirement that ILECs incur wasteful costs by developing solutions involving equipment and/or information technology to provide a 64 kbps channel over fiber that would rarely be used given consumers' shift away from traditional narrowband voice services. This requirement impedes the transition to more reliable and robust fiber networks, and the consumer benefits that flow from fiber.

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[159] *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978 (2003) ("*Triennial Review Order*"), *vacated in part on other grounds sub nom. USTA v. FCC*, 359 F.3d 554 (D.C. Cir. 2004).

[160] *Id.* at 17142 ¶ 273, 17145 ¶ 277.

By contrast, any consumer benefits of this requirement are minimal at best. The marketplace facts since 2003 have shown that consumers have shifted in huge numbers away from traditional narrowband services towards voice services provided by wireless, cable, and over-the-top ("OTT") VoIP providers. Facilities-based competition among wireline, wireless, and cable providers in the voice marketplace is robust, thereby producing competitive rates. Moreover, given the rapidly evaporating demand for standalone narrowband voice, consumers do not – and will not – benefit from saddling one set of providers with the obligation to provide a narrowband channel to competitors over their next-generation broadband networks. Moreover, the marketplace now provides other options – including wholesale alternatives, resale, or over-the-top – for non-facilities-based providers to compete in the provision of voice services.

A. The 64 Kbps Requirement Is Not Necessary to Ensure Just, Reasonable, and Nondiscriminatory Rates For Narrowband Services

Given the many choices available to consumers for access to competitive voice services, the 64 kbps requirement is not necessary to ensure that ILECs' rates for narrowband services are just, reasonable, and nondiscriminatory. As the Commission long has recognized, robust competition such as that typifying all segments of today's communications industry "is the most effective means of ensuring that the charges, practices, classifications, and regulations with respect to [a telecommunications service] are just and reasonable, and not unjustly or unreasonably discriminatory."[161] In today's marketplace, competition from wireless carriers,

[161] *Petition of U S WEST Communications, Inc. for a Declaratory Ruling Regarding the Provision of National Directory Assistance*, Memorandum Opinion and Order, 14 FCC Rcd 16252, 16270 ¶ 31 (1999); *see also Implementation of Sections 3(n) and 332 of the Communications Act*, Second Report & Order, 9 FCC Rcd 1411, 1478 ¶ 174 (1994) ("[c]ompetition, along with the impending advent of additional competitors, leads to reasonable rates"); *see also id.* at 1478 ¶ 173 ("in a competitive market, market forces are generally

cable companies, and OTT VoIP providers constrains the rates that ILECs can charge for narrowband voice services, and these facilities-based and OTT providers have attracted consumers in huge numbers over the last decade. In light of this competition, requiring ILECs that have retired a copper loop, to "provide unbundled access to a 64 kbps transmission path over its FTTH loop" undermines competition and harms consumers. Indeed, in some cases, this rule might foreclose ILECs from retiring the copper loop at all, forcing them to maintain redundant networks and diverting resources away from next-generation deployments.

From a competitive standpoint, the marketplace for voice services is vastly different today from when the 64 kbps requirement was adopted in 2003. The *Triennial Review Order* described the 64 kbps requirement as "a very limited requirement intended only to ensure continued access to a local loop suitable for providing narrowband services to the mass market in situations where an [ILEC] has deployed overbuild FTTH and elected to retire the pre-existing copper loops."[162] Discussing intermodal competition, the Order stated that although "[n]either wireless nor cable ha[d] blossomed into a full substitute for wireline telephony" at that time, the Commission "expect[ed] intermodal platforms to become increasingly a substitute for wireline voice telephony services and for wireline broadband services" and that "[t]he presence of such

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sufficient to ensure the lawfulness of rate levels, rate structures, and terms and conditions of service"); *Market Entry and Regulation of Foreign-Affiliated Entities*, Report and Order, 11 FCC Rcd 3873, 3878 ¶ 9 (1995) ("where we can reduce our regulations because of effective competition, carriers are better able to respond to consumer demand for innovative services at the lowest reasonable price").

[162] *Triennial Review Order*, 18 FCC Rcd at 17145 ¶ 277.

alternatives in the future may enable us to find that requesting carriers are no longer impaired in their ability to compete without access to [ILEC] loops."[163]

As discussed above, the intermodal competition predicted by the Commission – and the consumer choice fueled by those competitive choices – have arrived. As of June 2013, ILECs served a total of about 78.5 million switched and VoIP access lines – down almost 100 million from the 178 million they served in June 2000.[164] By contrast, the number of wireless telephone subscriptions exploded to 305,742,000 as of mid-2013, a 237 percent increase over the 90,644,000 mobile wireless telephone subscribers in June 2000.[165] The number of wireless-only households has increased even more dramatically. When the *Triennial Review Order* issued, "3 to 5 percent of wireless customers use[d] their wireless phone as their only phone."[166] According to the Centers for Disease Control ("CDC"), as of late 2013, 41 percent of American households were "wireless only."[167] An additional 16.1 percent of households have both wireline and wireless phones but receive all or almost all calls on their wireless phones.[168] In short, as

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[163] *Id.* at 17127-28 ¶¶ 245-46.

[164] *Compare 2009 Local Telephone Competition Report* at 13, Table 1, *with Mid-2013 Local Telephone Competition Report* at 12, Table 1.

[165] *Compare* Industry Analysis Div., FCC, *Local Telephone Competition: Status as of December 31, 2000* at Table 9 (May 2001), *available at* http://transition.fcc.gov/Bureaus/Common_Carrier/Reports/FCC-State_Link/IAD/lcom0501.pdf, *with Mid-2013 Local Telephone Competition Report* at 29, Table 18.

[166] *Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993*, Seventh Report, 17 FCC Rcd 12985, 13017 (2002).

[167] *CDC Second Half 2013 Wireless Report* at 5, Table 1 (data for the last six months of 2013).

[168] *Id.* at 4; *see also* Mayo Decl. ¶ 16 ("[W]hile the first part of the last decade saw the percentage of households subscribing to both wireline and wireless services grow, this

Professor Mayo puts it, "[t]he past ten years have witnessed a complete dismantling of one-hundred years of loyalty by Americans to wireline voice telephone service."[169]

Voice competition from cable has also increased dramatically. According to NCTA's website, there are now 28 million cable telephony subscribers, which is more than a tenfold increase over the figure cited in the *Triennial Review Order*.[170] The third largest provider of residential voice services in the country is Comcast.[171] Consumers can also obtain voice services from OTT VoIP providers like Vonage over any broadband connection. According to the most recent Commission data, there are now 45 million interconnected VoIP subscriptions.[172]

The dramatic increases in wireless, cable, and VoIP subscriptions and the dramatic decrease in the number of retail switched access lines over traditional ILEC facilities show that competition constrains the rates that ILECs can charge for their narrowband voice services. The 64 kbps requirement is unnecessary to constrain the rates that ILECs charge for such services.

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percentage peaked in 2007 and has declined precipitously since then. . . . This falling percentage of households subscribing to both wireline and wireless and the growing number of households that are 'wireless only' suggests that households have grown to see mobile telephone subscriptions as sufficient to satisfy all their telecommunications needs.").

[169] Mayo Decl. ¶ 6.

[170] *See* NCTA, Industry Data, Cable's Customers Base, https://www.ncta.com/industry-data (last visited Oct. 6, 2014); *Triennial Review Order*, 18 FCC Rcd at 17016 ¶ 52.

[171] News Release, Comcast, *Comcast Now the Third Largest Residential Phone Services Provider in the U.S.* (Mar. 11, 2009), *available at* http://corporate.comcast.com/news-information/news-feed/comcast-now-the-third-largest-residential-phone-services-provider-in-the-us.

[172] *See Mid-2013 Local Telephone Competition Report* at 2, Figure 1.

B. The 64 Kbps Requirement is Not Necessary to Protect Consumers

Just as the Commission's 64 kbps requirement is not necessary to ensure that rates are just, reasonable, and nondiscriminatory, the requirement is unnecessary to protect consumers. As Chairman Wheeler recently observed, "[c]ompetition promotes efficient pricing, technical progressiveness, consumer protection, and . . . private investment."[173] Here, the competition described above from wireless, cable, and OTT VoIP protects consumers of voice services.

Moreover, there is no evidence that providers still seek to provide "narrowband services to the mass market"[174] over ILECs' legacy facilities as a meaningful and ongoing business model, especially for residential customers. Indeed, voice competition has shifted dramatically away from intramodal services reliant on ILEC network elements and toward intermodal alternatives. From December 2008 to June 2013, the number of residential switched access lines served by non-ILECs (a term that encompasses CLECs) decreased by half, from approximately 5.6 million to 2.8 million.[175] The 2.7 million non-ILEC residential switched access lines accounted for less than 3.6 percent of total lines serving residential customers.[176] By contrast, non-ILECs served 29.2 million residential lines (or more than 90 percent of all residential lines served by non-

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[173] Tom Wheeler, Chairman, FCC, Remarks at National Cable & Telecommunications Association, at 5 (Apr. 30, 2014), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-326852A1.pdf.

[174] *Triennial Review Order*, 18 FCC Rcd at 17145 ¶ 277.

[175] *Compare* Industry Analysis and Technology Div., FCC, *Local Telephone Competition: Status as of December 31, 2008*, at 5, Figure 3 (June 2010), *available at* https://apps.fcc.gov/edocs_public/attachmatch/DOC-299052A1.pdf, *with Mid-2013 Local Telephone Competition Report* at 5, Figure 4.

[176] *See Mid-2013 Local Telephone Competition Report* at 5, Figure 4, and 21, Table 10.

ILECs) using interconnected VoIP.[177] Although the vast majority of the 29.2 million interconnected VoIP residential lines are cable lines, the fact remains that, even aside from all of the other facilities-based options available to consumers, competitors can rely on interconnected VoIP and other alternative approaches that obviate any need for a 64 kbps voice-grade channel over fiber.

Furthermore, as explained in the Caves Declaration, technological progress in the industry has substantially diminished the significance of the 64 kbps requirement. For example, among the RBOCs, the number of consumers receiving narrowband voice services from CLECs using analog UNE loops, which are typically used for narrowband voice service, represented only about **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** of the 135 million access lines in service as of 2013.[178] Further, among the RBOCs for which data are available, the number of analog UNE loops in service declined by approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** percent from 2003 – 2013, while the number of *new* analog UNE loops brought into service annually (*i.e.*, gross additions) declined by approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** percent.[179] In light of this rapidly dwindling demand for ILEC analog UNE loops, it makes no sense to require ILECs to provide a 64kbps narrowband voice-grade channel over fiber when they retire copper. Indeed, at least one prominent provider, TelePacific, has stated that a 64 kbps voice-grade channel "is inadequate to meet the bandwidth demanded by both business and residential

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[177] *See id.*

[178] Caves Decl. at ¶ 89.

[179] *Id.*

customers."[180] Thus, the 64 kbps requirement provides no benefits to consumers.[181] Marketplace developments have ensured that customers have the benefit of robust intermodal competition even without widespread unbundling.

Given the above, the 64 kbps requirement harms, rather than helps, consumers, by undercutting ILECs' incentives to deploy and migrate customers to more reliable and advanced fiber facilities and thereby diverting resources away from the provision of next-generation services and toward the maintenance of costly network-sharing mechanisms that would rarely even be used. The Commission has already recognized that providing unbundled access to newly deployed fiber-to-the-home would deter fiber investment,[182] and maintaining redundant copper facilities solely for the purposes of providing access to competitive providers has a similar effect.

The 64 kbps requirement also deters fiber investment. ILECs that have deployed fiber-to-the-home must either maintain the copper network or have a solution in place to provide 64 kbps narrowband voice-grade channels over fiber. Under current technologies, providing a 64 kbps voice-grade channel over fiber generally requires installation of costly equipment at Central Offices and/or the development of complicated information technology solutions. These costs undermine the pro-consumer shift to heavier reliance on more reliable and advanced fiber

[180] Comments of TelePacific Communications at 12, GN Docket No. 12-353 (Jan. 28, 2013).

[181] Some providers may argue that the Commission should respond to the decline in demand for narrowband voice services by requiring ILECs to unbundle their fiber facilities. However, the Commission concluded that providing unbundled access to newly deployed fiber-to-the-home would deter fiber investment and should not be required as a matter of law and policy. *Triennial Review Order*, 18 FCC Rcd at 17110 ¶ 213, 17141-42 ¶ 272. The same reasoning applies even more so today.

[182] *Id*.

facilities to serve consumers. ILECs should not be required to incur these costs when competitors themselves recognize that there is unlikely to be any meaningful level of demand by consumers for narrowband voice services by providers using legacy ILEC facilities and when consumers have a plethora of choices using other, more-widely-embraced alternatives.

Finally, although the Commission's focus is on protecting consumers and competition rather than particular classes of competitors, eliminating the 64 kbps requirement also would not eliminate providers' ability to provide voice services to consumers without building their own network facilities. The statute requires an ILEC to "offer for resale at wholesale rates any telecommunications service that the carrier provides at retail to subscribers who are not telecommunications carriers,"[183] and this resale obligation applies to telecommunications services offered over fiber. Likewise, ILECs offer wholesale voice alternatives, such as Verizon's Wholesale Advantage product, for competitive providers. Competitive providers are also free to compete in the voice marketplace through over-the-top voice services that are supported by fiber and other broadband networks. Thus, eliminating the 64 kbps requirement would not deprive non-facilities-based competitors of multiple options for offering voice services to consumers, as other types of providers are doing today.

C. Forbearance From the 64 Kbps Requirement is in the Public Interest

Granting forbearance from the unbundled 64 kbps requirement is in the public interest. The public interest is served by eliminating unnecessary regulations that impose costs on the industry, and every government agency should strive to increase efficiencies by doing away with

[183] 47 U.S.C. § 251(c)(4)(A).

outdated regulatory requirements.[184] Here, the regulation imposes substantial costs that far outweigh any benefits. The 64 kbps requirement forces ILECs that have decided to retire cooper to incur wasteful costs to maintain outdated copper networks or to develop solutions to provide 64 kbps voice-grade channels over fiber. These costs deter investment in more reliable and more advanced fiber networks that support not only high quality voice services but also high quality broadband and other services.

It is in the public interest to remove regulatory obstacles to investment in fiber, especially where the regulatory benefits are minimal. Consumer demand for narrowband voice services continues to decrease dramatically as consumers shift to voice services provided by wireless, cable, and OTT VoIP providers. Thus, 64 kbps voice-grade channels over fiber would rarely ever be used. The public interest is served by eliminating the 64 kbps requirement. Doing so will allow ILECs to focus on developing fiber networks of the 21st century instead of maintaining outdated traditional narrowband services that are rapidly becoming obsolete.

V. THE COMMISSION SHOULD FORBEAR FROM ENFORCING SECTION 214(E)-BASED OBLIGATIONS WHERE A PRICE CAP CARRIER DOES NOT RECEIVE HIGH-COST UNIVERSAL SERVICE SUPPORT

Section 214(e)(1)(A) of the Act obligates carriers designated as "eligible" to receive universal service support – eligible telecommunications carriers ("ETCs") – to "offer the services that are supported by Federal universal service support mechanisms under section 254(c)"

[184] *See, e.g.*, *USTelecom Forbearance Order*, 28 FCC Rcd at 7656 ¶ 55 (Commission has an "obligation to remove costly, overly broad, and outmoded requirements and burdens in response to changes in markets and regulatory needs."). *See also Amendment of Section 64.702 of the Commission*'s *Rules and Regulations* (*Second Computer Inquiry*), 77 FCC 2d 384, 423 ¶ 102 (1980) (avoidance of unnecessary cost is in the public interest) ("*Computer II Final Decision*"), *recon.*, 84 FCC 2d 50 (1980), *further recon.*, 88 FCC 2d 512 (1981), *aff'd sub nom. Computer and Communications Industry Ass'n v. FCC*, 693 F.2d 198 (D.C. Cir. 1982), *cert. denied*, 461 U.S. 938 (1983) (collectively referred to as "*Computer II*").

"throughout the service area for which the designation is received."[185] The Commission has interpreted Section 214(e)(1)(A) to require an ETC to provide the "supported" services throughout its service area regardless of whether such services are actually "supported" with high-cost funding throughout that area.[186] In order to eliminate barriers to infrastructure investment and competition, the Commission should forbear from applying its requirement that price cap ETCs provide "supported services" – defined as "'voice telephony service'" in the *Transformation Order*[187] – in those areas where they do not receive high-cost support.

Given the increasingly wide range of service options available, the wealth of competitive alternatives and consequent rapid decline in ILEC wireline market shares, and the fundamental revision of the high-cost universal service support regime brought about by the *Transformation Order*,[188] Section 214(e), as interpreted by the Commission, is not necessary to ensure reasonable and nondiscriminatory rates or to protect consumers. Indeed, the obligation has become counterproductive, and will become anticompetitive in some circumstances, once the

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[185] 47 U.S.C. § 214(e)(1)(A).

[186] *See, e.g., Federal-State Joint Board on Universal Service*, Report and Order, 12 FCC Rcd 8776, 8883-84 ¶ 192 (1997)("*First USF Order*") (noting that an ETC's "service area" is the "overall area for which the carrier *may* receive support," depending on costs of providing service) (emphasis added), *rev'd in part on other grounds sub nom. Texas Office of Public Utility Counsel v. FCC*, 183 F.3d 393 (5th Cir. 1999). *See also High-Cost Universal Service Support*, Order, 23 FCC Rcd 8834, 8847 ¶ 29 (2008) (carrier designated as ETC bears ETC obligations, regardless of whether it actually receives support), *aff'd Rural Cellular Ass'n v. FCC*, 588 F.3d 1095 (D.C. Cir. 2009).

[187] *Transformation Order*, 26 FCC at 17692 ¶ 77.

[188] *Id.* at 17709-17872 ¶¶ 115-647.

Commission implements its Connect America Fund Phase II ("CAF II") mechanism.[189] At that point, a price cap ETC might lose high-cost funding to a competitor serving the same area or might be saddled with unique service obligations in an area where no funding is available to any carrier.[190] Under those circumstances, it makes no sense to have that price cap carrier continue to bear ETC obligations. Forbearance from enforcement of Section 214(e)(1)(A) where a carrier receives no high-cost support would meet all of the criteria of Section 10.

A. Imposing ETC Obligations on Entities Not Receiving High-Cost CAF Support is Not Necessary to Ensure Just and Reasonable Rates or Practices or to Protect Consumers.

Where consumers have at least one other voice telephony service provider in a given service area, there is no policy or legal justification for mandating that one particular type of carrier – the price cap carrier – continue providing voice service in that area as an ETC. Today, consumers nationwide enjoy a wide array of voice service choices, provided over an expanding range of technologies and platforms. Thus, even apart from other considerations, the dynamic competition that characterizes the communications industry ensures that Sections 10(a)(1) and 10(a)(2) are satisfied.

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[189] *See id.* at 17725-38 ¶¶ 156-93.

[190] *See id.* at 17733 ¶ 180 (where price cap ILEC declines to make state-wide commitment for CAF Phase II support, its CAF Phase I support will be phased out), 17830 ¶ 509 (where unsubsidized providers have deployed service, no carrier – ILEC or CETC – will receive support), 18063 ¶ 1095 (ILECs and CETCs "may receive reduced support in their existing service areas, and ultimately may no longer receive any federal high-cost support").

Price cap carriers have seen their wireline subscriber base rapidly erode. ILEC switched legacy residential lines decreased by 73 percent from the end of 2000 to mid-2013,[191] and now serve barely one-quarter of U.S. households.[192] Even when ILEC VoIP lines are considered, total ILEC residential lines have fallen by two-thirds since 2000 and serve less than one third of all households.[193] ILEC total switched access and VoIP lines combined trail wireless penetration (89 percent) by a wide margin.[194] As discussed above, these trends have left ILECs with a small fraction of the total retail voice telephony service market. Only five percent of all households use ILEC legacy wireline services exclusively,[195] and ILEC lines account for less than 18 percent of all U.S. voice connections.[196]

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[191] *Compare 2009 Local Telephone Competition Report* at 12, Table 1, *with Mid-2013 Local Telephone Competition Report* at 5, Figure 4; *see also* Caves Decl. ¶ 12 ("ILECs collectively lost approximately 95.4 million voice lines from 2000 – 2012.").

[192] *Research Brief* at 1; *Banks Letter* at 1.

[193] *Compare 2009 Local Telephone Competition Report* at 13, Table 2, *and Mid-2013 Local Telephone Competition Report* at 5, Figure 4; *see also* Caves Decl. ¶ 27; Research Brief at 3 (six percent of U.S. households projected to be served by ILEC VoIP services by the end of 2013; adding the ILEC VoIP six percent to the 26 percent served by ILEC switched landline voice service yields a total of slightly under one-third of all U.S. households served by ILEC lines).

[194] *See* Anna-Maria Kovacs, *The New Network Compact: Consumers Are in Charge*, at 11 (July 2014) (89 percent of U.S. households took wireless service by mid-2013), *available at* http://internetinnovation.org/images/uploads/IIA_A_New_Network_Compact_071714_Report.pdf ("Kovacs 2014 *New Network Compact* Paper").

[195] *Kovacs 2013 Telecommunications Competition Paper* at 11-12 (five percent of the population relies solely on legacy wireline services, and 95 percent of all consumers no longer rely solely on their ILEC for service); *see also* Mayo Decl. ¶ 16.

[196] This figure reflects the 78,537,000 ILEC access lines and VoIP connections listed in the *Mid-2013 Local Telephone Competition Report* at 12, Table 1, the 56,590,000 non-ILEC access lines listed in that report, and the 305,742,000 wireless accounts reported by FCC as of the mid-2013. *See also* Caves Declaration at ¶¶ 10, 12.

Accordingly, not only are there many voice telephony service choices for consumers in areas served by price cap carriers, but the data also show that consumers have moved away from stand-alone legacy services.[197] With consumers "increasingly shift[ing] from traditional telephone service" to alternatives, including VoIP and wireless,[198] no competitive or consumer protection purpose is served by mandating the ILECs, and no one else, to continue providing "supported services." The Section 214(e) service obligations thus have been rendered superfluous by the marketplace.

While these competitive facts alone would warrant forbearance from Section 214(e)(1)'s requirements in all service areas, USTelecom seeks such forbearance only where a price cap carrier receives no high-cost support. The *Transformation Order* replaced a regime in which multiple ETCs often received support in a given high-cost service area with one in which only a single carrier at most may receive CAF II support and, in some cases, a single mobile wireless carrier may receive Mobility Fund support.[199] There is no guarantee that a price cap ETC will

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[197] *Kovacs 2014 New Network Compact Paper* at 11.

[198] *Transformation Order*, 26 FCC Rcd at 17669 ¶ 9. *See also Procedures for Assessment and Collection of Regulatory Fees*, Notice of Proposed Rulemaking and Further Notice of Proposed Rulemaking, 28 FCC Rcd 7790, 7795 ¶ 11 (2013) (wireless revenues have increased while switched access voice revenues have decreased, "in part due to substitution of wireless services for wireline services").

[199] *Transformation Order*, 26 FCC Rcd at 17727-32 ¶¶ 164-78, 17766-68 ¶¶ 280-84 (CAF support only for price cap carrier in each area or, under certain circumstances, for a single winner of competitive bidding in price cap areas), 17779-80 ¶¶ 316-20 (Mobility Fund support generally awarded to only one provider in any eligible area), 17825-30 ¶¶ 498-511 (identical support rule eliminated).

receive CAF II support in any given area.[200] Where a carrier no longer receives support, it likewise no longer should have the corresponding regulatory obligations. Stated differently, there is no justification for continuing to require a carrier to offer "supported" voice telephony services where it does not receive support. Under the Commission's new framework, this can occur in three different circumstances:

First, a price cap carrier will not receive support where costs in the relevant service area are not high enough to warrant high-cost support for any carrier. In these circumstances, service costs are low enough to elicit competitive entry. As the Commission explained in the *Transformation Order*, its goal is to ensure that all areas get service, "whether through the operation of the market or[,]" "where there is no private sector business case for deployment[,]" "through support from USF."[201] As discussed above, the plethora of communications options available nationwide "through the operation of the market" guarantees that consumer interests will be protected in these areas, and there is no need to perpetuate price cap carrier ETC designations and the corresponding ETC service mandate.

Second, a price cap carrier will not receive support where one or more unsubsidized carriers serve the same area.[202] Thus, in an area that does not qualify for high-cost support

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[200] *Id.* at 17733 ¶ 180 (where price cap ILEC declines to make state-wide commitment for CAF Phase II support, its CAF Phase I support will be phased out), 17830 ¶ 509 (where unsubsidized providers have deployed service, no carrier – ILEC or CETC – will receive support), 18063 ¶ 1095 (ILECs and CETCs "may receive reduced support in their existing service areas, and ultimately may no longer receive any federal high-cost support").

[201] *Id.* at 17720 ¶ 145.

[202] *Id.* at 17830 ¶ 509. In this circumstance, the unsubsidized competitor must be providing "terrestrial fixed voice and broadband service." *Id.* at 17701 ¶ 103.

because of the presence of unsubsidized competitors, competition ensures that consumers will not be dependent upon a single provider's services, and there is no need for the price cap ETC designation and service mandate.

Third, a price cap carrier will not receive support where another ETC is receiving the support in that area instead. In such areas, the supported carrier can offer voice telephony services at reasonable rates, ensuring that consumers need not rely on the unsupported ETC's service, and there is no need for the price cap ETC designation and service mandate.[203]

Thus, there is no situation in which it is necessary for a price cap carrier not receiving support for a given area to be required to continue providing voice telephony service in that area. There should always be one or more other carriers to provide that service. The same is true for Lifeline service. For example, in every single AT&T price cap wire center, there are at least three Lifeline providers, and the average number of Lifeline providers across all AT&T wire centers is over 12.[204] Moreover, almost all Lifeline customers prefer wireless services.[205] Given the substantial non-reimbursable costs to carriers involved in Lifeline participation and the multiple Lifeline providers in price cap carriers' service areas, there is no reason to continue

[203] *Id.* at 17693-94 ¶¶ 80-81, 84-85 (as a condition of receiving support, ETCs must provide voice telephone service at rates comparable to urban rates for similar services). *See also* 47 U.S.C. § 214(e)(4) (States "shall permit" an ETC to relinquish its ETC designation in an area served by another ETC). The forbearance sought here would not extend to the supported ETC.

[204] Comments of AT&T at 32, WC Dkt. No. 10-90 (Aug. 8, 2014) ("AT&T CAF Comments").

[205] In two representative AT&T price cap carrier affiliate service areas, the percentage of total 2013 Lifeline disbursements going to wireless carriers was over 95 percent. *Id. See also* letter from Mary L. Henze, Ass't V.P., Federal Regulatory, AT&T, to Marlene Dortch, Secretary, FCC, WC Dkt. No. 10-90, at 3-4 (Sept. 15, 2014) ("Henze Letter").

compelling price cap carriers to offer Lifeline service to consumers that do not want it.[206] For these reasons, both ILECs and competitive ETCs have supported relieving ETCs of their service obligations and designations under Section 214(e)(1)(A) in areas where they do not receive support.[207]

Accordingly, forbearance from enforcement of the Section 214(e) ETC designation and service requirement in an area where an ETC does not receive high-cost support meets the Section 10(a)(1) and 10(a)(2) criteria, because such enforcement is not necessary to ensure just and reasonable rates and practices or to protect consumers.[208]

B. Forbearance From Enforcement of Section 214(e)(1)(A) Will Further the Public Interest

Forbearance also would further the public interest, satisfying the requirements of Section 10(a)(3).[209] Specifically, forbearance will advance national broadband deployment goals, promote competitive neutrality, help ensure the current regime's compliance with Section 254, and conform the ETC regime to the revised high-cost framework.

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[206] Participating in the Lifeline program costs providers about $600 million annually, or about 37 percent of the yearly total cost of the program. AT&T CAF Comments at 32. Lifeline is a pass-through program, which means that carriers are reimbursed $9.25/month per customer for each $9.25 discount they provide to their Lifeline customers. *Id.* at 32-33. *See also* Henze Letter at 5.

[207] *See, e.g.*, Comments of AT&T at 3-17, WC Dkt. No. 10-90 (Jan. 18, 2012); Comments of T-Mobile USA, Inc. at 9, WC Dkt. No. 10-90 (Jan. 18, 2012).

[208] *See* 47 U.S.C. § 160(a)(1-2).

[209] *See id.* § 160(a)(3).

1. Forbearance Will Advance National Broadband Deployment Goals.

Section 706 of the Telecommunications Act of 1996 ("1996 Act") requires the Commission to "encourage the deployment . . . of advanced telecommunications capability."[210] Forbearance would advance the public interest because forcing carriers to provide unsupported service in areas where they are not otherwise incented to offer service impedes realization of that goal. Mandated uneconomic narrowband service provision undercuts providers' ability to invest in and deploy broadband facilities. As noted above, Chairman Wheeler recently stated that "the majority of the capital investments made by U.S. telephone companies from 2006 to 2011 went toward maintaining the declining telephone network, despite the fact that only one-third of U.S. households use it at all."[211] Those funds would have been more available for broadband deployment, and price cap carriers would have allocated more to such investments, if they had been free to do so.

The Commission has found that "regulation that constrains incentives to invest in and deploy the infrastructure needed to deliver broadband services is not in the public interest."[212] In Section 706, Congress specifically "direct[ed]" the Commission to "'utiliz[e]' its section 10

[210] *Id.* § 1302(a).

[211] Silicon Flatirons Address.

[212] *Petition of AT&T Inc. for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to Its Broadband Services*, Memorandum Opinion and Order, 22 FCC Rcd 18705, 18732 ¶ 49 (2007) ("*AT&T Forbearance Order*"), *aff'd sub nom. Ad Hoc Telecomms. Users Comm. v. FCC*, 572 F.3d 903 (D.C. Cir. 2009).

'regulatory forbearance' power" to promote broadband investment.[213] Thus, consistent with Section 706, Section 10 should be applied to "promote [broadband] infrastructure investment" and eliminate "regulation that constrains incentives to invest in and deploy" such infrastructure – in this case, by forbearing from enforcement of costly Section 214(e) ETC designations and associated service obligations where a carrier receives no high-cost support.[214]

2. Forbearance Will Promote Competitive Neutrality.

In the *Transformation Order*, the Commission stated that its reforms "generally advance the principle of competitive neutrality" by ensuring that "providers that offer service without subsidy will no longer face competitors whose service in the same area is subsidized by federal universal service funding."[215] The Commission made no distinction in this regard between ILECs and competitive ETCs. The current application of Section 214(e)(1)(A), however, vitiates this promise of competitive neutrality by requiring price cap ETCs to provide unsubsidized service even where a subsidized competitor serves the same area. Indeed, the current regime requires the unsubsidized price cap ETC to compete against a subsidized provider in an area where the Commission has determined that it is uneconomic to provide service without support.[216]

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[213] Brief for the Federal Communications Commission at 1, *Ad Hoc Telecommunications Users Committee, et al. v. FCC*, No. 07-1426 (D.C. Cir. filed Dec. 3, 2008) (citing 1996 Act, Pub. L No. 104-104, 110 Stat. 56, § 706(a), 47 U.S.C. § 157 note).

[214] *AT&T Forbearance Order*, 22 FCC Rcd at 18732 ¶ 49.

[215] *Transformation Order*, 26 FCC Rcd at 17731 ¶ 177.

[216] *Id.* at 17720 ¶ 145. *See also id.* at 17827 ¶ 502 (areas that "do not support a private business case for" provision of service).

In 2000, concerns over competitive neutrality nearly identical to those presented here led the Commission to opt against requiring new entrants to provide service throughout the service area as a prerequisite for designation as ETCs.[217] The Commission found that it was "unreasonable to expect an unsupported carrier to . . . provide a service that its competitor already provides at a substantially supported price."[218] "[A] requirement that a carrier . . . provid[e] service throughout the service area . . . is likely to have the effect of prohibiting the ability of carriers without eligibility for support to provide service in high-cost areas."[219] The Commission held that such a disadvantage violated the competitive neutrality requirement.[220] As in that case, requiring that any "unsupported carrier" – ILEC or CETC – "provid[e] . . . throughout the service area," including "high-cost areas," "a service that its competitor . . . provides at a substantially supported price" violates competitive neutrality.[221]

As the Fifth Circuit held in *Alenco*, the universal service program is required "by statute" to "treat all market participants equally . . . so that the market, and not . . . regulators, determines who shall compete for and deliver services to customers."[222] Regulators should not skew the market by forcing one carrier – the price cap carrier – to provide service in a high-cost area,

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[217] *Federal-State Joint Board on Universal Service*, Declaratory Ruling, 15 FCC Rcd 15168 (2000).

[218] *Id.* at 15173 ¶ 13.

[219] *Id.* at 15174 ¶ 16.

[220] *Id.* at 15176-77 ¶ 21.

[221] *Id.* at 15173 ¶ 13, 15174 ¶ 16.

[222] *Alenco Communications, Inc. v. FCC*, 201 F.3d 608, 616 (5th Cir. 2000) ("*Alenco*").

without the necessary support, in competition with the sole carrier in the area receiving support. "Universal service support mechanisms" should "neither unfairly advantage nor disadvantage one provider over another . . . ."[223]

Similarly, imposing these service obligations on only one category of carrier – ILECs – where no support is available for any carrier also violates competitive neutrality. Such asymmetric obligations also are not consistent with the Commission's principle that "[u]niversal service support mechanisms" should "neither unfairly advantage nor disadvantage one provider over another . . . ."[224]

Indeed, the Commission already has recognized, on similar grounds, that forbearance is appropriate where a provider would otherwise be compelled to provide service in an area for which it receives no support. In the *Mobility Fund Forbearance Order*, in the case of a conditional ETC designation, it forbore from requiring that the designated service area conform to the service area of any rural telephone company serving the same area.[225] Specifically, the Commission held:

> Absent forbearance, we find that parties seeking support may be required to take on unsupported ETC obligations in portions of rural carriers' study areas – *areas that may not be eligible for support* or for which they may not win support – and that this is likely to discourage participation in Mobility Fund Phase I. . . . Hence, we find that forbearing from the conformance requirement will encourage participation by assuring that *obligations of new*

[223] *First USF Order*, 12 FCC Rcd at 8801 ¶ 47.

[224] *Id.*

[225] *Connect America Fund*, Second Report and Order, 27 FCC Rcd 7856 (2012) ("*Mobility Fund Forbearance Order*"). The rural service area conformance requirement is found in 47 U.S.C. § 214(e)(5) and 47 C.F.R. § 54.207(b).

> *ETCs will not extend to portions of rural service areas for which a new ETC may not receive support.*[226]

This logic applies with equal force to "unsupported ETC obligations" imposed on price cap ILECs in "areas that may not be eligible for support."[227]

3. Forbearance Also More Accurately Implements the Current High-Cost Regime.

The interpretation of Section 214(e)(1)(A) adopted in the *First USF Order* may have been consistent with the high-cost regime established in that order, which included fully portable support to all CETCs serving the same area as an ILEC receiving support.[228] Because more than one ETC could receive high-cost support in a given service area, each ETC was in fact "eligible to receive universal service support in accordance with section 254," and was required to offer "throughout the service area for which the designation is received . . . the services *that are supported* by Federal universal service support mechanisms under section 254(c)."[229] The now abandoned portable high-cost regime established by the *First USF Order* thus was arguably congruent with the statutory language expressly tying ETC designations and obligations to high-cost support mechanisms.

Accordingly, leaving aside whether the Commission's interpretation of Section 214(e) once made sense, now that the *Transformation Order* has severed the link between the high-cost support mechanisms and ETC designations and obligations, as discussed above, there is no

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[226] *Mobility Fund Forbearance Order*, 27 FCC Rcd at 7862 ¶ 15 (emphasis added).

[227] *Id.*

[228] *Id.* at 8786 ¶ 15, 8813 ¶ 67, 8932-33 ¶¶ 286-89, 8944-45 ¶¶ 311-13.

[229] 47 U.S.C. § 214(e)(1) (emphasis added).

justification for treating carriers as designated ETCs where they no longer receive the associated high-cost support. Thus, where a carrier receives no support, forbearance from enforcement of the Section 214(e) ETC designation and service requirement satisfies all of the Section 10 forbearance criteria. The intense competition in the provision of voice telephone services ensures just and reasonable rates and protects consumers. Forbearance here would advance the Commission's deployment and universal service goals, helping assure competition where it can exist, and subsiding service only where competition is infeasible.

VI. THE COMMISSION SHOULD FORBEAR FROM ENFORCING ALL REMAINING *COMPUTER INQUIRY* RULES

In order to eliminate barriers to infrastructure investment and competition, the Commission should forbear from continuing to impose the remaining legacy *Computer Inquiry* requirements on any LEC offering enhanced services. These requirements are the remnants of decades-old proceedings, which were premised on the idea that the Commission had to prevent telephone companies from using their monopoly over wireline voice networks to the disadvantage of emerging enhanced services providers ("ESPs") who were dependent on those networks. However, there is no LEC monopoly over wireline networks today, and the narrowband TDM-based network itself has entered its twilight years, as the industry transitions to IP-based broadband facilities offered by multiple competitors. The *Computer Inquiry* requirements therefore have outlived their utility, particularly insofar as the Commission may still consider them applicable to modern broadband services.

As discussed herein, the *Computer Inquiry* requirements – which apply primarily to a limited, aging, and declining set of narrowband services – no longer are necessary to ensure that consumers have access to enhanced services on just, reasonable, and competitively disciplined

terms. Instead, these legacy requirements selectively impede LECs from competing on even terms with cable companies and other vigorous competitors. It therefore is in the public interest to eliminate these unnecessary requirements.

A. Background of the *Computer Inquiry* Rules

The Commission first launched its *Computer Inquiry* in 1966, at a time when "communication common carriers" were first "grafting on to their conventional undertaking of providing communication channels and services to the public various types of data processing and information services."[230] At the time, the Commission worried that "common carriers, in offering these services, are, or in many instances will be, competitive with services sold by computer manufacturers and service bureau firms," while "such firms will be dependent upon common carriers for reasonably priced communication facilities and services."[231]

The specifics of the restrictions the Commission imposed on carriers in response to these concerns morphed through the ensuing decades of Commission orders and judicial review. Ultimately, the Commission required all wireline carriers offering enhanced services to offer — and obtain — the transmission capabilities underlying such services by tariff.[232] The Regional Bell Operating Companies that wished to offer enhanced services were subjected to even tighter restrictions, and essentially had a choice of regimes. The RBOCs could choose to offer enhanced services through isolated affiliates in compliance with the *Computer II* structural-

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[230] *Regulatory and Policy Problems Presented by the Interdependence of Computer and Communication Services and Facilities*, Notice of Inquiry, 7 FCC 2d 11, 15 ¶ 15 (1966) ("*Computer I NOI*").

[231] *Id.*

[232] *Computer II Final Decision*, 77 FCC 2d at 474-75 ¶ 231.

separation requirements set out in Section 64.702 of the Commission's rules.[233] In the alternative, RBOCs could forego the structural separation requirements and offer enhanced services directly – but only if the RBOCs complied with the non-structural safeguards set out in the *Computer III* proceedings, most notably the Comparably Efficient Interconnection ("CEI") and Open Network Architecture ("ONA") requirements.[234]

At a high level, the CEI regime – which was intended merely as a transition to ONA – requires RBOCs to comply with numerous specified "equal access" parameters and to file a plan before launching any new enhanced service detailing how the carrier would comply with CEI requirements. The ONA regime, intended to be the longer-lasting *Computer III* framework, initially required carriers to proactively divide their legacy networks into building blocks – basic service elements, basic service arrangements, and complementary network services – that would

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[233] 47 C.F.R. § 64.702; *see also Computer II.*

[234] *See Amendment of Section 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry)*, Report and Order, 104 FCC 2d 958 (1986) ("*Computer III Phase I Order*"), *recon.*, 2 FCC Rcd 3035 (1987) ("*Computer III Phase I Reconsideration Order*"), *further recon.*, 3 FCC Rcd 1135 (1988), *second further recon.*, 4 FCC Rcd 5927 (1989); *Computer III Phase I Order and Computer III Phase I Reconsideration Order vacated sub nom., California v. FCC*, 905 F.2d 1217 (9th Cir. 1990) ("*California I*"); *Amendment of Section 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry)*, Report and Order, 2 FCC Rcd 3072 (1987) ("*Computer III Phase II Order*"), *recon.*, 3 FCC Rcd 1150 (1988), *further recon.*, 4 FCC Rcd 5927 (1989) ("*Phase II Further Reconsideration Order*"); *Computer III Phase II Order vacated*, *California I*, 905 F.2d 1217; *Computer III Remand Proceeding*, Report and Order, 5 FCC Rcd 7719 (1990) ("*ONA Remand Order*"), *recon.*, 7 FCC Rcd 909 (1992), *pets. for review denied sub nom. California v. FCC*, 4 F.3d 1505 (9th Cir. 1993) ("*California II*"); *Computer III Remand Proceedings: Bell Operating Company Safeguards and Tier 1 Local Exchange Company Safeguards*, Report and Order, 6 FCC Rcd 7571 (1991), v*acated in part and remanded sub nom. California v. FCC*, 39 F.3d 919 (9th Cir. 1994), *cert. denied*, 514 U.S. 1050 (1995); *Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services*, Notice of Proposed Rulemaking, 10 FCC Rcd 8360 (1995), Further Notice of Proposed Rulemaking, 13 FCC Rcd 6040 (1998), Report and Order, 14 FCC Rcd 4289 (1999), *recon.*, 14 FCC Rcd 21628 (1999) (collectively "*Computer III Proceedings*"). .

be described in carrier ONA Plans and be made available to competing ESPs. Pursuant to the Commission's ONA orders, carriers accomplished this task more than 20 years ago, after a lengthy and laborious process. The ONA plans cover virtually every element of a carrier's network. The ONA rules also imposed a variety of other obligations, including requirements that carriers establish procedures to ensure that they do not discriminate in their provision of ONA services, that they respond in a specified manner within 120 days to ESP requests for new network elements, and that they file nondiscrimination reports and annual affidavits demonstrating the nondiscriminatory service provided to unaffiliated ESPs and documenting other ONA-related activities.

Though the *Computer II* structural safeguards and the *Computer III* non-structural safeguards took different forms, their underlying purpose was the same: "to prevent the BOCs from using 'exclusionary market power' arising from their control over ubiquitous local telephone networks to impede competition in the enhanced services market."[235] "Exclusionary" market power, in this context, means the ability of a carrier to "'profitably to raise and sustain its price significantly above the competitive level by raising its rivals' costs and thereby causing the rivals to restrain their output.'"[236]

All of these restrictions thus rest on the assumption that independent ESPs are dependent on LEC facilities, allowing RBOCs or other LECs to exercise exclusionary market power in the absence of prophylactic regulations. In fact, however, changes in the market have rendered this

[235] *Petitions of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Denver, Minneapolis-St. Paul, Phoenix, and Seattle Metropolitan Statistical Areas,* 23 FCC Rcd 11729, 11760, ¶ 44 (2008).

[236] *Id*. at 11760 ¶ 44 n.157.

assumption obsolete. The *Computer Inquiry* restrictions therefore are no longer necessary to discipline carrier charges or practices, to protect consumers, or to advance the public interest.

B. Enforcement of the Remaining *Computer Inquiry* Rules is Not Necessary to Ensure Just, Reasonable and Nondiscriminatory Rates and Practices or to Protect Consumers

The remaining *Computer Inquiry* rules are no longer necessary because RBOCS and other LECs are no longer capable of exercising exclusionary market power against ESPs. The original regulatory rationale underpinning the *Computer Inquiry* rules – that competitive providers of enhanced services "will be dependent upon common carriers for reasonably priced communication facilities and services,"[237] – no longer exists. As broadband and wireless have grown, the ILEC share of the fixed-line voice marketplace has eroded. From the end of 2000 to June 2013, ILEC switched and VoIP access lines fell from 178 million to only 78.5 million.[238] As of June 2013, there were nearly as many interconnected VoIP residential lines as traditional switched access residential lines in the U.S.[239] Since the end of 2000, the ILEC share of total fixed end user connections (including ILEC-provisioned VoIP services) has dropped dramatically, from 92 percent to 58 percent.[240] As Dr. Caves observes in his attached Declaration, "[m]easured as a proportion of end-user switched access lines, interconnected VoIP subscriptions, and mobile wireless subscriptions, ILECs' aggregate market share fell from 60.5

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[237] *Computer I NOI*, 7 FCC 2d at 15.

[238] *Compare 2009 Local Telephone Competition Report* at 13, Table 1, *with Mid-2013 Local Telephone Competition Report* at 12, Table 1.

[239] *See Mid-2013 Local Telephone Competition Report* at 5, Figure 4.

[240] *Compare 2009 Local Telephone Competition Report* at 13, Table 1, *with Mid-2013 Local Telephone Competition Report* at 12, Table 1.

percent to 18.5 percent" from 2000 to 2012,[241] and ILEC fixed access lines accounted for *less than 18 percent* of the voice market as of mid-2013.[242]

In today's marketplace, therefore, ESPs are clearly not dependent on common carrier facilities; to the contrary, non-common carriers such as cable companies are strong and growing competitors in both the wireline voice marketplace and the broadband marketplace. If approved, the pending Comcast-Time Warner Cable merger will further enhance cable providers' competitive role. Even the types of enhanced services most closely associated with narrowband POTS lines – alarm services and voicemail – today can easily be obtained by consumers over competing platforms. Many alarm systems can and do use cable and other qualifying VoIP providers.[243] Voicemail can be obtained through a variety of consumer- or business-grade online services that route to traditional lines, mobile phones, or exclusively through the Internet.[244]

LECs therefore cannot exercise exclusionary market power by charging ESPs supra-competitive rates. If LECs raised their rates above what the market will bear, ESPs could and

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[241] Caves Decl. ¶ 12.

[242] This figure reflects the 78,537,000 ILEC access lines and VoIP connections listed in the *Mid-2013 Local Telephone Competition Report* at 12, Table 1, the 56,590,000 non-ILEC access lines listed in that report, and the 305,742,000 wireless accounts reported by FCC as of the mid-2013. *See also* Caves Declaration at ¶¶ 10, 12.

[243] *See* CPI Security Systems, VoIP Requirements, http://www.cpisecurity.com/customer-care-center/resources/voip-requirements/ (last visited Oct. 6, 2014); ADT, *Questions about VoIP*, http://www.adt.com/customer-service/voip-faqs/ (last visited Oct. 6, 2014).

[244] *See* Google, About Google Voice, https://support.google.com/voice/answer/115061?hl=en&ref_topic=1707989https://support.google.com/voice/answer/115061?hl=en&ref_topic=1707989 (last visited Oct. 6, 2014); eVoice, How eVoice® Works, http://www.evoice.com/how-it-works (last visited Oct. 6, 2014); YouMail, Visual Voicemail, http://www.youmail.com/home/feature/visual-voicemail (last visited Oct. 6, 2014).

would obtain necessary transmission services from competing providers. Accordingly, enforcement of the remaining *Computer Inquiry* rules is unnecessary to ensure just and reasonable rates for the products and services that ESPs purchase from RBOCs and other LECs, or to protect consumers.

Further, to the extent they even continue to apply, the *Computer Inquiry* obligations are largely anachronisms in the context of broadband services.[245] As broadband service has grown over the last two decades, non-LEC competitors have gained leading positions in the marketplace for all types of broadband service. The Commission's most recent data indicate that there were 94 million fixed broadband connections as of mid-2103.[246] Telecommunications company services accounted for slightly greater than 41 percent of fixed connections.[247]

For residential services and for higher speed tiers, non-ILECs' position in the marketplace is even stronger. For example, among residential connections, telecommunications companies served slightly less than 40 percent.[248] Additionally, telecommunications companies provided just 32 percent of residential fixed connections offering at least 3 Mbps downstream and 768 Kbps upstream, and only about 25 percent of residential fixed connections offering at

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[245] *See Appropriate Framework for Broadband Access to the Internet over Wireline Facilities*, Report and Order and Notice of Proposed Rulemaking, 20 FCC Rcd 14853 (2005) ("*2005 Wireline Broadband Order*"), *aff'd sub nom.*, *Time Warner v. FCC*, 507 F.3d 205 (3rd Cir. 2007).

[246] *Mid-2013 Internet Access Report* at 23, Table 5.

[247] *Id.* Services attributed to telecommunications companies include aDSL, sDSL, Other Wireline, and FTTP.

[248] *Id.* at 24, Table 6.

least 6 Mbps downstream and 1.5 Mbps upstream.[249] Cable modems accounted for 66 percent and 74 percent of such connections, respectively.[250] Meanwhile, as noted above, mobile broadband now stands at more than 181 million connections[251] and mobile voice at 306 million connections,[252] surpassing fixed broadband and fixed voice connections, respectively. Consumer adoption of broadband alternatives provided by entities other than wireline telecommunications companies, including cable modem services and mobile broadband services, is evident not only at the national level but also across all of the states.[253]

In short, any ILEC monopoly over the transmission capabilities needed to provide enhanced services has been broken.[254] As demonstrated above, it is now possible for ESPs to provide services without direct access to traditional phone lines, and therefore ESPs no longer are dependent upon LECs for access to consumers. In today's competitive marketplace, no LEC could exercise exclusionary market power to the detriment of ESPs. Accordingly, the animating rationale for the entire *Computer Inquiry* framework has been rendered obsolete. The remaining

[249] *Id.* at 28, Chart 12.

[250] *Id.*

[251] *Id.* at 5, Table 1.

[252] *Mid-2013 Local Telephone Competition Report* at 29, Table 18.

[253] *Mid-2013 Internet Access Report* at 39-40, Table 17.

[254] Previously, the Commission refused to forbear from the substantive *Computer Inquiry* requirements, based in part on its view that there was insufficient record evidence that alternative wholesale transmission services would be available to ESPs. *USTelecom Forbearance Order*, 28 FCC Rcd at 7643-44 ¶ 26. But the *Computer Inquiry* rules are not designed to protect ESP wholesale arrangements for their own sake. Rather, these rules are Commission creations designed to promote consumer interests. They are explicitly premised on the fear that LECs would privilege their own enhanced services over enhanced services provided by competitors who would be "dependent upon common carriers." *Computer I NOI*, 7 FCC 2d at 15.

Computer Inquiry rules are therefore not necessary to ensure just and reasonable rates and practices for facilities and services that LECS provide to ESPs, nor are these rules necessary to protect consumers. The robustly competitive marketplace now fulfills that role, making forbearance from enforcement of the remaining *Computer Inquiry* requirement appropriate.

C. Forbearance From Enforcement of the *Computer Inquiry* Rules Will Serve the Public Interest by Eliminating Costs and Excessive Burdens and Allowing RBOCs and Other LECs to More Efficiently Invest Their Resources in Modern Networks

The Commission already has acknowledged the *Computer Inquiry* obligations as inefficient anachronisms in the context of broadband services. The *2005 Wireline Broadband Order* eliminated all *Computer Inquiry* requirements for wireline broadband services, including when provided by RBOCs.[255] The Commission correctly observed that the *Computer Inquiry* requirements "impede the development and deployment of innovative wireline broadband Internet access technologies and services" because "vendors do not create technologies with the *Computer Inquiry* requirements in mind."[256]

The Commission also concluded that the *Computer Inquiry* requirements compelled wireline carriers when deploying advanced network equipment to either "decide not to use all the equipment's capabilities" or "defer deployment" while the equipment was re-engineered "to facilitate compliance with the Computer Inquiry rules" – which, according to the Commission, were "less-than-optimal" outcomes, as they reduced "operational efficiency" and created

[255] *2005 Wireline Broadband Order*, 20 FCC Rcd 14853.

[256] *Id.* at 14887-88, ¶ 65.

"unnecessary costs and service delays."[257] The Commission reached similar conclusions in a series of decisions granting forbearance from the application of *Computer Inquiry* requirements to a wide range of enterprise broadband services.[258]

Despite the fact that the CEI and ONA rules no longer serve any meaningful purpose, RBOCs continue to incur significant costs in order to comply with them. All RBOCs continue to maintain unwieldy and arcane regulatory processes to comply with CEI and ONA. By way of example, carriers must maintain internal regulatory processes to ensure that employees remain familiar with the aging ONA and CEI requirements, that CEI/ONA-specific non-discrimination and equal access requirements are met, that new products receive CEI/ONA reviews, and that CEI/ONA-related documentation (*e.g.*, extensive descriptive material in carrier tariffs) is maintained. These processes increasingly result in confusion and operational churn as carriers strive to apply 30-year old regulatory frameworks in today's fast-moving and dynamic telecommunications environment.

Collectively, these processes impose material costs in terms of employee time and

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[257] *Id.*

[258] *See, e.g.*, *AT&T Forbearance Order*, 22 FCC Rcd at 18733-34 ¶¶ 54, 56 (because enterprise customers have "individualized needs" that AT&T must be able to meet through "innovative service arrangements that make full use of its networks' telecommunications and information service capabilities," continued application of the *Computer Inquiry* requirements to enterprise broadband services "constrains AT&T's ability to respond to technological advances and customer needs in an efficient, effective, or timely manner"); *Qwest Petition for Forbearance Under 47 U.S.C. § 160(c) from Title II and Computer Inquiry Rules with Respect to its Broadband Services*, Memorandum Opinion and Order, 23 FCC Rcd 12260, 12288-89 ¶ 55, 12289 ¶ 57 (2008) ("*Qwest Forbearance Order*") (noting that eliminating the *Computer Inquiry* requirements "should benefit potential enterprise customers by giving them increased opportunities to obtain integrated service packages that meet their needs.").

dollars invested to support them. CenturyLink, for example, estimates that, in the year ending July 31, 2013, it had between 55 and 60 employees who either maintained CEI/ONA specific processes or became engaged in some CEI/ONA-related compliance activities, large or small.[259] Determining the costs of compliance is difficult, but the costs are real, even apart from the equally real, but more elusive, cost of the operational churn described above.

The CEI and ONA rules also impose other costs. Both the rules and the regulatory processes they have spawned fundamentally impede the ability of carriers to develop and deploy innovative products that respond to market demands in a timely fashion. Similarly, advance product notice aspects such as the CEI plan posting requirement give RBOC competitors an undue advantage and provide further disincentives to RBOC innovation in the information service area. These impacts ultimately reduce each carrier's incentive and ability to invest in and deploy network infrastructure.

These further "unnecessary costs and service delays" are all well documented in the Commission's own past orders, particularly in the 2005 *Wireline Broadband Order*, discussed above.[260] Elimination of CEI and ONA will relieve carriers of these additional types of costs, which are distinct from those costs historically associated with meeting the ONA reporting requirements.[261] Notwithstanding the high costs the *Computer Inquiry* requirements impose and

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[259] Comments of CenturyLink at 11, CC Dkt. Nos. 95-20 & 98-10 (July 31, 2013).

[260] *2005 Wireline Broadband Order*, 20 FCC Rcd at 14887-88 ¶ 65.

[261] The Commission eliminated ONA reporting requirements via waiver in 2011. In the Notice of Proposed Rulemaking leading to that waiver, the Commission acknowledged that the CEl/ONA reporting rules impose significant costs on RBOCs without any corresponding benefit. *Review of Wireline Competition Bureau Data Practices*, Notice of Proposed Rulemaking, 26 FCC Rcd 1579 (2011).

the lack of any corresponding benefits to consumers, the Commission has continued to apply these requirements to narrowband services, and it appears to have left open the possibility of applying them even to enterprise broadband service offerings that have not specifically been granted forbearance.[262]

Given today's highly competitive voice and broadband markets, the Commission should eliminate that prospect once and for all. The *Computer Inquiry* requirements are particularly unjustifiable in the context of any broadband-based service, given that LECs have never enjoyed any dominant position in the broadband market. Moreover, even if the Commission were to conclude that there might be some remaining relevance to the *Computer Inquiry* rules in the context of legacy narrowband services, the Commission at a minimum should forbear from requiring carriers to unbundle any new narrowband elements. The Commission also should forbear from any requirements – beyond the standard Section 214 discontinuance process, if and when applicable – that impede carriers from retiring ONA elements. Granting this level of forbearance would fully protect the interests of any ESPs or consumers relying on existing narrowband elements, while ensuring that carriers will be allowed to innovate and compete effectively going forward and service providers will design applications based on the superior capabilities and functionality of advanced broadband networks.

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[262] USTelecom believes that the *2005 Wireline Broadband Order* made clear that the *Computer Inquiry* rules no longer apply to *any* broadband services. To the extent any *Computer Inquiry* requirements arguably still apply to any sub-category of broadband services, however, the Commission should forbear from enforcing those requirements. Forbearance is appropriate here even if there is disagreement or uncertainty as to whether any *Computer Inquiry* requirements still apply to any broadband services. *AT&T v. FCC*, 452 F.3d 830, 836 (D.C. Cir. 2006) ("[A] forbearance petition's conditional nature gives the Commission no discretion to escape ruling on its merits.").

VII. THE COMMISSION SHOULD FORBEAR FROM REQUIRING ILECS TO SHARE NEWLY DEPLOYED ENTRANCE CONDUIT AT REGULATED RATES.

As interpreted by the Commission, the conduit access provisions of Sections 224 and 251(b)(4) allow CLECs to demand access to ILEC-constructed conduits – at below-market rates – while denying ILECs reciprocal access to conduits their competitors construct. These one-sided obligations are not mandated by the plain language of the Communications Act, do not serve the public interest, and do not benefit consumers. They are unnecessary and particularly inequitable in deployments where a new entrance conduit must be constructed.

ILECs have no special advantages in carrying out these deployments and they should not be subject to special regulatory burdens. In today's market, all providers are equally capable of constructing entrance conduits in new developments ("greenfields") or to buildings previously unserved by fiber in existing developments ("brownfields"),[263] and many competitors can – and do – engage in such construction. Accordingly, in order to eliminate barriers to infrastructure investment and competition, the Commission should forbear from applying these asymmetric conduit-access obligations in greenfield and brownfield deployments. Further, perpetuating the current asymmetric conduit-access obligations actually disserves the public interest and harms consumers by distorting both ILEC and CLEC incentives to construct new conduit that can be used to further deploy advanced services.

Forbearance here meets the statutory standard. Forbearance from applying the conduit-access requirements would increase competition by creating a level playing field. Because

[263] *See Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Order on Reconsideration, 19 FCC Rcd 20293, 20295-96 ¶ 6 (2004) (noting distinction between "greenfield" and "brownfield" fiber deployments) ("*FTTC Recon Order*").

competitors have demonstrated that they are equally capable of constructing the entrance conduits at issue, no special restrictions on ILECs are warranted. Market forces will protect customers and ensure that the charges for such construction are just and reasonable.[264] In addition, forbearance from the conduit-access requirements would serve the public interest by ensuring that all providers have appropriate incentives to invest in new facilities.

A. Background

Section 251(b)(4) of the Communications Act imposes on "[e]ach local exchange carrier" the duty "to afford access to the poles, ducts, conduits, and rights-of-way of such carrier to competing providers of telecommunications services on rates, terms, and conditions that are consistent with section 224."[265] Section 224, in turn, requires any "utility" – which includes local exchange carriers and other public utilities – to "provide a cable television system or any telecommunications carrier with nondiscriminatory access to any pole, duct, conduit, or right-of-way owned or controlled by it."[266] However, for the purpose of Section 224, ILECs are explicitly excluded from the definition of "telecommunications carrier."[267] The Commission therefore concluded in the *First Local Competition Order* that "no incumbent LEC may seek access to the

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[264] USTelecom notes that the relief sought in this section of the Petition does not affect conduit access rights or obligations attaching to conduits that merely pass properties. Thus, even assuming *arguendo* that ILECs have more overall infrastructure, on an MSA-wide basis, than *some* competitors in *some* areas, the existence of that overall infrastructure is not determinative in considering whether conduit access obligations remain necessary as addressed by this forbearance request: new entrance conduits serving individual brownfield and greenfield properties.

[265] 47 U.S.C. § 251(b)(4).

[266] *Id.* § 224(f)(1).

[267] *Id.* § 224(a)(5).

facilities or rights-of-way of a LEC or any utility under either section 224 or section 251(b)(4)" because "section 224 does not provide access rights to incumbent LECs" and "[w]e give deference to the specific denial of access under section 224 over the more general access provisions of section 251(b)(4)."[268]

The Ninth Circuit expressed "serious doubts about the FCC's analysis" on this point, noting that in its view Sections 224 and 251(b)(4) could be better harmonized as imposing reciprocal access obligations on all LECs (under Section 251(b)(4)) but granting only CLECs a right to demand access to the facilities of non-LEC utilities (such as electric and gas companies).[269] Nonetheless, the Ninth Circuit concluded that it was bound to defer to the Commission's analysis.[270] The Commission's 2011 *Pole Attachment Order* reaffirmed the Commission's interpretation that "incumbent LECs have no right of access to utilities' poles pursuant to section 224(f)(1)" and that the Act "do[es] not grant incumbent LECs an access right under section 251(b)(4) that does not exist under section 224."[271]

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[268] *Implementation of the Local Competition Provisions in the Telecommunications Act of 1996*, First Report and Order, 11 FCC Rcd 15499, 16103-04, ¶ 1231 (1996) ("*First Local Competition Order*") (subsequent history omitted).

[269] *US West Communications, Inc. v. Hamilton*, 224 F.3d 1049, 1053-54 (9th Cir. 2000), *amended opinion*, 2000 U.S. App. LEXIS 26416 (9th Cir. Or. Sept. 13, 2000), *pet. for rehearing denied*, 2000 U.S. App. LEXIS 26417 (9th Cir. Or. Oct. 23, 2000).

[270] *Id*. at 1054.

[271] *Implementation of Section 224 of the Act*, Report and Order and Order on Reconsideration, 26 FCC Rcd 5240, 5327-28 ¶ 202, 5333 ¶ 212 n.643 (2011) ("*2011 Pole Attachment Order*"). The *2011 Pole Attachment Order* separately concluded that where ILECs already have such access, they are entitled to rates, terms, and conditions that are "just and reasonable" in accordance with Section 224(b)(1). *Id.* at 5327-28 ¶ 202. The relief sought in this Petition does not affect that finding, which would remain intact.

In sum, the Commission has held that ILECs must grant cable companies and other CLECs nondiscriminatory access to the ILECs' poles, ducts, conduits, and rights-of-way at regulated rates, but that ILECs have no reciprocal right to demand such access from CLECs.

B. Continued Enforcement of Conduit Access Obligations is Not Necessary to Ensure Just, Reasonable and Nondiscriminatory Rates and Practices or to Protect Consumers

When Congress enacted Section 224 in 1978, it did so to ensure that then-fledgling cable companies could gain reasonable access to poles, conduits, ducts, and rights-of-way controlled by utilities.[272] At the time, most local telephone companies were monopoly providers. The Commission noted in its *2011 Pole Attachment Order* that "historically incumbent LECs owned roughly as many poles as electric utilities."[273] Thus, when Congress expanded Section 224 in 1996 to provide "telecommunications carriers" with a guaranteed right of access to these facilities at regulated rates, it viewed ILECs as akin to "utilities" that were markedly distinct from other "telecommunications carriers" (which Congress generally assumed would need to rely, at least initially, on ILEC facilities).[274] The Commission concluded that Congress intended to grant CLECs a right to access ILEC infrastructure while denying ILECs a reciprocal right to access fledgling CLEC facilities.

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[272] *See id.* at 5245 ¶ 9; S. Rep. No. 104-230, at 205-06.

[273] *2011 Pole Attachment Order*, 26 FCC Rcd at 5327 ¶ 199.

[274] *See* 47 U.S.C. § 224(a)(5) (excluding ILECs from definition of "telecommunications carrier" for pole attachment purposes); *cf.* S. Rep. No. 104-230, at 148 ("This conference agreement recognizes that it is unlikely that competitors will have a fully redundant network in place when they initially offer local service, because the investment necessary is so significant.").

Today, however, these distinctions are unjustified. Competitors no longer need access to ILEC conduit because they can and do construct their own conduit. Enforcement of the Section 224 and 251 obligations requiring ILECs to provide competitors access to ILEC conduit is no longer necessary to ensure reasonable rates and practices with regard to conduit or to protect consumers. The Commission itself has recognized that "current market realities" have evolved beyond the assumptions Congress made in 1996 regarding pole ownership, with "incumbent LEC pole ownership [having] diminished relative to that of electric utilities" in the intervening years.[275] Similarly, the overall imbalance between the conduit infrastructure deployed by ILECs and their major CLEC competitors has narrowed considerably. Competitive providers are no longer fledgling newcomers that must rely upon ILEC infrastructure to offer services. This is particularly the case where the "CLEC" is really a major cable company operating through a CLEC affiliate, which is a common occurrence.

Moreover, in the context of new entrance conduits in greenfield and brownfield situations, the relevant question is not how much conduit ILECs and CLECs have historically deployed overall, but rather whether CLECs today have as much ability to construct these entrance conduits as ILECs have without reliance on ILEC facilities. Experience shows that CLECs indeed have this capability – a capability further enhanced by the prevalence of "dig once" laws designed to facilitate the deployment of new conduits whenever work is underway on public rights of way.[276]

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[275] *2011 Pole Attachment Order*, 26 FCC Rcd at 5328-29 ¶ 206.

[276] *See* Intergovernmental Advisory Committee, FCC, *Advisory Recommendation Number 2013-8 Regarding "Dig Once" Policies to Help Create a Robust, National Digital Infrastructure*, at 2-3 (July 31, 2013), *available at* http://transition.fcc.gov/statelocal/recommendation2013-08.pdf

In the context of new fiber deployments, the Commission has recognized that entry barriers "were largely the same for incumbent and competitive carriers," both of which must obtain rights-of-way, bid for developments, obtain materials and implement construction programs.[277] The same is true for new entrance-conduit construction. In that context, the assumptions underlying the imposition of asymmetrical conduit access obligations on ILECs no longer reflect current market realities.

C. Forbearance Would Serve the Public Interest by Ensuring that All LECs Have Incentives to Invest in New Facilities

Even providers that are well-positioned to construct their own entrance conduits in new developments or to previously unserved buildings (such as the largest cable companies) frequently choose instead to obtain access rights from the ILEC at artificially low regulated rates. ILECs, in contrast, generally must construct their own entrance conduits in greenfield and brownfield situations. These asymmetric obligations reduce ILEC incentives to proactively deploy new infrastructure, given the considerable risk that competitors will be able to coopt much of the value of their capital investment. At the same time, the conduit-access regime depresses CLEC incentives to develop their own facilities.[278] Eliminating the current asymmetric

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(recommending that federal projects "notify parties that may be interested in placing fiber or conduit in the trench of the proposed work" in order to "accommodate and facilitate all future public and private fiber deployments").

[277] *FTTC Recon Order*, 19 FCC Rcd at 20298-99 ¶ 12.

[278] Competitors also have little incentive to maintain the integrity of ILECs' conduit and other outside plant. Indeed, the experience of one USTelecom member, CenturyLink, exemplifies the asymmetric incentives of ILECs and CLECs. Many CenturyLink underground vaults and pedestals have been damaged by competitors drilling or boring into those facilities without regard for engineering standards -- in a manner that minimized the competitor's cost of providing service while increasing CenturyLink's network maintenance expenses and threatening its

unbundling obligation by forbearing from requiring ILECs to provide access to conduit would serve the public interest by eliminating these distortions. This would create accurate and appropriate incentives for both ILECs and CLECs to construct conduit infrastructure going forward, further facilitating the deployment of advanced services to the benefit of consumers.

Whatever special advantage some believe ILECs once may have enjoyed over their competitors with respect to the deployment of entrance conduits in new developments or to other newly served buildings, that advantage has eroded and today no longer exists, particularly for brownfield and greenfield deployments. Indeed, today the ILEC conduit unbundling requirement harms the public interest rather than benefiting it. For instance, ILECs have faced challenges in serving customers stemming from the disparate conduit access obligations imposed on ILECs. **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** This tilted playing field does not benefit consumers, and it often frustrates ILECs' ability to deliver the services that customers want.

As a practical matter, ILECs stand in the same position as their major CLEC competitors when it comes to competing for and providing the service at issue. Whether the winning bidder

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network reliability and service quality. In even more instances, competitors have placed their facilities in CenturyLink's conduit without authorization, thus undermining CenturyLink's ability to manage its network. In certain cases, CenturyLink has resorted to legal action to address egregious instances of network damage or trespass, but such actions are costly and time-consuming. Until the Commission rectifies the current asymmetric rules for conduit access, it is likely that some CLECs will continue to view ILEC conduit as a public good that can be used (or misused) as the CLEC sees fit -- to the detriment of all users of that network plant.

is an ILEC or a CLEC, the company must undertake the cost of constructing a new entrance conduit. However, if an ILEC constructs this conduit, competitors such as Comcast or tw telecom are immediately entitled to demand access to the conduit at regulated – generally below-market – rates. Pursuant to Section 224(e) of the Communications Act, the Commission has issued regulations to "ensure that a utility charges just, reasonable, and nondiscriminatory rates" for conduit access and other pole attachments, with the maximum rate based on an apportionment of the conduit owner's costs according to a Commission-mandated formula.[279]

For example, providers leasing conduit from CenturyLink on a regulated basis pay, on average, **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** per foot per year. For a 100-foot run, a competitor therefore would pay approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** per year. Not surprisingly, it costs much more than that to build conduit. In greenfield situations CenturyLink spends an average of **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** per foot to place a four inch conduit, not including the cost of a handhole to access the conduit. Thus it would cost CenturyLink approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** to install a typical 100-foot conduit to a new building in a central business district. Brownfield deployments in high-density urban areas are even more costly. In such situations, CenturyLink typically spends an additional **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** per foot to cut and restore concrete, resulting in a total cost of approximately **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]** to install a 100-foot conduit. One can see why a provider might prefer to lease conduit from the local ILEC, rather than building its

[279] 47 U.S.C. § 224(e)(1); 47 C.F.R. § 1.1409(e)(3).

own conduit, as it would take more than ten years to make it more economical to build its own conduit in a greenfield development and even longer for brownfield deployment.

In contrast, if Cox constructs the new conduit, the local ILEC has no corresponding access right. In practice, competitors generally refuse to allow ILEC facilities in their conduit under any terms, and, if they do allow such access, they charge many times the regulated rates applicable to the sharing of ILEC conduit. If the ILEC wishes to compete for customers in a building served by a Cox-owned entrance conduit, the ILEC must either pay market rates for conduit access or else undertake to construct its own entrance conduit.

Forbearance from applying ILEC conduit-access obligations to entrance conduits constructed in greenfield and brownfield developments would improve competition by eliminating this asymmetry and correcting the competitive distortions outlined above. In these situations, both ILECs and their competitors must undertake new construction to serve customers in a new development or a newly served building. These are not areas where ILECs typically already have deployed conduit and can repurpose it. They instead must build from scratch. In the context of new fiber deployments, the Commission recognized that requiring unbundling "created disincentives for competitive LECs to invest in their own facilities,"[280] with "'CLECs tempted to wait for ILECs to deploy FTTH and ILECs fearful that CLEC access would undermine the investments' potential return.'"[281] In contrast, the Commission found that

[280] *FTTC Recon Order*, 19 FCC Rcd at 20300 ¶ 15.

[281] *Id*. at 20301 ¶ 16.

granting relief from this unbundling obligation would "provide[] incentives for carriers to invest in such facilities."[282]

The same dynamic applies to requirements that ILECs grant competitors access to new entrance conduits at regulated rates. Forbearing from applying the conduit-access provisions in these situations would allow all providers to efficiently incorporate this construction cost into their bids and ultimate service prices. ILECs would have greater assurance of making a return on their capital investment, while other providers would have an incentive to build their own facilities when doing so would be more cost-effective than paying market rates for access to another provider's conduit. This regime would create a level playing field that would better serve the public interest, while ensuring that providers' prices would remain constrained by robust competition for conduit-construction services.

VIII. THE COMMISSION SHOULD FORBEAR FROM THE RULES PROHIBITING THE USE OF CONTRACT TARIFFS FOR BUSINESS DATA SERVICES IN ALL REGIONS

In order to eliminate barriers to infrastructure investment and competition, the Commission should forbear from applying the rules that prohibit price cap ILECs from using contract tariffs to offer "Business Data Services" in all regions.[283] Doing so would effectively extend nationwide the Phase I pricing flexibility that today exists in only limited geographic areas.

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[282] *Id*. at 20301 ¶ 15.

[283] For purposes of this Petition, "Business Data Services" is defined as tariffed TDM special access (DS0 and above) services and tariffed enterprise broadband services.

The Commission's rules require ILECs to offer their Business Data Services on a generally available tariffed basis except in the limited geographic areas where they have been granted pricing flexibility. Outside of those limited areas, the pricing flexibility rules preclude ILECs – but not their competitors – from offering arrangements tailored to individual customers expeditiously, distorting the marketplace and reducing choices for consumers. These rules are unnecessary to protect consumers, because affected providers would still be required to offer these services at generally available regulated tariffed rates. To the contrary, forbearance also would benefit consumers by facilitating specialized arrangements involving lower prices and customized terms that customers demand, and meets each of the Section 10 forbearance criteria.

In the *Pricing Flexibility Order*,[284] the Commission granted price cap LECs increased pricing flexibility in areas where specified competitive "triggers" were satisfied. Under "Phase I" pricing flexibility, price cap LECs that made a specific competitive showing for particular access services were permitted to offer those services under contract tariffs and volume and term discounts on one day's notice as long as they maintained their generally available price cap tariffed rates for those services.[285] Because their generally available price cap rates continued to serve as a backstop, such relief permitted them, as a practical matter, to reduce their rates, but not raise rates for the same services, through contract tariffs or volume and term discounts.[286] In the

[284] *Access Charge Reform*, Fifth Report and Order and Further Notice of Proposed Rulemaking, 14 FCC Rcd 14221 (1999) ("*Pricing Flexibility Order*"), *aff'd sub nom. WorldCom, Inc. v. FCC*, 238 F.3d 449 (D.C. Cir. 2001).

[285] *Id.* at 14234-35 ¶ 24, 14288 ¶ 122.

[286] *Special Access for Price Cap Local Exchange Carriers*, Report and Order and Further Notice of Proposed Rulemaking, 27 FCC Rcd 16318, 16321 ¶ 5 (2012) ("*Special Access Data*

Pricing Flexibility Suspension Order, citing flaws in the competitive triggers adopted in the *Pricing Flexibility Order*, the Commission suspended, on an interim basis, any further grants of pricing flexibility for special access services under the pricing flexibility rules.[287]

As discussed herein, the explosive growth of competition has radically altered the wholesale transmission marketplace, especially high capacity services, since the *Pricing Flexibility Order* was released in 1999. Not only are ILECs competing with many other providers to provide legacy special access services, but demand for these services also has been shrinking as they are supplanted by higher-capacity and more flexible broadband services, which have been largely removed from the price cap regime. The marketplace has moved toward reliance on competitively provisioned Ethernet services that provide economical substitutes for legacy special access services but can also provide speeds many times higher than those legacy offerings. Recent developments – including increased competition from cable, fixed wireless, and other providers – have accelerated this trend.

In the context of these competitive developments, Phase I pricing flexibility has yielded significant benefits for consumers. For example, AT&T, Verizon and CenturyLink together have entered into a total of **[BEGIN CONFIDENTIAL]** [redacted] **[END CONFIDENTIAL]**

Collection Order"); *Special Access for Price Cap Local Exchange Carriers*, Report and Order, 27 FCC Rcd 10557, 10568 ¶ 23 (2012) ("*Pricing Flexibility Suspension Order*"). Under "Phase II" pricing flexibility, price cap LECs, upon a more stringent competitive showing, were permitted to file tariffs on one day's notice free from any price cap rate level or rate structure rules, thus permitting them to raise or lower rates. *Pricing Flexibility Order*, 14 FCC Rcd at 14235 ¶ 25, 14258 ¶ 69.

[287] *Pricing Flexibility Suspension Order*, 27 FCC Rcd at 10558 ¶ 1, 10616 App. A (deleting only Section 1.774(f)(1) of the Commission's rules, but leaving other pricing flexibility rules in place). Section 1.774(f)(1) deems pricing flexibility petitions granted unless denied by the Wireline Competition Bureau within 90 days. 47 C.F.R. § 1.774(f)(1).

negotiated agreements with customers filed as contract tariffs pursuant to Phase I pricing flexibility, reflecting a range of discounts of up to **[BEGIN CONFIDENTIAL]** ▉ **[END CONFIDENTIAL]** percent in addition to the discounts available under generally available discount plans and discount tiers in some plans as high as **[BEGIN CONFIDENTIAL]** ▉ **[END CONFIDENTIAL]** percent. These contract tariffs, some with major carriers and other customers, represent a tremendous saving for consumers and spur for competition. In each of those contracts, customers paid rates lower than the carrier's standard discount rates and purchased service on rates and terms better than any other competitor offered, showing that, on a level playing field, ILECs can compete with other providers.

In light of these benefits, it is not surprising that commenters representing large customers of access and other telecommunications services and commenters representing other providers supported AT&T's proposal to extend Phase I pricing flexibility relief to all price cap areas to meet competition or similar unlimited downward pricing flexibility.[288] It is also not surprising that the *Pricing Flexibility Suspension Order* left existing pricing flexibility grants in place.[289]

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[288] *See* Supplemental Comments of AT&T Inc. at 27 & n.67, WC Dkt. No. 05-25 (Aug. 8, 2007); Comments of the Ad Hoc Telecommunications Users Committee at 50-52, WC Dkt. No. 05-25 (June 13, 2005); Comments of CompTel/ALTS, *et al.* at 31-32, WC Dkt. No. 05-25 (June 13, 2005) (supporting downward pricing flexibility through continuation of Phase I pricing flexibility, with additional limitations on terms and conditions); Comments of Sprint Corp. at 11, WC Dkt. No. 05-25 (June 13, 2005) (supporting ILEC special access contract tariffs and discount plans to meet competition as long as price cap rates remain available). *See also* Comments of the Ad Hoc Telecommunications Users Committee at 27, WC Dkt. No. 05-25 (Aug. 8, 2007).

[289] Rather than withdrawing or otherwise questioning its previous grants of Phase I relief, the Commission simply concluded that its competition triggers were flawed and needed to be updated to, *inter alia*, "extend[] relief to areas that are likely competitive but have been denied

A. The Services Covered and Relief Sought in This Request

Given the benefits resulting from Phase I pricing flexibility and the explosive growth in higher-capacity services competing with ILEC DSn services, the Commission should forbear from applying the rules that preclude price cap ILECs from offering Business Data Services via contract tariffs in the absence of Phase I pricing flexibility authorization. This relief would cover the full range of TDM special access services as well as the higher capacity enterprise broadband services now competing with legacy services. Because most price cap ILECs have obtained complete forbearance from all dominant carrier and tariff regulation of their enterprise broadband services,[290] the only enterprise broadband services covered by this request would be those ILEC services for which forbearance relief has not been obtained. Thus, the relief sought

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regulatory relief under our existing framework." *Pricing Flexibility Suspension Order*, 27 FCC Rcd at 10560 ¶ 5, 10558-59, ¶ 1. Indeed, the Commission implicitly confirmed the benefits from Phase I relief by largely confining its concerns to the more expansive Phase II relief. *See id.* at 10561 ¶ 7 n.15 (commenters allege that "prices in Phase II areas are higher than prices in other areas" and that "'month-to-month and term tariff rates have nearly universally increased in Phase II areas to levels higher than is the case in price cap markets'"), *id.* at 10602-03 ¶ 81 ("While incumbent LECs assert that special access prices have fallen in pricing flexibility areas, competitors state that prices, particularly in areas granted Phase II relief, have increased."); *Special Access Data Collection Order*, 27 FCC Rcd at 16344 ¶ 63 (other carriers "raise concerns that, particularly in Phase II markets, incumbent carriers have increased special access rates to supracompetitive levels."), *id.* at 16347 ¶ 69 n.153 ("While incumbent LECs assert that special access prices have fallen in pricing flexibility areas, competitors state that prices, particularly in Phase II areas, have increased."). *See also* GAO, *FCC Needs to Improve its Ability to Monitor and Determine the Extent of Competition in Dedicated Access Services*, GAO 07-80, at 4 (Nov. 2006) (list prices and revenues in Phase I areas lower than in Phase II areas).

[290] *See AT&T Forbearance Order*, 22 FCC Rcd 18705; *Petition of the Embarq Local Operating Companies for Forbearance Under 47 U.S.C. § 160(c) from Application of Computer Inquiry and Certain Title II Common-Carriage Requirements*; Memorandum Opinion and Order, 22 FCC Rcd 19478 (2007) ("*Embarq Forbearance Order*"); *Qwest Forbearance Order*, 23 FCC Rcd 12260.

here would at least partially level the playing field for all Business Data Services. Such relief would allow ILECs to offer reduced rates – but not increased rates – in contract tariffs nationwide while continuing to offer these Business Data Services at the generally applicable tariffed rates.

Specifically, the Commission should forbear from applying:

- Rule 61.3(o), limiting the definition of "Contract-based tariff" for a price cap ILEC to services offered by carriers that have obtained pricing flexibility;
- Rule 61.55(a), limiting the applicability of Rule 61.55, which details the contents of "Contract-based tariffs," to price cap ILECs permitted to offer contract-based tariffs under Rule 69.727(a).
- Rule 69.709(b), establishing Phase I triggers for dedicated transport and special access services other than channel terminations between ILEC end offices and customer premises;
- Rule 69.711(b), establishing Phase I triggers for channel terminations between ILEC end offices and customer premises;
- The portion of Rule 69.727(a) requiring satisfaction of the Phase I triggers specified in Rules 69.709(b), 69.711(b) and 69.713(b) for an MSA or non-MSA portion of a study area in order to be granted Phase I relief for the services specified in Rules 69.709(a) (dedicated transport and special access services other than channel terminations between ILEC end offices and customer premises), and 69.711(a) (channel terminations between ILEC end offices and customer premises), *but not the portion of Rule 69.727(a) providing such relief (which includes contract tariff authority)*;
- Rule 69.705, requiring price cap ILECs to follow the procedures in Rule 1.774 to obtain Phase I pricing flexibility relief;[291] and
- If necessary, the requirement that packet-switched or optical transmission services must be subject to price cap regulation in order to be eligible for pricing flexibility.[292]

[291] Because Rule 1.774(f)(1), which deems pricing flexibility petitions granted unless denied within 90 days, was suspended in the *Pricing Flexibility Suspension Order*, 27 FCC Rcd at 10616 App. A, no forbearance from enforcement of that rule is necessary.

Forbearance from these rules will effectively provide blanket Phase I authority everywhere under the pricing flexibility rules as they existed prior to their suspension, for the limited purpose of allowing price cap ILECs to offer Business Data Service at reduced rates and more flexible terms and conditions in contract tariffs. These rules are unnecessary to protect consumers because, under the relief sought here, consumers will still have available to them all standard price cap access rates, terms and conditions, and relief will advance the public interest by making available *reduced* access rates in individualized contract tariffs, thereby facilitating competition by enabling price cap ILECs to respond to competitive offers more quickly.

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[292] Previously, some price cap ILECs had not included their packet-switched and optical transmission services in their price cap tariffs, and those services thus were not eligible for pricing flexibility. *See, e.g., Petition for Waiver of Pricing Flexibility Rules for Fast Packet Services*, Memorandum Opinion and Order, 20 FCC Rcd 16840, 16843-44 ¶ 7 (2005) ("*Verizon Advanced Services Waiver*"); *Qwest Petition for Waiver of Pricing Flexibility Rules for Advanced Communications Networks Services*, Order, 22 FCC Rcd 7482, 7482-83 ¶ 2 (WCB 2007) ("*Qwest Advanced Services Waiver*") (together, "*Advanced Services Waiver Orders*"). In order to provide the "blanket" Phase I pricing flexibility authority sought here for any price cap ILECs whose packet-switched and/or optical transmission services have not received forbearance relief but which are also not otherwise subject to price cap regulation, the Commission should forbear from the requirement that services must be in price caps to be eligible for Phase I pricing flexibility. *Cf. Verizon Advanced Services Waiver*, 20 FCC Rcd at 16844 ¶ 8 & n.32; *Qwest Advanced Services Waiver*, 22 FCC Rcd at 7484 ¶ 5 & n.20 (waiving requirement that packet-switching services must be in price caps to be eligible for Phase I pricing flexibility). In order to treat those services the same as price cap services for purposes of this request, they should continue to be offered under currently available tariffs.

B. Forbearance From Application of the Rules Prohibiting Price Cap ILECs' Use of Contract Tariffs to Provide Business Data Services in All Regions Meets the Section 10 Criteria

1. Applying the Rules Prohibiting the Use of Contract Tariffs to Provide Business Data Services in All Regions is Not Necessary to Ensure that Charges or Practices Are Just and Reasonable and not Unjustly or Unreasonably Discriminatory

Applying the rules itemized above is not necessary to ensure that charges or practices in connection with price cap ILECs' offerings of Business Data Services are just and reasonable and not unjustly or unreasonably discriminatory.[293]

a. Business Data Services Will Still be Generally Available in Current Tariffs

Carriers with Phase I pricing flexibility authority offering access services in contract tariffs are required to continue making access services generally available via their standard tariffs.[294] This requirement ensures that "access customers can choose between obtaining services pursuant to contract tariff or [the] generally available tariff" and that "no access customer will be required to pay dramatically higher access rates as a result of Phase I pricing flexibility."[295] Petitioners do not seek forbearance from this requirement. Thus, forbearance from the rules prohibiting the offering of services via contract tariffs will result in a regime under which price cap ILECs will be able to offer Business Data Services in contract tariffs anywhere but will also continue to maintain generally available price cap tariffs for these services everywhere. Under this structure, price cap ILEC Business Data Service rates, terms and

[293] *See* 47 U.S.C. § 160(a)(1).

[294] *Pricing Flexibility Order*, 14 FCC Rcd at 14234-35 ¶ 24, 14288 ¶ 122.

[295] *Id.* at 14288 ¶ 122.

conditions, including those offered in contract tariffs, will continue to be just and reasonable and not unjustly or unreasonably discriminatory.

b. Business Data Services Will be Available at Reduced Rates and/or on More Flexible Terms and Conditions in Contract Tariffs

Because price cap ILECs offering access services in contract tariffs must continue to offer access services at generally available tariffed rates and terms, they will be able to offer the same services via contract tariffs, as a practical matter, only at reduced rates and/or on more flexible terms and conditions more favorable to the customer.[296] Thus, forbearance from the rules prohibiting the offering of access services via contract tariffs will result in a regime under which price cap ILECs will be able to offer Business Data Services at reduced rates and/or on more flexible terms and conditions in individually negotiated contract tariffs, while they continue to offer the same services under generally available rates, terms and conditions.

c. Competition Will Continue to Ensure Just and Reasonable and Nondiscriminatory Rates, Terms and Conditions

The high-capacity service marketplace is highly competitive and is growing more so as demand skyrockets. This increased demand is being driven in large part by an explosion in U.S. wireless data traffic, which is expected to grow 7.5 times between 2013 and 2018.[297] The Commission has confirmed that "demand for backhaul capacity is increasing."[298] Competition

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[296] *See Special Access Data Collection Order*, 27 FCC Rcd at 16321 ¶ 5; *Pricing Flexibility Suspension Order*, 27 FCC Rcd at 10568 ¶ 23.

[297] *See* Cisco, Cisco Visual Networking Index Forecast Widget (2014), *available at* http://www.ciscovni.com/forecast-widet/advanced.html.

[298] *Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993*, Fifteenth Report, 26 FCC Rcd 9664, 9846 ¶ 322 (2011).

for these higher-capacity services is so intense that most of the higher-capacity services have been freed of price cap and tariffing rules.[299] At least 30 cable, wireless, CLEC and other fiber and Ethernet-over-copper providers now offer enterprise broadband services nationally or to large areas of the country.[300] ILECs enjoy no advantages over other providers in deploying fiber to a wireless provider's cell sites or to any type of customer location.[301] In fact, tw telecom was among the top three U.S. business Ethernet service providers as of mid-2014,[302] and ILECs now command less than half of the total Ethernet marketplace.[303] In responding to Sprint's request for bids for its nationwide wireless backhaul needs, Verizon won fewer than *six percent* of the Sprint sites within its region.[304]

The cable industry has become a force in the high-capacity service marketplace and expressly markets its business services as alternatives to ILEC DS1 and DS3 services. Cable companies already have one-quarter of the Ethernet service marketplace nationally, and that

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[299] *See, e.g., AT&T Forbearance Order*, 22 FCC Rcd 18705; *Embarq Forbearance Order*, 22 FCC Rcd 19478; *Qwest Forbearance Order*, 23 FCC Rcd 12260, discussed in Comments of CenturyLink, Inc. at 18-20, WC Dkt. No. 05-25 (Feb. 11, 2013) ("CenturyLink Special Access Data Comments").

[300] CenturyLink Special Access Data Comments at 20-32.

[301] *See, e.g.*, CenturyLink Petition for Forbearance at 34-36, WC Dkt. No. 14-9 (filed Dec. 13, 2013) ("CenturyLink Forbearance Petition").

[302] *See* Press Release, Vertical Systems Group, *Mid-Year 2014 U.S. Carrier Ethernet LEADERBOARD* (Aug. 20, 2014) *available at* http://www.verticalsystems.com/vsglb/mid-year-2014-u-s-carrier-ethernet-leaderboard/.

[303] Reply Comments of AT&T Inc. at 26, WC Dkt. No. 05-25 (Mar. 12, 2013) ("AT&T Special Access Data Reply Comments").

[304] Letter from Glenn Reynolds, VP, Policy, USTelecom, to Marlene Dortch, Secretary, FCC, at 2, WC Dkt. No. 05-25 (June 4, 2014).

share will likely grow to approximately one-third in the next few years. Bloomberg/BNA estimates that, by 2017, cable companies will control more than 40 percent of US small business Ethernet services and one-third of the wireless backhaul marketplace.[305]

Expanding capacity needs have reduced the preeminent role played by the DSn offerings principally at issue here, forcing them into competition with higher capacity packet-switched Ethernet services. DSn services have declined as other providers increasingly provide the higher-capacity services in their place. One analyst has reported that the proportion of enterprise purchasers' spending attributed to DS3s and lower capacity circuits declined from 68 percent in 2008 to 36 percent in 2011.[306] AT&T also has reported that its sales of DS1s and DS3s to wireless carriers peaked in April 2011, and by the end of 2012, wireless purchases of DS1s declined by nearly 20 percent.[307] AT&T reported that its Local Private Line/Special Access volumes shrank each month from March 2013 to February 2014, with the largest declines coming in the last five months of that period.[308] For CenturyLink, demand for DS1s and DS3s peaked in 2010 and 2011, respectively.[309]

Given the intense competition in the provision of higher-capacity services, precluding ILECs from offering Business Data Services through contract tariffs in all regions is unnecessary

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[305] *Id.* at 3-4.

[306] CenturyLink Special Access Data Comments at 17.

[307] *Id.* at 17; Reply Declaration of Paley C. Casto ¶ 28 (attached to AT&T Special Access Data Reply Comments).

[308] Letter from Robert C. Barber, Gen. Attorney, AT&T, to Marlene H. Dortch, Secretary, FCC, GN Dkt Nos. 13-5 and 12-353, Attachment at 1 (Mar. 27, 2014).

[309] CenturyLink Special Access Data Comments at 18.

to ensure just and reasonable and nondiscriminatory rates, terms and conditions. Competition already puts downward pressure on DSn and other Business Data Service rates, and the forbearance relief sought here is intended to help ILECs respond to that competition with contract offers that will further rate reductions for such services.

Wholesale competition, especially in higher capacity services, has accelerated even in the two years since the *Pricing Flexibility Suspension Order*. Even then, no one suggested that Phase I pricing flexibility was problematic. Rather, the Commission was reacting to parties' allegations that prices have increased in *Phase II* pricing flexibility areas.[310] The Commission also avoided any finding that competition was not sufficient to justify Phase I pricing flexibility where Phase I relief had been granted. Instead, the Commission simply concluded that its pricing flexibility triggers "are not working as predicted."[311] The *Pricing Flexibility Suspension Order* thus should not stand in the way of the narrow relief sought here, which is limited to the authority to offer rate reductions and more flexible terms and conditions in contract tariffs, while maintaining all existing Business Data Service tariffs.

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[310] *See Pricing Flexibility Suspension Order*, 27 FCC Rcd at 10561 ¶ 7 n.15 (commenters allege that "prices in Phase II areas are higher than prices in other areas" and that "month-to-month and term tariff rates have nearly universally increased in Phase II areas to levels higher than is the case in price cap markets"), 10602-03 ¶ 81 ("While incumbent LECs assert that special access prices have fallen in pricing flexibility areas, competitors state that prices, particularly in areas granted Phase II relief, have increased."); *Special Access Data Collection Order*, 27 FCC Rcd at 16344 ¶ 63 (other carriers "raise concerns that, particularly in Phase II markets, incumbent carriers have increased special access rates to supracompetitive levels."), 16347 ¶ 69 n.153 ("While incumbent LECs assert that special access prices have fallen in pricing flexibility areas, competitors state that prices, particularly in Phase II areas, have increased."). *See also* GAO, *FCC Needs to Improve its Ability to Monitor and Determine the Extent of Competition in Dedicated Access Services* at 1 (Nov. 2006) (list prices and revenues in Phase I areas lower than in Phase II areas).

[311] *See Pricing Flexibility Suspension Order*, 27 FCC Rcd at 10558 ¶ 1.

Such narrow relief also is not barred by the allegations cited in the *Pricing Flexibility Order* to the effect that ILEC contract tariff terms and conditions unfairly "'lock up'" demand, thereby deterring competitive entry in an anticompetitive manner.[312] As the ILECs have demonstrated in the special access proceeding, those allegations are false and are fueled by the self-interest of other competitors who, as customers, demanded, and are taking full advantage of, longer term plans and deep discounts that go with them. Contract tariffs do not "lock up" demand. Rather, they simply offer more choices to the customer.[313]

In any event, permitting contract tariffs to provide lower rates and more flexible terms would not result in unjust or unreasonable rates or unjustly or unreasonably discriminatory rates in such an intensely competitive environment. In fact, the Commission has recognized the benefits of such term and volume discounts for decades.[314] "[B]oth volume and term discounts [are] generally legitimate means of pricing special access facilities so as to encourage the efficiencies associated with larger traffic volumes and the certainty associated with longer-term

[312] *See id.* at 10560 ¶ 3, 10561 ¶ 7 n.15.

[313] *See* AT&T Special Access Data Reply Comments at 20-40; CenturyLink Special Access Data Comments at 36-44; Reply Comments of Verizon and Verizon Wireless at 19-28, WC Dkt. No. 05-25 (Mar. 12, 2013); Reply Comments of CenturyLink Inc. at 21-33, WC Dkt. No. 05-25 (Mar. 12, 2013).

[314] *See, e.g., Personal Communications Industry Association's Broadband Personal Communications Services Alliance's Petition for Forbearance For Broadband Personal Communications Services*, Memorandum Opinion and Order and Notice of Proposed Rulemaking, 13 FCC Rcd 16857, 16871 ¶ 29 (1998); *Private Line Rate Structure and Volume Discount Practices*, Report and Order (Proceeding Terminated), 97 FCC 2d 923, 947-48 ¶ 39-40 (1984).

relationships."[315] The D.C. Circuit has concurred, explaining that these types of discounts are "most naturally viewed as a bargain containing terms that both benefit and burden its subscribers,"[316] and that discount plans necessarily offer far more benefits to consumers than non-discounted rates.[317] Indeed, courts have explained that "'[l]ow prices benefit consumers regardless of how those prices are set, and so long as they are above predatory levels, they do not threaten competition.'"[318]

Accordingly, forbearance from the rules precluding the offering of Business Data Services in contract tariffs in all regions meets the Section 10(a)(1) criterion because those rules are unnecessary to ensure just and reasonable and nondiscriminatory rates, terms and conditions.[319] All of the services offered at more favorable rates, terms and conditions in contract

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[315] *Transport Rate Structure and Pricing*, Fourth Memorandum Opinion and Order On Reconsideration, 10 FCC Rcd 12979, 12984 ¶ 13 (1995) (citing *Expanded Interconnection with Local Telephone Company Facilities*, Report and Order and Notice of Proposed Rulemaking, 7 FCC Rcd 7369, 7463 ¶ 199 (1992)).

[316] *BellSouth Telecomms. Inc. v. FCC*, 469 F.3d 1052, 1060 (D.C. Cir. 2006).

[317] *Id.* at 1057 ("[I]n determining whether the . . . discount structure is discriminatory it seems far more logical to compare it to the . . . world of no volume discounts rather than to a hypothetical [ideal] volume discount plan."). Indeed, the courts have consistently held that "bundled discounts are a common feature of our current economic system." *Cascade Health Solutions v. PeaceHealth*, 515 F.3d 883, 895 n.5 (9th Cir. 2008) ("*Cascade*"); *LePage's Inc. v. 3M*, 324 F.3d 141 (3rd Cir. 2003). *See also Cascade*, 515 F.3d at 896 (citing *Barry Wright Corp. v. ITT Grinnell Corp.*, 724 F.2d 227, 234 (1st Cir. 1983))("[W]e should not be too quick to condemn price-reducing bundled discounts as anticompetitive, lest we end up with a rule that discourages legitimate price competition.").

[318] *Brooke Group Ltd. v. Brown and Williamson Tobacco Corp.*, 509 U.S. 209, 223 (1993) (quoting *Atlantic Richfield Co. v. USA Petroleum Co.*, 495 U.S. 328, 340 (1990) (noting "[i]t would be ironic indeed if . . . antitrust suits themselves became a tool for keeping prices high.")).

[319] 47 U.S.C. § 160(a)(1).

tariffs will also continue to be offered in generally available tariffs at existing rates, terms and conditions, and the increasingly intense competition in the Business Data Service marketplace, particularly higher capacity services, will help to ensure just and reasonable and nondiscriminatory rates and practices.

2. Applying the Rules Prohibiting the Use of Contract Tariffs to Provide Business Data Services is Not Necessary to Protect Consumers

Applying the rules prohibiting the offering by price cap ILECs of Business Data Services in contract tariffs is not necessary to protect consumers.[320] Given that the affected services will remain available at price cap rates and terms under the requested forbearance regime, customers will still be able to choose the generally available tariffed rates and terms. The dynamic competition that is transforming the high capacity marketplace will also ensure that customers have a wide range of choices. Finally, the rules precluding the offering of Business Data Services at reduced rates in individually negotiated contract tariffs reflecting customers' desired service arrangements in all regions do not protect consumers. Consumers do not need to be protected from having the service arrangements they want, at the rates they want to pay, from the service provider they have chosen – much less from having these options *plus* others.

Forbearance satisfies the Section 10(a)(2) consumer protection requirement where the requested relief provides a service option that "may benefit some customers, and existing customers may continue to purchase existing services if they find" the new option "unattractive."[321] In the *ITTA Forbearance Order*, the Commission held that a request to forbear

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[320] *Id.* § 160(a)(2).

[321] *Petition for Forbearance of the Independent Tel. & Tel. Alliance*, Sixth Memorandum Opinion and Order, 14 FCC Rcd 10840, 10847 ¶ 11 (1999) ("*ITTA Forbearance Order*").

from applying the Part 69 rules for mid-size ILECs to allow them to introduce new access services without obtaining prior permission met the Section 10(a)(2) threshold because "a new service expands the range of service options available to consumers," and "the introduction of a new service does not by itself compel any access customer to reconfigure its access services and so cannot adversely affect any access customer."[322] Here, too, allowing price cap ILECs to offer Business Data Services at reduced rates in contract tariffs "may benefit some customers," and, because "existing customers may continue to purchase existing [tariffed Business Data Services] if they find" that they cannot qualify for the contract tariffs, the contract tariff option "cannot adversely affect any access customer."[323] Forbearance thus satisfies the Section 10(a)(2) criterion.[324]

Moreover, far from protecting consumers, the current regime precludes customers from obtaining services from the provider they choose on terms that meet their needs, including lower rates. By preventing these sophisticated buyers from negotiating Business Data Service contracts designed to meet their specific needs, the rules hinder ILECs' ability to meet competitive bids. Price cap carriers, but not their competitors, are prevented from offering the type of national and regional packages customers demand. Enabling price cap ILECs to offer Business Data Services at reduced rates and more flexible terms and conditions in contract tariffs thus would benefit consumers by providing them more competitively-priced choices than they have now.

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[322] *Id.*

[323] *Id.*

[324] *Id.*

The Commission has long recognized that special access customers are not individuals; rather, they are carriers and other "sophisticated purchasers of telecommunications services, fully capable of finding competitive alternatives where they exist and determining which competitor can best meet their needs."[325] These wholesale and enterprise customers are capable of making informed decisions, "aware of the multitude of choices available to them."[326] Such companies have access to "expert advice about service offerings and prices"[327] and "demand the most flexible service offerings possible."[328] They are the types of customers that could benefit the most from the opportunity to negotiate customized arrangements.

Wireless providers, for example, have issued numerous RFPs for regional or national backhaul services.[329] Indeed, even customers with "more regional or localized operations … are able to solicit telecommunications services from a range of potential providers."[330] High-capacity customers use their buying power to play providers off each other to get more favorable rates, terms and conditions.[331] Thus, the sophistication of the customer base for high-capacity

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[325] *Pricing Flexibility Order*, 14 FCC Rcd at 14302 ¶ 155.

[326] *Verizon Communications Inc. and MCI, Inc. Applications for Approval of Transfer of Control*, Memorandum Opinion and Order, 20 FCC Rcd 18433, 18475 ¶ 76 (2005). *See also AT&T Forbearance Order*, 22 FCC Rcd at 18720 ¶ 24.

[327] *AT&T Forbearance Order*, 22 FCC Rcd at 18720 ¶ 24.

[328] *Id.*

[329] CenturyLink Forbearance Petition at 25.

[330] *AT&T Forbearance Order*, 22 FCC Rcd at 18718 ¶ 21; *Embarq Forbearance Order*, 22 FCC Rcd at 19491 ¶ 20; *Qwest Forbearance Order*, 23 FCC Rcd at 12274 ¶ 24.

[331] CenturyLink Forbearance Petition at 37-39.

services leads to a competitive marketplace in which complexity signals successful efforts to meet client needs, *not* the imposition of unreasonable terms and conditions.

Accordingly, forbearance from applying the rules prohibiting price cap ILECs from offering Business Data Services at reduced rates in contract tariffs in all regions meets the Section 10(a)(2) criterion because such enforcement is not necessary to protect consumers, and forbearance would give consumers more opportunities to acquire the service arrangements they desire from the providers they choose.[332]

3. Forbearance From Applying the Rules Prohibiting the Use of Contract Tariffs to Provide Business Data Services Will Promote Competitive Conditions and Further the Public Interest

Forbearance also would promote competitive market conditions and further the public interest, satisfying the requirements of Sections 10(a)(3) and 10(b).[333] Specifically, forbearance will enable price cap ILECs to compete more effectively against their less regulated and unregulated rivals and to focus resources on deployment of the next-generation facilities used to provide business data services. The rules that prohibit price cap ILECs from offering Business Data Services at reduced rates via contract tariffs inhibit price cap ILEC competitive responses to other providers' offers of those services and impede customers from receiving the competitively priced service arrangements they want from the providers they want. Enabling such competitive responses will promote competitive conditions and further the public interest, as reflected in the hundreds of contract tariffs at substantially discounted rates that the RBOCs have negotiated under Phase I pricing flexibility. As in the *ITTA Forbearance Order*, "[w]ith the removal of this

[332] *See* 47 U.S.C. § 160(a)(2).

[333] *See id.* §§ 160(a)(3), (b).

competitive disadvantage," price cap ILECs "will be better able to respond to competition from CLECs" and others; forbearance thus is "consistent with . . . the public interest" and "would promote competitive market conditions."[334]

As with the *Advanced Services Waiver Orders*, relief from rules limiting the application of Phase I relief will enable price cap ILECs to compete more effectively. In the *Verizon Advanced Services Waiver*, the Commission granted a waiver to allow Verizon to exercise Phase I pricing flexibility for certain advanced services that did not qualify for pricing flexibility in the absence of a waiver.[335] Verizon sought such relief in order to "respond to competition effectively" by "offer[ing] individually negotiated contracts for these advanced services and to adjust prices . . . for different customer and market segments."[336] The Commission found good cause for a waiver to permit Verizon to exercise Phase I pricing flexibility for its advanced services because such relief would "promote[] competition for advanced services, resulting in more choices and better prices for customers."[337] Subsequently, Qwest was granted similar waiver relief under the same competitive rationale, *i.e.*, "that the waiver granted here serves the public interest" by "[p]roviding Qwest the flexibility to offer contract tariffs tailored to the needs of individual customers," which "will enable it to respond more effectively to competition" and thereby "promote competition in the market for advanced services and result in more choices and

[334] *ITTA Forbearance Order*, 14 FCC Rcd at 10847-48 ¶¶ 12-13.

[335] *Verizon Advanced Services Waiver*, 20 FCC Rcd at 16843-44 ¶ 7.

[336] *Id.* at 16842 ¶ 4.

[337] *Id.* at 16844-45 ¶¶ 8-9.

better prices for customers."[338] The forbearance relief sought here would provide similar competitive and consumer benefits in the Business Data Services marketplace.

Enabling price cap ILECs to compete more effectively against their less regulated and unregulated rivals also will serve the public interest in regulatory parity. In the *AT&T Forbearance Order*, the Commission held that, "[b]y regulating AT&T on the same terms as its nondominant competitors" in the enterprise broadband marketplace, forbearance for AT&T would "serve the public interest by promoting regulatory parity among providers of these services."[339] The ability to offer individualized arrangements in contract tariffs would not put ILECs completely on par with their competitors, who need not file any tariffs, but it would reduce the ILECs' handicap in an increasingly unforgiving Business Data Services marketplace and thereby "serve the public interest by promoting regulatory parity among providers of these services."[340] Indeed, the Commission further found in the *AT&T Forbearance Order* that such regulatory parity would "promote competitive market conditions and enhance competition among providers of telecommunications services as contemplated by section 10(b) [and] . . . in a manner consistent with the public interest."[341]

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[338] *Qwest Advanced Services Waiver*, 22 FCC Rcd at 7485 ¶ 7.

[339] *AT&T Forbearance Order*, 22 FCC Rcd at 18732 ¶ 49.

[340] *Id. See also Embarq Forbearance Order*, 22 FCC Rcd at 19504 ¶ 48; *Qwest Forbearance Order*, 23 FCC Rcd at 12288 ¶ 52.

[341] *AT&T Forbearance Order*, 22 FCC Rcd at 18731 ¶ 47; *Qwest Forbearance Order*, 23 FCC Rcd at 12287 ¶ 50; *Embarq Forbearance Order*, 22 FCC Rcd at 19503-04 ¶ 46. *See also Petition of ACS of Anchorage, Inc. Pursuant to Section 10 of the Communications Act of 1934, as Amended* (*47 U.S.C. § 160(c)), for Forbearance from Certain Dominant Carrier Regulation of Its Interstate Access Services, and for Forbearance from Title II Regulation of Its Broadband*

In the *USTelecom Forbearance Order*, the Commission also cited the competitive and other public interest benefits of equal regulatory treatment as a significant consideration supporting various forbearance grants.[342] For example, in granting forbearance from the equal access "scripting" requirement, the Commission explained that such relief would "foster competition by removing regulatory requirements and the resulting costs that affect only ILECs subject to the rules and not their competitors."[343] The Commission also found that forbearance for all price cap carriers from the cost assignment rules would "promote[] competition by providing a more level playing field because other providers of similar services are not subject to the rules."[344] Finally, the Commission granted forbearance from certain reporting rules in order to "promote competitive market conditions and . . . competition among providers . . . because [forbearance] removes . . . obligations that only apply to certain carriers" and "ensure[s] that competing providers face a level playing field."[345]

Similarly, customers will benefit from a more "level playing field"[346] in the Business Data Services marketplace following the grant of this petition. Forbearance will enable price cap

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Services, in the Anchorage, Alaska, Incumbent Local Exchange Carrier Study Area, Memorandum Opinion and Order, 22 FCC Rcd 16304, 16355-56 ¶ 118 (2007).

[342] *USTelecom Forbearance Order*, 28 FCC Rcd 7627.

[343] *Id.* at 7637-38 ¶ 17.

[344] *Id.* at 7650-51 ¶ 41

[345] *Id.* at 7678-79 ¶ 115. *See also id.* at 7675-76 ¶ 107 (forbearance from ARMIS Report 43-01 filing requirement granted partly because "[i]mposing these costs on some competitors but not others may undermine competition.").

[346] *Id.* at 7678-79 ¶ 115.

ILECs to respond more quickly to customer requests for individualized offerings tailored to their specific needs. Unrestricted Business Data Service contract tariff authority for price cap ILECs will thus allow them to compete more effectively for Business Data Service business against other providers, by reducing the inequality in "the ability of all competitors to respond to competing market-based price offerings that take the form of promotions and multi-tiered service packages."[347] Although forbearance would still leave price cap ILECs substantially more heavily regulated than other providers, it would at least partially reduce the tilt in the playing field.

Accordingly, applying the rules prohibiting price cap ILECs from offering Business Data Services at reduced rates in contract tariffs in the absence of pricing flexibility is not necessary to ensure just and reasonable and nondiscriminatory charges and practices or to protect consumers, and forbearance from such enforcement would further the public interest and promote competitive conditions.

IX. CONCLUSION

For the reasons discussed above, the Commission should grant forbearance from application of the requirements discussed herein. Such forbearance will remove barriers to infrastructure investment, promoting deployment and competition in the provision of truly high-speed services and benefiting the American public.

Respectfully submitted,

By /s/ Jonathan Banks
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Senior Vice President,
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[347] *AT&T Forbearance Order*, 22 FCC Rcd at 18723 ¶ 29; *Embarq Forbearance Order*, 22 FCC Rcd at 19496 ¶ 28; *Qwest Forbearance Order*, 23 FCC Rcd at 12279 ¶ 32.

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Appendix A

REDACTED – FOR PUBLIC INSPECTION

APPENDIX A

47 C.F.R. § 1.54(a)(1); 47 C.F.R. § 1.54(e)(3)(i)

USTelecom seeks forbearance (to the extent forbearance has not previously been granted) from statutory provisions, rules or requirements set forth in the table below.

Section 271/272 and Equal Access Obligations

Statutory Provision, Rule or Requirement	**As applied to**
All remaining Section 271 obligations; 47 U.S.C. § 271.	All RBOCs
All remaining Section 272 obligations; 47 U.S.C. § 272.	All RBOCs
All remaining legacy equal access obligations carried forward via 47 U.S.C. § 251(g).	All ILECs
The nondiscrimination and imputation requirements set out in the *Section 272 Sunset Order*, *Section 272(f)(1) Sunset of the BOC Separate Affiliate and Related Requirements*, Report and Order and Memorandum Opinion and Order, 22 FCC Rcd 16440 (2007).	All RBOCs

Rule 64.1903 Structural Separation Requirements

Statutory Provision, Rule or Requirement	**As applied to**
All remaining obligations under 47 C.F.R. § 64.1903, including any conditions imposed by prior Commission orders granting partial forbearance from 47 C.F.R. § 64.1903, including *Petition of USTelecom for Forbearance Under 47 U.S.C. § 160(c) from Enforcement of Certain Legacy Telecommunications Regulations*, Memorandum Opinion and Order and Report and Order and Further Notice of Proposed Rulemaking and Second Further Notice of Proposed Rulemaking, 28 FCC Rcd 7627 (2013).	All ILECs

Requirement to Provide 64 kbps Voice Channel Where Copper Loop has been Retired

Statutory Provision, Rule or Requirement	**As applied to**
47 C.F.R. § 51.219(a)(3)(iii)(C) (*Triennial Review Order* requirement to make 64 kbps voice channel available where an ILEC retires copper in fiber loop overbuilds; *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers*, Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978 (2003) ("*Triennial Review Order*"), *vacated in part on other grounds sub nom. USTA v. FCC*, 359 F.3d 554 (D.C. Cir. 2004)).	All ILECs

Section 214(e) Obligations Where a Price Cap Carrier does not Receive High Cost Universal-Service Support

Statutory Provision, Rule or Requirement	**As applied to**
All remaining 47 U.S.C. § 214(e) obligations, where a price cap carrier does not receive high cost universal service support, including 47 C.F.R. §54.201(d)	Price Cap ILECs
The Commission's determination that an Eligible Telecommunications Carrier is required to provide the "supported" services throughout its service area regardless of whether such services are actually "supported" with high-cost funding throughout that area. *Federal-State Joint Board on Universal Service*, Report and Order, 12 FCC Rcd 8776, 8883-84 ¶ 192 (1997), *rev'd in part on other grounds sub nom. Texas Office of Public Utility Counsel v. FCC*, 183 F.3d 393 (5th Cir. 1999). *See also High-Cost Universal Service Support*, CETC Interim Cap Order, 23 FCC Rcd 8834, ¶ 29 (2008).	Price Cap ILECs

Computer Inquiry Rules

Statutory Provision, Rule or Requirement	**As applied to**
All remaining obligations under 47 C.F.R. § 64.702.	All ILECs
All remaining obligations, including structural separation requirements, imposed by the Commission's *Computer II* Orders; *Amendment of Section 64.702 of the Commission's Rules and Regulations* (*Second Computer Inquiry*), 77 FCC 2d 384 (1980) ("*Computer II Final Decision"*), *recon.*, 84 FCC 2d 50 (1980) ("*Computer II Reconsideration Order"*), *further recon.*, 88 FCC 2d 512 (1981) ("*Computer II Further Reconsideration Order"*), *aff'd sub nom. Computer and Communications Industry Ass'n v. FCC*, 693 F.2d 198 (D.C. Cir. 1982), *cert. denied*, 461 U.S. 938 (1983) (collectively "*Computer II Proceedings"*).	All ILECs
All remaining obligations, including Comparably Efficient Interconnection (CEI), Open Network Architecture (ONA), and other requirements as set forth in the Commission's *Computer III* Orders; *Amendment of Section 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry)*, Report and Order, 104 FCC 2d 958 (1986) ("*Computer III Phase I Order"*), *recon.*, 2 FCC Rcd 3035 (1987) ("*Computer III Phase I Reconsideration Order"*), *further recon.*, 3 FCC Rcd 1135 (1988) ("*Computer III Phase I Further Reconsideration Order"*), *second further recon.*, 4 FCC Rcd 5927 (1989) ("*Computer III Phase I Second Further Reconsideration Order"*); *Computer III Phase I Order and Computer III Phase I Reconsideration Order vacated sub nom,. California v. FCC*, 905 F.2d 1217 (9th Cir. 1990) ("*California I"*); *Amendment of Section 64.702 of the Commission's Rules and Regulations (Third Computer Inquiry)*, Report and Order, 2 FCC Rcd 3072 (1987) ("*Computer III Phase II Order*), *recon.*, 3 FCC Rcd 1150 (1988) ("*Computer III Phase II Reconsideration Order"*), *further recon.*, 4 FCC Rcd 5927 (1989) ("*Phase II Further Reconsideration Order"*); *Computer III Phase II Order vacated, California I*, 905 F.2d 1217 (9th Cir. 1990); *Computer III Remand Proceeding*, Report and Order, 5 FCC Rcd 7719 (1990) ("*ONA Remand Order"*), *recon.*, 7 FCC Rcd 909	All ILECs

Statutory Provision, Rule or Requirement	**As applied to**
(1992), *pets. for review denied sub nom. California v. FCC*, 4 F.3d 1505 (9th Cir. 1993) ("*California II"*); *Computer III Remand Proceedings: Bell Operating Company Safeguards and Tier 1 Local Exchange Company Safeguards*, Report and Order, 6 FCC Rcd 7571 (1991) ("RBOC Safeguards Order"), *vacated in part and remanded sub nom. California v. FCC*, 39 F.3d 919 (9th Cir. 1994) ("*California III"*), *cert. denied*, 514 U.S. 1050 (1995); *Computer III Further Remand Proceedings: Bell Operating Company Provision of Enhanced Services*, Notice of Proposed Rulemaking, 10 FCC Rcd 8360 (1995) ("*Computer III Further Remand Notice"*), Further Notice of Proposed Rulemaking, 13 FCC Rcd 6040 (1998) ("*Computer III Further Remand Further Notice"*); Report and Order, 14 FCC Rcd 4289 (1999) ("*Computer III Further Remand Order"*), *recon.*, 14 FCC Rcd 21628 (1999) ("*Computer III Further Remand Reconsideration Order*") (collectively, "*Computer III Proceedings").*	All ILECs

Requirement to Provide Access to Newly Deployed Entrance Conduit at Regulated Rates

Statutory Provision, Rule or Requirement	**As applied to**
47 U.S.C. § 224, as to the obligation to provide access to newly deployed entrance conduit at regulated rates.	All ILECs
47 U.S.C. § 251(b)(4), as to the obligation to provide access to newly deployed entrance conduit at regulated rates.	All ILECs

The Prohibition Against Using Contract Tariffs for Business Data Services in All Regions

Statutory Provision, Rule or Requirement	**As applied to**
Rule 61.3(o), 47 C.F.R. § 61.3(o), limiting the definition of "Contract-based tariff" for a price cap ILEC to services offered by carriers that have obtained pricing flexibility.	All Price Cap ILECS
Rule 61.55(a), 47 C.F.R. § 61.55(a), limiting the applicability of Rule 61.55, which details the contents of "Contract-based tariffs," to price cap ILECs permitted to offer contract-based tariffs under Rule 69.727(a).	All Price Cap ILECS
Rule 69.709(b), 47 C.F.R. § 69.709(b), establishing Phase I triggers for dedicated transport and special access services other than channel terminations between ILEC end offices and customer premises.	All Price Cap ILECS
Rule 69.711(b), 47 C.F.R. § 69.711(b), establishing Phase triggers for channel terminations between ILEC end offices and customer premises.	All Price Cap ILECS

Statutory Provision, Rule or Requirement	**As applied to**
The portion of Rule 69.727(a), 47 C.F.R. § 69.727(a), requiring satisfaction of the Phase I triggers specified in Rules 69.709(b), 69.711(b) and 69.713(b) for an MSA or non-MSA portion of a study area in order to be granted Phase I relief for the services specified in Rules 69.709(a) (dedicated transport and special access services other than channel terminations between ILEC end offices and customer premises), and 69.711(a) (channel terminations between ILEC end offices and customer premises), *but not the portion of Rule 69.727(a) providing such relief (which includes contract tariff authority).*	All Price Cap ILECS All Price Cap LECs
Rule 69.705, 47 C.F.R. § 69.705, requiring price cap ILECs to follow the procedures in Rule 1.774 to obtain Phase I pricing flexibility relief.	All Price Cap ILECS
If necessary, the requirement that packet-switched or optical transmission services must be subject to price cap regulation in order to be eligible for pricing flexibility. Previously, some price cap ILECs had not included their packet-switched and optical transmission services in their price cap tariffs, and those services thus were not eligible for pricing flexibility. *See, e.g., Petition for Waiver of Pricing Flexibility Rules for Fast Packet Services,* Memorandum Opinion and Order, 20 FCC Rcd 16840, 16843-44 ¶ 7 (2005) ("*Verizon Advanced Services Waiver*"); *Qwest Petition for Waiver of Pricing Flexibility Rules for Advanced Communications Networks Services,* Order, 22 FCC Rcd 7482, 7483 ¶ 2 (WCB 2007) ("*Qwest Advanced Services Waiver*") (together, "*Advanced Services Waiver Orders*"). In order to provide the "blanket" Phase I pricing flexibility authority sought here for any price cap ILECs whose packet-switched and/or optical transmission services have not received forbearance relief but which are also not otherwise subject to price cap regulation, the Commission should forbear from the requirement that services must be in price caps to be eligible for Phase I pricing flexibility. *Cf. Verizon Advanced Services Waiver,* 20 FCC Rcd at 16844 ¶ 8 & n.32; *Qwest Advanced Services Waiver,* 22 FCC Rcd at 7484 ¶ 5 & n.20 (waiving requirement that packet-switching services must be in price caps to be eligible for Phase I pricing flexibility). In order to treat those services the same as price cap services for purposes of this request, they should continue to be offered under currently available tariffs.	All Price Cap ILECS

47 C.F.R. § 1.54(a)(2)

USTelecom requests that this forbearance relief be applied as a class to each carrier or group of carriers, as specified for each provision in the table above.

47 C.F.R. § 1.54(a)(3)

USTelecom requests that forbearance relief be applied to all covered services, including but not limited to interstate and international voice and data services, whether provided to the consumer or business markets.

47 C.F.R. § 1.54(a)(4)

USTelecom requests that forbearance relief apply in all regions across the entire United States and all territories.

47 C.F.R. § 1.54(a)(5)

N/A.

47 C.F.R. § 1.54(c)

Pursuant to the requirements of Section 1.54(c) of the Commission's rules, USTelecom notes that it has participated in the following proceedings pending before the Commission, in which it has taken positions regarding regulatory relief from the subject rules and regulations that are identical to, or comparable to, the relief sought in this petition:

- *Petition of USTelecom for Declaratory Ruling that Incumbent Local Exchange Carriers Are Non-Dominant in the Provision of Switched Access Services* , WC Docket No. 13-3.

- *Petition of USTelecom for Forbearance Pursuant to 47 U.S.C. § 160(c) from Enforcement of Certain Legacy Telecommunications Regulations,* WC Docket No. 12-61.

- *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, as Amended by the Broadband Data Improvement Act,* GN Docket No. 11-121.

- *Connect America Fund*, WC Docket No. 10-90.

- *Special Access for Price Cap Local Exchange Carriers; AT&T Corporation Petition for Rulemaking to Reform Regulation of Incumbent Local Exchange Carrier Rates for Interstate Special Access Services,* WC Docket No. 05-25, RM-10593.

- *Notice of Inquiry Concerning a Review of the Equal Access and Nondiscrimination Obligations Applicable to Local Exchange Carriers,* CC Docket No. 02-39.

- *Biennial Regulatory Review Separate Affiliate Requirements of Section 64.1903 of the Commission's Rules,* CC Docket No. 00-175.

In addition to these pending proceedings, USTelecom has routinely participated in the Commission's biennial reviews of its telecommunications regulations in which it has advocated for the elimination of various regulations that are the subject of its Forbearance Petition.

47 C.F.R. § 1.54(e)(3)(i)

The scope of relief sought is as indicated above.

47 C.F.R. § 1.54(e)(3)(ii)

Market analysis and supporting data supporting the entirety of the relief sought in this Petition is set forth in the affidavits of Dr. Kevin Caves and Professor John Mayo, Appendices B and C, respectively, to this Petition. Additional market analysis and supporting data is included both in the Executive Summary and Introduction section of the Petition, and in each discrete request for Section 10 Forbearance, as appropriate.

47 C.F.R. § 1.54(e)(3)(iii)

The supporting affidavits of Dr. Kevin Caves and Professor John Mayo are provided as Appendices B and C, respectively, to the Petition.

Appendix B

REDACTED – FOR PUBLIC INSPECTION

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	)	
	)	
Petition of USTelecom for Forbearance Pursuant	)	WC Docket No. 14-___
to 47 U.S.C. § 160(c) from Obsolete ILEC	)	
Regulatory Obligations that Inhibit Deployment of	)	
Next-Generation Networks	)	

Expert Declaration of Kevin W. Caves, PhD
October 6, 2014

INTRODUCTION

1. In its 2010 *Phoenix Order*, the Federal Communications Commission ("FCC" or "Commission") established a framework for evaluating requests for forbearance from traditional monopoly-based regulations that currently govern local voice services provided by Incumbent Local Exchange Carriers ("ILECs").[1] In this study, I analyze the degree of competition in the market for voice services, focusing on the price-disciplining effects of intermodal alternatives in general and wireless voice services in particular, as well as the framework for competitive analysis adopted by the Commission in the *Phoenix Order*.

2. Based on the analysis below, I conclude (1) that ILEC wireline voice offerings face widespread competition, with prices disciplined by a range of competitive alternatives, including wireless telephony, cable voice, over-the-top VoIP, and offerings from Competitive Local Exchange Carriers ("CLECs"); (2) that, in contrast with the *Phoenix Order*'s conclusions, the available evidence shows clearly and unambiguously that wireless voice service has evolved into a competitive alternative to wireline service; (3) that certain aspects of the analytical framework adopted by the Commission in the *Phoenix Order* are inconsistent with fundamental principles of economics and antitrust; and (4) that these inconsistencies will tend to preclude the Commission from properly incorporating the price-disciplining effects of wireless and other competitive alternatives into its own analyses.

3. My conclusions regarding the growth in competition in the industry reflect a consensus that has been accumulating for the better part of a decade, if not longer. For example,

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1. *In the Matter of Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Phoenix, Arizona Metropolitan Statistical Area, Memorandum Opinion And Order*, WC Docket No. 09-135 (June 22, 2010) [hereafter *Phoenix Order*], ¶1 ("We evaluate Qwest's petition using a market power analysis, similar to that used by the Commission in many prior proceedings and by the Federal Trade Commission (FTC) and the Department of Justice (DOJ) in antitrust reviews.")

even economists studying cord-cutting patterns in early time periods (1999 – 2001), when wireless-only households were a rare phenomenon, drew attention to the possibility that mobile wireless service would be able to significantly constrain wireline pricing power in the "near future."[2] More broadly, prominent economists and leading economics textbooks have recognized the price-disciplining effects of competitive alternatives to traditional wireline voice service since at least the mid-2000s.[3]

4. My conclusions also reflect substantial evidence of increased competition that has accumulated in the years since the *Phoenix Order* was issued. This evidence includes (but is not limited to) econometric work by myself and other economists, which confirms that the cross-price elasticity between wireless and wireline telephony is positive and highly significant, in both a statistical and an economic sense. Other evidence—including the fact that more than 40 percent of households are now "wireless-only," and the fact that ILECs' overall share of voice connections has fallen to less than 20 percent—confirms that the trend towards increased competition has only intensified in recent years. Accordingly, by any reasonable economic standard, the marketplace has transitioned from a former monopoly to an "industry with many players" that compete using a "variety of rapidly developing technologies," just as economists predicted years ago.[4]

5. The rationale for economic regulation is to nudge an industry "closer to the perfectly competitive ideal than [what it] would have [achieved] in the absence of this type of

2. *See* Part III.A.2, *infra*.
3. *See* Part I, *infra*.
4. *Id*.

intervention."[5] But regulation, like anything else, carries costs as well as benefits, and economists recognize that the former can—and often does—outweigh the latter, such that "actual regulation often deviates considerably from optimal regulation and exacerbates market inefficiencies."[6] Thus, in competitive communications markets, outmoded regulations can be expected to harm consumers, competition, and economic efficiency.[7] It is therefore more important than ever that the Commission ensure that its analytical framework accurately reflects the competitive realities of the industry.

QUALIFICATIONS

6. My name is Kevin W. Caves. I am a Senior Economist at Economists Incorporated, a premier economic consulting firm in the fields of law and economics, public policy, and business strategy, offering expert consulting and testifying services in the context of litigation, arbitration, proposed mergers and acquisitions, regulatory hearings, and business planning. My business address is 2121 K Street Northwest, Suite 1100, Washington, DC 20037.

7. I served as Assistant Economist at the Federal Reserve Bank of New York before earning a PhD in economics from the University of California at Los Angeles in 2005, specializing in applied econometrics and industrial organization. I have held senior positions in the economic consulting industry for several years. Prior to joining Economists Incorporated, I

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5. W. KIP VISCUSI, JOHN M. VERNON, AND JOSEPH E. HARRINGTON, JR., ECONOMICS OF REGULATION AND ANTITRUST (MIT Press 2nd ed. 1996), at 10.

6. *See* DENNIS CARLTON & JEFFREY PERLOFF, MODERN INDUSTRIAL ORGANIZATION (Prentice Hall 4th ed. 2005) [hereafter *Carlton & Perloff*] at 682. *See also* Viscusi et. al., *supra*, at 10-11.

7. The potential for regulation to harm consumers in the communications marketplace is not mere speculation. According to one estimate, the FCC's delay in authorizing cellular service resulted in annual costs of approximately $34 billion over a ten-year period. (The estimated costs to consumers would be even greater if adjusted for inflation). *See* Jerry Hausman, "Valuing the Effect of Regulation on New Services in Telecommunications," *Brookings Papers In Economic Activity: Microeconomics*, 1-38 (1997).

held positions at Deloitte & Touche, Criterion Economics, Empiris LLC, and Navigant Economics. I have authored and co-authored filings, white papers, and expert declarations, including several encompassing telecommunications and network industries.

8. I am a regular contributor to peer-reviewed academic journals. My academic work spans a variety of topics, including antitrust, telecommunications and network industry analysis, vertical integration, labor economics, applied econometrics, and class certification. My work has been cited and appeared in various popular and academic outlets, including *Antitrust, The Atlantic, The Capitol Forum, Communications & Strategies, The Economist, The Economists' Voice, Forbes, Information Economics & Policy, Journal of Competition Law & Economics, Labor Law Journal, Regulation, Research in Law & Economics, Review of Network Economics,* and *Telecommunications Policy*. A copy of my curriculum vita is attached as Exhibit A.

I. A RANGE OF COMPETITIVE ALTERNATIVES EXERT COMPETITIVE DISCIPLINE ON TRADITIONAL ILEC VOICE SERVICES

9. Economists have recognized for some time that a range of competitive alternatives exert competitive discipline on ILEC pricing. For example, in a leading economics textbook published nearly a decade ago, Professor Dennis Carlton (former Deputy Assistant Attorney General in the DOJ Antitrust Division) noted that

> Competition from wireless providers of phone services has deepened competitive pressures on both local and long distance rates. Roughly half of the U.S. population have cell phones. Moreover, the Internet holds out the possibility of providing competition using the Voice Over Internet Protocol (VOIP), and cable can now provide phone service. Thus an industry that once was a monopoly that provided local and long-distance phone service over traditional phone lines is rapidly becoming an industry with many players using a variety of rapidly developing technologies to provide consumers

> with local and long-distance phone service. In such an industry, regulation can distort or delay the introduction of new technologies, to consumers' detriment.[8]

10. In subsequent years, the trend toward increased competition has intensified on a variety of fronts. As explained below, each of the sources of intermodal competition identified above has become more prominent, and ILEC market shares have continued to erode in tandem. About 93 percent of households are now passed by high-speed cable infrastructure,[9] while approximately 97 percent of consumers are covered by three or more wireless carriers.[10] More than 40 percent of households are "wireless-only,"[11] which, in concert with customer switching to wireline competitors such as cable companies, VoIP providers, and CLECs, has pushed the ILEC household share down to approximately 33 percent.[12] The share of voice connections served by ILECs is even lower (less than 20 percent).[13]

11. More generally, traditional ILEC voice services also face competition from a broad range of rapidly evolving communications technologies such as text messaging, e-mail, and social networks, as well other converged services, such as Skype, FaceTime, iMessage, Snapchat, Viber, and WhatsApp, which transmit various combinations of voice, text, pictures, and video across the globe, often at little to no incremental cost to the consumer. Thus, by any reasonable economic standard, the marketplace has transitioned from a former monopoly to an "industry with many players"[14] that compete using a "variety of rapidly developing technologies,"[15] just as economists predicted years ago.[16]

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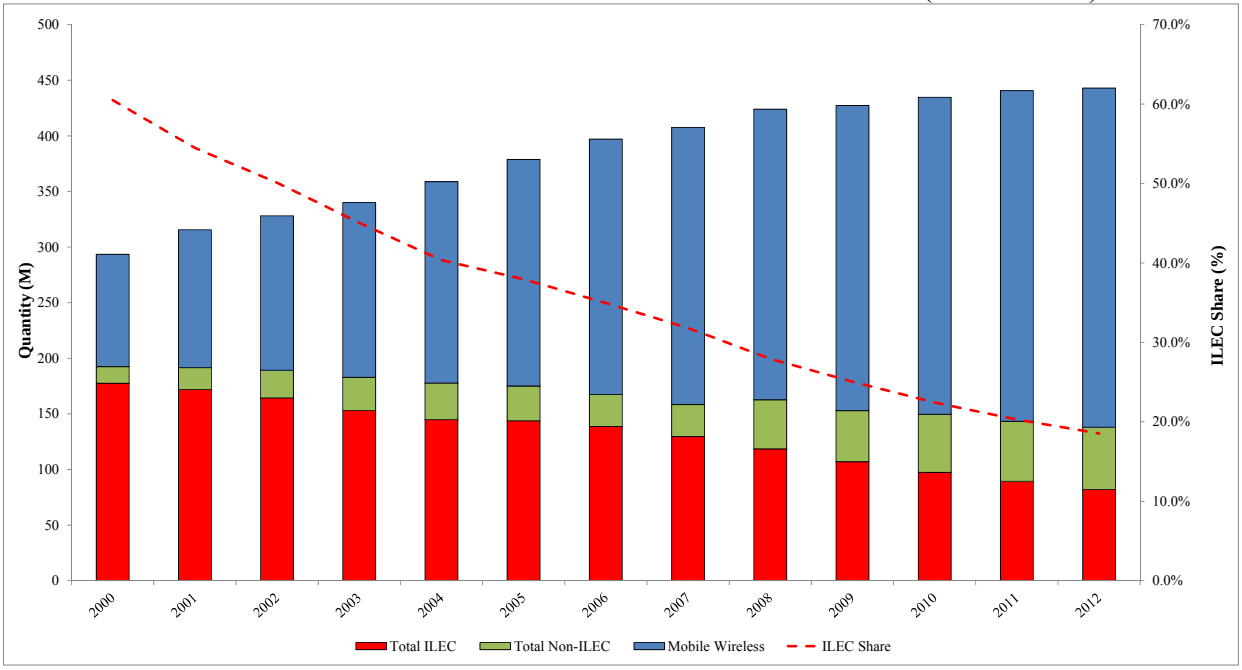
8. *Carlton & Perloff* at 729.
9. *See, e.g.*, https://www.ncta.com/industry-data.
10. *See, e.g.*, http://www.ctia.org/your-wireless-life/how-wireless-works/wireless-quick-facts.
11. See Part II.A, *infra*.
12. *Id*.
13. See Figure I, *infra*.
14. *Carlton & Perloff* at 729.
15. *Id*.

12. As seen in Figure 1, since the early 2000s, ILECs have steadily lost market share to wireless competition, to intermodal technologies such as cable VoIP, and to CLECs. ILECs collectively lost approximately 95.4 million voice lines from 2000 – 2012. Measured as a proportion of end-user switched access lines, interconnected VoIP subscriptions, and mobile wireless subscriptions, ILECs' market share fell from 60.5 percent to 18.5 percent over this interval. By mid-2013, ILEC's market share had declined further, to 17.8 percent.[17] Similar results hold when ILEC market shares are measured as a proportion of households (as opposed to a proportion of total connections). As explained in Part II.A, the ILEC household share had fallen to approximately 33 percent as of 2013.

FIGURE I: VOICE LINES & MOBILE WIRELESS SUBSCRIPTIONS (2000 – 2012)



Source: Federal Communications Commission, *Local Telephone Competition Reports* (various years). *Notes*: Total ILEC and Non-ILEC figures include both end-user switched access lines and interconnected VoIP subscriptions. Mandatory reporting by interconnected VoIP service providers was instituted in December 2008. Before this time,

16. *Id.*

17. Federal Communications Commission, *Local Telephone Competition: Status as of June 30, 2013* [hereafter *2013 Local Competition Report*], Tables 2 and 18 (showing 78.5 million ILEC connections, 56.6 million Non-ILEC connections, and 305.7 million mobile wireless subscriptions).

wireline carriers included VoIP subscribers in reported switched access lines to a varying and largely unknown degree. Prior to June 2005, the Commission collected data only from carriers with at least 10,000 switched access lines or mobile telephony subscribers in service in a particular state.

13. The collective competitive discipline imposed on traditional ILEC offerings is almost certainly understated in the data presented above. For example, the Commission's statistics on VoIP subscribership include only what the Commission classifies as "interconnected VoIP"[18] and therefore exclude services such as Skype and FaceTime. VoIP technology permits even small competitors to offer voice service to millions of broadband subscribers, and has allowed literally hundreds of new operators to enter the market in recent years.[19] More generally, no weight is given to developments such as the increasingly obsolete distinction between local and long-distance calling, the ability to communicate over long distances via text messaging, e-mail, or social networks, or the emergence of other converged communications services offering various combinations of voice, text, and video, such as iMessage, Snapchat, Viber, and WhatsApp.[20] The rapid entry and expansion of these alternatives to traditional "voice-only" service has transformed the communications marketplace in recent years. For example, an estimated 87 percent of US adults used the Internet as of 2014, up from only 15 percent in 1995,[21] with the vast majority of Internet users communicating via e-mail and social media.[22] Skype alone reported approximately 25 million connected US users as

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18. Interconnected VoIP is distinguished from VoIP service more generally by "permitting users to receive calls that originate on the public switched telephone network *and* to terminate calls to the public switched telephone network." See Federal Communications Commission, *Local Telephone Competition: Status as of December 31, 2012*, at 1.

19. Frost & Sullivan, *VoIP: State of the Over-the-Top Voice Market* (March 2011).

20. *See, e.g.,* Simon Hill, "Who will rule the post-texting world? In search of the ultimate messaging app," *Digital Trends* (May 20 2013), available at http://www.digitaltrends.com/mobile/best-chat-messaging-apps/ [hereafter *Digital Trends*].

21. Pew Research Internet Project, *Internet Use Over Time*, (August 2014), available at http://www.pewinternet.org/data-trend/internet-use/internet-use-over-time/.

22. Pew Research Internet Project, *Three Technology Revolutions*, available at http://www.pewinternet.org/three-technology-revolutions/; *see also Search and email still top the list of most*

of December 2010,[23] and over 280 million global users in 2012;[24] Viber reported reaching 200 million global users as of 2013.[25] In that year, an estimated 153 billion text messages were sent and received each month in the U.S., along with about 10 billion multimedia messages.[26]

14. The trend towards increased competition has not gone unnoticed by industry analysts. The market research firm Frost and Sullivan noted in late 2013 that "[r]esidential voice customers continue to migrate away from traditional landline services to less-expensive options offered by wireless and cable providers."[27] As shown in Figure II, according to Frost and Sullivan, the rise in residential cable telephony and VoIP subscriptions over the six year interval spanning 2007 – 2013 is substantial, with a cumulative increase of 12.4 million subscribers. Over this same interval, the cumulative decline in the Telco subscriber base came to approximately 39.4 million (from 89.3 million in Q4 2007 to just 49.9 million in Q4 2013). Thus, the data imply that approximately 39.4 million - 12.4 million ≈ 27 million subscribers chose to abandon landline service in favor of wireless service between 2007 and 2013, even if population growth is ignored. Indexing the initial subscriber total to the growth in US households since 2007 would increase this figure to approximately 33.1 million. Similar results have been obtained for prior time periods by industry analysts at SNL Kagan.[28]

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popular online activities, (August 2011), available at http://www.pewinternet.org/2011/08/09/search-and-email-still-top-the-list-of-most-popular-online-activities/.

23. *See* Skype S.à r.l., *Amendment No. 2 To Form S-1*, available at http://www.sec.gov/Archives/edgar/data/1498209/000119312511056174/ds1a.htm.

24. *See* Microsoft Corporation, *Earnings Release FY13 Q1*, available at http://www.microsoft.com/investor/EarningsAndFinancials/Earnings/PressReleaseAndWebcast/FY13/Q1/default.aspx.

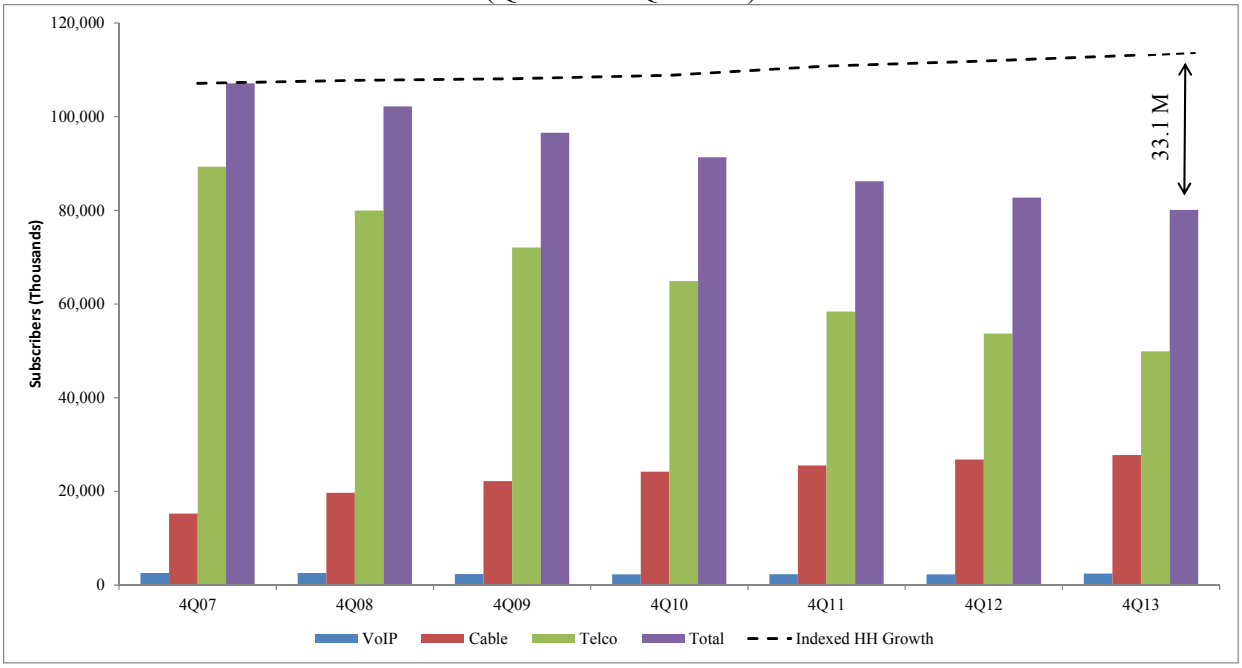
25. *See* Parmy Olson, "Free-Calling App Viber Jumps To Desktop, Hits 200 Million Users," *Forbes* (May 7, 2013), available at http://www.forbes.com/sites/parmyolson/2013/05/07/free-calling-app-viber-jumps-to-desktop-hits-200-million-users/.

26. *See* http://www.ctia.org/your-wireless-life/how-wireless-works/annual-wireless-industry-survey.

27. Frost & Sullivan, *North American Voice Tracker: Third Quarter 2013* CCS 7-28 (December 2013).

28. *See* Part II, *infra*.

FIGURE II: SUBSCRIBERSHIP AMONG ILEC VOICE & SELECTED COMPETITIVE ALTERNATIVES
(Q4:2007 – Q4:2013)



Notes: Residential VoIP, Cable, and Telco subscriber counts from Frost & Sullivan, *North American Voice Tracker: Fourth Quarter 2013* CCS 8-6 (March 2014). Household growth index computed from Census H-1 household counts.

15. The data also show that business customers are rapidly switching away from ILEC voice services and towards competitive alternatives. In addition to more traditional voice offerings from cable companies or CLECs, a large proportion of businesses have access to high-speed broadband, which in turn permits access to a variety of competitive VoIP offerings.[29] According to the Commission's latest *Local Competition Report*, from December 2008 – June 2013, ILEC business line counts declined by approximately 12.5 million, for a loss of "only" 27 percent (compared with approximately 34 percent overall).[30] Over this same interval, non-ILEC

29. For example, a recent NTIA survey found that download speeds of 10Mbps or faster were available in 98 percent of businesses as of June 2012. *See* National Telecommunications & Information Administration, *Broadband Availability In The Workplace* (November 2013), at Figure 2.

30. *2013 Local Competition Report*, Table 2.

business line counts grew by approximately 5.4 million.[31] The fact that ILECs appear to be losing business landlines at a significantly faster pace than they are being replaced by non-ILEC lines suggests that traditional ILEC business voice subscriptions are being replaced to a significant degree by non-traditional services (e.g., Skype for business) that may not be captured by the FCC's current data collection protocols.[32]

16. All of the major cable multiple-system operators ("MSOs") have entered the business services market, offering voice service in conjunction with various data-intensive products.[33] Comcast and Time Warner Cable collectively sell more than $5 billion worth of Internet, voice, and network services to business customers annually, and each company's business revenues have experienced growth rates in excess of 20 percent over the past year.[34] As of 2013, Cox reported more than $1.6 billion in annual business revenue, and served more than 330,000 companies in its geographic footprint.[35]

17. There is also evidence that cable MSOs and other competitors are significantly expanding their capacity to serve commercial customers, with many providers attaining (or poised to attain) Carrier Ethernet 2.0 ("CE 2.0") certification.[36] The CE 2.0 standard supports an

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31. *Id*.

32. *Id.* at 1, n. 2 ("We note that the current interpretation of element (4) of the definition excludes the VoIP services that Skype offers in the United States, and subscribers to those services are not reported on Form 477."). *See also* http://www.forbes.com/sites/kateharrison/2012/08/08/how-to-break-up-with-your-landline/; http://www.pcworld.com/article/260859/voip_buying_guide_for_small_business.html; http://www.skype.com/en/business/.

33. Cable Industry Insider, "Cable Operations & Ethernet: Serious Market Share," (August 2013).

34. Liana B. Baker, "Comcast: Business services is sweet spot in Time Warner Cable deal," *Reuters* (April 1, 2014).

35. *See, e.g.,* Alan Breznick, "Cox Joins Carrier Ethernet 2.0 Club" *LightReading* (June 6, 2014) [hereafter *Breznick 2014*]

36. *Id.* ("Cox Business has received Carrier Ethernet 2.0 certification from the Metro Ethernet Forum (MEF), putting it in position to offer more advanced Ethernet services to its commercial customers. Cox Business…thus becomes the third major US MSO business services unit to gain the Carrier Ethernet 2.0 blessing from Metro Ethernet Forum (MEF). Previously, the business divisions of Comcast Corp. (Nasdaq: CMCSA, CMCSK) and Time Warner Cable Inc. (NYSE: TWC) won that stamp of approval, along with the commercial services arms of

array of data-intensive commercial applications, including VoIP,[37] and allows carriers to expand their geographic footprints for such services.[38] Several cable companies (Comcast, Time Warner, Cox, RCN) have already obtained CE 2.0 certification, as have some CLECs.[39]

18. Relatedly, analysts have recently reported that MSOs in the U.S. have been "aggressively deploying"[40] high-speed data networks based on DOCSIS 3.0 technology, which allows for high-speed data connections, as well as voice service.[41] Analysts have noted that operators' infrastructure investments in DOCSIS 3.0 are "paying off in new subscribers and upgrades to existing subscribers' services," [42] as indicated by significant growth in demand for broadband customer premises equipment in recent years.[43]

II. ROBUST LONG-TERM TRENDS SUPPORT THE HYPOTHESIS THAT WIRELINE VOICE COMPETES WITH WIRELESS VOICE

19. A key question addressed in the *Phoenix Order* was whether or not wireless voice offerings exert significant competitive discipline on traditional ILEC wireline voice

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such smaller cable operators as RCN Corp. The Carrier Ethernet 2.0 accreditation means Cox can broaden the scope and range of Ethernet services that it can offer to commercial customers.") *See also* Dan O'Shea, "MEF: CE 2.0 Certification Pipeline Filling Up" *LightReading* (January 10, 2014) http://www.lightreading.com/ethernet-ip/carrier-ethernet-20/mef-ce-20-certification-pipeline-filling-up/d/d-id/707237

37. Metro Ethernet Forum, *The Case for Carrier Ethernet 2.0* (February 2012), at 4 (describing "the most common Carrier Ethernet applications, all of which are enhanced by implementing Carrier Ethernet 2.0," as "[s]ite-to-site access, server consolidation, business continuity/disaster recovery, Enterprise-class cloud-based applications, Internet access, distributed imaging, distributed storage area networks, VoIP, streamed/interactive video, L2-VPNs, virtualization.")

38. *See Breznick 2014* ("Most notably, the advanced MEF standard enables broadband providers to offer multiple classes of services and interconnect with other broadband networks to deliver Ethernet services over larger geographic areas.")

39. *Id. See also* Metro Ethernet Forum *Services Certification Registry* (showing "unique MEF-sourced listing of those companies that have achieved certification of CE 1.0 and/or CE 2.0 compliance of their services and products.") Available at http://www.metroethernetforum.org/certification/services-certification-registry

40. Zacks Equity Research, *DOCSIS 3.0 Market Thriving* (December 17, 2013).

41. *Id. See also* Alan Breznick, "Docsis 3.0 Strikes Bonanza" *LightReading* (July 19, 2013) [hereafter *Breznick 2013*] ("Worldwide shipments of broadband consumer premise equipment (CPE) hit a new high of 144.9 million units last year, thanks in large part to the growth of Docsis 3.0 cable modems, voice modems, routers, gateways and other home devices.")

42. Infonetics Research, *DOCSIS 3.0 boosts broadband CPE market; Huawei, ZTE in scrum for 1st* (July 18, 2012).

43. *Id. See also Breznick 2013*.

service. Although the *Phoenix Order* acknowledged that "the increasing number of households that rely solely on mobile wireless services suggests that more consumers may view mobile wireless as a closer substitute for wireline voice service than in the past,"[44] the *Phoenix Order's* market power analysis ultimately concluded that there was insufficient evidence in the record to conclude that wireless voice service "may materially constrain the price of residential wireline voice service."[45] Noting that most households have both a landline and a wireless subscription, the *Phoenix Order* found instead consumers used mobile wireless service "to supplement their wireline service rather than as a substitute for their wireline service."[46]

20. According to fundamental economic principles, "Goods…where an increase in the price of one leads to an increase in the quantity of the other…are referred to as substitutes."[47] Commonsense examples include "coffee and tea, Toyotas and Hondas, and air conditioners and fans."[48] On the other hand, two goods are considered economic complements if an increase in the price of one leads to a decrease in the demand for the other. Commonsense examples include "[c]offee and cream…cars and gasoline, and baseball gloves and baseballs."[49] (From these definitions, it should be clear that the fact that some customers purchase two goods at the same time does not necessarily imply that the two goods are complements). As explained in this section and the next, well-documented trends in the available data are far more supportive of the hypothesis that mobile wireless service is, in the economic sense of the word,

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44. *Phoenix Order*, ¶60.
45. *Id.*, ¶55.
46. *Id.*, ¶59.
47. MICHAEL L. KATZ & HARVEY S. ROSEN, MICROECONOMICS (Irwin McGraw-Hill 3rd ed. 1998) [hereafter *Katz & Rosen*] at 60 (emphasis in original).
48. *Id*.
49. *Id*.

"a…substitute for wireline voice service"[50]—such that an increase in the price of one service leads to an increase in demand for the other—than the alternative hypothesis that wireless and wireline are economic complements—such that an increase in *either* the price of wireless *or* the price of wireline would cause demand for *both* services to contract.

21. It is now widely recognized that the share of "wireless-only" households in the U.S. has increased very rapidly since the early 2000s, and that these customers now represent a substantial fraction of the market for voice communications. Unsurprisingly, the data also reveal that the demand for traditional ILEC wireline connections has fallen off sharply. Throughout this time period, overall demand for wireless service has surged, while overall demand for traditional wireline telephony has declined steeply.[51]

22. These observed trends imply that consumers' collective willingness to replace wireline service with wireless service at the margin has increased substantially: Holding all else fixed, it can be inferred that the price of wireline service would have to fall substantially in order for the share of "wireless-only" households to revert from its current level (over 40 percent) to the levels observed in the early 2000s (in the neighborhood of 1 percent). It is also clear that these trends are not confined to any narrow geographic area or demographic niche. To the contrary, the data reveal that this is a widespread phenomenon, based on state and county-level estimates of the percentage of individuals living in "wireless-only" households, in addition to estimates of the wireless-only share by age group, ethnicity, and income.

23. The broad-based and sustained increase in wireless-only households documented below occurred at a time when wireless prices were declining, both in absolute terms and

50. *Phoenix Order*, ¶60.
51. *See* Figure I, *supra*.

relative to landline prices, which have typically been subject to regulation, and have remained relatively stable, even increasing somewhat on average.[52] Therefore, as the relative price of wireless voice service has fallen, the share of wireless-only households has surged, while demand for traditional fixed line service has declined steeply. These long-term trends support the hypothesis that wireless and wireline service are competitive alternatives, but not the alternative hypothesis that they are complements.

24. Of course, the trends documented in this section are not equivalent to econometric estimates of the cross-price elasticity between wireless and wireline service (which are dealt with in Part III). Nevertheless, it bears emphasis that agencies such as the Department of Justice ("DOJ") and the Federal Trade Commission ("FTC")—whose overall framework for antitrust analysis is explicitly endorsed in the *Phoenix Order*[53]—are frequently obliged to conduct their own analyses of market power without the luxury of robust econometric evidence to precisely quantify customer switching patterns.[54] To assess the extent of competition among differentiated products (of which wireless and wireline service are a prime example), the *Horizontal Merger Guidelines* direct the agencies to "consider any reasonably available and reliable information to evaluate the extent of direct competition between the products sold by

52. *See, e.g.,* Kevin W. Caves, *Quantifying Price-Driven Wireless Substitution in Telephony,* 35 TELECOMMUNICATIONS POLICY 984-998 (December 2011) [Attached as Exhibit B; hereafter *Caves (2011)*], Figure 2.

53. *Phoenix Order*, ¶1.

54. *See, e.g.*, Carl Shapiro, *The 2010 U.S. Horizontal Merger Guidelines: From Hedgehog to Fox in Forty Years,* 77 ANTITRUST LAW JOURNAL 701-759 (2010), at 741-42 ("DOJ economists and the economists consulting for the merging parties routinely devote considerable effort to estimating demand, using whatever reliable and relevant data are available. However, we often lack sufficient data to reliably and robustly estimate the demand system, making it necessary to follow approaches that are less stringent in terms of their data or modeling requirements.").

the merging firms,"[55] including "customer switching patterns, and customer surveys."[56] Data sets that document these patterns, such as those discussed below, should therefore be assessed as evidence of direct competition between wireless and wireline voice service.

A. National Trends

25. For more than a decade, an increasing tendency for households to abandon wireline voice service in favor of wireless service has been well documented in publicly available data. The Centers for Disease Control and Prevention ("CDC"), through the National Health Interview Survey ("NHIS"), conducts biannual interviews of tens of thousands of households drawn from the civilian, non-institutionalized population.[57] The NHIS identifies a household as "wireless-only" if (1) there is no functioning landline inside the household; and (2) at least one family member living in the household possesses a functioning wireless telephone.[58]

26. As seen in Figure III, the NHIS data show that the proportion of US households using wireless voice service in lieu of a landline connection reached 41.0 percent by the second half of 2013. Given the large number of observations they reflect, the NHIS estimates are statistically precise. For example, the 2013 point estimate is based on a sample of 21,512 households, with a 95 percent confidence interval of 39.8 – 42.3 percent.[59]

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55. US Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines (August 19, 2010) [hereafter *Merger Guidelines*], §6.1.

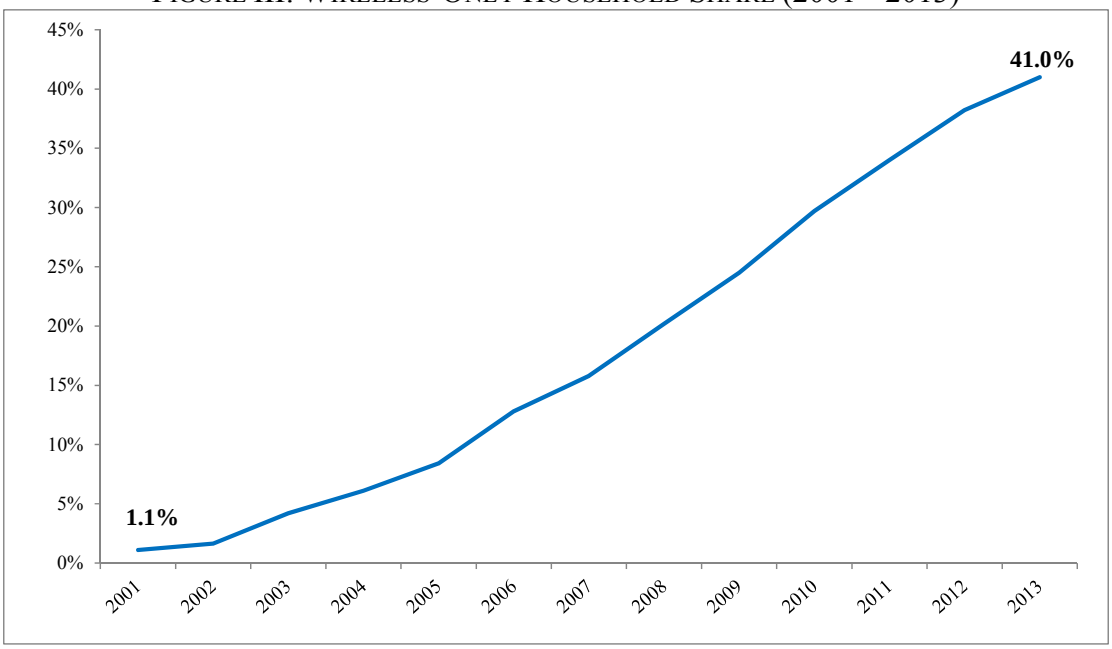
56. *Id.*

57. *See, e.g.,* Stephen Blumberg and Julian Luke, *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey*, Division of Health Interview Statistics, National Center for Health Statistics, Centers for Disease Control & Prevention (January – June 2013) [hereafter *Blumberg & Luke (2013)*]. The Commission has previously acknowledged some of the key trends documented in the NHIS. *See Sixteenth CMRS Report* at 25-26.

58. *Blumberg & Luke (2013)* at 2 ("Households are identified as "wireless-only" if they include at least one wireless family and if there are no working landline telephones inside the household.")

59. Stephen Blumberg and Julian Luke, *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey*, Division of Health Interview Statistics, National Center for Health Statistics, Centers for Disease Control & Prevention (July – December 2013) [hereafter *Blumberg & Luke (2013b)*], Table 1.

FIGURE III: WIRELESS-ONLY HOUSEHOLD SHARE (2001 – 2013)



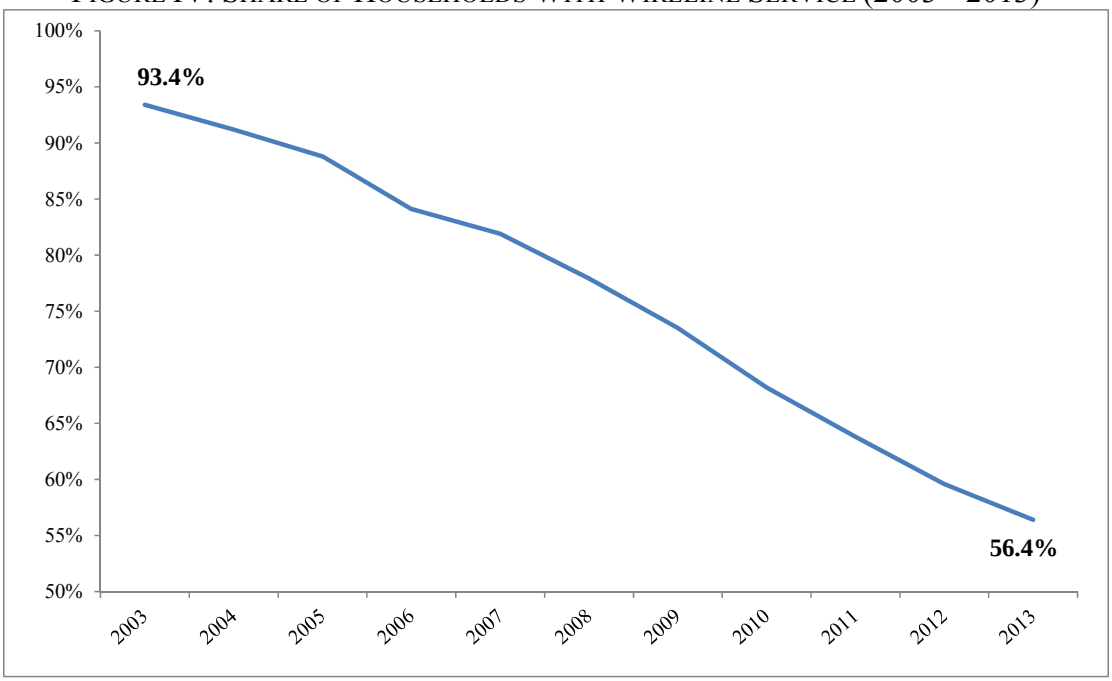
Notes: Data for 2003 onward reflect the NHIS wireless-only share for second half of each year. Data for 2001 – 2002 reflect FCC estimates of wireless-only households as a proportion of total US Households. *See* FCC, *Trends In Telephone Service* (Aug. 2008), Table 7.4.

27. Unsurprisingly, the NHIS data also reveal a steep decline in the proportion of households purchasing landline service. As illustrated in Figure IV, as recently as 2003, more than 90 percent of households surveyed reported having at least one functioning wireline telephone. Over the course of the next decade, the wireline share has fallen to well under 60 percent.[60] Further, given that Non-ILECs accounted for about 41 percent of residential landlines as of 2013,[61] the ILEC household share can be estimated at approximately (1 - 0.41)*0.56 ≈ 33 percent.

60. As before, the large NHIS sample sizes reinforce the statistical precision of the point estimates underlying these figures. *See Blumberg & Luke (2013b)*, Table 1.

61. *2013 Local Competition Report*, Table 10.

FIGURE IV: SHARE OF HOUSEHOLDS WITH WIRELINE SERVICE (2003 – 2013)



Notes: Share of NHIS survey respondents with landline service computed as the sum of (Landline with wireless + Landline without wireless + Landline with unknown wireless). Because the proportions sum to 100 percent, the statistic can be equivalently computed as the 100 minus the sum of (Nonlandline with unknown wireless + Wireless-only + Phoneless).

28. Because they do not capture usage, the trends documented in Figures I and II tend to understate the shift in consumer demand away from wireline telephony. Starting in 2007, the NHIS began to record whether "all or almost all calls are received on cell phones, some are received on cell phones and some on regular phones, or very few or none are received on cell phones."[62] This yields an estimate of the proportion of "wireless-mostly" households, which the NHIS defines as households with both landline and mobile service inhabited by families receiving all or almost all calls on mobile phones.[63] As of late 2013, an estimated 16 percent of all households were "wireless-mostly;" these households represent approximately 34

62. *Id.* at 4.
63. *Id.* at 3-4.

percent of all households with both a landline and a wireless connection, up from approximately 22 percent in 2007.[64]

29. Industry analysts have found wireless competition to be the driving factor behind the continued erosion of the landline business. In 2011, analysts at SNL Kagan, while acknowledging that "[c]able phone alternatives have eroded the once dominant position of the telcos, taking one-fifth of the segment at the end of 2010,"[65] nevertheless found that "[w]ireless replacement has played the single largest role in the changing landscape."[66] The Kagan analysts also predicted (accurately) that the wireless-only household share would reach approximately 40 percent by 2013.[67] More recently, analysts at Frost and Sullivan have reached similar conclusions.[68]

B. State and Regional Trends

30. For several years, the NHIS has also produced estimates at the state and county level.[69] To obtain these geographically disaggregated estimates, the NHIS combines demographic data from the Census Bureau's American Community Survey ("ACS"), along with

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64. *Blumberg & Luke (2013b)* at 4; *see also* Stephen Blumberg and Julian Luke, *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey*, Division of Health Interview Statistics, National Center for Health Statistics, Centers for Disease Control & Prevention (July – December 2007), at 3.

65. Ian Olgeirson and Mari Rondeli, "Wireless substitution cuts into wireline phone forecast," SNL Kagan *Multichannel Market Trends* (April 18, 2011).

66. *Id*.

67. *Id*.

68. *See* Part I, *supra*.

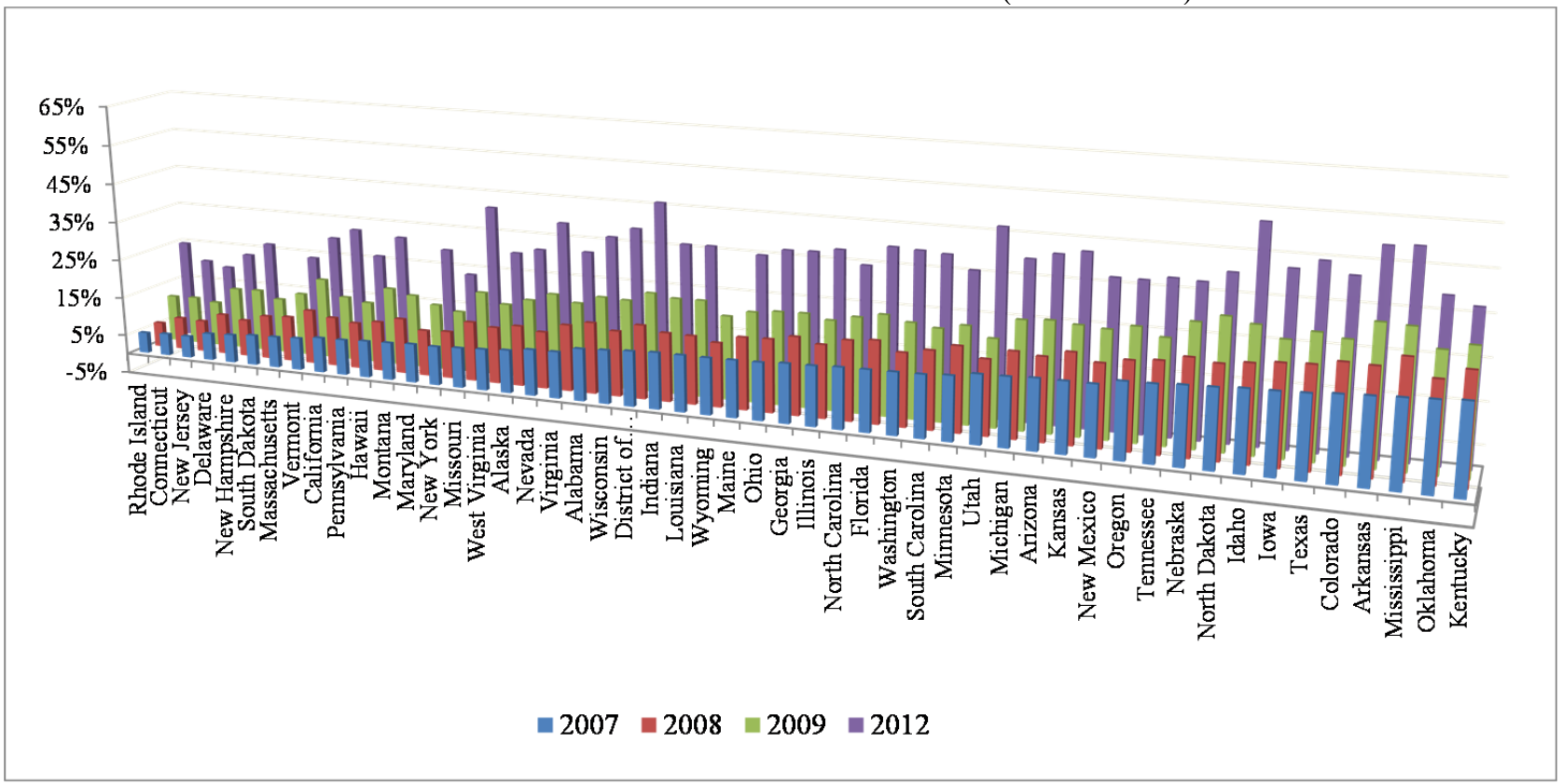
69. The NHIS first released state-level cord-cutting estimates in 2009. *See* Stephen Blumberg et. al., *Wireless Substitution: State-level Estimates From the National Health Interview Survey*, *January – December 2007* National Center for Health Statistics, Centers for Disease Control & Prevention (March 11, 2009). Subsequent state-level analyses yielded updated estimates with a greater degree of statistical precision. *See* Stephen Blumberg et. al., *Wireless Substitution: State-level Estimates From the National Health Interview Survey*, *January 2007–June 2010* National Center for Health Statistics, Centers for Disease Control & Prevention (April 20, 2011); *see also* Stephen Blumberg et. al., *Wireless Substitution: State-level Estimates From the National Health Interview Survey*, *2012* National Center for Health Statistics, Centers for Disease Control & Prevention (December 18, 2013) [hereafter *Blumberg et. al. (2013)*].

data on the number of listed telephone lines per capita to construct a statistical model that predicts the share of wireless-only households within a given geographic area.[70]

31. Figure V displays the estimated state-level wireless-only shares for 2007 through 2012, sorted in ascending order of the 2007 estimate. As seen below, the data indicate that wireless-wireline competition is both widespread and increasing across the United States. As of 2007, the NHIS estimated wireless-only shares ranging from 5.3 percent (Rhode Island) to 21.7 percent (Kentucky). By 2012, the point estimates ranged from 19.4 percent (New Jersey) to 52.3 percent (Idaho). In other words, even the state at the "low" end of the spectrum as of 2012 had roughly the same estimated wireless-only share as the state with the highest wireless-only share in 2007. In fact, the NHIS point estimates have increased for literally every one of the states for which data are available over the sample period shown in Figure V.

70. *See Blumberg et. al. (2013).*

FIGURE V: WIRELESS-ONLY SHARE BY STATE (2007 – 2012)



Notes: Figures reflect NHIS estimates of the percentage of adults living in wireless-only households. NHIS does not report 2012 point estimates for Montana, South Dakota, or Wyoming. Nevertheless, each of these three states registered increases in their point estimates from 2007-2008, and again from 2008-2009.

32. Measured in terms of percentage points, the state with the smallest increase over this five year interval was New York (whose point estimate increased by 13.7 percentage points, from 9.8 percent to 23.5 percent). Idaho registered the largest increase (32.7 percentage points, from 19.6 percent to 52.3 percent). On average, the NHIS state-level wireless-only estimates shown in Figure IV increased by 21.9 percentage points between 2007 and 2012. Finally, for many states, the NHIS also produces estimates for specific counties, or groups of counties. These data, like the state-level estimates, reveal elevated and increasing wireless-only shares.[71]

33. Since 2008, the FCC has published state-level data on the share of residential switched access lines provided by Non-ILECs, defined to include CLECs, cable companies, and interconnected VoIP providers.[72] These data can be combined with the NHIS wireless-only share estimates to obtain a more complete picture of competition at the state level. For example, if 50 percent of households in a given state are wireless-only, and if ILECs account for 50 percent of residential switched access lines, then the ILEC household share can be estimated at 0.5*0.5 = 25 percent, implying that 75 percent of households select competitive alternatives in lieu of traditional ILEC voice service.[73]

34. As seen in Figure VI, these state-level estimates provide further confirmation of widespread competition across the United States. Among states for which complete 2012 data are available, the estimated share of households purchasing competitive alternatives to traditional ILEC voice service ranges from 51 percent (Hawaii) to 73 percent (Utah), with an

71. *Id.,* Table 1.

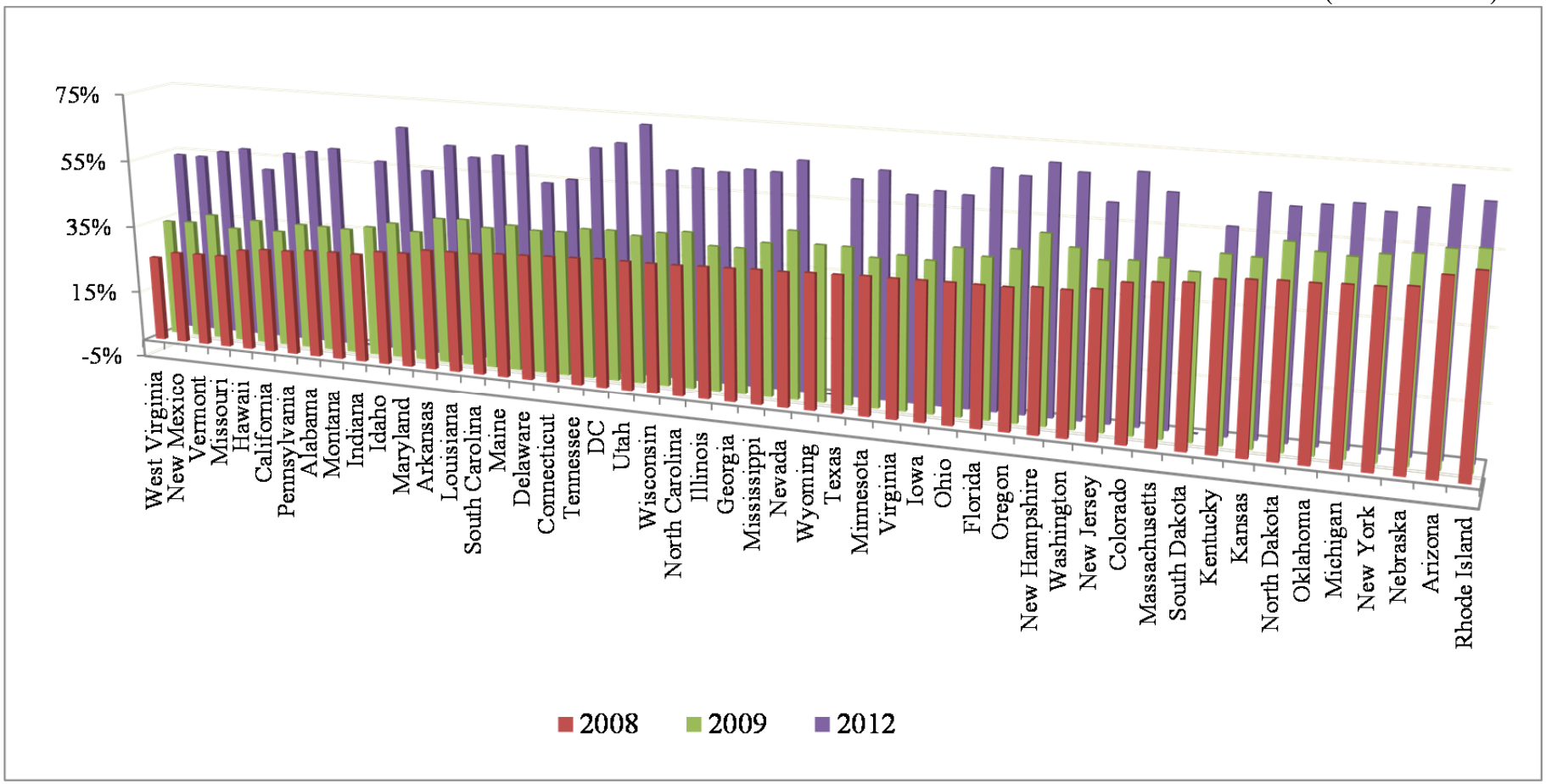
72. Federal Communications Commission, *Local Telephone Competition: Status as of December 31, 2008*, at 2.

73. The NHIS state-level wireless-only shares reflect the estimated percentage of wireless-only adults, which consistently falls slightly below the estimated percentage of wireless-only households. *See, e.g., Blumberg & Luke (2013),* at Table 1.

average of 62 percent across all states (up from 38 percent in 2008). Stated differently, as of 2012, the ILEC household share was below 50 percent in every state for which data are available, and below 40 percent on average.

35. Finally, note that certain states such as Rhode Island, New Jersey, Connecticut, and Delaware, with relatively "low" wireless-only shares in 2012 (between 19 and 25 percent), exhibit high rates of customer switching to CLECs, cable companies, and interconnected VoIP providers. The net result is that each of these states exhibits substantial combined switching to competitive alternatives, ranging from 54 percent (Delaware) to 68 percent (Rhode Island).

FIGURE VI: SHARE OF HOUSEHOLDS CHOOSING COMPETITIVE WIRELESS OR WIRELINE ALTERNATIVES (2008 – 2012)



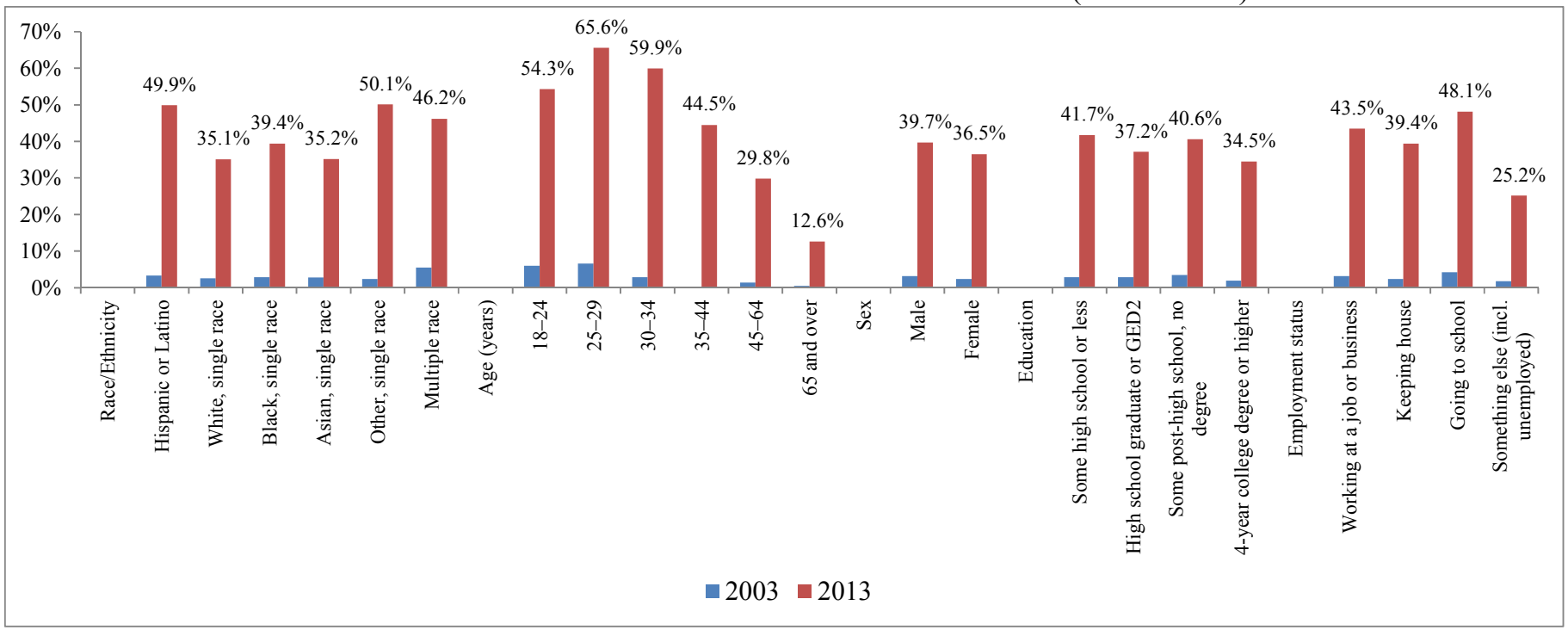
Notes: Figures reflect the sum of estimated non-ILEC landline voice households and wireless-only households based on (*a*) FCC estimates of the Non-ILEC share of residential landlines; and (*b*) NHIS estimates of the percentage of adults living in wireless-only households. The share of households choosing competitive wireless or wireline alternatives is estimated as $1-(1-a)*(1-b)$. NHIS does not report 2012 point estimates for Montana, South Dakota, or Wyoming. To maintain firm confidentiality, the FCC does not report the Non-ILEC share for Alaska.

C. Demographic Trends

36. The NHIS data also show that rates of wireless-wireline competition have increased across a range of demographic groups, based on estimates of the wireless-only share by age, ethnicity, income, and other indicators. Figure VII displays the wireless-only share for more than 20 demographic categories tracked by NHIS from 2003 to 2013. As seen below, regardless of whether the sample is divided according to race, age, sex, education, or employment status, the estimated rates of cord-cutting increased substantially over the decade.[74] In 2003, none of the demographic groupings in Figure VII reported wireless-only shares above ten percent. By 2013, the majority of the groups were above 40 percent. Even among adults age 65 and older, cord-cutting had increased substantially by 2013 (from 0.5 percent to more 12.6 percent). Thus, switching away from landline service has increased substantially, even among demographic groups that might have previously seemed disinclined to cut the cord.

74. Analogous patterns are observed when the NHIS sample is disaggregated by household structure, poverty status, geographic region, metropolitan versus not metropolitan, and home ownership status.

FIGURE VII: WIRELESS-ONLY SHARES BY DEMOGRAPHIC GROUP (2003 – 2013)



Notes: Figures reflect NHIS estimates of the percentage of adults living in wireless-only households by selected demographic characteristics. Statistics for 2003 obtained from Stephen Blumberg and Julian Luke, *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey*, Division of Health Interview Statistics, National Center for Health Statistics, Centers for Disease Control & Prevention (July-December 2006), at Table 2. Estimates for 2013 obtained from *Blumberg & Luke (2013)*, Table 2.

37. As explained in Part IV, because firms choose optimal prices based on the switching behavior of marginal customers (as opposed to inframarginal customers, who could be less price-sensitive), it is not necessary to show that all wireline customers are equally willing to switch to wireless in response to a change in relative prices in order to demonstrate that wireless offerings constrain the price of wireline. Nevertheless, the evidence above belies the notion that certain demographic groups are predisposed to cut the cord, and others are not, as well as the idea that wireless-wireline competition is likely to increase among certain demographic groups but not others. Finally, even if it were the case that (contrary to the available evidence) certain customer subsets were unlikely to ever engage in significant cord-cutting, it is extremely unlikely that an ILEC could profitably engage in targeted price discrimination to particular subsets of price-insensitive customers.[75]

III. ECONOMETRIC STUDIES CONFIRM THAT WIRELINE VOICE COMPETES WITH WIRELESS VOICE

38. As explained in Part IV, the *Phoenix Order* fails to incorporate into its analysis the basic antitrust principle that ILEC pricing power is constrained not by one alternative in isolation, but by the degree of aggregate switching to all competitive alternatives that would take place in response to a hypothetical price increase. As I explain in this Section, even setting this aside, the *Phoenix Order* significantly understates the degree of wireless-wireline competition by implicitly relying on evidence from dated econometric studies, which utilized data from the late 1990s and early 2000s, when customer switching from wireline to wireless had only just begun to emerge.[76] Nevertheless, even these studies provide evidence that, even at

75. See Part IV.A, *infra*.

76. The *Phoenix Order* found insufficient econometric evidence in the record to conclude that wireless had evolved into a competitive alternative for wireline service. *See Phoenix Order*, ¶¶58-60. The *Phoenix Order* relied,

this early stage, wireless and wireline had already begun to compete with one another. Moreover, the authors of these early studies were careful to note the likelihood that mobile and fixed service would evolve into closer competitors over time—as well as the need to adjust current regulatory stances in response to such a development.

39. Subsequent econometric work by myself and other economists (including at least one of the authors of the earlier econometric studies) have confirmed that, when more recent data are analyzed, the cross-price elasticity between wireless and wireline is found to be positive and economically significant.[77] For example, the cross-price effects from my own econometric models indicate that roughly two thirds of landline attrition observed in the United States between 2001 - 2007 can be attributed to the overall decline in the price of wireless service—relative to wireline prices—that occurred over this timeframe.[78] Thus, the persistent trends in cord-cutting observed in the aggregate data are largely a price-driven phenomenon, which can be trigged by a decrease in wireless prices and/or an increase in wireline prices.

A. The *Phoenix Order's* Reliance on Dated Econometric Studies

40. In the *Phoenix Order*, the Commission acknowledged that "the increasing number of households that rely solely on mobile wireless services suggests that more consumers may view mobile wireless as a closer substitute for wireline voice service than in the past."[79]

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in part, on a 2008 DOJ report, which concluded that "econometric analyses of the issue have not shown that wireless and landline telephone services are in the same product market, though they may be getting close." *See* U.S. Department Of Justice, *Voice, Video, And Broadband: The Changing Competitive Landscape And Its Impact On Consumers* (2008) (DOJ Voice, Video And Broadband Symposium), [hereafter *Competitive Landscape Report*], at 66. The DOJ's conclusion was based on two econometric studies that analyzed data sets reflecting consumer behavior between 1999 and 2001. *See* Parts III.A.1 – III.A.2, *infra*.

77. *Caves (2011)*; *see also* Jerry Macher, John Mayo, Olga Ukhaneva, and Glenn Woroch, "Demand in a Portfolio-Choice Environment: The Evolution of Telecommunications," Georgetown McDonough School of Business Research Paper No. 2012-19 (August 2012; revised July 2014) [hereafter *Mayo et. al. (2014)*].

78. *Caves (2011)* at 996-97.

79. *Phoenix Order*, ¶60.

Nevertheless, the Commission ultimately concluded that there was "insufficient data in the record to make such a determination"[80] within the confines of the *Phoenix Order*, and noted the absence of econometric estimates showing a significant cross-elasticity of demand between wireline and wireless services.[81]

41. In support of its findings, the Commission implicitly relied upon dated econometric studies, utilizing data sets compiled at the turn of the millennium, when cord-cutting was extremely rare. Specifically, the Commission cited the DOJ's 2007 *Competitive Landscape Report*,[82] according to which "econometric analyses of the issue have not shown that wireless and landline telephone services are in the same product market, though they may be getting close."[83] The *Competitive Landscape Report*, in turn, cited two econometric studies—a paper published in *Telecommunications Policy* in 2003, and a working paper released in 2004.[84]

1. Rodini, Ward, and Woroch (2003)

42. In the first study, Mark Rodini, Michael Ward, and Glenn Woroch utilized a US bill-harvesting dataset spanning 2000-2001 to estimate an econometric model of the determinants of consumers' decisions to subscribe to (1) second landlines; and (2) mobile service.[85] A consumer's decision to subscribe (or not to subscribe) to each type of service is

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80. *Id.* ¶60.
81. *Id.* ¶58.
82. *Id.* ¶¶57-59 (citing *Competitive Landscape Report*).
83. *Competitive Landscape Report* at 66.
84. *Id.* at 66, n. 364, citing Mark Rodini, Michael Ward, & Glenn Woroch, *Going Mobile: Substitutability between Fixed and Mobile Access*, 27 TELECOMMUNICATIONS POLICY 457-476 (2003) [hereafter *Rodini et. al. (2003)*]; and, Michael Ward & Glenn Woroch, "Usage Substitution between Mobile Telephone and Fixed line in the U.S.," Center for Research on Telecomm. Policy Working Paper (May 2004) [hereafter *Ward & Woroch (2004)*].
85. *Rodini et. al. (2003)* at 462 ("The main source of data in our analysis are the Bill Harvesting data from TNS Telecoms ReQuest Market Monitors along with its survey responses. This quarterly sample of US household consumption of various telecommunications services is derived from a large national panel. Participating households are asked to submit one set each of their original bills for local, long distance, cable TV, cellular and Internet services. Besides summary information, the data set extracts detailed call information from each

modeled as a binary choice using logistic regressions.[86] The authors found some evidence of competition between wireless and wireline: The cross-price elasticity of mobile access with respect to the wireline price is found to be positive and statistically significant, ranging from 0.13-0.18.[87] (In other words, a one percent increase in the price of landline service was found to increase the demand for wireless service by 0.13 to 0.18 percent). However, the authors were unable to detect a statistically significant relationship between mobile prices and the demand for second landlines. (The point estimates suggest moderate cross-price elasticities, ranging from 0.22-0.26).[88]

43. Significantly, because wireless-only households were rare in the early 2000s—only about one to two percent of the authors' data sample did not subscribe to fixed line service—the authors found it statistically impracticable to directly model the decision to abandon wireline service altogether, and were therefore unable to obtain an econometric estimate of the cross-price elasticity of wireline demand with respect to the price of wireless.[89] Instead, they were obliged to impute an indirect estimate based on restrictions on the cross-elasticities implied by economic theory, which suggested that a one percent increase in the price of wireless would lead wireline demand to increase by approximately 0.06 – 0.08 percent.[90]

44. In reviewing their results, Rodini, Ward, and Woroch concluded that wireless offerings represented a "moderate substitute" for landline telephony, but that it would be "premature…to infer from these estimates that mobile service currently constrains local

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''harvested'' phone bill. While these data were first collected in 1995, this paper uses data from the 2-year period January 2000–December 2001 during which a uniform sampling method and survey instrument were employed.")

86. *Id.* at 468.

87. *Id.* at 470.

88. *Id.*

89. *Id.* ("Our data are not rich enough to estimate the cross-elastic effect from wireless price changes on the decision to subscribe to any fixed line. Only about 1–2% of our sample does not subscribe to fixed line service.")

90. *Id.* at 470-72.

telephone service market power to any economically significant degree over the 2000–2001 period."[91] Nevertheless, they also noted that "[e]volving usage patterns suggest that mobile and fixed service will become greater substitutes over time," [92] and that "discrepancies between the two services are fading."[93]

2. Ward and Woroch (2004)

45. In the second study cited in the *Competitive Landscape Report*, Michael Ward and Glenn Woroch analyze a similar bill harvesting dataset spanning 1999 – 2001 to measure usage switching patterns between wireless and fixed line service.[94] The authors use an Almost Ideal Demand System framework[95] to model the share of minutes that customers allocate between wireless usage and wireline usage. The authors "find significant positive cross-price elasticities between mobile and wireline usage."[96] Further, the authors estimate that changes in relative prices over their (relatively short) sample period lead to substantial changes in usage patterns, noting that "[b]ecause mobile usage prices fell dramatically over this period, we estimate that wireline usage may have been about 50% higher had mobile prices not fallen."[97]

46. Ward and Woroch conclude that, although mobile service appears to be a "moderate substitute" for wireline usage, it would be "premature…to infer from these estimates that mobile service currently constrains local telephone service market power to any

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91. *Id.* at 475.
92. *Id*.
93. *Id*.
94. *Ward & Woroch (2004)* at 5.
95. Angus Deaton and John Muellbauer, *An Almost Ideal Demand System*, 70(3) AMERICAN ECONOMIC REVIEW 312-326 (1980).
96. *Ward & Woroch (2004)* at Abstract.
97. *Id*.

economically significant degree."[98] Nevertheless, the authors (writing more than ten years ago) were careful to note the potential for fundamental change in the "near future":

> Substitutability may increase over time due to continued price declines and feature improvements of mobile services outpacing those of wireline service. At some point in the near future, it is possible that mobile telephone service will be able to significantly constrain wireline providers' exercise of market power. When this does occur, it will be appropriate to modify many of the current regulatory stances toward telecommunications provision.[99]

B. Econometric Studies of More Relevant Time Periods

47. More recently, both my own econometric work and that of other economists have incorporated data from more relevant time periods, yielding results confirming that wireless and wireline compete with one another. In addition to producing positive and statistically significant estimates of the cross-price elasticity between wireless and wireline, these studies have also shown that the cross-price effects are economically significant: A substantial fraction of the observed increase in demand for wireless service in recent years—and the concomitant decrease in demand for wireline service—can be attributed to the observed decline in the relative price of wireless voice service.

1. Caves (2011)

48. In a paper published in *Telecommunications Policy* in 2011, I compiled a state-level panel dataset from a relatively recent time period (2001-2007) and estimated a structural demand system yielding econometric estimates of the own-price, cross-price, and income elasticities of demand for wireless and wireline telephony in the United States.[100] The study utilizes standard econometric techniques to estimate a demand system for wireless and wireline

98. *Id.* at 12.
99. *Id.*
100. *Caves (2011).* A copy of the published paper is attached as Exhibit B.

telephony. Demand systems are econometric tools commonly applied in economics and antitrust to capture customer switching patterns among a group of differentiated products. The two-equation demand system is reproduced below in (0.1) and (0.2):

$$q_{st}^{w} = \alpha_0 + \alpha_1 p_t^{w} + \alpha_2 p_{st}^{l} + \alpha_3 i_{st} + \sum_{k=1}^{K} \lambda^k X_{st}^{k} + \sum_{j=1}^{J} \theta^j D_s^j + \varepsilon_{st} \quad (0.1)$$

$$q_{st}^{l} = \beta_0 + \beta_1 p_{st}^{l} + \beta_2 p_{st}^{w} + \beta_3 i_{st} + \sum_{k=1}^{K} \gamma^k X_{st}^{k} + \sum_{j=1}^{J} \phi^j D_s^j + \mu_{st} \quad (0.2)$$

49. Above, q_{st}^{w} is the natural log of the quantity of wireless subscribers in state s in year t, while q_{st}^{l} is the natural log of the quantity of ILEC residential billable access lines in state s in year t, as reported by the FCC.[101] Similarly, p_{st}^{l} and p_{st}^{w} give the natural log of the price of landline and wireless service by state and year, also reported by the FCC.[102] Consistent with the increasingly obsolete distinction between local and long distance calling, the FCC's wireless price data do not vary by state. However, there is considerable cross-state variation in the tax rates on wireless service in the United States. Therefore, p_{st}^{w} is adjusted to reflect this variation using state-specific wireless tax data.

50. The remaining variables control for other factors that may shift the demand for wireless and/or wireline service. The variable i_{st} denotes real median income by state and year. Additional covariates, denoted X_{st}^{k}, include controls for population density, cellular tower density, average commute times, and various demographic controls.[103] In addition, the D_s^j (with $D_s^j = 1$ if $j = s$, and $D_s^j = 0$ otherwise) denote state fixed effects, which control for all state-

101. *Id.* at 989-991.
102. *Id.*
103. *Id.* at 990.

specific factors that are invariant over time. Finally, ε_{st} and μ_{st} are random error terms, driven by unobserved demand shocks and/or measurement error in the dependent variable of each equation.

51. As is commonly the case in demand system estimation, there exists the potential for endogeneity in the price variables. For example, in equation (0.1), both p_{st}^{w} and p_{st}^{l} are potentially correlated with unobserved demand shocks in ε_{st}. With respect to p_{st}^{w}, over the sample period there were significant advances in the quality and versatility of wireless technology along several dimensions (handset size, battery life, sound quality, etc.). As a consequence, there have likely been positive unobserved shocks to wireless demand. Holding other factors constant, these shifts in demand may be correlated with wireless prices.

52. More generally, there is also reason to suspect that p_{st}^{l} and p_{st}^{w} may both be correlated with ε_{st} and μ_{st}. Although landline prices in the US remain constrained by regulation, which may mitigate endogeneity problems,[104] it is also the case that some states have begun to deregulate wireline prices, or at least to allow for additional pricing flexibility. Given the expansion of intermodal alternatives during the sample period, it is likely that unobserved shocks to ILEC wireline demand have occurred over the sample period, suggesting that p_{st}^{l} may be correlated with μ_{st}. Moreover, if wireless and wireline are competitors, then unobserved positive shocks to wireless demand should generally be correlated with unobserved negative shocks to wireline demand. For example, an improvement in the sound quality of wireless calls would be expected to increase the demand for wireless service, while decreasing fixed line

104. Laurits Christensen & William Greene, *Economies of Scale in U.S. Electric Power Generation* 84 JOURNAL OF POLITICAL ECONOMY, 655–676 (1976).

demand. This suggests that p_{st}^{l} may be correlated with ε_{st}, and that p_{st}^{w} may be correlated with μ_{st}.

53. To ensure that the estimated own- and cross-price elasticities reflect the responsiveness of demand to prices alone, holding non-price factors constant, it is important to correct for potential endogeneity bias. Accordingly, I estimated the system using iterated three-stage least squares (I-3SLS), which combines the techniques used in Seemingly Unrelated Regression (SUR) and two stage least squares (2SLS).[105] This requires instrumental variables, which are correlated with the (potentially endogenous) price variables, but uncorrelated with the error terms. The instruments utilized in the study include state-specific taxes on wireless and wireline service, which provide exogenous price variation across states and over time. In addition, because the wireless industry has undergone significant technical change, an index of wireless telecommunications productivity is included as a third instrument, to capture shifts in the industry cost curve over time.

54. According to my econometric estimates of the cross-price elasticity between wireless and wireline, a one percent decrease in the price of wireless service would decrease the demand for fixed-line service by approximately 1.2 to 1.3 percent.[106] Because these results substantially exceed prior econometric estimates from the empirical literature (which the study reviews in detail), they indicate that wireless voice service had evolved into a strong competitive alternative to traditional landline service. To illustrate the economic significance of

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105. 3SLS yields instrumental variable estimates, taking into account the covariances across equation disturbances. The objective function for three stage least squares is the sum of squared transformed fitted residuals. *See, e.g.,* ROBERT PINDYCK & DANIEL RUBINFELD, ECONOMETRIC MODELS & ECONOMIC FORECASTS (McGraw Hill 3rd ed. 1991), at 310-311.

106. The estimated cross-price elasticities are statistically significant at the one percent level or better. *See Caves (2011)* at 995.

these results, I also showed that the parameter estimates from the demand system imply that roughly two thirds of observed landline attrition in the United States over the sample period is attributable to the observed decline in the relative price of wireless service over that same timeframe. The study concludes as follows:

> Because a wireline incumbent attempting to increase prices above competitive levels will lose customers to wireless competitors at significant rate if and only if the cross-price elasticity is positive and economically significant, these results support the view that regulators should take wireless competition into account when assessing the degree of market power that wireline incumbents would be able to exercise, absent regulatory pricing constraints. Specifically, the empirical results suggest that wireless offerings should be included among the set of intermodal alternatives capable of imposing price discipline on wireline incumbents, and that wireless substitution contributes substantially to the aggregate price-disciplining effect imposed by the full suite of intermodal alternatives to landline telephony. The continued erosion of the landline business since the time period analyzed here, combined with increasing rates of wireless substitution, lend additional credence to this perspective.[107]

2. Mayo et. al. (2014)

55. Professor John Mayo and his co-authors have recently released a working paper utilizing household-level data to empirically estimate discrete choice models of the consumer demand for telecommunications services.[108] The paper provides important corroboration of my own work: Despite utilizing a very different set of data and econometric techniques, Mayo et. al. conclude that their empirical analysis "provides strong evidence that wireless telephony has become a close substitute for wireline telephony over the 2003-2010 period."[109]

56. Professor Mayo and his co-authors were granted access to the individual household-level data that comprise the NHIS, including confidential data not released to the general public. Their database is therefore much more detailed and granular than the aggregated

107. *Id*. at 997.
108. *Mayo et. al. (2014)*.
109. *Id.* at 3.

NHIS statistics on cord-cutting that appear in standard CDC publications. Instead of simply observing the overall proportion of surveyed households that were wireless-only at a given point in time, the authors of the study are able to observe whether or not each individual household surveyed was wireless-only, as well as household-specific characteristics such as age, educational attainment, employment status, and the geographic location of the surveyed household. Using the household's location, the authors were able to link the individual survey responses with location-specific data from a variety of public data sources. The resulting data set measures a large number of variables that may influence the demand for wireless and wireline service, including price, income, local population density and topography, local cell tower coverage, and various demographic variables.[110]

57. Mayo et. al. estimate a simultaneous equation bivariate probit model of the demand for wireless and wireline service. The model captures the fact that a given household may, in theory, subscribe to (1) wireline service only; (2) wireless service only; (3) both wireless and wireline; or (4) neither wireless nor wireline. The model can be summarized as follows:

$$y_{it}^{*} = \alpha_l p_{it}^{l} + \alpha_w p_{it}^{w} + \sum_{k=1}^{K} \lambda^k X_{it}^{k} + \varepsilon_{it} \tag{0.3}$$

$$\tilde{y}_{it}^{*} = \beta_l p_{it}^{l} + \beta_w p_{it}^{w} + \sum_{k=1}^{K} \delta^k X_{it}^{k} + \tilde{\varepsilon}_{it} \tag{0.4}$$

58. As is standard in discrete choice econometric models, y_{it}^{*} is defined as a continuous variable; household i will subscribe to wireline service at time t if y_{it}^{*} exceeds a critical threshold c. Similarly, household i will subscribe to wireless service at time t if $\tilde{y}_{it}^{*}$

110. *Id.* at 9-16.

exceeds another critical threshold, denoted $\tilde{c}$. The variables p_{it}^{l} and p_{it}^{w} denote the price of wireline and wireless service faced by household i at time t, while the X_{it}^{k} denote control variables such as income, demographics, employment status, population density, and cell site deployment.[111]

59. Mayo et. al. use their econometric estimates to compute marginal effects, including the cross-price effects that define wireless-wireline competition. Just as in my own work, they find, all else equal, that an increase in the price of wireline service has a positive and statistically significant effect on the demand for wireless service. Likewise, an increase in the wireless price leads to an increase in the demand for wireline service.[112] In addition, Mayo et. al. are able to decompose household-level responses to an increase in the wireline price into (1) those that drop their wireline service and become wireless-only households; and (2) those that keep their wireline service but also purchase wireless service. During the early portion of their sample (2003 – 2006), the authors estimated that roughly half wireline-only households would respond to an increase in wireline prices by transitioning to wireless-only status. By the later portion of their data sample (2007 – 2010), more than three quarters of wireline-only households were estimated to respond in this manner. Thus, the authors find that the marginal propensity to cut the cord has increased substantially over their sample period.[113]

111. *Id.* at 17-20. Similar to my own work, Mayo et. al. use a two-stage procedure designed to correct for endogeneity in their price variables. *Id.* at 14.

112. *Id.* at 21.

113. *Id.* at 22. The authors estimate alternative models, which confirm the robustness of their key conclusions. *Id.* at 23.

IV. THE *PHOENIX ORDER'S* ANALYTICAL FRAMEWORK IS INCONSISTENT WITH FUNDAMENTAL PRINCIPLES OF ECONOMICS AND ANTITRUST

60. Although the *Phoenix Order* explicitly endorses the standard principles of antitrust analysis practiced by DOJ and other agencies,[114] certain aspects of the *Phoenix Order's* analytical framework are inconsistent with fundamental principles of economics and antitrust. As explained below, the *Phoenix Order's* first major error is to disregard the basic economic principle that competition occurs, and prices are set, at the margin—i.e., by the most price-sensitive customers in the marketplace. This leads the Commission to err in its analysis by (1) drawing invalid inferences based on the behavior of inframarginal customers; and (2) giving undue weight to a non-standard economic theory, which asserts that ILECs would have less pricing power if they did not face any competition from intermodal alternatives such as wireless voice service. (As explained below, this theory is tailored to special circumstances surrounding generic competition in the pharmaceutical industry, and is not relevant to telecommunications markets).

61. These analytical flaws are compounded by the *Phoenix Order's* unjustified (and unstated) assumption that current, regulated wireline prices have been accurately calibrated to competitive levels. The source of this error appears to be a misinterpretation of the DOJ/FTC *Merger Guidelines*, which often (but not always) evaluate the potential for a post-merger exercise of market power based on the ability of the merged firm to implement a small but significant and non-transitory increase in price ("SSNIP")—relative to the *unregulated* pre-merger price level.[115] By equating regulated ILEC wireline prices with the unregulated profit-

114. *Phoenix Order*, ¶1.

115. *Merger Guidelines*, §4.1.1. ("The hypothetical monopolist test requires that a product market contain enough substitute products so that it could be subject to post-merger exercise of market power significantly

maximizing prices of two merging firms, the *Phoenix Order* proceeds under the assumption that any increase in wireline prices above current levels would be anticompetitive. This assumption is fundamentally flawed because economists have long recognized that the regulatory process cannot be expected to replicate competitive pricing outcomes. Furthermore, there is direct empirical evidence that regulation has artificially suppressed telecommunications prices below competitive levels, which implies that the *Phoenix Order's* framework will systematically generate improperly narrow product market definitions and incorrect inferences of market power.

62. Finally, in attempting to determine whether wireless voice service should be included in the relevant product market, the *Phoenix Order* fails to recognize that antitrust product markets are delineated based on the extent of aggregate switching towards all products outside of the candidate market. The *Phoenix Order* instead poses the inapposite question of whether wireless voice service is capable of single-handedly defeating a hypothetical price increase. This ignores the basic principle that, when contemplating a price increase, a hypothetical monopolist over wireline services would need to consider the potential for customers to switch not only to wireless services, but also to other competitive alternatives such as Cable VoIP or CLEC offerings. Formally, this is due to the fact that the own-price elasticity of demand for any service is a share-weighted average of the cross-price elasticities for all competitive alternatives. The greater the aggregate effect of the cross-price elasticities, the greater is the own-price elasticity, and the less pricing power the firm will possess. Therefore, a

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exceeding that existing absent the merger. Specifically, the test requires that a hypothetical profit-maximizing firm, not subject to price regulation, that was the only present and future seller of those products ("hypothetical monopolist") likely would impose at least a small but significant and non-transitory increase in price ("SSNIP") on at least one product in the market, including at least one product sold by one of the merging firms.")

framework that considers switching towards only one competitive alternative at a time will tend to overstate ILEC pricing power.

A. The *Phoenix Order* Disregards the Fact That Prices Are Set At The Margin

63. A fundamental principle of economics is that a profit-maximizing firm sets prices by equating marginal revenue to marginal cost. The demand curve faced by a firm gives the maximum price that can be charged in order to sell a given quantity of output, which, in turn, is determined by the maximum willingness-to-pay of the firm's marginal customers (i.e., those willing to pay exactly that price, but nothing higher). If the firm raises its price above that level, then some marginal customers will drop out of the market, and the firm will sell less output; if the firm lowers the price, it can draw in more marginal customers, and sell a higher quantity. In light of this tradeoff, a profit-maximizing firm adjusts its price until the revenue earned on the marginal customer is just equal to the marginal cost of serving that customer.[116]

64. Accordingly, a firm's optimal pricing strategy depends on the price sensitivity of its marginal customers. The centrality of price sensitivity at the margin is illustrated by the fundamental concept of the elasticity of demand, which summarizes the price-responsiveness of a firm's marginal customers to a change in price.[117] It is also evident from the definition of competitive alternatives, which, as noted above, is defined by the willingness of marginal customers to increase their consumption of one good in response to an increase in the price of the other.

65. Price sensitivity of marginal consumers is an important component of standard antitrust analysis. The standard SSNIP test articulated in the DOJ/FTC *Merger Guidelines* asks

116. *Katz & Rosen* at 209-212.
117. *Id.* at 73-77.

whether "a hypothetical profit-maximizing firm, not subject to price regulation…likely would impose at least a small but significant and non-transitory increase in price."[118] The profitability of such hypothetical price increase (or lack thereof) hinges on the responses of the firm's marginal customers.

66. It bears emphasis that it is extremely unlikely that an ILEC could profitably engage in targeted price discrimination to particular subsets of price-insensitive customers. It is true that regulators have, historically, sometimes required that monopoly telecommunications providers engage in certain forms of price discrimination or cross-subsidization. However, implementing a strategy of profitable price discrimination becomes highly problematic under competitive conditions, particularly in industries such as telecommunications, which are characterized by large fixed costs and low marginal costs. Economists have shown that firms in such industries would need to accurately target price-sensitive customers approximately 95 percent of the time in order for a strategy of price discrimination to be profitable—yet it is unlikely that ILECs would possess sufficiently detailed, customer-specific information to achieve this degree of accuracy,[119] and there appear to be no instances in which ILECs have engaged in targeted price discrimination (unless mandated by regulation to do so). The ability to price discriminate is further constrained by the fact that competing communications providers offer uniform services not tailored to particular demographic niches, including VoIP providers offering flat-rate nationwide plans, wireless providers offering uniform access to nationwide

118. *Merger Guidelines* §4.1.1.

119. *See, e.g.,* Jerry Hausman and J. Gregory Sidak, "Telecommunications Regulation: Current Approaches with the End in Sight," *in Economic Regulation And Its Reform: What Have We Learned?* (Nancy L. Rose editor, National Bureau of Economic Research & University of Chicago Press 2014), at 400-401; *see also* Jerry Hausman, Gregory Leonard, and Christopher Vellturo, "Market Definition Under Price Discrimination," 64(2) *Antitrust Law Journal*, 367-386 (1996).

networks, and converged alternatives offering video, voice, and text-based communications wherever an Internet connection is available. Finally, I understand that Section 202 of the Communications Act explicitly forbids these forms of price discrimination.[120]

1. The *Phoenix Order* Draws Incorrect Inferences Based on the Behavior of Inframarginal Customers

67. Although the *Phoenix Order* recognizes the importance of the SSNIP test,[121] the *Phoenix Order* improperly relies on evidence of the behavior of inframarginal customers[122] in the course of its competitive analysis. In analyzing whether mobile wireless services belong in the same relevant product markets as fixed wireline service, the *Phoenix Order* observes that:

> Although a growing number of mass market customers subscribe exclusively to mobile wireless service, the majority of households continue to subscribe to both a wireline and a mobile wireless telephone service, and the proportion of households subscribing to both services has not substantially changed since the first half of 2006.[123]

The *Phoenix Order* also claims that:

> [S]everal classes of customers appear unlikely to drop wireline service in response to a significant price increase, including those who: (a) value the reliability and safety of wireline service; (b) value a single point of contact for multiple household members; (c) live in a household with poor wireless coverage; (d) operate a business out of their home and believe that wireline service offers better reliability and sound quality; or (e) desire a service that is more economically purchased when bundled with a local service (e.g., wireline broadband Internet service, or a video service).[124]

68. The Commission goes on to conclude that "because the record reflects that the majority of residential customers continue to subscribe to both mobile wireless and wireline services, it appears that most mass market consumers use mobile wireless service to supplement

120. 47 U.S.C. §202; *see also* Hausman and Sidak, *supra*.
121. *Phoenix Order*, ¶56.
122. A firm's inframarginal units are those which do not respond when a firm changes its price by a given amount. *See Katz & Rosen* at 414-416.
123. *Phoenix Order*, ¶55.
124. *Id.* ¶59.

their wireline service rather than as a substitute for their wireline service."[125] As it happens, this statistic declined significantly in subsequent years: As of early 2013, approximately 49.5 percent of households purchased both wireline and wireless service, down from approximately 58.1 percent as of early 2010.[126] But the fundamental problem with the *Phoenix Order's* analysis is that it assumes incorrectly two goods do not compete with for one another merely because some customers purchase them simultaneously. This is false, and is contradicted by elementary economic principles, which define competition in terms of customer willingness to switch from one good to the other in the face of a change in relative prices.[127] For example, the fact that some families may own both a Toyota sedans and a Honda clearly does not imply that consumers view a Toyota as a complement for a Honda. Likewise, the fact that some inframarginal customers purchase both wireless and wireline services does not capture switching at the margin, and is not the relevant statistic for competitive analysis. To illustrate, note that, while the Commission is correct in observing that the proportion of households purchasing both wireline and wireless service remained relatively stable in the years leading up to the *Phoenix Order*, (hovering in the neighborhood of 55 to 60 percent from 2007-2010, before declining to approximately 48 percent in subsequent years),[128] it is also true that, from 2007-2010, the proportion of wireless-only households nearly doubled (from 13.6 percent to

125. *Id*.
126. *Blumberg & Luke (2013)*, Table 1.
127. *Katz & Rosen* at 60.
128. *See* Stephen Blumberg and Julian Luke, *Wireless Substitution: Early Release of Estimates From the National Health Interview Survey*, Division of Health Interview Statistics, National Center for Health Statistics, Centers for Disease Control & Prevention (January - December 2010), at Table 1. *See also Blumberg & Luke (2013b)*, Table 1.

26.6 percent),[129] while the fraction of households purchasing only a landline fell steeply (from 23.8 percent to 12.9 percent).[130]

69. It should be clear that what matters from the point of view of ILEC profitability (or lack thereof) is not the "proportion of households subscribing to both services,"[131] but rather the fact that the demand for landlines has declined. Indeed, the Commission's observation—that a substantial fraction of the ILEC's dwindling customer base also chose to purchase wireless service—appears to be an indication that these customers are *more likely* to engage in cord-cutting, given that they can do so without purchasing new wireless service. This is consistent with the fact that the wireless-only share has increased steadily in the years since the *Phoenix Order*, while the proportion of households purchasing both wireless and wireline has simultaneously declined (as noted above).

2. The *Phoenix Order* Gives Undue Weight To An Inapplicable and Non-Standard Theory That Pricing Power Would Be Enhanced by the Presence of Competitive Alternatives

70. Elementary economic theory shows how the existence of competitive alternatives for a given product tends to make demand for that product more elastic.[132] This is true both of homogenous products and of the more general case of differentiated product markets.[133] All else equal, a dealership can charge more for a Honda sedan when there are no competing Toyota dealerships in the vicinity. In contrast, the *Phoenix Order* gives undue weight to the non-standard theory that "the demand for wireline services may have become less elastic

129. *Id.*
130. *Id.*
131. *Phoenix Order*, ¶55.
132. *Katz & Rosen* at 79.
133. *Id.* at 463-64. *See also Merger Guidelines,* §6.1 ("In differentiated product industries, some products can be very close substitutes and compete strongly with each other, while other products are more distant substitutes and compete less strongly. For example, one high-end product may compete much more directly with another high-end product than with any low-end product.")

over time if the remaining wireline customers view the actual or perceived benefits of retaining the wireline service to have increased over time."[134] According to this theory, ILECs would have *less* pricing power if they did not face *any* competition from intermodal alternatives such as wireless voice service. This non-standard theory is based on special circumstances observed in pharmaceutical markets, and has been invoked to explain why the price of branded pharmaceuticals may increase after generic entry occurs, despite the fact that average prices for the drug tend to fall as a large fraction of customers switch to cheaper generics when they become available. The existence of a sub-group of price-insensitive customers that remain disproportionately loyal to the branded product, even when a generic equivalent is available at a significantly reduced price, causes demand for the branded drug to become less elastic even as it contracts.[135]

71. It bears emphasis that, even under this non-standard theory, generics place significant downward pricing pressure on the average price of pharmaceuticals.[136] Thus, even if this theory were applicable here, it would still predict (1) that wireless competes with wireline; and (2) that cord-cutting places substantial downward pressure on average prices in the voice services market.

72. In any case, the presumption that the market for wireline voice services should somehow deviate from the standard antitrust framework, and instead resemble the decidedly non-standard case of branded pharmaceuticals, is not justified. In the first place, it is obvious that wireless voice service is not the generic equivalent of wireline voice. If it were, then

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134. *Phoenix Order*, ¶58, n. 174.

135. Richard Frank & David Salkever, *Generic Entry and the Pricing of Pharmaceuticals* 6(1) *Journal of Economics & Management Strategy*, 75-90 (1997), at 76-77.

136. *Id.* at 76, 89.

wireless service would perform precisely the same function as wireline service, only at a substantially reduced price. Cord-cutting could then, in theory, leave the ILEC with only a sub-group of customers with disproportionately inelastic demand for "branded" wireline service, as opposed to the "generic" version. Of course, this is not an accurate description of the market for voice services. Far from being a generic equivalent, wireless service is a differentiated product with a qualitatively distinct set of product attributes.

73. More generally, the presumption that the market for voice services somehow differs fundamentally from standard differentiated product markets is unfounded. The *Phoenix Order* refers to a declaration submitted in a prior proceeding suggesting that "certain customers have a powerful demand for wireline service, either because of habit, higher-quality, ease-of-use in a large household, dependability to reach first-responders, or other reasons."[137] But this is simply a restatement of standard conditions that would be expected to apply in any differentiated products market: Customers tend to be heterogeneous in their tastes for product attributes, and therefore tend to cluster around the products offering the bundle of characteristics they find most appealing.[138] This clustering does not upset the standard assumption in antitrust analysis that pricing power in differentiated product markets is diminished, rather than enhanced, by the presence of competitive alternatives: While there may be "Honda loyalists" and "Toyota loyalists," this does not prevent Honda from exerting downward pricing pressure on Toyota (and vice-versa), because prices are constrained by the behavior of marginal customers willing to choose Honda over Toyota (or vice-versa) when relative prices are altered.

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137. *Phoenix Order*, ¶58, n. 174.
138. *Katz & Rosen* at 463-464; *see also Merger Guidelines* §6.1.

74. Finally, the non-standard theory offers a clear prediction about consumer behavior that has been contradicted by recent events. According to the non-standard theory, because the ILEC's residual customer base has a "powerful demand"[139] for wireline service, these remaining customers should have been unwilling to engage in cord-cutting. Indeed, proponents of the non-standard theory predicted in 2009 that it was "very likely that the households that remain attached to the cord are less likely in the future to cut the cord..."[140] If this were true, then cord-cutting should have tapered off in subsequent years. Instead, the proportion of households engaging in cord-cutting has nearly doubled (from approximately 23 percent in 2009 to approximately 41 percent in late 2013).[141] Similarly, as noted above, Professor Mayo and his co-authors found that the marginal propensity to cut the cord increased substantially over their sample period; yet the non-standard theory would have predicted precisely the opposite.[142]

B. The *Phoenix Order* Assumes Without Justification That Current, Regulated Wireline Prices Are At Or Above Competitive Levels

75. In applying the SSNIP test, the *Phoenix Order* asks "whether a hypothetical profit-maximizing firm that was the only present and future seller of wireline local access services could profitably impose a small but significant and nontransitory increase in price."[143] In finding that mobile wireless offerings do not constrain the price of wireline service, the *Phoenix Order* points to evidence that "stand-alone landline access prices have remained

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139. *In the Matter of Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Phoenix, Arizona Metropolitan Statistical Area*, Cavalier Telephone LLC Opposition to Qwest Petition for Forbearance, WC Docket No. 09-135 (September 21, 2009) Declaration of Michael D. Pelcovits [hereafter *Pelcovits Declaration*] at 15.

140. *Id*. at 14

141. *See* Figure III, *supra*.

142. *Mayo et. al. (2014)* at 22.

143. *Phoenix Order* ¶56.

relatively stable and do not appear to have declined substantially below the levels at which they are capped by regulation."[144]

1. Economists Recognize That Regulation Cannot Be Expected To Replicate Competitive Pricing Outcomes

76. The *Phoenix Order* therefore presumes that regulators have accurately calibrated wireline prices at or above competitive levels, such that even a small increase above current, regulated price levels would be anticompetitive. However, economists have long recognized that it, as a practical matter, it is difficult for the regulatory process to duplicate the type of outcomes that market forces would produce under competitive conditions.[145] Accordingly, the assumption underlying the *Phoenix Order's* implementation of the SSNIP test is not justified.

2. Failure To Distinguish Regulated Prices From Competitive Prices Can Lead To Improperly Narrow Market Definitions And Erroneous Inferences Of Market Power

77. Because regulated prices do not generally mimic their competitive counterparts, the *Phoenix Order's* approach to the SSNIP test can be misled by a "reverse cellophane fallacy,"[146] resulting in "improperly narrow market definitions and erroneous inferences of market power."[147] According to the standard cellophane fallacy, applying the SSNIP test to an unconstrained monopolist would lead one to infer incorrectly that the monopolist lacks market

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144. *Id.* ¶58, n. 175 (citing *Competitive Landscape Report* at 66).

145. *See, e.g., Carlton & Perloff* at 682 ("Government regulation of firms may increase welfare in markets that are not perfectly competitive. Unfortunately, actual regulation often deviates considerably from optimal regulation and exacerbates market inefficiencies.")

146. *See* Debra Aron & David Burnstein, *Regulatory Policy and the Reverse Cellophane Fallacy*, 6(4) JOURNAL OF COMPETITION LAW & ECONOMICS 973-994 (2010) [hereafter *Aron & Burnstein (2010)*]; *see also* Luke Froeb & Gregory Werden, *The Reverse Cellophane Fallacy In Market Delineation*, 7 REVIEW OF INDUSTRIAL ORGANIZATION 241-247 (1992).

147. *Aron & Burnstein (2010)* at 973; *see also* Gregory Werden, *Demand Elasticities In Antitrust Analysis*, 66 ANTITRUST LAW JOURNAL 363-414 (1998) [hereafter *Werden (1998)*], at 388 ("The common critique of the Supreme Court's analysis in *Cellophane* is that the Court delineated an overly broad market because it measured the elasticity of demand when market power was already being exercised. While there is merit to this critique, the delineation of overly narrow markets also can result from measuring the elasticity of demand when market power is not already fully exercised.")

power, because an the monopolist will already have increased its price to the point where consumers begin to perceive goods as competitive alternatives, even though they do not belong in the relevant product market.[148]

78. Conversely, by artificially restricting prices below competitive levels, regulation can make competing services appear to be less attractive alternatives, creating the illusion that the regulated firm possesses market power.[149] To illustrate, suppose hypothetically that price of wireline voice service were subject to an unrealistically low price cap of $0.25 per month. Removal of the price cap through deregulation would almost certainly result in a substantial and non-transitory increase in price, the magnitude of which would be well in excess of the standard five percent threshold typically used to delineate relevant antitrust markets in merger reviews by the DOJ and FTC.[150] If the tendency for market forces to push prices above sub-competitive levels is erroneously taken as evidence of ILEC market power, then price regulation can become self-perpetuating.[151]

79. There is empirical evidence that regulation has generated just such an outcome in the telecommunications industry. In an article published in the *Journal of Competition Law & Economics*, the economists Debra Aron and David Burnstein observe that, in competitive markets with economically efficient pricing structures, prices and costs tend to be positively correlated: Competition should push prices higher in areas where costs are higher, and lower where costs are lower. Using a probit regression analysis of telecommunications pricing the

148. *See, e.g., Werden (1998)* at 377 ("The Court's error, commonly termed the "*Cellophane* fallacy," was mistaking competition created by the exercise of market power for competition that can prevent the exercise of market power. As a firm with market power raises price above competitive levels, there is a strong tendency for demand to become more elastic as other products become better substitutes at the margin. A firm fully exercising its substantial market power is necessarily constrained by competition from further raising price.")

149. *Aron & Burnstein (2010)* at 973.

150. *Merger Guidelines*, §4.1.2.

151. *Aron & Burnstein (2010)* at 973.

authors found the opposite: After controlling for other factors, regulated ILEC retail prices were found to be higher in the lower-cost areas, and lower in the higher-cost areas. The authors also found that retail price regulation had discouraged entry by CLEC competitors in the high-cost areas (where the available price-cost margins were least attractive). They concluded that regulation had produced artificially low prices, which had prevented competition from materializing.[152]

C. The *Phoenix Order* Ignores the Fact That the Price of Wireline Service Is Constrained by All Competitive Alternatives Simultaneously

80. In analyzing the relevant product market, the *Phoenix Order* examines the extent to which competition from wireless services constrain the pricing of wireline service by asking "whether there are a sufficient number of wireline service customers who, in response to a price increase in wireline local access service, would stop subscribing to their wireline service and instead rely exclusively on mobile wireless service, so as to render the price increase unprofitable."[153] As explained below, this approach to product market definition is flawed, and contradicts elementary economic principles.

1. Antitrust Product Markets Are Delineated Based On The Extent Of Aggregate Customer Switching to All Products Outside of the Candidate Market

81. As the *Merger Guidelines* make clear, a relevant product market consists of a *group* of competing products; the hypothetical monopolist test involves identifying a set of products that, from customers' point of view, are reasonably interchangeable with the product in question (in this case, wireline voice service). In order to constitute a relevant product, the candidate market must "contain enough substitute products so that it could be subject to post-

152. *Id.* at 992.
153. *Phoenix Order*, ¶56.

merger exercise of market power significantly exceeding that existing absent the merger."[154] Stated differently, a candidate market must include enough competitive alternatives to allow the hypothetical monopolist to engage in a post-merger exercise of market power. Otherwise, the product market will be defined too narrowly.

82. Thus, what matters is not whether some individual competitive alternative (such as wireless voice service) is capable of single-handedly defeating a hypothetical price increase; what matters is whether *aggregate* switching towards *all* competitive alternatives would be sufficient to defeat such a price increase. As I have noted in prior work, ILEC pricing power is determined not by switching towards wireless alone, but by switching between wireline service and all intermodal alternatives simultaneously:

> Regulators attempting to determine whether price caps for Incumbent Local Exchange Carriers (ILECs) should be relaxed must assess the degree of market power that a deregulated local service provider would be able to exercise. This depends on the extent to which consumers view intermodal alternatives—such cable voice, voice over internet protocol (VoIP), and wireless telephony—as economic substitutes for traditional landline service. The greater the degree of substitutability that exists between landline service and the *aggregate suite of intermodal alternatives*, the less likely it is that a price increase above competitive levels would be profitable for the incumbent landline carrier.[155]

2. The Own-Price Elasticity Is a Weighted Average of The Cross-Price Elasticities for All Competitive Alternatives

83. The same point can be illustrated with elementary economics, which shows formally how the own-price elasticity of a given product depends on the cross-price elasticities

154. *Merger Guidelines*, §4.1.1.
155. *Caves (2011)*, at 985 (emphasis added).

between that product and all competitive alternatives. The relationship can be expressed mathematically as follows:[156]

$$\varepsilon_{11} = 1 + \sum_j \left[\frac{\varepsilon_{j1} s_j}{s_1} \right] \tag{0.5}$$

84. Above, ε_{11} is the own-price elasticity for product 1, and ε_{j1} is the cross-elasticity of demand for product *j* in response to a one percent increase in the price of product 1. Finally, s_1 and s_j represent the customer's expenditure shares on products 1 and *j*, respectively. Thus, the own-price elasticity of demand for a product is, in essence, a weighted sum of the cross elasticities of demand for other products with respect to the first product's price. When cross-price effects of competitive alternatives are greater—that is, when the ε_{j1} are larger—the own-price elasticity ε_{11} increase in absolute value, because a greater mass of consumers will tend to switch to competitive alternatives in the face of a price increase.

85. For this reason, the strong cross-price effects observed between wireless and wireline cannot be considered in isolation, as in the *Phoenix Order*. Instead, the price-disciplining effect of wireless offerings should be considered in addition to those of intermodal alternatives (such as cable voice and over-the-top VoIP), as well as competitive offerings from CLECs.

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156. *See, e.g., Werden 1998* at 413-414. The formula in (0.5) holds real income constant. If nominal income is held constant instead, the formula is modified to $\varepsilon_{11} = 1 + \sum_j \left[\frac{\varepsilon_{j1} s_j}{s_1} \right]$.

V. OUTDATED REGULATIONS ARE EXPECTED TO HARM COMPETITION, CONSUMERS, AND ECONOMIC EFFICIENCY IN COMPETITIVE TELECOMMUNICATIONS MARKETS

86. Economists recognize that outdated regulations in competitive industries are not just unnecessary, but also harmful to consumers, competition, and economic efficiency.[157] In this Section, I provide specific examples of regulations whose justification has been undermined by competitive forces in the industry.

A. The Commission's 64 kbps Unbundling Requirement

87. The Commission's 64 kbps requirement requires that ILECs offer unbundled narrowband service, either by maintaining an existing copper loop connected after deploying fiber to the home, or by "provid[ing] unbundled access to a 64 kbps transmission path over its FTTH loop."[158] Economists have recognized for some time that unbundling regulations such as these can harm both consumer welfare and economic efficiency. For example, both economic theory and empirical evidence indicate that unbundling regulations can lead to diminished investment incentives, lower broadband penetration, and slower deployment of fiber-to-the-premises (FTTP) networks.[159]

88. The Commission itself has correctly recognized the principle that increased competition should eliminate any remaining justification for such regulation, noting more than a decade ago that it "expect[ed] intermodal platforms to become increasingly a substitute for

157. *Carlton & Perloff* at 682, 734.

158. *Review of the Section 251 Unbundling Obligations of Incumbent Local Exchange Carriers,* Report and Order and Order on Remand and Further Notice of Proposed Rulemaking, 18 FCC Rcd 16978, ¶ 277 (2003) (hereafter *Triennial Review Order*).

159. *See, e.g.,* Robert Crandall, Jeffrey Eisenach, and Allan Ingraham, "The Long-Run Effects of Copper Unbundling and the Implications for Fiber," 37 *Telecommunications Policy*, 262-281 (2013); *see also* Robert Crandall, Allan Ingraham, and Hal Singer, "Do Unbundling Policies Discourage CLEC Facilities-Based Investment?" *The B.E. Journals in Economic Analysis & Policy* (April 2004).

wireline voice telephony services,"[160] and that the emergence competitive alternatives for traditional wireline telephony "may enable us to find that requesting carriers are no longer impaired in their ability to compete without access to incumbent LEC loops."[161] The evidence reviewed above provides ample justification for such a finding.

89. There is also evidence that technological progress in the industry has substantially diminished the competitive significance of the 64 kbps requirement. For example, among the RBOCs, the number of consumers receiving narrowband voice services from CLECs using analog UNE loops, which are typically used for narrowband voice service, represented only about [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]] of the 135 million access lines in service[162] as of 2013. From 2009-2013, the number of RBOC analog UNE loops declined by approximately [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]]. Over this four-year interval, the number of access lines in service declined by about 14 percent (from 157 million 135 million).[163] Thus, the erosion in analog UNE loops [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]] the overall decline in the landline business. Further, among the RBOCs for which data are available, the number of analog UNE loops in service declined by approximately [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]] from 2003 – 2013, while the number of *new* analog UNE loops brought into service annually (i.e., gross additions) declined by approximately [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]].

160. *Triennial Review Order* ¶¶245-46.
161. *Id*.
162. *2013 Local Competition Report*, Table 1.
163. *Id*.

90. Given the diminishing significance of narrowband voice service, it is unsurprising that one CLEC has stated in the record that a 64 kbps voice-grade channel "is inadequate to meet the bandwidth demanded by both business and residential customers,"[164] and that "[f]ew business customers today want only simple, single-line, voice service, which is all a CLEC can offer using a 64 kbps channel."[165] These trends in the data provide further evidence that eliminating the unbundling requirement would promote competition and economic efficiency, by encouraging investments in and deployments of the network technologies that consumers and businesses actually demand.

B. Regulation of Stand-Alone Long Distance Services

91. Competition from wireless carriers, VoIP operators, and other sources have rendered the distinction between local and long distance calling increasingly obsolete, and long distance rates have fallen precipitously over time.[166] As the Commission itself observed in 2008,

> The increased availability and marketing of discount and promotional long distance plans, as well as the popularity of wireless "bucket-of-minutes" plans, has made basic schedule rates obsolete for many long distance customers, particularly business customers and high volume residential consumers. Today wireline, wireless, and cable companies are offering consumers bundled packages of local and long distance service, and buckets of minutes that can be used to call anyone, anywhere, and anytime.[167]

92. Given the trends noted several years ago by the Commission, it is unsurprising that data from more recent time periods confirm that the vast majority of voice customers do not presubscribe to any stand-alone long distance carrier. Among the RBOCs, approximately

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164. Comments of TelePacific Communications, *In re AT&T Petition to Launch a Proceeding Concerning the TDM-to-IP Transition*, GN Docket No. 12-353 (January 28, 2013), at 12.

165. *Id.*

166. *Caves (2011)*, at 989; *see also* Kevin Caves & Jeffrey Eisenach, "What Happens When Local Phone Service Is Deregulated?," *Regulation* (Fall 2012).

167. Federal Communications Commission, *Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service* (2008), at iv (emphasis added).

[[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]] of customers had a presubscribed long distance carrier as of 2013. Yet among those that did presubscribe, only about [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]] opted for a stand-alone long-distance carrier. Given that ILEC lines accounted for only about 18 percent of voice connections in 2013,[168] the overall share of voice connections that were ILEC lines presubscribed to stand-alone long distance carriers can be estimated at approximately [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]].[169]

93. These developments are unsurprising in light of the fact that the range of competitive alternatives for long-distance communication has expanded still further in the years since the Commission first observed the increasing obsolescence of traditional long distance markets. Long-distance alternatives currently available to consumers include VoIP offerings such as Vonage, which offers unlimited, flat-rate domestic and international calling,[170] wireless voice offerings, which include (sometimes unlimited) flat-rate calling plans with no distinction between local and long distance,[171] and an array of services that transmit various combinations of text, voice, pictures, and video across the globe (often at little to no incremental cost), including e-mail, text messaging, social networks, Skype, FaceTime, Hangouts, iMessage, Snapchat, Viber, WhatsApp, and others.[172]

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168. *See* Part I, *supra*.

169. The corresponding figures for 2012 are [[BEGIN CONFIDENTIAL]] [redacted] [[END CONFIDENTIAL]]. Note that the estimates for both 2012 and 2013 are conservative because, due to data limitations, some RBOC affiliate VoIP lines had to be excluded when calculating the proportion of lines presubscribed to RBOCs. Because RBOC VoIP lines are, by definition, presubscribed to RBOCs, the exclusion of such data will increase the estimated share of RBOC lines presubscribed to stand-alone long-distance providers.

170. *See* http://www.vonage.com/.

171. *See, e.g.* http://www.t-mobile.com/simple-choice-international-plans.html.

172. *See, e.g., Digital Trends*, *supra*.

CONCLUSIONS

94. As economists have recognized for some time, traditional ILEC voice offerings face widespread competition from a range of competitive alternatives. In the years since the *Phoenix Order* was issued, evidence of robust and intensifying intermodal competition has continued to accumulate. Thanks to ongoing competition from both wireless and wireline rivals, traditional ILEC services are now selected by only about one in three households, and account for fewer than one in five voice connections. Even these statistics understate the relevant competitive pressures, because ILECs must also contend with an expanding set of communications technologies that transmit voice, text, pictures, and video over vast distances, often at little to no incremental cost. By any reasonable economic standard, traditional ILEC services are now just one of many communications offerings in a competitive industry with many players.

95. In competitive communications markets, the risk that outmoded regulations will result in harm to consumers, competition, and economic efficiency is particularly acute. Unfortunately, the *Phoenix Order* magnifies this risk by adopting an analytical framework inconsistent with fundamental principles of economics and antitrust. By ignoring the principle that prices are set at the margin, the *Phoenix Order* erroneously infers economic complementary between wireless and wireline service, and compounds the error by relying on outdated econometric studies from now-irrelevant time periods. By improperly conflating current, regulated prices with their competitive counterparts, the *Phoenix Order* increases the likelihood that product markets will be defined too narrowly, and that market power will be inferred erroneously. Finally, the *Phoenix Order* fails to recognize the basic principle that ILEC pricing power is constrained not by one alternative in isolation, but by aggregate switching to all competitive alternatives in response to a hypothetical price increase.

96. The Commission should therefore adopt a framework for assessing competition more consistent with standard principles of economics and antitrust, allowing it to properly incorporate the price-disciplining effects of wireless and other competitive alternatives. This would help to ensure that the Commission reaches conclusions and adopts policies consistent with the competitive realities of the industry, to the benefit of consumers, competition, and economic efficiency.

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October 6, 2014

EXHIBIT A: CURRICULUM VITAE

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Education

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Associate Director, Navigant Economics, February 2010 to March 2011

Vice President, Empiris LLC, September 2008 to February 2010

Senior Economist, Criterion Economics LLC, October 2006 to September 2008

Senior Consultant, Deloitte & Touche LLP, September 2005 to October 2006

Teaching Fellow, Department of Economics, UCLA, January 2002 to June 2004

Assistant Economist, Federal Reserve Bank of New York, August 1998 to June 2000

Publications and Research Papers

Life After Comcast: The Economist's Obligation to Decompose Damages Across Theories of Harm, 28 ANTITRUST (Spring 2014), co-authored with Hal J. Singer.

Mobile Wireless Performance the EU and the US: Implications for Policy, 93 COMMUNICATIONS & STRATEGIES (Q1 2014), co-authored with Erik Bohlin and Jeffrey A. Eisenach.

Econometric Tests for Analyzing Common Impact, co-authored with Hal J. Singer, in THE LAW AND ECONOMICS OF CLASS ACTIONS: 26 RESEARCH IN LAW AND ECONOMICS 135-160 (James Langenfeld, ed., Emerald Publishing 2014).

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White Papers

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Modeling the Welfare Effects of Net Neutrality Regulation: A Comment on Economides and Tåg (prepared with support from Verizon Communications, April 2010).

Retransmission Consent and Economic Welfare: A Reply to Compass-Lexecon (prepared with support from The National Association of Broadcasters, co-authored with Jeffrey A. Eisenach, April 2010).

The Benefits and Costs of Implementing "Return-Free" Tax Filing in the U.S. (prepared with support from The Computer & Communications Industry

Association, co-authored with Jeffrey A. Eisenach & Robert E. Litan, March 2010).

The Benefits and Costs of I-File (prepared with support from The Computer & Communications Industry Association, co-authored with Jeffrey A. Eisenach & Robert E. Litan, April 2008).

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Guardian Pipeline, L.L.C., v. 295.49 acres of land, more or less, in Brown County, Calumet County, Dodge County, Fond du Lac County, Jefferson County and Outagamie County, Wisconsin, et al., Case No. 08-C-28 (E.D. Wis.), Declaration Of Kevin W. Caves, Ph.D. (September 2010).

Speaking Engagements

Competition and Monopsony In Labor Markets: Theory, Evidence, and Antitrust Implications, New York State Bar Association, Antitrust Law Section, New York, NY (April 23, 2014).

Econometric Tests of Common Impact, Covington & Burling LLP, Washington, DC., (May 23, 2013).

Regression Methods: Theory and Applications of Fixed-Effects Models, O'Melveny & Myers LLP, Washington, DC., (July 16, 2012).

Regression Methods: Theory and Applications, Antitrust Practice Group, Cohen Milstein Sellers & Toll PLLC, Washington, DC., (June 4, 2012).

Using Regression in Antitrust Cases, University of Pennsylvania Law School, Philadelphia, PA., (April 12, 2012).

Interview with *IT Business Edge* on Rural Utilities Service Broadband Subsidies (May 17, 2011).

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EXHIBIT B: CAVES (2011)

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Quantifying price-driven wireless substitution in telephony

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ABSTRACT

For the better part of a decade, a non-trivial and steadily increasing share of households in the United States has come to rely exclusively on wireless technology for their voice communications needs. Aggregate data show clearly (1) that the share of wireless-only households has risen steadily in recent years; while (2) the price of wireless service has fallen substantially relative to traditional landline service. The aggregate data are therefore consistent with the hypothesis that wireless/wireline cross-price elasticities are positive and economically significant. However, econometric corroboration of this conjecture has proven elusive in the existing empirical literature, which has relied on datasets compiled at the turn of the millennium, when wireless substitution was very limited. Partly in response to this dearth of econometric evidence, regulators and competition authorities in the US have generally been reluctant to conclude that wireless voice service represents a meaningful economic substitute for traditional wireline telephony. In the absence of reliable econometric estimates, even the sign of the relevant cross-price elasticities is an open question: The majority of US households maintain both a landline and at least one wireless connection, so it is unclear, ex ante, whether the two services are substitutes or complements. Thus, it is critical to identify consumer behavior at the margin. Using state-level panel data from a relatively recent time period (2001–2007), this study develops and estimates a demand system that permits evaluation of the own-price, cross-price, and income elasticities of demand for wireless and wireline telephony in the United States. A one percent decrease in the price of wireless service is estimated to decrease the demand for fixed-line service by approximately 1.2–1.3%, and the parameter estimates imply that the Slutsky symmetry holds for the demand system. These results substantially exceed prior econometric estimates from the existing empirical literature, and provide evidence that wireless voice service has evolved into a strong economic substitute for traditional landline service. The parameter estimates from the demand system suggest that roughly two thirds of observed landline attrition in the United States over the sample period is attributable to the observed decline in the relative price of wireless service.

1. Introduction

For the better part of a decade, a non-trivial and steadily increasing share of consumers in the United States has eschewed wireline telephony in the home, relying instead on wireless voice communications technology. The most recently available estimates indicate that approximately one in four US households was wireless-only as of early 2010.[1] Nevertheless, regulators and competition authorities in the United States have generally been reluctant to conclude that

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[1] Blumberg and Luke (2010) identify a household as wireless-only if (1) there is no functioning landline inside the household; and (2) at least one family member living in the household possesses a functioning wireless telephone.

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wireless voice service represents a meaningful economic substitute for traditional telephony. Instead, regulators have generally focused on facilities-based providers of cable voice services as the only demonstrably viable competitors faced by incumbent wireline voice carriers.

When performing competition analysis in telecommunications, key empirical issues include the sign and magnitude of cross-price elasticities between intermodal alternatives. Regulators attempting to determine whether price caps for Incumbent Local Exchange Carriers (ILECs) should be relaxed must assess the degree of market power that a deregulated local service provider would be able to exercise. This depends on the extent to which consumers view intermodal alternatives – such cable voice, voice over internet protocol (VoIP), and wireless telephony – as economic substitutes for traditional landline service. The greater the degree of substitutability that exists between landline service and the aggregate suite of intermodal alternatives, the less likely it is that a price increase above competitive levels would be profitable for the incumbent landline carrier. In this context, the sign of the cross-price effect between wireless and wireline is a first-order concern, because a wireline incumbent attempting to increase prices above competitive levels will lose customers to wireless competitors if and only if the cross-price elasticity is positive. If the cross-price elasticity is zero or negative, wireless services are not properly included in the set of products that constrain the price of wireline. The magnitude of the cross-price effect is also highly relevant, because wireless substitution will contribute little to intermodal price discipline if the cross-price elasticity is positive yet economically insignificant (Brennan, 2008).

In the absence of reliable cross-price elasticity estimates, even the sign of these parameters is an open question: The majority of US households continue to maintain both a landline connection and at least one wireless telephone, and it is unclear, ex ante, whether the two services are substitutes or complements. Thus, it is critical to identify consumer behavior at the margin. Absent reliable econometric estimates, one can make rough conjectures about these parameters by observing trends in the aggregate data—which, as it happens, tend to support the hypothesis that wireless/wireline cross-price effects are both positive and economically significant. But despite these high-level trends, econometric evidence corroborating this hypothesis has proven elusive in empirical work, which has typically relied on rather dated datasets compiled at the turn of the millennium, when wireless substitution was still quite rare: A recent survey of the literature summarized the state of existing empirical work by stressing the paucity of "quantitative analyses of the latest and arguably most dramatic developments [in the industry]" (Vogelsang, 2010, p. 14).

Partly in response to this dearth of empirical evidence, US competition authorities such as the U.S. Department of Justice (DOJ) and the Federal Communications Commission (FCC) have generally been skeptical of the proposition that mobile telephony should be included in the suite of intermodal alternatives that potentially constrain the price of wireline telephony. The DOJ has summarized this view, stating that "[c]ompetition for residential consumers occurs primarily between the ILECs and cable companies", and that "the available evidence does not establish that mobile services currently represent an effective competitive constraint on landline access pricing" (DOJ, 2008, p. 88). The FCC largely concurred with this assessment in a recent proceeding in Arizona, citing a lack of "evidence that would support a conclusion that mobile wireless service constrains the price of wireline service" (FCC, 2010a, p. 32). At the same time, in light of the rapidly growing share of wireless-only households, regulators and academics alike have acknowledged the possibility that the true magnitude of cross-price effects might not be reflected in the empirical literature to date.

In this study, a state-level panel dataset from a relatively recent timeframe (2001–2007) is employed to develop and estimate a demand system that permits evaluation of the own-price, cross-price, and income elasticities of demand for wireless and wireline telephony in the United States. The results provide evidence that wireline and wireless voice service are strong economic substitutes, and indicate that changes in relative prices drive economically significant intermodal substitution. Specifically, it is estimated that a one percent decrease in the price of wireless service leads to a decline in the demand for traditional wireline service of approximately 1.2–1.3%. These results substantially exceed prior econometric estimates from the existing empirical literature, and suggest that roughly two thirds of observed landline attrition in the United States over the sample period is attributable to observed declines in the relative price of wireless service.

2. Trends in aggregate US data

The share of US households relying exclusively on wireless telephony has risen steadily in recent years, and now represents a substantial fraction of the voice communications market. The Centers for Disease Control and Prevention (CDC), through the National Health Interview Survey, have collected detailed data on wireless substitution since the year 2003 (Blumberg & Luke, 2006), and the FCC has reported similar data in earlier time periods. (FCC, 2008a). The CDC survey results reflect biannual interviews of tens of thousands of households drawn from the civilian, non-institutionalized population.[2] As seen in Fig. 1, the share of US households that use wireless voice service in lieu of a landline connection has risen from 1.1% to 26.6% from 2001 to 2010, respectively.[3]

[2] Note that the CDC implemented changes to its questionnaire in 2007. In prior years, respondents were asked whether "the family's phone number" was a cellular telephone number. If so, the respondent was then asked whether there was at least one functioning telephone in the home that was not a cell phone. Starting in 2007, instead of a being asked two-part question, respondents were simply asked whether there was "at least one phone inside your home that is currently working and is not a cell phone" (Blumberg & Luke, 2009a).

[3] Although nationwide statistics on the share of wireless-only households provide useful high-level evidence of wireless substitution, note that these data are not well-suited to econometric analysis, and are not employed to estimate the econometric model developed here. See Section 4.1.

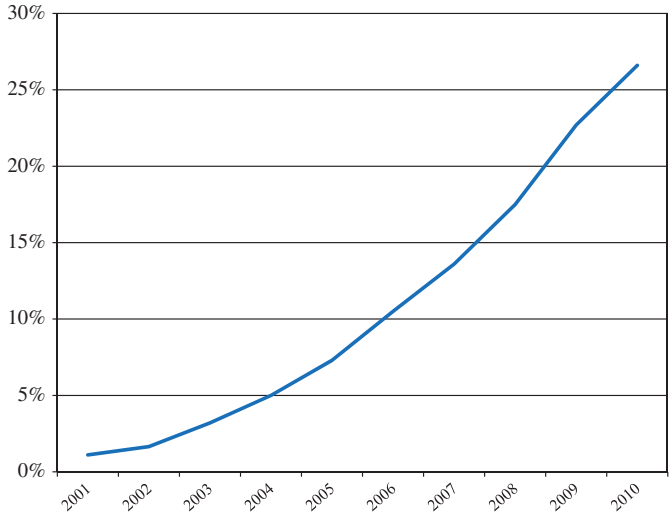

Fig. 1. Wireless-only share of US households, 2001–2010.
Source: Data for 2001–2002 from FCC (2008a). Data for 2003 forward from Blumberg and Luke (2006, 2007a, 2007b, 2008a, 2008b, 2009a, 2009b, 2010).

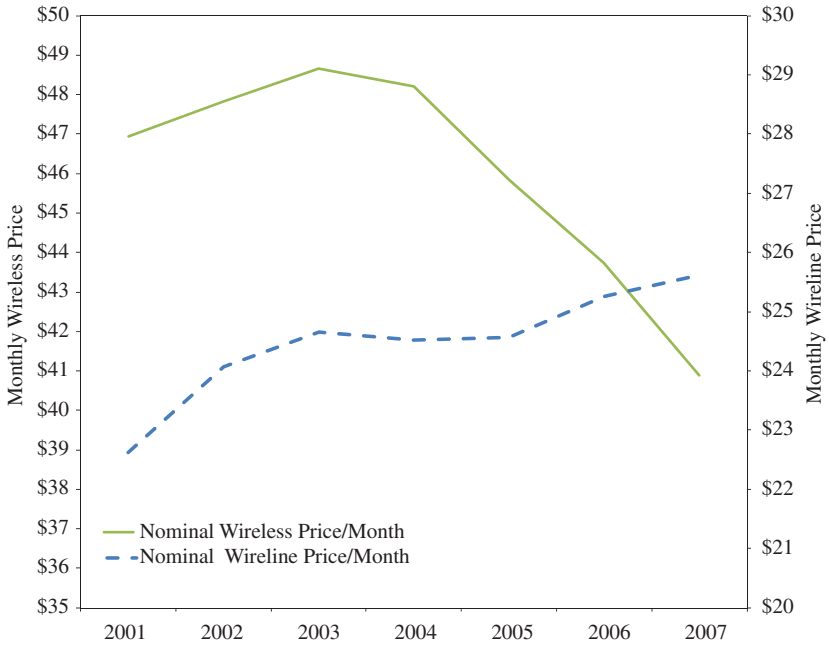

Fig. 2. US wireless and wireline prices, 2001–2007.
Sources: Wireless prices based on average monthly local wireless bills for voice service (excluding data revenues), derived from a survey of wireless carriers, reported in FCC (2010c). Wireline prices also based on average monthly local rates, derived from a separate survey of wireline carriers, reported in FCC (2008b).

In earlier years, wireless substitution was sometimes viewed as a niche phenomenon restricted to certain narrow demographic groups (Rodini, Ward, & Woroch, 2003). In light of the fact that approximately one in four US households is now wireless-only, this characterization has become increasingly obsolete. Indeed, the data show that cord-cutting has become widespread across a range of demographic categories (Blumberg & Luke, 2010). There is also evidence that wireless substitution varies substantially across geographic regions in the United States, although the available data on state-level variation are more limited.[4]

Given the rise in wireless telephony and other intermodal voice technologies, it is perhaps unsurprising that ILECs have been losing landlines at non-trivial rates for some time. According to the FCC, incumbent fixed lines decreased by more

[4] Although most of the CDC's wireless substitution surveys report only national aggregates, the CDC has also released a cross-section of state-level wireless-only estimates. However, the CDC's state-level estimates should be interpreted with caution, as they rely on a methodology that exploits state-level demographics to predict rates of wireless substitution, and are characterized by relatively loose statistical precision. For example, the widest plausible interval for the Oklahoma point estimate ranges from 12.9% to 38.8% (Blumberg et al., 2009).

than 40% over the past decade (FCC, 2010b). Industry analysts estimate that wireless substitution has been the most important factor behind the erosion of the market for traditional fixed line service, with current trends projected to continue unabated in future years (Olgeirson & Rondeli, 2011).

During this timeframe, the price of wireless voice telephony has declined significantly, while average wireline telephony prices have increased. Fig. 2 displays the nominal price of wireless and wireline services over time, based on trends in average monthly prices for local voice service. From 2001–2007, the price of wireless service dropped by approximately 12.9%. Meanwhile, although the price of wireline service remained significantly below the price of wireless, it is also the case that average wireline rates increased by approximately 13.3% during this timeframe. Adjusting for inflation, real wireless prices declined by about 25.6%, while real landline prices declined much more modestly (by about 3.3%). Thus, the data show clearly that wireless prices in the U.S. have declined significantly relative to the price of fixed line service over the sample period.

In summary, trends in the aggregate US data appear to support the hypothesis of significant economic substitutability between wireless and wireline telephony: As the relative price of wireless voice service has fallen, the share of wireless-only households has surged, while demand for traditional fixed-line service has declined steeply. Thus, the aggregate data provide prima facie evidence of positive and economically significant cross-price effects. Yet such evidence is of limited value on its own, due to the inability to control for non-price factors that may influence the relative demand for wireless versus wireline – such as improvements/expansions in cellular network coverage, etc. – as well as the inability to conduct formal statistical analysis and hypothesis tests.

3. Existing empirical literature

The existing empirical literature on substitution between wireline and wireless telephony generally makes use of datasets compiled at the turn of the millennium, when wireless substitution was very limited.[5] Vogelsang (2010, p. 14) provides a thorough survey of the literature, stressing the paucity of "quantitative analyses of the latest and arguably most dramatic developments [in the industry]." Therefore, it is perhaps unsurprising that the body of empirical work to date provides scant econometric evidence of strong wireless/wireline intermodal substitution (although empirical work has generally found wireless and wireline to be substitutes, rather than complements). Nevertheless, researchers have recognized the possibility that substitutability might become more evident in more recent time periods.

Broadly speaking, the existing empirical literature can be divided into studies focusing on usage substitution and research focused on access substitution. Perhaps not surprisingly, empirical estimates of the wireline/wireless cross-price elasticity are generally positive when substitution is defined in terms of usage, while the evidence is more mixed when substitution is defined in terms of access. Although both strands of the literature are reviewed here, it bears emphasis that regulators are likely to view access substitution as more economically relevant than usage substitution, since regulated Local Exchange Carriers generally provide local wireline service on a flat-fee basis (DOJ, 2008).

3.1. Empirical evidence: usage substitution

Using survey data for over 7000 British consumers spanning 1999–2001, Horváth and Maldoom (2002) employ an endogenous switching model to estimate the effect of mobile subscribership on fixed-line usage. After controlling for potentially confounding self-selection effects, the authors estimate that mobile telephone usage significantly depresses fixed-line usage, a finding consistent with the hypothesis that wireless usage is a substitute for wireline usage. The study does not yield direct estimates of cross-price elasticities, since the analysis relies on quantity comparisons, and does not examine price responsiveness directly. The evidence of substitution is strongest in the later years of the sample. However, the results must be interpreted with some care, as the data are self-reported, and only ranges of consumption (as opposed to precise quantities) are reported in the surveys.

Yoon and Song (2003) analyze a monthly traffic and revenue dataset from South Korea for the years 1997–2002 to study substitution between fixed and mobile usage. The authors estimate a demand system for calls originating in both mobile and fixed networks, focusing on the demand for (1) fixed-to-fixed calls (FF); (2) fixed-to-mobile calls (FM); and (3) calls originating in mobile networks. The empirical estimates provide evidence of fixed-mobile usage substitutability, with the cross-elasticity of demand for FF calls with respect to mobile prices estimated at approximately 0.6. The corresponding cross-elasticity for FM calls is not statistically significant, although it is unclear precisely what this would imply for usage substitution, since FM calls, by definition, reflect usage of both wireline and wireless services.

Briglauer, Schwarz, and Zulehner (2009) analyze a monthly Austrian dataset for the time period from 2002–2007 to estimate the demand response of fixed-line domestic calling to changes in the price of mobile service. The authors use an instrumental variables approach to account for the endogeneity of output and prices; the instruments include fixed and mobile termination charges, as well as variables related to scale and scope economies, such as the quantity of fixed network access lines and the number of broadband and voice over broadband subscribers. The econometric estimates suggest a long-run cross-price elasticity of 0.50, although the short-run elasticity estimates are smaller and sometimes statistically insignificant.

[5] See Fig. 1. Note also that the literature on mobile telephony diffusion provides evidence that wireless substitution is less likely to be observed early in the technology life cycle, when mobile penetration is low (Grajec & Kretschmer, 2009).

Ward and Woroch (2004) employ an Almost Ideal Demand System framework to model the share of minutes accounted for by wireless and wireline usage. Using US household-level survey data spanning 1999–2001, the authors find evidence of modest cross-price elasticities of landline usage with respect to the mobile price per minute, between 0.22 and 0.33. Ward and Woroch (2004, p. 12) conclude that, although mobile service appears to be a moderate substitute for wireline usage, "[i]t would be premature…to infer from these estimates that mobile service currently constrains local telephone service market power to any economically significant degree".

Although fewer studies have estimated the elasticity of wireless usage with respect to the price of wireline, the available evidence points to smaller (but still positive) values. Ingraham and Sidak (2004) employ US household survey data from 1999 to 2001 to model the demand for wireless minutes as a function of the price per minute of wireless service, the price per minute of wireline long distance, and a series of demographic controls. Although wireless substitution is not the primary focus of their study, the authors' econometric model indicates that wireless minutes are a weak substitute for wireline minutes. Specifically, a one percent increase in the price of wireline long distance is estimated to increase the demand for wireless minutes by approximately 0.02%. Using the same bill-harvesting dataset, Rodini (2009) estimates a structural model of mobile telephony demand, derived from a quadratic utility function. The econometric estimates again imply small but statistically significant elasticities of wireless minutes with respect to wireline prices.

3.2. Empirical evidence: access substitution

Empirical studies of the wireless/wireline cross-price elasticity have produced more ambiguous evidence when substitution is defined in terms of access, rather than usage, with some studies finding complementarity rather than substitutability. In one relatively early study, Ahn and Lee (1999) analyze a cross-section of 64 countries in order to study the determinants of the demand for mobile subscriptions. The probability of subscribing to mobile telecommunications is found to be positively and significantly correlated with the number of fixed lines per capita, a finding consistent with complementarity. However, because the authors do not include the price of fixed lines in their estimating equations, they do not obtain a direct estimate of the cross-price elasticity.

Garbacz and Thompson (2005) estimate fixed and mobile demand equations using panel data for developed and developing countries for the time period from 1996 to 2001. Many of their cross-price elasticity estimates are negative, leading the authors to conclude that their results are "generally suggestive of…complementary relationships" (Garbacz & Thompson, 2005, p. 495). The authors also note that sign of the relationship appears to change towards the end of their sample, particularly for developing countries, suggesting a possible transition away from complementarity. In a subsequent study, using a panel of developing country data spanning 1996–2003, Garbacz and Thompson (2007) present evidence of asymmetries in the sign of the cross-price elasticity. Specifically, their results suggest that, although the cross-price elasticity of wireless demand with respect to the price of wireline is positive, the cross-price elasticity of wireline demand with respect to wireless prices is negative. Both effects are relatively modest in magnitude: Estimates of the cross-price elasticity of wireline demand with respect to the monthly price of wireless fall in the range of -0.1, while the cross-price elasticity of wireless demand with respect to the monthly price of wireline is estimated to fall in the range of 0.05.

Narayana (2010) estimates a binary logit model of mobile and fixed-line demand using 2003 survey data from India. The survey variables allow the author to control for various non-price demographic factors. However, a lack of variation in mobile price data across survey respondents complicates the interpretation of the cross-price effects, which are not separately identified from own-price effects. Instead, in the econometric specifications, fixed and mobile prices are combined into a single composite variable. Specifically, the mobile demand equation in Narayana (2010) allows the probability of subscribing to mobile service to vary with a composite price variable equal to the difference between the mobile price and the fixed-line price. Similarly, the probability of subscribing to fixed-line service is estimated as a function of the ratio of the fixed-line price to the mobile price. Nevertheless, the econometric estimates are consistent with substitutability, and suggest that the probability of subscribing to mobile (fixed-line) telephony increases significantly with the fixed-line price (mobile price).

Rodini et al. (2003) employ US bill-harvesting household survey data from 2000 to 2001 to investigate access substitution. The authors model the determinants of consumers' decisions to subscribe to second landlines and mobile service using logit regressions. The cross-price elasticity of mobile access with respect to the wireline price is positive and statistically significant, ranging from 0.13 to 0.18.[6] However, the authors are unable to detect a statistically significant relationship between mobile prices and the demand for second landlines (although point estimates suggest moderate cross-price elasticities, ranging from 0.22 to 0.26). Moreover, because wireless-only households comprise only a very small share of their sample, the data do not allow the researchers to directly identify the determinants of consumer decisions to abandon first *and* second landlines, making it impractical to directly estimate the elasticity of total fixed-line demand with respect to the price of wireless. Instead, the authors invoke Slutsky symmetry to infer the value of this parameter. The cross-price elasticities implied by this calculation are small, ranging from 0.06 to 0.08. The authors conclude that wireless offerings represent a "moderate substitute" for landline telephony, but that "[e]volving usage patterns suggest that mobile and fixed service will become greater substitutes over time" (Rodini et al., 2003, p. 475).

[6] Rodini (2009) obtains a similar estimate (0.22) using a similar dataset for the years 1999–2001.

Using the same US bill-harvesting data from a similar time period (1999–2001), Ward and Woroch (2010) estimate consumer demand for communications services by taking advantage of a natural experiment created by Lifeline Assistance telephony subsidies, which injects additional variation into the effective wireline prices faced by low-income consumers that qualify for the subsidy. For households receiving the Lifeline subsidy, they estimate a cross-price elasticity of mobile demand with respect to the price of fixed-line service ranging from 0.253 to 0.310. Because Lifeline does not subsidize mobile service during the sample period, the data do not give rise to a parallel natural experiment that would allow for a direct estimate the elasticity of fixed-line demand with respect to the price of wireless. However, assuming that the Slutsky symmetry holds, the authors estimate that this elasticity ranges from 0.126 to 0.155, based on the fact that Lifeline subsidy recipients' expenditures on mobile services are estimated to be about half as large as their expenditures on fixed-line voice service.

4. Econometric model

4.1. Methodology and data

To obtain a more current empirical assessment of the economic substitutability between wireless and wireline telephony, this study develops and estimates a demand system that permits evaluation of the own-price, cross-price, and income elasticities of demand for wireless and wireline telephony in the United States, using state-level panel data from a relatively recent time period (2001–2007). Demand is defined in terms of access (rather than usage), given that regulators generally view access substitution as more economically relevant than usage substitution (DOJ, 2008). Note that the econometric model developed here does not rely on estimates of wireless-only households. Although such statistics provide useful high-level evidence of wireless substitution, these estimates are typically nationwide aggregates, leaving insufficient cross-sectional variation for econometric analysis.[7] Moreover, the key parameter of interest – the cross-price elasticity between wireless and wireline service – is not actually defined in terms of wireless-only households, since households may have multiple landlines (Rodini et al., 2003), and subscription decisions may also take place at the level of the individual. Therefore, consistent with the definition of the cross-price elasticity, the econometric model developed below relies on state-level panel data to measure the responsiveness of the demand for wireless (wireline) subscriptions to changes in the price of wireline (wireless) telephony.

A standard, aggregated linear approach is used to estimate the demand system, rather than aggregated discrete choice methods, which have become quite prevalent in demand estimation (Berry, Levinsohn, & Pakes, 1995). A key advantage of discrete choice models is their ability to account for unobserved consumer heterogeneity, even when only aggregate data are available; another advantage they convey is the fact that the number of parameters to be estimated does not grow with the number of equations in the demand system, making it statistically feasible to incorporate a large number of products into the system, and to estimate a potentially large matrix of cross-price elasticities. Unfortunately, most discrete choice frameworks also impose strong ex ante assumptions regarding substitutability between products in the demand system, rather than allowing the data to identify whether products are substitutes or complements.[8] For present purposes, this is a clear disadvantage: The majority of households maintain both a landline and at least one wireless telephone, and the two services could, in theory, be either substitutes or complements. (As noted in Section 3, this ambiguity is borne out in the existing empirical literature, which has found evidence of both substitutability and complementarity). Therefore, it is clearly preferable to allow the data to identify the sign of the cross-price elasticity. This can be accomplished by applying a standard, aggregated linear demand framework, which allows the cross-price elasticity to vary freely. Moreover, because here the focus is on the demand for just two products (wireless and fixed-line voice service), the number of parameters to be estimated within this framework is quite manageable.

The basic demand relationship for wireless telephony is given in Eq. (1.1) below

$$Q_{st}^{w} = f(P_{st}^{w}, P_{st}^{l}, I_{st}, X_{st}; \Theta) \tag{1.1}$$

Here, Q_{st}^{w} gives the demand for wireless voice service, measured by the quantity of wireless subscribers in state s in year t, as reported by the FCC (FCC, 2008d). Similarly, P_{st}^{w} gives the price of wireless service, also reported by the FCC.[9] Consistent with the increased prevalence of national calling plans and the increasingly obsolete distinction between local and long distance calling, the FCC's wireless price data do not vary by state. However, there is considerable cross-state variation in

[7] Note also that the state-level estimates produced by the CDC are characterized by relatively loose statistical precision. See Section 2.

[8] For example, Berry et al. (1995) and Hendel (1999) both impose ex ante substitutability among all products in the demand system, and therefore do not allow for complementarity. Augereau, Greenstein, and Rysman (2006) restrict all goods to be independent in demand, and therefore do not allow for substitutability or complementarity. The exception is Gentzkow (2007), who develops a discrete choice framework specifically designed to identify whether the products in the demand system are substitutes or complements. Unfortunately, the data requirements of this approach fall well outside the scope of what is available here: Applied in the current context, the Gentzkow (2007) framework would require that the data set contain, among other things, information on the number of consumers purchasing both wireless and wireline service. In contrast, in the data set employed here, only the aggregate quantity of wireless connections and the aggregate quantity of wirelines (and not the overlap between the two) are observed. Furthermore, implementation of the full Gentzkow (2007) model requires micro-level data on consumer behavior, which is also unavailable here.

[9] The wireless price data reflect average local monthly wireless bills for voice service, derived from a survey of wireless carriers (FCC, 2010c). Data revenues, toll revenues, and roaming revenues are excluded. In this way, comparability is maintained between the wireless and wireline price series, which is also based on local calling rates. As noted above, the wireless price series is adjusted to reflect variation in state taxes on wireless service.

Table 1
Summary statistics for panel regression data.

Variable	Obs.	Mean	Std. Dev.	Min	Max
Wireless Quantity	264	4,266,512	4,413,591	291,429	30,203,858
Wireline Quantity	266	2,098,037	1,941,611	159,357	10,987,835
Real Wireless Price	266	49.64	5.38	37.47	57.90
Real Wireline Price	266	27.20	4.62	17.93	40.68
Real Median Income	266	48,656	7958	34,579	68,080
Population Density	266	221	274	6	1167
Cell Tower Density	266	0.35	0.19	0.06	0.81
Commute Time	266	23.65	3.13	16.28	31.50
White Pop	266	4,873,499	3,493,352	809,511	16,075,421
Black Pop	266	910,150	861,633	3013	2,900,822
Asian Pop	266	290,510	675,748	4839	4,377,304
Hispanic Pop	266	1,046,334	2,311,232	10,469	13,144,423
Other Pop	266	139,858	164,354	17,113	1,056,918

Note: Wireless subscriber data redacted for one state (Montana) in 2001 and 2004.

the tax rates on wireless service in the United States. Therefore, P^w_{st} is adjusted to reflect this variation using a panel of state-specific wireless tax data. (Council On State Taxation, 2002, 2005; Mackey, 2004, 2008, 2011). The variable P^l_{st} denotes the price of landline telephony service in state s in year t, as reported by the FCC. The landline price variable, like P^w_{st}, is inclusive of taxes.[10] The variable I_{st} denotes real median income by state and year. All price and income data are deflated by the Consumer Price Index (CPI).

Lastly, X_{st} is a vector of demand shifters, including demographic controls such as state population densities and populations by race/ethnicity across states and over time. Another control variable in X_{st} is the average commute time, which may affect demand for mobile communications. Finally, over the sample period, wireless coverage throughout the US improved significantly, as mobile carriers built out and upgraded their network infrastructures (FCC, 2010c). To capture this effect, X_{st} includes a cellular tower density variable, defined as the number of FCC-registered cellular antennae per 1000 inhabitants in a given state in a given year (FCC, 2008c). Finally, the variable Θ in Eq. (1.1) denotes the vector of parameters to be estimated. Table 1 displays summary statistics for each of the variables employed in the panel data analysis.

4.2. Single-equation model

In the most basic model, the demand for wireless is expressed as a function of wireless prices, wireline prices, and income, as shown in Eq. (1.2). Below, lower-case letters denote natural logs, and ε_{st} is a random error term, driven by unobserved demand shocks and/or measurement error in the dependent variable:

$$q^w_{st} = \alpha_0 + \alpha_1 p^w_{st} + \alpha_2 p^l_{st} + \alpha_3 i_{st} + \varepsilon_{st} \tag{1.2}$$

Note that the (Marshallian) own-price elasticity of demand for wireless service is given by α_1, while the (Marshallian) cross-price elasticity of demand for wireless service with respect to the price of wireline is given by α_2. The income elasticity of demand is given by α_3:

$$\alpha_1 = \frac{\partial Q^w}{\partial P^w}\frac{P^w}{Q^w} = \frac{\partial q^w}{\partial p^w} \equiv \eta^M_w \tag{1.3}$$

$$\alpha_2 = \frac{\partial Q^w}{\partial P^l}\frac{P^l}{Q^w} = \frac{\partial q^w}{\partial p^l} \equiv \eta^M_{wl} \tag{1.4}$$

$$\alpha_3 = \frac{\partial Q^w}{\partial I}\frac{I}{Q^w} = \frac{\partial q^w}{\partial i} \equiv \eta_{wi} \tag{1.5}$$

In the next specification, shown in Eq. (1.6), the vector of demand shifter, X_{st}, is added to the OLS regression:

$$q^w_{st} = \alpha_0 + \alpha_1 p^w_{st} + \alpha_2 p^l_{st} + \alpha_3 i_{st} + \sum_{k=1}^{N} \lambda^k X^k_{st} + \varepsilon_{st} \tag{1.6}$$

[10] Like the wireless price data, the wireline price data reflect the average monthly rates for local service, derived from a separate survey of wireline carriers (FCC, 2008b). Wireline prices include subscriber line charges, touch-tone service, surcharges, 911 charges, and taxes (including state-specific taxes).

Next, in Eq. (1.7), state-level fixed effects are added, with $D_s^j = 1$ if $j=s$, and $D_s^j = 0$ otherwise. Thus, the model controls for all state-specific factors that are invariant over time. (To avoid singularity, one state is omitted.)

$$q_{st}^w = \alpha_0 + \alpha_1 p_t^w + \alpha_2 p_{st}^l + \alpha_3 i_{st} + \sum_{k=1}^{K} \lambda^k X_{st}^k + \sum_{j=1}^{J} \theta^j D_s^j + \varepsilon_{st} \tag{1.7}$$

Note that both p_{st}^w and p_{st}^l are potentially correlated with unobserved demand shocks in ε_{st}. With respect to wireless prices, over the sample period there have been significant advances in the quality and versatility of wireless technology along several dimensions (handset size, battery life, sound quality, etc.). As a consequence, there have likely been positive unobserved shocks to wireless demand. These shifts in demand are potentially correlated with wireless prices, which are unregulated in the US.

Although landline prices in the US remain partly constrained by regulation, which may help to mitigate endogeneity problems (Christensen & Greene, 1976), it is also the case that several states have begun to deregulate wireline prices, or at least to allow for additional upward pricing flexibility. Moreover, regulation typically does not prevent wireline incumbents from *lowering* prices (either in real or nominal terms) in response to *negative* demand shocks. Given the advent and expansion of cable telephony, VoIP, and, of course, mobile telephony, it is likely that unobserved negative shocks to wireline demand have occurred during the sample period. These shocks are likely correlated with unobserved shifts in wireless demand, implying that p_{st}^l is likely to be correlated with ε_{st}.[11]

To ensure that the estimated own- and cross-price elasticities reflect the responsiveness of demand to prices alone, holding non-price factors constant, it is important to address this potential for simultaneity bias. Therefore, the model in Eq. (1.7) is also estimated via two-stage least squares (2SLS), treating both p_{st}^w and p_{st}^l as endogenous. Instruments and identification are discussed in Section 5.

4.3. Full model: wireless/wireline demand system

By definition, cross-price elasticities are governed by multiple demand equations. Although it is not necessary to model every equation in the demand system in order to obtain consistent parameter estimates, it is nonetheless desirable to include multiple equations in the econometric model in order to estimate the key parameters of interest more efficiently. Therefore, an equation is added to model the demand for fixed lines.[12] The resulting system is expressed below in Eqs. (1.8) and (1.9)

$$q_{st}^w = \alpha_0 + \alpha_1 p_t^w + \alpha_2 p_{st}^l + \alpha_3 i_{st} + \sum_{k=1}^{K} \lambda^k X_{st}^k + \sum_{j=1}^{J} \theta^j D_s^j + \varepsilon_{st} \tag{1.8}$$

$$q_{st}^l = \beta_0 + \beta_1 p_{st}^l + \beta_2 p_{st}^w + \beta_3 i_{st} + \sum_{k=1}^{K} \gamma^k X_{st}^k + \sum_{j=1}^{J} \phi^j D_s^j + \mu_{st} \tag{1.9}$$

Here, q_{st}^l is the natural log of the quantity of wirelines in state s in year t (FCC, 2007), and μ_{st} is a random error term representing shocks to wireline demand and/or measurement error in the dependent variable. State fixed effects are included in each equation, as indicated by the D_s^j terms. As discussed above, both p_{st}^w and p_{st}^l are potentially endogenous to Eq. (1.8).[13] Moreover, if the demand curves for wireless and wireline are interrelated, then ε_{st} is likely to be correlated with μ_{st}. (For example, an unobserved improvement in the quality of wireless service is likely to affect demand for both services.) This implies that p_{st}^w and p_{st}^l are also potentially endogenous to Eq. (1.9). Therefore, the model is estimated via iterated three-stage least squares (I-3SLS), treating both wireless and wireline prices as endogenous to the demand system. Instruments and identification are discussed in Section 5.

As before, the (Marshallian) own-price elasticity for wireless, the (Marshallian) cross-price elasticity between wireless and wireline, and the income elasticity of wireless service are given by α_1, α_2, and α_3. The corresponding (Marshallian) own- and cross-price elasticities for wireline service, along with the wireline income elasticity, are defined symmetrically:

$$\beta_1 = \frac{\partial Q^l}{\partial P^l}\frac{P^l}{Q^l} = \frac{\partial q^l}{\partial p^l} \equiv \eta_l^M \tag{1.10}$$

[11] If wireless and wireline are substitutes, unobserved positive shocks to wireless demand will generally be correlated with unobserved negative shocks to wireline demand. For example, an improvement in the sound quality of wireless calls would be expected to increase the demand for wireless service, while decreasing fixed-line demand.

[12] All else equal, it would of course be informative to estimate a complete demand system for voice telephony, including equations for wireline telephony, wireless telephony, cable voice telephony, and VoIP. Due to constraints on data availability, this approach is infeasible here. (Indeed, it appears that no study in the existing empirical literature has estimated a complete demand system, presumably due to similar data constraints). Note, however, that it is not necessary to estimate a complete demand system to obtain consistent parameter estimates. In particular, the own-and cross-price elasticities for wireless and wireline service are estimated consistently as long as the instruments for wireless and wireline prices are uncorrelated with unobserved demand shocks. Note also that the key parameters of interest – the cross-price elasticities between wireless and wireline – appear only in the wireless and wireline equations.

[13] Note that Eq. (1.8) is equivalent to Eq. (1.7).

$$\beta_2 = \frac{\partial Q^l}{\partial P^w}\frac{P^w}{Q^l} = \frac{\partial q^l}{\partial p^w} \equiv \eta_{lw}^M \tag{1.11}$$

$$\beta_3 = \frac{\partial Q^l}{\partial I}\frac{I}{Q^l} = \frac{\partial q^l}{\partial i} \equiv \eta_{li} \tag{1.12}$$

In addition, the Slutsky symmetry implies certain cross-equation restrictions on the demand system. Below, s_w and s_l denote expenditure shares for wireless and wireline service, while η_{wl}^H and η_{lw}^H represent the Hicksian cross-price elasticities:

$$\frac{s_w}{s_l}\eta_{wl}^H = \eta_{lw}^H \tag{1.13}$$

Therefore, the percentage response of wireline demand to the price of wireless exceeds the responsiveness of wireless demand to the price of wireline, to the extent that expenditures on wireless exceed expenditures on wireline telephony. The Hicksian cross-price elasticities are, in turn, related to the Marshallian cross-price elasticities η_{wl}^M and η_{lw}^M, along with the income elasticities η_{wi} and η_{li}, as follows:

$$\eta_{wl}^H = \eta_{wl}^M + s_l\eta_{wi} \tag{1.14}$$

$$\eta_{lw}^H = \eta_{lw}^M + s_w\eta_{li} \tag{1.15}$$

Finally, note also that the Hicksian own-price elasticities, η_w^H and η_l^H, are related to the Marshallian own-price elasticities and the corresponding income elasticities as follows:

$$\eta_w^H = \eta_w^M + s_w\eta_{wi} \tag{1.16}$$

$$\eta_l^H = \eta_l^M + s_l\eta_{li} \tag{1.17}$$

5. Empirical results and interpretation

5.1. Econometric estimates: single-equation model

The results of the single-equation estimates of the wireless demand function are reported in Table 2. Column (1) reports the estimates corresponding to specification (1.2). Given the demand specification, the coefficients on prices and incomes are properly interpreted as elasticities. These initial results indicate that the wireless own-price elasticity is inelastic, while the estimated income elasticity implies that the demand for wireless service expands with household income. The results of the first specification also indicate that $\hat{\eta}_{wl}^M < 0$. Specifically, a one percent increase in the price of wireline service is associated with a 1.3% decrease in the demand for wireless, implying complementarity, rather than substitutability, between the two services.

Column (2) reports the estimates corresponding to specification (1.6), which adds demographic controls to the initial specification. The results of this regression indicate that the own-price elasticity of wireless demand is greater than one in absolute value. Cellular tower density and commute times are both positively and significantly associated with wireless demand; in addition, many of the demographic variables are statistically significant. However, the results in column (2) no longer yield a statistically significant cross-price elasticity between wireless and wireline. Moreover, when state-level fixed effects are added to the OLS regression, in column (3) (which estimates specification (1.7)), the cross-price elasticity is even smaller in absolute value, and again insignificantly different from zero. In addition, the absolute value of the own-price elasticity decreases substantially, and becomes inelastic.

As discussed above, both wireless and wireline prices are potentially endogenous to the demand equation. If this is the case, then the parameter estimates reported for the OLS regressions in columns (1)–(3) of Table 2 are biased and inconsistent. To address this potential for simultaneity bias, the model is estimated via two-stage least squares in column (4), treating both p_{st}^w and p_{st}^l as endogenous. The instruments include state-specific taxes on wireless and wireline service, which provide exogenous price variation across states and over time. In addition, because the wireless industry has undergone significant technical change, an index of wireless telecommunications productivity is included to capture shifts in the industry cost curve over time (BLS, 2001, 2002, 2003, 2004, 2005, 2006, 2007, 2008). Standard *F*-tests applied to the first-stage regressions reject the null hypothesis of weak instruments at high levels of significance, as do tests based on the minimum eigenvalue of the *F*-statistic's matrix analog (Stock & Yogo, 2005).

The 2SLS estimates yield economically plausible results. The demand for wireless service is found to be significantly elastic, with the own-price elasticity estimated at approximately -1.76. Most relevant for present purposes, the cross-price elasticity estimate is positive and statistically significant, implying that wireline and wireless service are substitutes in demand. Specifically, a one percent increase in the price of wireline service is associated with an expansion of wireless demand of approximately 0.69 percent.

Table 2
Panel regression results, single-equation model.

Explanatory variable	Dependent variable: Natural log of wireless subscribers			
	Panel of US States, 2001–2007			
	(1) OLS	(2) OLS	(3) OLS	(4) 2SLS
ln(*Price of Wireless*)	−0.916	−1.611	−0.303	−1.756
	(−2.06)	(−21.06)	(−3.00)	(−6.55)
***ln*(*Price of Wireline*)**	−1.315	−0.062	0.010	**0.687**
	(−4.36)	(−1.19)	(0.11)	**(3.25)**
ln(*Median Household Income*)	1.749	0.009	0.182	−1.182
	(5.49)	(0.08)	(0.76)	(−3.17)
Population Density		0.0001	−0.007	0.002
		(1.34)	(−3.39)	(0.6)
Cellular Tower Density		0.484	0.016	0.760
		(4.59)	(0.06)	(2.11)
Commute Time		0.020	0.031	−0.001
		(3.59)	(1.94)	(−0.06)
ln(*White Pop*)		0.592	−2.965	−1.126
		(17.32)	(−7.13)	(−1.84)
ln(*Black Pop*)		0.0916	0.5727	0.4655
		(7.66)	(4.95)	(3.11)
ln(*Asian Pop*)		0.073	1.840	0.761
		(2.4)	(8.04)	(2.24)
ln(*Hispanic Pop*)		0.145	0.294	0.068
		(9.79)	(1.91)	(0.34)
ln(*Other Pop*)		0.088	0.940	−0.069
		(3.53)	(3.65)	(−0.19)
Constant Term	3.908	6.750	19.438	33.715
	(0.96)	(4.32)	(3.19)	(4.08)
State Fixed Effects	No	No	Yes	Yes
Observations	264	264	264	264
R-Squared	0.2095	0.9821	0.9963	0.9925

Note: *t* and *z* statistics in parentheses.

A comparison of columns (3) and (4) of Table 2 suggests the importance of controlling for price endogeneity in estimation. In particular, note that the estimated cross-price elasticity increases substantially when prices are treated as endogenous, which is consistent with the notion that wireline prices are negatively correlated with unobserved shocks to wireless demand: If unobserved factors have increased the attractiveness of wireless offerings relative to landline offerings, and if this has forced wireline prices lower than they would have been otherwise, then failure to control for the endogeneity of p^l_{st} would lead to downward bias in the estimated cross-price elasticity. Similarly, note that the absolute value of the estimated own-price elasticity increases substantially when the model is estimated via 2SLS. This is consistent with the notion that wireless prices are positively correlated with unobserved shocks to wireless demand: If unobserved factors have increased the demand for wireless offerings, and if this has caused wireless prices to be higher than they would have been otherwise, then failure to control for the endogeneity of p^w_{st} would lead to downward bias in the (absolute value of) the estimated own-price elasticity of demand for wireless service.

5.2. Econometric estimates: wireless/wireline demand system

Table 3 presents the econometric estimates for the full wireless/wireline demand system specified in Eqs. (1.8) and (1.9). The system is estimated using iterated three-stage least squares. As before, both p^w_{st} and p^l_{st} are treated as endogenous, using the same tax and productivity instruments noted above. (Since the first stage of 2SLS is identical to the first stage of I-3SLS, the null hypothesis of weak instruments continues to be rejected).

As before, the estimated coefficients for the price and income variables are properly interpreted as elasticities. The I-3SLS regressions yield economically plausible parameter estimates. Each of the own-price elasticities is statistically significant at the 1% level or better, and each has an economically intuitive interpretation. The demand for wireless services is significantly elastic ($|\hat{\eta}^M_w| > 1$), while wireline demand, although not completely insensitive to price, is significantly inelastic ($|\hat{\eta}^M_l| < 1$). Interestingly, the coefficient on median income is negative and statistically significant in the wireless demand equation: An increase in income is associated with a decrease in the demand for wireless. In contrast, the coefficient on median income is positive and significant in the wireline demand equation. Stated differently, wireless telephony is found to be an inferior good ($\hat{\eta}_{wi} < 0$), whereas wireline telephony is found to be a normal good ($\hat{\eta}_{li} > 0$). These results are consistent with the CDC's finding that households near the poverty line are consistently more likely to be wireless-only (Blumberg & Luke, 2010).

Table 3
Iterated three-stage least squares results, full demand system.

Panel of US States, 2001–2007		
Explanatory variable	**Dependent variable: Natural log of wireless quantity**	
	(1) I-3SLS (Unrestricted)	**(2) I-3SLS (Restricted)**
First Demand Equation (Wireless)		
ln(*Price of Wireless*)	−1.756	−1.630
	(−6.55)	(−7.02)
***ln*(*Price of Wireline*)**	**0.687**	**0.475**
	(3.25)	**(5.00)**
ln(*Median Household Income*)	−1.182	−1.099
	(−3.17)	(−3.16)
Population Density	0.002	0.002
	(0.6)	(0.67)
Cellular Tower Density	0.760	0.748
	(2.11)	(2.18)
Commute Time	−0.001	−0.001
	(−0.06)	(−0.04)
ln(*White Pop*)	−1.126	−1.344
	(−1.84)	(−2.43)
ln(*Black Pop*)	0.465	0.496
	(3.11)	(3.55)
ln(*Asian Pop*)	0.761	0.858
	(2.24)	(2.74)
ln(*Hispanic Pop*)	0.068	0.072
	(0.34)	(0.38)
ln(*Other Pop*)	−0.069	−0.062
	(−0.19)	(−0.18)
Constant Term	33.715	34.873
	(4.08)	(4.48)
State Fixed Effects	Yes	Yes
Observations	264	264
R-Squared	0.9925	0.9932
	Dependent variable: Natural log of wireline quantity	
Second Demand Equation (Wireline)		
ln(*Price of Wireline*)	−0.575	−0.544
	(−2.71)	(−2.55)
***ln*(*Price of Wireless*)**	**1.249**	**1.324**
	(4.65)	**(5.00)**
ln(*Median Household Income*)	0.761	0.849
	(2.03)	(2.28)
Population Density	−0.001	−0.002
	(−0.44)	(−0.73)
Cellular Tower Density	−0.163	−0.224
	(−0.45)	(−0.62)
Commute Time	−0.013	−0.011
	(−0.63)	(−0.5)
ln(*White Pop*)	1.518	1.449
	(2.47)	(2.34)
ln(*Black Pop*)	−0.206	−0.210
	(−1.37)	(−1.38)
ln(*Asian Pop*)	−0.509	−0.454
	(−1.49)	(−1.33)
ln(*Hispanic Pop*)	0.084	0.102
	(0.42)	(0.5)
ln(*Other Pop*)	0.194	0.281
	(0.52)	(0.76)
Constant Term	−14.546	−16.336
	(−1.76)	(−1.98)
State Fixed Effects	Yes	Yes
Observations	264	264
R-Squared	0.9923	0.9921

Notes: *z* statistics in parentheses. Standard errors calculated according to the standard I-3SLS formula: $[\widehat{Z}'(\widehat{\Sigma}^{-1} \otimes I)\widehat{Z}]^{-1}$, where $\widehat{Z}$ denotes the predicted values of the independent variables, and $\widehat{\Sigma}$ denotes the estimated variance-covariance matrix for the error term vector from the two equations.

Table 4
Marshallian and Hicksian elasticity estimates.
Source: Author's calculations based on demand system parameter estimates.

	Unrestricted	Restricted
Marshallian		
$\widehat{\eta}_w^M$	−1.756	−1.630
$\widehat{\eta}_l^M$	−0.575	−0.544
$\widehat{\eta}_{wl}^M$	0.687	0.475
$\widehat{\eta}_{lw}^M$	1.249	1.324
Hicksian		
$\widehat{\eta}_w^H$	−1.777	−1.650
$\widehat{\eta}_l^H$	−0.570	−0.539
$\widehat{\eta}_{wl}^H$	0.679	0.468
$\widehat{\eta}_{lw}^H$	1.263	1.339

Wireless demand is also positively and significantly related to cellular tower density, indicating that demand for mobile telephony has expanded as wireless carriers have upgraded and expanded their networks. Although the commute duration variable is not statistically significant, this result is not particularly surprising, given that commute times exhibit mostly cross-sectional variation, and relatively little time series variation, while the econometric model controls for any state-specific effects that are fixed over time. The demographic variables, while sometimes individually insignificant, are collectively highly significant.

The most relevant result for present purposes is that the cross-price elasticity estimates in Table 3 are all positive and statistically significant at the 1% level or better. Specifically, a one percent increase in the price of wireline service is estimated to increase the demand for wireless service by approximately 0.48–0.69%, while the cross-price elasticity of wireline demand with respect to the wireless price is estimated to fall between 1.25% and 1.32%.

Table 3 displays both restricted and unrestricted estimates of the demand system: Rather than imposing the Slutsky symmetry from the outset, the model is first estimated without any cross-equation restrictions. Next, expenditures on wireless and wireline services, along with the household income data, are used to construct budget shares and to statistically test the Slutsky restrictions given by Eqs. (1.13)–(1.15). The test results indicate that the null hypothesis that the restrictions are valid cannot be rejected. Therefore, in the second column of Table 3, the Slutsky restrictions are imposed ex ante. The estimates of the unrestricted system are quite similar to those of the restricted system, reflecting the fact that the theoretical constraints on the demand system appear to be borne out in the actual relationships observed in the data.

Although the price elasticity estimates reported in Table 3 are Marshallian own- and cross-price elasticities, the corresponding Hicksian elasticities are quite similar in magnitude, given that expenditures on each technology represent a relatively small share of household income. Table 4 summarizes the Marshallian and Hicksian own- and cross-price elasticity estimates, with and without the imposition of the Slutsky symmetry restrictions on the demand system. The Marshallian own- and cross-price elasticity estimates reported in Table 4 are simply equal to the corresponding coefficient estimates reported in Table 3. The Hicksian own- and cross-price elasticities are computed according to Eqs. (1.14)–(1.17). The estimated Hicksian elasticities are quite close to the corresponding Marshallian elasticities. For instance, the Hicksian cross-price elasticity of wireless demand with respect to the wireline price, $\hat{\eta}_{wl}^H$, ranges from 0.468 to 0.679, while $\hat{\eta}_{wl}^M$ ranges from 0.475 to 0.687.

5.3. Relationship to prior empirical work

The cross-price elasticity estimates obtained here substantially exceed prior estimates from the existing literature, which has found only weak evidence of substitutability, particularly when substitution is defined in terms of access (as it is here). As noted above, the existing empirical literature has relied almost exclusively on older datasets compiled at the turn of the millennium, and has sometimes found evidence of complementarity, rather than substitutability. Those studies that have found positive cross-price elasticities have typically produced small and/or statistically insignificant estimates. In contrast, the results obtained here, using data from a relatively recent time period, provide evidence that wireless voice service has evolved into a strong economic substitute for landline service.

The most comparable estimates in the prior literature are those obtained by Ward and Woroch (2010). Using household survey data from the years 1999–2001, they estimate $\widehat{\eta}_{wl}^M$ in the range of 0.253–0.310. These cross-price elasticity estimates are somewhat close to the low end of the estimates of $\widehat{\eta}_{wl}^M$ reported in Table 4 (which range from 0.475 to 0.687). However, while the estimates in Table 4 imply that $\widehat{\eta}_{lw}^M > \widehat{\eta}_{wl}^M$, Ward and Woroch (2010) reach the opposite conclusion. As a consequence, their estimates of $\widehat{\eta}_{lw}^M$ (ranging from 0.126 to 0.155), are substantially smaller than the estimates of

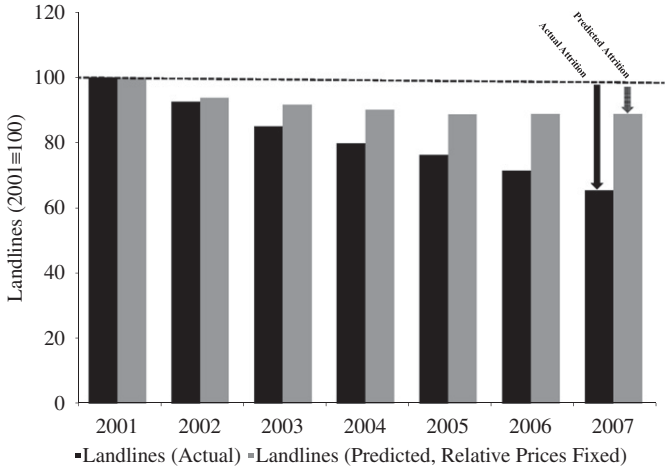

Fig. 3. Actual and predicted landline attrition, 2001–2007.
Source: Author's calculations based on demand system data and parameters.

$\widehat{\eta}^{M}_{lw}$obtained here (ranging from 1.249 to 1.324). Recall that Ward and Woroch (2010) obtained $\widehat{\eta}^{M}_{lw}$ only indirectly, by imposing the Slutsky symmetry; thus, their result is driven by the fact that the households in their data set had higher expenditures on wireline than on wireless service. In contrast, the present approach allows the data to identify $\widehat{\eta}^{M}_{lw}$ directly. The fact that the statistical tests accept the null hypothesis of the Slutsky symmetry reflects the tendency for expenditures on wireless voice services to significantly exceed wireline expenditures during the sample period.

In addition to being consistent with theoretical priors, the fact that the data support the Slutsky symmetry is informative in other, more practical ways. For instance, the parameter of greatest interest to policymakers is almost certainly the elasticity of wireline demand with respect to the price of wireless, or η^{M}_{lw}, as opposed to η^{M}_{wl}, since the former effect is likely to be viewed as providing the most direct evidence that ILEC pricing is constrained by wireless offerings. Yet regulators control only the wireline price, which is defined in terms of η^{M}_{wl}, and not directly in terms of η^{M}_{lw}. It is therefore informative to provide empirical support for the theoretical proposition that an increase (decrease) in wireline prices, which the regulator controls, is equivalent to a decrease (increase) in wireless prices, which the regulator does not control. Stated differently, a finding of the Slutsky symmetry in the demand system indicates that regulators can influence wireless substitution directly, despite the fact that they directly control only one component of the price ratio.

Finally, the cross-price elasticity estimates in Table 4 also suggest that the degree of substitutability between wireless and wireline voice service is comparable to or greater than the cross-price effects between intermodal alternatives in other network industries, such as video programming: By way of comparison, the cross-price elasticity between the demand for cable television and the price of direct broadcast satellite (DBS) service and has been estimated in the range of 0.3–0.5. (Goolsbee & Petrin, 2004). In other words, the evidence suggests that consumers view wireless telephony to be at least as interchangeable with wireline telephony as cable television service is with DBS service.

5.4. Quantifying price-driven wireless substitution

As noted previously, the price of wireless voice service has fallen significantly relative to the price of fixed-line service over the sample period, and during this same interval, there has been very substantial landline attrition. A natural question that arises is the extent to which the former can explain the latter. Given the parameter estimates from the demand system, it is possible to assess this question empirically. In particular, it is possible to estimate the equilibrium landline quantity that would have been observed at the end of the sample period if the relative price of wireless had not decreased. Because wireless and wireline telephony are substitutes, the demand system will tend to predict a higher equilibrium quantity of landlines at the end of the sample period when relative prices are constrained in this way. This in turn yields an estimate of the share of observed landline attrition attributable to the observed decline in the relative price of wireless over the sample period.

Specifically, the parameter estimates from the demand system are used to estimate the equilibrium quantity of landlines under the counterfactual scenario in which both the real wireless price and the real wireline price are held fixed at their initial observed values for the duration of the sample period. This counterfactual is illustrated in Fig. 3, which shows that the model predicts a much more gradual decline in the equilibrium quantity of landlines when relative prices are held constant. In particular, the parameter estimates imply that landline losses over the sample period would have been only about one third as large if relative prices had remained unaltered. Thus, approximately two thirds of observed landline attrition can be attributed to the observed decline in the relative price of wireless service over the sample period.

Although the wireless/wireline price ratio remains fixed under the counterfactual, all other demand shifters in the model are permitted to evolve over time according to their observed values in the dataset, which implies that the difference between the real world and the counterfactual world in Fig. 3 is driven by the estimated cross-price elasticity. By definition, the cross-price elasticity measures the extent to which landline attrition is driven by decreases in the relative price of wireless, holding constant other factors, such as improvements in the quality/versatility of wireless technology, or general (non-price) diffusion effects. To the extent that these factors are not captured by the control variables already included in the model (such as cellular tower density), they would appear in the error terms of the demand equations. Therefore, the counterfactual contemplated in Fig. 3 isolates the effect of relative prices on wireline attrition as long as the instruments used to obtain the I-3SLS cross-price elasticity estimates are uncorrelated with unobserved demand shifters. This should be the case here, since the instruments (wireless taxes, wireline taxes, and wireless industry productivity), are exogenous to the demand system.

6. Conclusion

For the better part of a decade, a non-trivial and steadily increasing share of US households has chosen to rely exclusively on wireless technology for their voice communications needs, while demand for traditional wireline telephony has declined steeply. At the same time, the price of wireless service has fallen significantly relative to the price of fixed-line service, suggesting that the cross-price elasticity between wireless and wireline voice services is positive and economically significant. However, econometric corroboration of this conjecture has proven elusive in the existing empirical literature, which has found only weak evidence of substitutability. To date, the empirical literature on wireless substitution has relied almost exclusively on rather dated datasets, compiled when wireless substitution was quite limited. In particular, the bill-harvesting household survey datasets upon which so much prior empirical work has relied in the US are now a decade old, and therefore capture time periods when only a very small fraction of households were wireless-only, and the relative price of wireless service was significantly higher. Partly in response to the dearth of econometric evidence in the literature, regulators and competition authorities in the United States have generally been reluctant to conclude that wireless voice service represents a meaningful economic substitute for traditional telephony.

To obtain a more current empirical assessment of the economic substitutability between wireless and wireline telephony, this study develops and estimates a demand system whose parameters include the own-price, cross-price, and income elasticities of demand for wireless and wireline telephony in the United States, using state-level panel data from a relatively recent time period (2001–2007). The econometric estimates yield positive and economically significant cross-price elasticities: A one percent decrease in the price of wireless service is estimated to decrease the demand for fixed-line service by approximately 1.2–1.3%, and the parameter estimates imply that the Slutsky symmetry holds for the demand system. These results substantially exceed prior cross-price elasticity estimates from the existing empirical literature, and suggest that roughly two thirds of observed landline attrition in the United States over the sample period is attributable to observed declines in the relative price of wireless service. Therefore, the econometric results provide evidence that wireless telephony has evolved into a strong substitute for traditional landline service—even at existing fixed-line price levels, whose levels were largely regulated during the sample period.

Because a wireline incumbent attempting to increase prices above competitive levels will lose customers to wireless competitors at a non-trivial rate if and only if the cross-price elasticity is positive and economically significant, these results support the view that regulators should take wireless competition into account when assessing the degree of market power that wireline incumbents would be able to exercise, absent regulatory pricing constraints. Specifically, the empirical results suggest that wireless offerings should be included among the set of intermodal alternatives capable of imposing price discipline on wireline incumbents, and that wireless substitution contributes substantially to the aggregate price-disciplining effect imposed by the full suite of intermodal alternatives to landline telephony. The continued erosion of the landline business since the time period analyzed here, combined with increasing rates of wireless substitution, lend additional credence to this perspective.

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Appendix C

REDACTED – FOR PUBLIC INSPECTION

Before the
Federal Communications Commission
Washington, D.C. 20554

In the Matter of	
	)
Petition of USTelecom for Forbearance	)
Pursuant to 47 U.S.C. § 160(c) from Obsolete	)
ILEC Regulatory Obligations that Inhibit	)
Deployment of Next-Generation Networks	)

Expert Declaration of John Mayo, PhD

October 6, 2014

I. INTRODUCTION

Qualifications

1. I am a Professor of Economics, Business and Public Policy in the McDonough School of Business at Georgetown University. I am also the Executive Director of the Georgetown Center for Business and Public Policy. I previously have served as Dean of the McDonough School at Georgetown University and have served as a Visiting Scholar at both the University of California, Berkeley and Stanford University. Since 2000, I am also a Zaeslin Fellow in Law and Economics at the University of Basel in Switzerland. My business address is Georgetown University, McDonough School of Business, 37th and O Streets, N.W., Washington, D.C., 20057.

2. I hold a Ph.D. in economics from Washington University in St. Louis (1982), with a principal field of concentration in industrial organization, which includes the analysis of antitrust and regulation. I also hold both an M.A. (Washington University in St. Louis, 1979) and a B.A. (Hendrix College, Conway, Arkansas, 1977) in economics. I have taught both undergraduate and graduate economics, business and public policy courses at Georgetown University, Washington University, the University of Tennessee and Virginia Tech.

3. I have actively studied the telecommunications industry for thirty years and have authored numerous peer-reviewed articles, research monographs, and a number of specialized articles related to the industry. These have appeared in academic journals such as the *RAND Journal of Economics, Journal of Law and Economics, Journal of Industrial Economics, International Journal of Industrial Organization, Review of Network Economics, Review of Industrial Organization, Journal of Regulatory Economics* and *Yale Journal on Regulation.* I

have also written a comprehensive text entitled *Government and Business: The Economics of Antitrust and Regulation*. In addition, I have served as President of the Transportation and Public Utilities Group and am currently serving in editorial capacities for the *Journal of Regulatory Economics*, *Economic Inquiry* and the *Review of Industrial Organization*.

4. Additionally, I have been an economic advisor for, and consultant to, both public agencies and private companies, including the Antitrust Division of the United States Department of Justice, the Federal Trade Commission, AT&T, Sprint, UPS and AmerenUE. A more detailed accounting of my education, publications and employment history is contained in Exhibit 1.

Assignment

5. I have been asked by US Telecom to provide a description of my ongoing research on the transition that the telecommunication industry is currently undergoing, and in particular the substantial shift by consumers to wireless telephony from wireline telephony. This shift is part a larger industry dynamic that now enables consumers who once faced a single monopoly provider of telephony to use a variety of alternatives including not only wireless telephony but also cable telephony, over-the-top VoIP, and offerings from Competitive Local Exchange Carriers ("CLECs"). While the economic impact of these alternatives is certainly relevant for the appropriate design of regulatory policy, I will focus here solely on the wireline-to-wireless shift.

Summary of Conclusions

6. The past ten years have witnessed a complete dismantling of one-hundred years of loyalty by Americans to wireline voice telephone service. I am aware that in its past

consideration of the role of wireless service the Federal Communications Commission (hereafter, Commission) was reticent to conclude that residential consumers' subscriptions to wireless service are a competitive alternative for traditional wireline access.[1] This reticence appeared to stem from several observations. First, the Commission noted that while the number of wireless-only households had grown from 2006-2009, the proportion of households continuing to subscribe to both wireline and wireless services "has not substantially changed since the first half of 2006."[2] The facts have now changed. As shown in Figure 1 below the percentage of households subscribing to both wireline and wireless service has fallen sharply since the Commission made this observation. From 2009 to 2014, the percentage of households subscribing to both services fell from 59 to 47 percent. It is altogether clear from the data that this trend is driven by the corollary decisions by households to simply subscribe to wireless telephony. In particular, over the 2009-2014 period, the share of wireless-only household grew from 24 percent to over 42 percent. Moreover, as discussed below, these trends are robust across virtually all demographic groups that may be worthy of special public policy attention.

7. Second, the Commission noted that econometric evidence was absent on the economic relationship between wireless and wireline services. In particular, the Commission noted an absence of econometric evidence supporting the proposition that consumer shifts from wireline to wireless services were sufficiently strong that wireline service providers would be constrained in raising the price of wireline service were they to have pricing flexibility.[3] Again, this situation has changed. Both clear descriptive statistics and modern econometric

[1] *In the Matter of Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Phoenix, Arizona Metropolitan Statistical Area, Memorandum Opinion And Order*, WC Docket No. 09-135 (June 22, 2010).
[2] *Ibid*, para.55. The Commission also refers to a report by the Department of Justice which notes that at the time of its 2007 inquiry "less than 20 percent of consumers have 'cut the cord'."
[3] *Ibid*, para. 58.

evidence exists today which point clearly to the competitive role of wireless service. Beyond my own research, other econometric studies, too, provide support for this intuitive proposition.[4]

8. Third, while acknowledging the growing number of wireless-only customers in the United States, the Commission suggested that the choices to rely exclusively on wireless services may be "driven more by differences in consumers' age, household structure, and underlying preferences than by relative price differentials."[5] While the Commission correctly notes differences in the degree of wireline-wireless substitutability across different demographic categories, it is now clear that the sensitivity of consumers to price differentials exists after accounting for these demographic effects. The shift to wireless cannot at this point simply be dismissed as a phenomenon embraced only by the young and tech-savvy.

9. In sum, in its prior assessment the Commission was cautious. While eschewing an "affirmative finding" in 2010 that wireless and wireline services "do not currently, or may not soon, belong in the same product market as residential wireline voice services," its own language recognized the potential for the emerging pattern of consumer behavior to move that passiveness to a more "affirmative finding." The rapid evolution of consumer behavior now warrants the affirmative finding that wireless services presents a substantive, viable and economically constraining influence on the behavior of wireline telephone providers.

II. BACKGROUND

[4] See, e.g., the Declaration of Kevin W. Caves in this proceeding.

[5] *In the Matter of Petition of Qwest Corporation for Forbearance Pursuant to 47 U.S.C. § 160(c) in the Phoenix, Arizona Metropolitan Statistical Area, Memorandum Opinion And Order*, WC Docket No. 09-135 (June 22, 2010), p. 33.

10. Wireline telephony has been regulated by state and federal authorities since the early 20th century. The reasons for this public oversight were manifold, ranging from the public's goal to ensure universal service to the desire to assure reasonable prices. Over the years, the combination of private sector investments in the telephone network and public oversight have produced a modern telecommunications network that is in many respects the envy of the world.

11. While both the public oversight and industry itself evolved slowly during the bulk of the 20th century,[6] the combination of emerging technology and a national embrace of competition for the industry has now radically unsettled the industry. On the technological front, the single technological platform for wireline voice communications has in relatively short order given way to a plethora of largely Internet-enabled technological options for wireline – or wireless – voice, video and data communications. The consequence is that consumers can, and do, routinely avail themselves of the option to communicate in ways that would have been unthinkable only a few short years ago. A loved one may telephonically send a photograph from the top of a mountain on her cellphone to her spouse. A son walking on the streets of a city may forward an informative video to his father. A businessperson may communicate with colleagues who are travelling in a car to provide an update to the day's schedule. These, and countless other examples provide incontrovertible, and profound, testimony to a new and substantially more vibrant set of telecommunications options for consumers than even a few short years ago.

12. The embrace of competition as a viable option to regulation has also dramatically changed the industry. In particular, the 1996 Telecommunications Act embraced a "pro-

[6] The divestiture of AT&T in 1984 and the passage of the Telecommunications Act of 1996 provide two notable exceptions.

competitive, de-regulatory national policy framework"[7] for the governance of the industry. This embrace, in turn, set in motion a series of policies to reduce barriers to entry that have substantially enhanced the portfolio of consumers' telecommunications choices. And while few in the early post-Telecommunications Act period may have envisioned today's sources of competitive pressure for incumbent local exchange carriers, it is by this point clear that the combination of cable telephony, wireless telephony, over-the-top VoIP, and offerings from Competitive Local Exchange Carriers ("CLECs") have substantially enhanced consumers' choices for satisfying their telecommunications needs.

13. Substantial portions of modern regulation were historically justified in an industry characterized by a single local wireline provider of essentially all communications. The vibrant emergence of a larger portfolio of communications choices for consumers, however, provides a clear call for the evolution of regulation, and in particular a review of existing regulations that may no longer be warranted in an industry that is radically different today. A critical part of this review should turn on the revealed willingness and propensity of consumers to shift away from wireline telephony. This shift (together with other discipline brought about by the emergence of cable-telephony, VOIP and CLEC services) can properly provide policymakers with confidence that the disciplinary forces of consumer choices will more efficiently govern the marketplace than traditional monopoly regulation of the industry. Whether, however, consumers do in fact treat wireline and wireless telecommunications offerings as economic substitutes or economic complements is an empirical question. It is this question that has been the focus of my research which I will now describe.

III. CONSUMERS' SHIFT TO WIRELESS FROM WIRELINE TELEPHONY

[7] Conference Report, Telecommunications Act of 1996, House of Representatives, 104th Congress, 2d Session, H.Rept. 104-458, at p. 1.

14. When commercially introduced in 1983, few would have imagined the inroads that wireless telephony would have made by 2014. In 1983, the price of a wireless handset was over $4000 and airtime was over $1 per minute.[8] Additionally, the lack of infrastructure meant that even while nominally "mobile," dead-zones and dropped calls made wireless telephony less ubiquitous than the name "mobile" implied and a distinctly inferior option to traditional wireline service. As is well-documented, the years have seen both the price of wireless services fall and investments in wireless-enabling infrastructure explode.[9] Additionally, the rapid introduction and proliferation of smart-phones, which are capable of sending and receiving Internet-based data, voice, and video communications, have dramatically enhanced the versatility of wireless telephony.

15. It is apparent to even casual observers that consumers have responded dramatically to the emergence of affordable, ubiquitous and versatile wireless telephony. My research with colleagues provides data-based documentation of this shift.[10] For instance, Figure 1 depicts the evolving portfolio of consumer choices for the 2003-2013 decade. In particular, Figure 1 depicts the revealed choices of American households, who have chosen to satisfy their telecommunications needs by the use of: (1) a wireline telephone; (2) both a wireline and wireless telephones; (3) only wireless telephones, or (4) no telephone of any sort.

FIGURE 1

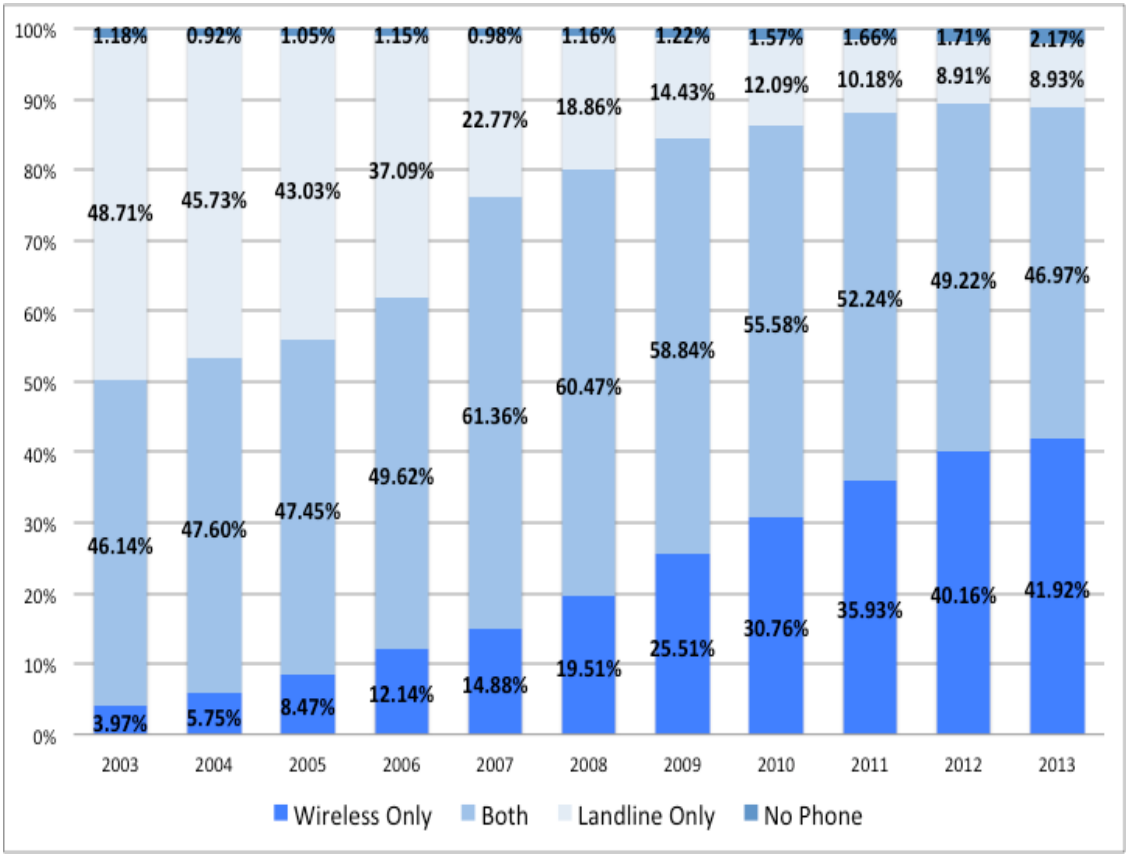
[8] John W. Mayo and Glenn Woroch, "Wireless Technologies," Information Economics and Policy, Vol. 22, March 2010, pp. 1-3.

[9] *Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless*, Including Commercial Mobile Services, WT Docket No. 11-186 (Terminated) Sixteenth Report, March 21, 2013.

[10] The data for our research stem from several sources, including the National Center for Health Statistics of the Center for Disease Control (Health Interview Survey), the Federal Communications Commission, the United States Census Bureau, the United States Bureau of Labor Statistics, the Cellular Telecommunications and Internet Association and the United States Department of Agriculture. These data are described in greater detail in Jeffrey T. Macher, John W. Mayo, Olga Ukhaneva and Glenn A. Woroch "Demand in a Portfolio Choice Environment: the Evolution of Telecommunications" July 15, 2014, hereafter, Macher, at al. (2014) which is appended as Exhibit 2.

HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NEITHER

2003-2013



16. Several features of Figure 1 are especially noteworthy. First, while the decade began with nearly half of American households subscribing to wireline service exclusively, that number had fallen to under 9 percent by 2013. Second, the proportion of American households that have abandoned their landline telephone service, becoming "wireless only" has grown from under four percent in 2003 to almost 42 percent by 2013. This is a *dramatic* shift away from Americans' reliance on wireline telephony. Third, while the first part of the last decade saw the percentage of households subscribing to both wireline and wireless services grow, this percentage peaked in 2007 and has declined precipitously since then. This reduction is driven in considerable measure by the introduction of extremely consumer-friendly and powerful

smartphones that have massively enhanced the versatility of wireless devices for consumers.[11] This falling percentage of households subscribing to both wireline and wireless and the growing number of households that are "wireless only" suggests that households have grown to see mobile telephone subscriptions as sufficient to satisfy all their voice telecommunications needs.

17. While this substantial shift between wireline and wireless-base subscriptions is both easily visible and substantial, a natural set of questions arise regarding the ability and willingness of historically vulnerable groups to make the wireline-wireless change. For instance, policymakers may legitimately seek to assure themselves that poor households and elderly households are able to substitute away from any unwarranted price increases by their incumbent local exchange providers. In particular, two concerns may arise. First, considering the rapidly evolving shift of households generally from wireline to wireless, if the poor and elderly are unwilling to shift away from unwarranted price increases by a deregulated local exchange carrier, effectively becoming the "residual" consumers, then such price increases may become more attractive to incumbent local exchange carriers.[12] Second, if these customers are less able and willing to shift from wireline to wireless services in the face of an attempt by a price-deregulated local exchange provider to raise rates, then these groups may bear a disproportionate amount of the burden associated with any price increase.

18. Fortunately, these concerns appear to have little substantive merit. Consider Figure 2, which displays the evolution of telephone portfolio choices of below-poverty households.

[11] The Apple iPhone was introduced in 2007 touching off a substantial innovation-based competition among device manufacturers and mobile service providers that has robustly continued. The most recent, but surely not the last, round of this innovation-based competition is centered on the recent introduction of the Apple iPhone 6.0.

[12] In the language of more formal economics, the concern is that more price-elastic consumers have already fled the wireline network and that the remaining consumers are less price elastic, thereby raising the desired price-cost margin of the suppliers of wireline service.

There we see that the shift away from wireline telephony over the past decade has been substantially *more pronounced* among poor households than those with incomes above the poverty level. For instance, while the dependency of poor households on "landline only" telephone subscriptions was substantially higher than other households (68.7 percent versus 48.7 percent) in 2003, the share of poor households that rely exclusively on wireline telephony has fallen very sharply to under 13 percent today. Even more dramatically, the share of poor households that have "cut the cord", becoming wireless only, grew from 6 percent in 2003 to over 57 percent by 2013. Undoubtedly, poor households have demonstrated both the ability and the propensity to avail themselves of the wireless alternatives to traditional wireline telephony. Importantly, this observed propensity to switch has occurred in an environment with little price-based incentives to switch away from wireline service.[13] This suggests that the propensity of poor household to switch away from landline service would be especially pronounced in the event of an unwarranted price increase by their current local exchange provider.

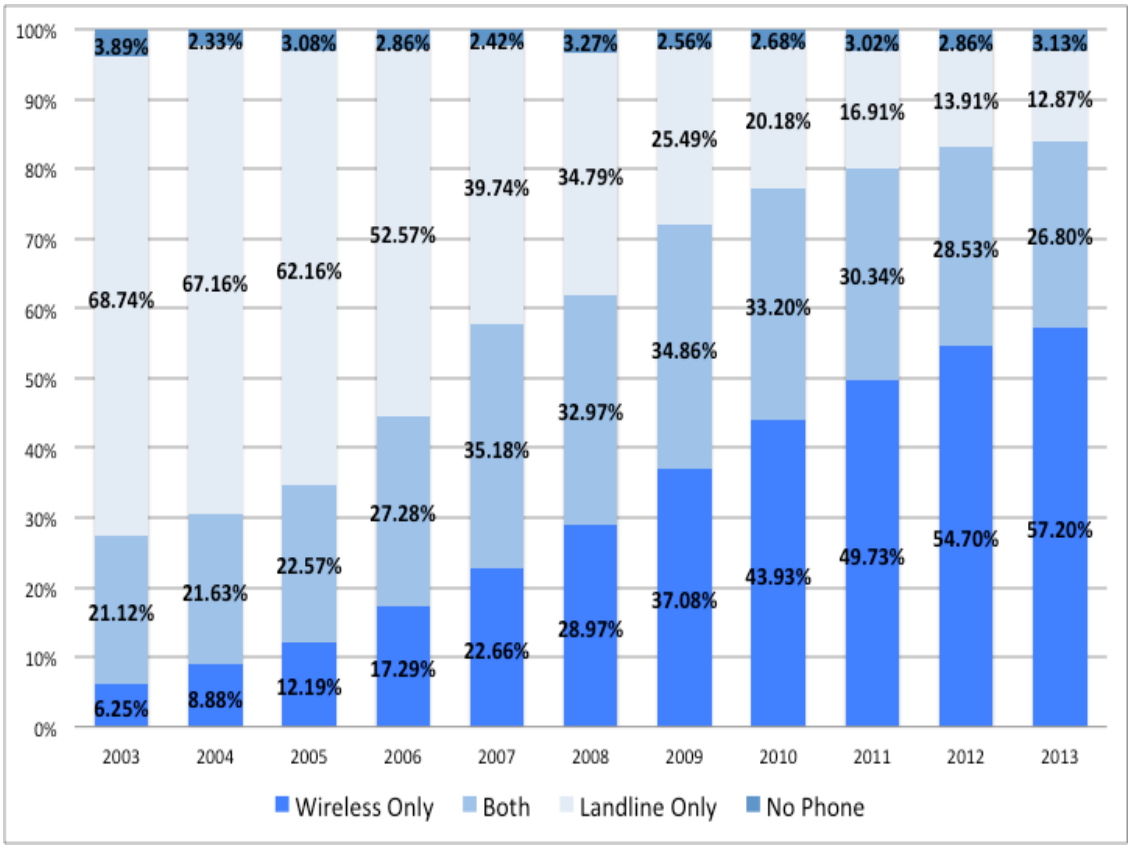
FIGURE 2

HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NEITHER

AMONG HOUSEHOLDS BELOW POVERTY THRESHOLD

2003-2013

[13] Landline telephone service prices have virtually mirrored changes in the aggregate Consumer Price Index over the December 2009-July 2013 period, indicating no inflation-adjusted price increase over this period. See Table 4.3 of the Universal Service Monitoring Report 2013, Federal Communication Commission. Over the same time period, the breadth and versatility of services offered via wireless telephony have increased with the proliferation of smart-phones.



19. Another "but what about" issue that naturally surfaces in discussions of relaxing regulatory constraints on local exchange carriers is the potential impact of any regulatory reform on the elderly. Of particular concern is the fear that this demographic segment will not participate in the transformation to a "wireless economy" to the same extent as other demographic segments. That is, might the elderly be disadvantaged due to their inabilities or unwillingness for change, technological anxieties, limited wireless telephony options, or some other reason? While these concerns are substantive, policy ought not to be based merely on fears. In particular, two important questions must be addressed before concerns about the ability of the elderly to make the transition to wireless telephony is allowed to slow otherwise

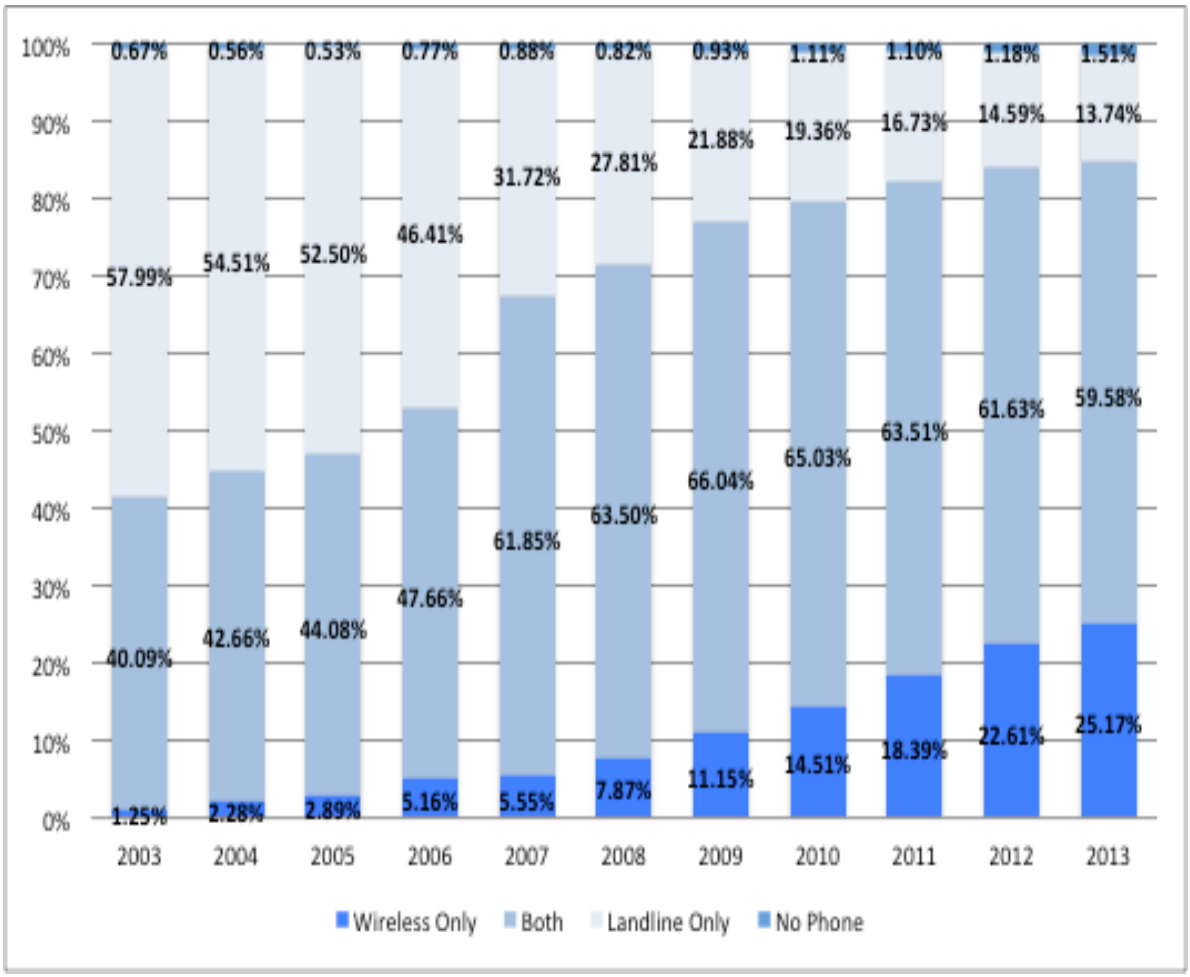
needed regulatory reform. First, do the elderly have telephony choices? And second, are the elderly taking advantage of these telephony choices?

20. As part of my larger research effort, my colleagues and I have investigated the evolution of telephone demand among the U.S. elderly population over the 2003-2013 period.[14] The results—both at a cursory level and a more econometrically refined level—are telling: while younger households have moved more quickly to embrace the wireless revolution, older households are rapidly transitioning to wireless services. In short, elderly households are not "stuck in the past" or "stuck in their ways" but are instead demonstrably nimble adopters of modern wireless technologies and the ever-increasing platform of communications options that this new technology brings.

21. Consider Figure 3 which shows the portfolio of elderly households' telephone choices over the 2003 through 2013 period. As with Figures 1 and 2, each household is categorized as being in one of four mutually exclusive and exhaustive categories: "none," "landline," "wireless," or "both".

FIGURE 3
HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NEITHER
AMONG HOUSEHOLDS WITH HEAD OF HOUSEHOLD OVER 50 YEARS OLD
2003-2013

[14] See, e.g., Jeffrey T. Macher and John W. Mayo "The Wireless Revolution: Are the Elderly Keeping Up?" Economic Policy Vignette 2012-5-29, Georgetown Center for Business and Public Policy, McDonough School of Business, Georgetown University, May 2012.



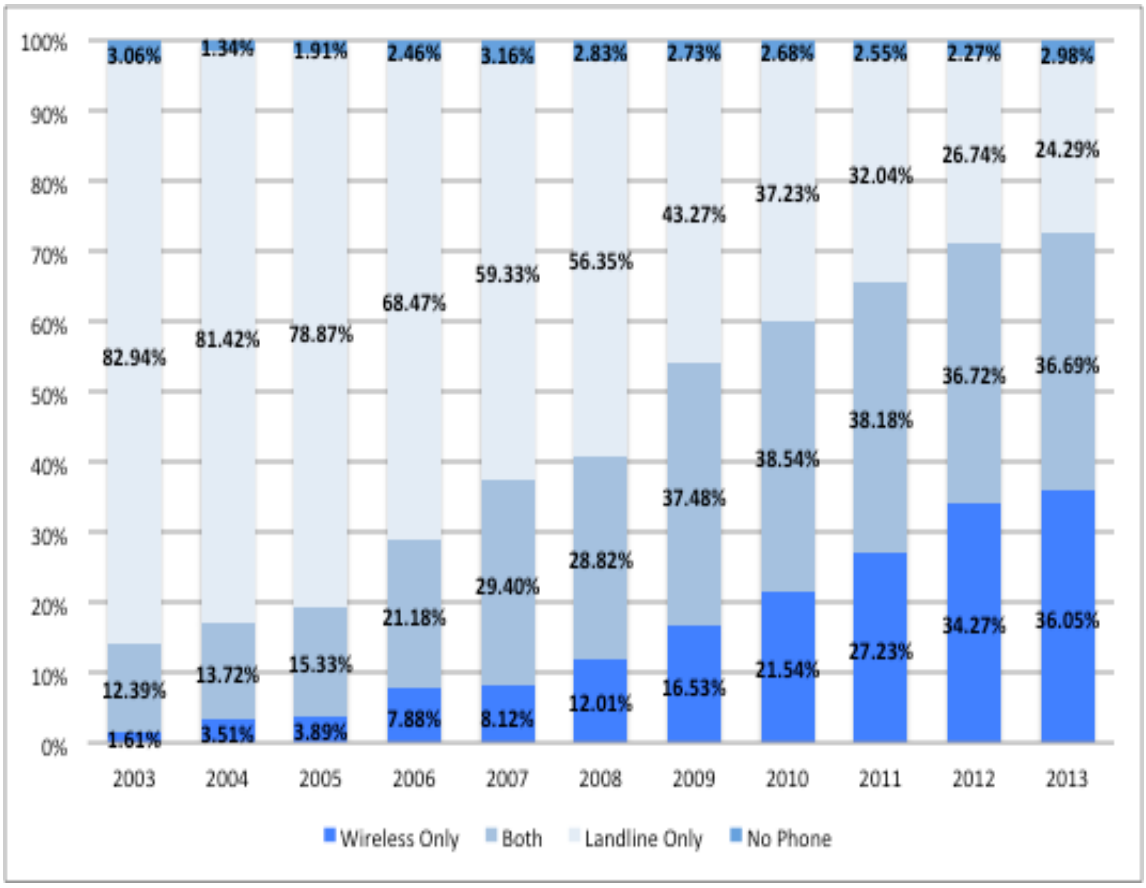
22. Three facts regarding the elderly and wireless telephony are readily transparent in Figure 3. First, the adoption of wireless telephony by the elderly has been pronounced, especially over the past decade. Although cellular telephony was first introduced in 1983, twenty years later only 41 percent of elderly households possessed wireless subscription service in 2003. But by 2013, wireless adoption among the elderly has grown to 85 percent. Over four out of five elderly households today possess wireless service as an alternative to traditional landline service.

23. Second, the growth of wireless-only elderly households has been significant: from one percent in 2003 to over 25 percent by the end of 2013. Fully one-quarter of elderly households have become wireless-only, and the growth path of wireless-only elderly households is along the same path as the larger population of households, but with a slight lag. While it is still true that the level of wireless-only elderly households is lower than the average across the general population of other U.S. households, this demographic segment is indeed embracing the wireless revolution and "catching up" to the younger population.

24. Third, complementing the move by elderly households toward wireless services, we find that the percentage of these households that rely exclusively on landline telecommunications has fallen dramatically: from 58 percent in 2003 to under 14 percent by the end of 2013. These data indicate that elderly households are not economically yoked to traditional wireline telephone subscriptions.

25. A final "but what about" issue concerns the confluence of the elderly and the poor. That is, a particular concern may arise about the vulnerability of poor, elderly households to the consequences of regulatory flexibility by incumbent local exchange carriers. Figure 4 provides comfort about this concern as it reveals a ready willingness of poor elderly households to shift from wireline to wireless telephony. Among the nominally most vulnerable elderly households—those living in poverty—we find that roughly 36 percent have "cut the cord" by dropping their landline telephone subscription all together. And exclusive reliance among these households on traditional wireline telephone subscriptions has fallen precipitously from 83 percent to 24 percent in the last decade.

FIGURE 4
HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NEITHER AMONG HOUSEHOLDS WITH HEAD OF HOUSEHOLD OVER 50 YEARS OLD AND BELOW POVERTY THRESHOLD
2003-2013



26. In sum, the data that we have examined provide considerable comfort that elderly households are not as economically vulnerable as some may fear or have posited. Indeed, elderly households—similar to all other U.S. households—appear to increasingly see value in wireless services and are transitioning rapidly to adopt a portfolio of wireless and landline telephones. While regulatory reform in landline telecommunications needs to be sensitive to potentially vulnerable segments of society, it should not be sidetracked by empty concerns.

While some elderly households will surely remain loyal to wireline services, our research provides no indication that elderly households are, as a group, unwilling or unable to shift from wireline to wireless services to satisfy their telecommunications needs.[15]

27. Another intriguing group of customers that merits focus as issues of relaxing regulation moves to the fore are young households. In particular, it is often observed that in matters of technology adoption, trends among young households are precursors to the behaviors that will spread to the larger population. In this context, examining consumption patterns among young households provides a window into the emerging future of telecommunications portfolios that the broad population will soon reveal.

28. Consider Figure 5. There we see that the share of households headed by young adults who rely exclusively on landline telephone service has fallen massively over the 2003-2013 period. By the end of 2013, only 1.3 percent of a young households relied exclusively on wireline telephone subscriptions to satisfy their telecommunications needs. The share of these households that rely on both wireline and wireless subscriptions has similarly declined dramatically. While over 40 percent of young households relied on both wired and wireless telephone subscriptions in 2003, that dual reliance had fallen to less than 13 percent by the end of 2013. Most dramatically, the share of wireless-only young-adult households grew to over 82 percent by the end of 2013. While the exact timing of the evolution of other households along this path is uncertain, the overwhelming demonstration by young households of the versatility and value of wireless communications relative to wired telephone service provides substantial

[15] Moreover, as a practical matter attempts to target any such vulnerable groups are likely to be exceedingly difficult and costly, further reducing the likelihood that such groups are economically disadvantaged by pricing strategies of any supplier.

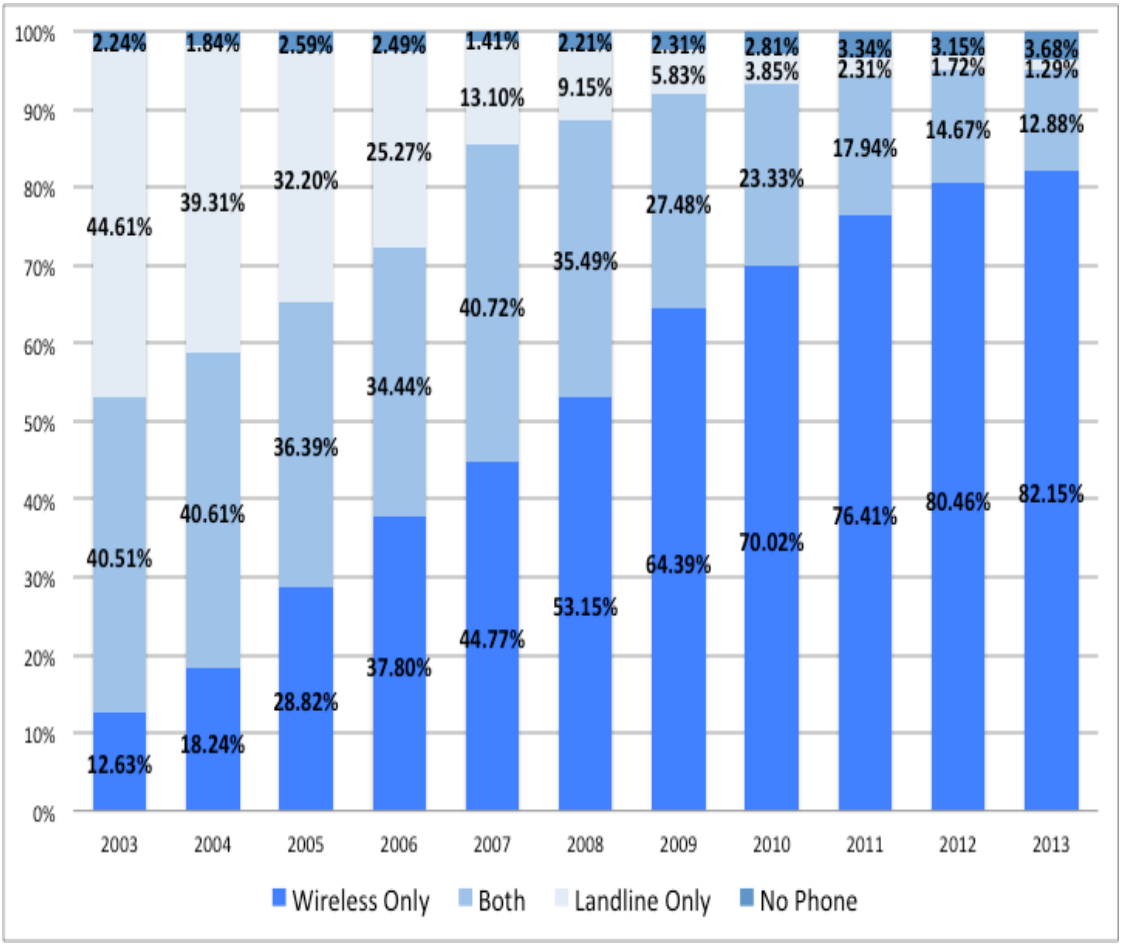
comfort to any concerns about the larger base of consumers being "locked-in" to wireline telephone service or subject to monopolistic price increases.

FIGURE 5

HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NEITHER

AMONG HOUSEHOLDS WITH ALL MEMBERS UNDER AGE 31

2003-2013



29. While the descriptive statistics presented here provide substantial intuitive support for the proposition that wireless telephone subscriptions offer a substantive competitive alternative to traditional landline services, my research efforts have probed this issue more deeply in

recent years. In particular, in Macher, et al. (2014), we develop an economic model of price and non-price determinants of consumers' telephone subscription portfolios.[16] While the particulars of that paper are provided in Exhibit 2, it is important to highlight several aspects of the paper.

30. First, the theoretical framework for the paper is built upon a sound foundation of the microeconomics of consumer choice; highlighting the non-price characteristics of telephone alternatives (e.g., the quality of each offering), the non-price characteristics of households (e.g., their peripatetic tendencies), as well as price characteristics of each alternative. This framework provides a more complete foundation for understanding the *portfolio* of subscription choices of households than models that have traditionally focused on either the demand for wireline service or, alternatively, wireless service.

31. Second, our econometric approach adopts alternative approaches to estimate consumers' portfolio choices rather than imposing a single approach. The base model is one that envisions consumers making two interrelated decisions: whether to subscribe to wireline telephone service or not and whether to subscribe to a mobile telephone service or not. This conceptualization leads to a bivariate probit estimation which allows the two decisions to be statistically yoked. An alternative conceptualization envisions households making a single portfolio-choice decision: whether to subscribe to wireline telephone, a wireless telephone, both or neither. This frame for consumer decision-making leads to a mixed logit estimation. In both specifications we carefully employ modern econometric methods to ensure the integrity

[16] This paper, appended as Exhibit 2, represents the most recent version of our research, which was first posted on the Social Science Research Network (SSRN) in August 2012. http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2133424.

of the resulting estimates. For example, we control in the estimation for the potentially confounding effects of the endogeneity of prices.

32. Third, the data we employ are both detailed and comprehensive. Our measure of consumers' choices for telephone service are drawn from a unique database developed by the Centers for Disease Control, who survey thousands of households annually on, *inter alia*, their portfolio of telephone subscriptions. While the publicly-available portions of his database are informative, we were able to secure approval from the National Center for Health Statistics to access the confidential locations of surveyed households. This then permitted us, in turn, to yoke household choices to other publicly-available data from a variety of sources.[17] The result is a dataset that spans the 2003-2010 period with household-level observations for roughly 190,000 households. Our expanded dataset comprehensively incorporates measures of the prices faced by households, their incomes, the quality of wireline and wireless networks, network effects variables, demographic variables and measures of the degree to which household members are more or less closely affiliated with their domicile.

33. Finally, the results of our empirical inquiry are telling. Simple tetrachoric correlations between household subscription decisions for wireline and wireless services are negative and statistically significant at the 1 percent level, indicating that households that subscribe to a wireless service are less likely to adopt wireline telephony. Moreover, this pattern occurs for the entire period of the data and for each individual year in our sample. Additionally, the negative correlation in subscription decisions occurs at all income levels, with the largest negative correlation for the lowest income households. Because these observed correlations do not parse out individual effects of the various determinants of households' subscription

[17] See footnote 10, *supra*.

decisions, we also employ modern discrete-choice econometric methods to illuminate the price and non-price determinants of households' decisions to subscribe to a wireline service, a wireless service, both or neither.

34. In all estimations, regardless of the specification, we find that prices of the relevant alternatives (wireless and wireline) are statistically significant drivers of consumers' choices of their telephone subscription portfolios. In particular, we find that the price of any alternative (landline or mobile) is negatively related to subscriptions to that service. That is, if the price of landline service were to be increased, the estimations robustly reveal that subscriptions to that service will decline. Importantly, this is after the econometric model has controlled for the independent influence of a host of other non-price determinants of consumers' demand. While this "own-price" effect is perhaps unsurprising, the estimation results also indicate that the price of any alternative (landline or mobile) is *positively* related to price movements of the other alternative. That is, price increases of landline telephone service are positively related to wireless telephone subscription. In the jargon of economists, the results reveal that wireline and wireless subscriptions are "substitutes" rather than "complements"[18]

35. The model estimates permitted us to explore the evolution of consumer behaviors to price changes. For instance, by bifurcating our sample into an early period (2003-2006) and a later period (2007-2010) we were able to estimate the impact of a price change of wireline service on consumers.[19] The estimates reveal that in the early period changes in the price of wireline service precipitated only modest substitution by marginal consumers (i.e., those who would respond to a price change). Specifically, during the early period, only about one-half of

[18] Our estimations also explored the sensitivity of this result among both elderly and poor households. While we find modestly more price sensitivity among young households, our principal results remain intact. For more details, see Macher at al. (2014), footnote 38.

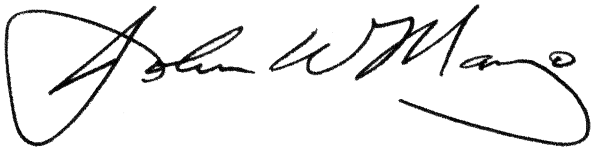
[19] Similar results occur with alternative bifurcations of the sample.

the marginal substitution was the result of households dropping their wireline service. Instead, while some consumers dropped their wireline service, a substantial share was prompted to experimentally adopt wireless service without disconnecting from their wireline service. In the later period, however, the estimates reveal that the marginal consequence of any wireline price change was predominantly to stimulate "cord cutting" behavior by households. This result is likely to have been driven by the substantial increase in the quality and versatility of wireless networks and devices.

IV. CONCLUSION

36. Regulatory policy changes are, appropriately, deliberate. When the Commission last examined the issue of wireline-wireless substitutability it cautiously pulled up short of recognizing the role of consumer substitution across these technologies. Today, however, a plethora of data and analysis reveal that wireless services present a substantive, viable and economically constraining influence on the behavior of wireline telephone providers.

I affirm that the foregoing is true and accurate to the best of my knowledge.



John W. Mayo

October 6, 2014

Exhibit 1

REDACTED – FOR PUBLIC INSPECTION

VITA

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ACADEMIC APPOINTMENTS:

Georgetown University, McDonough School of Business
- Professor of Economics, Business and Public Policy 1998-present
- Executive Director, Georgetown Center for Business and Public Policy, 2002 – present
- Dean, 2002-2004
- Senior Associate Dean, 1999-2001

Georgetown University, Department of Economics
- Professor of Economics (by courtesy), 2011-present.

Stanford University
- Visiting Scholar, February 2013
- Stanford Institute for Economic Policy Research

University of California, Berkeley
- Visiting Scholar, January-May 2011
- Haas School of Business

University of Tennessee, Knoxville
- Professor of Economics, 1994-1998
- Research Associate Professor, Center for Business and Economic Research 1989-1994
- Associate Professor of Economics, Department of Economics, 1989-1994
- Research Assistant Professor, Center for Business and Economic Research, 1981-1989
- Assistant Professor of Economics, Department of Economics, September 1981-1989.

Virginia Polytechnic and State University (Virginia Tech)
- Visiting Assistant Professor, fall 1983

EDUCATION:

Honorary Doctorate in Economics, 2007, University of Basel, Basel, Switzerland

Ph.D., Economics, 1982, Washington University in St. Louis
Dissertation: "Diversification and Performance in the U.S. Energy Industry"
A.M. Economics, 1979, Washington University in St. Louis
B.A., Economics, 1977, Hendrix College, Conway, Arkansas

FIELDS OF SPECIALIZATION:

Industrial Organization
Regulatory and Antitrust Policy
Applied Microeconomics
Econometrics

NON-ACADEMIC APPOINTMENTS

U.S. Senate, Small Business Committee
Chief Economist, Democratic Staff, June 1984 - June 1985

International Institute for Applied Systems Analysis (IIASA)
Energy Research Fellow, Laxenburg, Austria, summer 1979

Transportation and Public Utilities Group
President, 2005-2006. President-Elect, 2013.

National Safety Council,
Board of Directors, Vice President, October 2002- 2006.

HONORS, AWARDS, AND GRANTS:

Undergraduate: Mosley Economics Prize (#1 graduating economics major), Alpha Chi (scholastic), Blue Key Honor Society, Senior Honors Seminar.

Graduate: University Fellowship, Washington University (1977-78); National Academy of Sciences Young Research Fellow, Laxenburg, Austria (1979); President, Washington University Economics Graduate Student Association (1979-81); Dissertation Fellowship, Center for the Study of American Business, Washington University (1980-81).

Post-Graduate: 2006 recipient of the Public Utility Research Center Distinguished Service Award; Zaeslin Fellow of Law and Economics, University, of Basel, Basel, Switzerland (2000 - present); William B. Stokely Scholar, College of Business Administration, The University of Tennessee (1993-1995); South Central Bell Research Grant (1988); Research Affiliate, Center of Excellence for New Venture Analysis, The University of Tennessee (1985); Summer Faculty Research Fellowships, The University of Tennessee (1983-1985).

COURSES TAUGHT:

Undergraduate: The Miracle of Markets?, Principles of Microeconomics, Economic Foundations of Commerce, Current Economic Problems, Government and Business, Intermediate Microeconomics, Energy Economics

Graduate: Managerial Economics (MBA), Firm Analysis and Strategy (MBA), Managing in a Regulated Economy (MBA), Economics (Executive MBA), The Economics of Strategy (MBA), Business and Public Policy (MBA), Competition and Competition Policy (MBA), Regulation and Deregulation in the American Economy (MBA), Strategic Pricing: Theory, Practice and Policy (MBA), Understanding International Business (MBA), Industrial Organization and Public Policy (Ph.D.), The Economics of Antitrust and Regulation (Ph.D.)

PUBLICATIONS:

A. JOURNAL ARTICLES

"Revenue Adequacy: the Good, the Bad and the Ugly" (with Jeffrey T. Macher and Lee F. Pinkowitz), Transportation Law Journal, forthcoming.

"The Evolution of Innovation and the Evolution of Regulation: Emerging Tensions and Emerging Opportunities in Communications" (with Larry Downes) CommLaw Conspectus: Journal of Communications Law and Policy, forthcoming.

"Moving Past the Ideological Debate: A Results-Based Regulation Approach to Net Neutrality," Democracy: A Journal of Ideas, No. 34, fall 2014, pp. 21-27.

"Influencing Public Policymaking: Firm-, Industry- and Country Institution-Level Determinants," (with Jeffrey T. Macher) Strategic Management Journal, forthcoming.

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Taxation; and, Senate State and Local Government Committee); Maryland State Legislature (Environmental Works Committee); Pennsylvania Public Utility Commission; Michigan Public Service Commission; Missouri Public Service Commission; Illinois Commerce Commission; West Virginia Public Utility Commission; Wyoming Public Utility Commission; Washington Utilities and Transportation Commission; Utah Public Service Commission; Wisconsin Public Service Commission; California Public Utilities Commission; Florida Public Service Commission; Delaware Public Service Commission; Montana Public Service Commission; Maryland Public Service Commission; Massachusetts Department of Public Utilities; Georgia Public Service Commission; Colorado Public Utilities Commission; North Carolina Public Utilities Commission; Missouri Public Service Commission; Texas Public Utility Commission; Arkansas Public Service Commission; Connecticut Department of Public Utility Control; Kansas State Corporation Commission; and New Jersey Board of Public Utility Commissioners.

INVITED SEMINARS AND SELECTED CONFERENCE PRESENTATIONS:

Columbia University, University of Chicago, London Business School, University of Paris (Dauphine IX), Vanderbilt University, INSEAD, Washington University in St. Louis, University of Michigan, Ohio State University, University of Minnesota, University of Florida, University of Arkansas, University of Texas, University of Missouri, Florida State University, Rutgers University, American University, University of Missouri, Kansas University, University of Utah, University of Colorado, University of Basel (Switzerland), University of Freiburg (Germany), University of Central Florida, American Enterprise Institute, Brookings Institution, Federal Communications Commission, Australian Competition and Consumer Commission (ACCC), Telecommunications Policy Research Conference (TPRC), National Conference of State Legislatures, U.S. Advisory Commission on Intergovernmental Relations

SELECTED CONSULTING:

U.S. Department of Justice, Antitrust Division; U.S. Federal Trade Commission; AT&T; Sprint; MCI Telecommunications; Verizon; Optus Communications (Australia); United Parcel Service; Commonwealth of Virginia, Tennessee Valley Authority; Antitrust Division, Office of the Attorney General, State of Tennessee; U.S. Senator Howard Baker, Jr., U.S. Senate Majority Leader; Oak Ridge National Laboratory; AmerenUE; Arkansas Consumer Research; Division of Energy Conservation and Rate Advocacy, Office of the Arkansas Attorney General; U.S. Department of Energy

PROFESSIONAL PRESENTATIONS:

American Economic Association Annual Conference, Western Economic Association Annual Conference, Southern Economic Association Annual Conference, European Association for Research in Industrial Economics Annual Conference, Center for Research in Regulated Industries Eastern Annual Conference, Center for Research in Regulated Industries Western Annual Conference, Southeastern Economic Analysis Conference

WORKING PAPERS:

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EDITORIAL AND ACADEMIC OVERSIGHT BODIES

Associate Editor, Information Economics and Policy, 2007-2011.

Editorial Board, Journal of Regulatory Economics, 1999-present.

Editorial Board, Review of Industrial Organization, 2002-2003; 2010-present.

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Board of Academic Advisors, The Free State Foundation, 2008 – 2009.

Research Advisory Committee, National Regulatory Research Institute (Ohio State University), 1993-1997.

PROFESSIONAL MEMBERSHIPS:

American Economic Association
Western Economic Association
Southern Economic Association
American Law and Economics Association
International Telecommunications Society
European Association for Research in Industrial Economics

Exhibit 2

Demand in a Portfolio-Choice Environment: The Evolution of Telecommunications

Jeffrey T. Macher *
John W. Mayo*
Olga Ukhaneva*
Glenn A. Woroch †

Abstract

We explore the pattern and evolution of the rapidly changing landscape of consumers' wired and wireless telecommunications choices with a model that extends the traditional (node-to-node) demand structure. We then empirically estimate a consumer choice model using household-level observations from 2003-2010. Households that are more affiliated with their domicile are more prone toward wireline services while more "on the go" households are more attracted to wireless telephony. The estimations indicate that subscription to wireline and wireless telephony are substitutes rather than complements. Finally, the quality convergence in wireless and wireline services has contributed significantly to shifts in consumers' telephone portfolios.

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1 Introduction

The emergence and rapid proliferation of wireless telephony and broadband service have introduced the most dramatic transformations in the telecommunication industry since the invention of the telephone in 1876. When Ameritech first introduced cellular service in the United States in 1983, however, few would have imagined its explosive growth potential. After all, the first wireless phones were large, weighing over two pounds each, and airtime prices were nearly $1 per minute.[1] Yet by 2012, the technology had improved significantly and the prices of wireless handsets and subscription services had fallen dramatically. The result: over 300 million wireless subscribers in the U.S. and roughly 6 billion wireless subscribers worldwide.[2] Over 40 percent of all U.S. households today are wireless-only.[3]

The rapid pace of consumer demand, technology and public policy changes in this industry has raised a number of important questions that economists have only recently begun to address. Prominent among these questions is how the presence of wireless telephony affects households' choices as they seek to have their communications needs met. Insights into this question promise, in turn, to shed light on a number of current economic policy questions, including whether wireline and wireless services are better described as complements or substitutes, whether traditional public policy efforts to promote wireline subscription to the public switched network are necessary in light of the rapid wireless services adoption, and whether competition between wireline and wireless platforms is sufficient to warrant a "light-handed" approach to industry regulation. Additionally, the emergence of wireless technologies raises broader questions regarding the potential for improved efficiencies in specific industries, such as health care, education, insurance, agriculture and fishing, as well as to the broader economy.[4]

Two streams of economic research have emerged which provide some assistance in addressing the issue of household telephony choices in an environment that includes wireline and wireless options. The first is a rich literature on the demand for wireline telecommunications.[5] The second is a more recent literature on the diffusion of wireless telephony.[6] While

[1] Mayo and Woroch (2010).

[2] International Telecommunication Union (2012).

[3] See Blumberg and Luke (2013). Following their terminology, we refer to "wireless" as what alternatively is termed "mobile", "cell", or "cellular" service.

[4] For industry-based studies of the impact of advanced telecommunications, see, e.g., Brown and Goolsbee (2002), Jensen (2007) and Aker (2010). See Röller and Waverman (2001) for a study of the macroeconomic consequences of the deployment of advanced telecommunications.

[5] For a detailed review, see Taylor (2002).

[6] Vogelsang (2010) provides a thorough review of the diffusion of wireless telephony, including studies using microdata from the early 2000s that seek to estimate evidence of consumer substitution across fixed (wired) and mobile (wireless) services. See, e.g., Rodini, Ward and Woroch (2003) and Ward and Woroch (2010). For a literature survey of economic issues related to the wireless telephone industry, see Gans, King and Wright (2005).

both research streams are informative, neither captures the rich evolution of consumers' decisions regarding their telecommunications portfolios over the past decade. In particular, given the dramatic evolution of wireline and wireless services, natural questions arise regarding the economic motivations driving adoption when consumers now have multiple options to satisfy their communications needs, including wireline service only, wireless service only, both wireline and wireless services, and neither wireline nor wireless service.

In this paper, we take a step toward understanding the evolution of telecommunications demand in the context of an environment in which consumers face a portfolio choice. We do so by first developing a simple model of household choice for alternative platforms that satisfy their communications needs. One alternative is a high quality wireline platform that provides telecommunications services between wired nodes, but is incapable of providing communications for consumers who are not physically located at such nodes. Another choice is (initially) a lower quality wireless platform, but offers consumers the ability to communicate while away from the wired nodes. Other household choices include the selection of both platforms or neither platform. Our model provides insights into the household and network characteristics that are likely to arise as key determinants of the choices that households make regarding how to satisfy their communications needs. We also explore conceptually the implications and interpretations of consumer patterns of substitution across platforms in the face of alternative prices. This approach allows us to frame an empirical analysis that explores both non-price and price determinants of demand, including the substitutability or complementarity of wireline and wireless services.

Given this model, we then draw upon a large and unique survey of household-level communications platform choices over 2003-2010 to empirically model households' decisions to adopt wireline services, wireless services, both services, or neither service. The estimations provide consistent support for the conceptual framework. In particular, households whose characteristics indicate greater spatial mobility of household members are significantly more likely to gravitate toward portfolio choices that include wireless telephone service. And conversely, households whose characteristics signify greater attachment to their homes are more attracted to wireline telephone service. Our empirical analysis also provides strong evidence that wireless telephony has become a close substitute for wireline telephony over the 2003-2010 period.

2 A Model of Consumer Choice in a Wired and Wireless Environment

2.1 Substitution Patterns: Nonprice Considerations

Consumers' demand for telecommunications services is a consequence of the desire both to be able to transfer information (i.e., voice, data or video) to others and to be able to receive information from others when sufficiently spatially separated to make direct communications difficult. Historically, telecommunications has been available only at fixed (wireline) nodes, so telephone calls from one consumer to another were characterized by exact physical locations. Within this context, models of telephony demand emerged in the 1970s. Over time these models have sought, for example, to capture the essence of network externalities [e.g., Rohlfs (1974)], to model consumer demand in the presence of multiple nonlinear pricing options [e.g., Train, McFadden and Ben-Akiva (1987)], and to model the role that local and long-distance service boundaries and pricing play on telecommunications demand [e.g., Martins-Filho and Mayo (1993)].

While advancing understanding of the demand for traditional telephone services, these models have not typically allowed for consumer preferences to reflect a desire (or an ability) to communicate away from fixed nodes. The emergence of wireless telephony, however, provides the opportunity for a broader description of consumer demand. In particular, while a consumer may retain the demand for wireline communications, she may also gain utility from being able to reach other consumers who are not at a wireline node. Similarly, a consumer may also gain utility from the ability of another consumer to reach her while she is away from her node.[7]

That is, communications demand was driven by the utility of a consumer i, located at her node, to communicate with another consumer j, $j = 1 \ldots m$, located at her node, by either making or receiving telephone calls between i and j.[8] The emergence of wireless telephony, however, provides the opportunity for a broader description of consumer demand. In particular, while consumers may retain the demand for N_i to N_j communications, they may also gain utility from being able to reach other consumers who are not at a wireline node. Similarly, a consumer i may also gain utility from the ability of another consumer j to reach her while she is away from her node.[9]

[7]It is also possible that wireless service may not only afford mobility, but also enhance communications services breadth. This would happen, for instance, if wireline broadband service was unavailable while broadband service was available via wireless technologies.

[8]Of course, households also may place value on the option to make or receive calls between nodes.

[9]It is also possible that wireless service may not only afford mobility, but also enhance communications services breadth. This would happen, for instance, if wireline broadband service was unavailable while broadband service was available via wireless technologies.

Thus, consider a household with $N = \{1, ..., n\}$ members. Each household member n_i has a "community of interest" consisting of $M_{ik} = \{m_{i1}, m_{i2}, ..., m_{ik}\}$ other non-family members. At any moment in time, a household member i may get the urge to communicate with family member j or a member of her community of interest m_{ij}.[10] This urge occurs randomly and independently of a person's subscription decisions and her present location (at home or away). For simplicity, suppose that communications between person i and other family members and members of the community of interest are undifferentiated, so we allow j to index both household members and community of interest members. If i is able to connect with j she derives utility u_{ij}. As the receiver will also be affected by the call, let v_{ji} be the utility to j if she is called by i. It is reasonable to assume the caller has more to gain than the receiver (*i.e.*, $u_{ij} > v_{ji}$) if only because the caller was incited to initiate the call before the receiver did so. In fact, the receiver may not want calls from certain callers (e.g., telemarketers) in which case $v_{ji} < 0$. The utilities to both the caller and receiver are assumed to vary depending on the quality of the wireless connection relative to calls made using a landline telephone (which is the assumed default).

We further assume that individual i is at home with probability ϕ_i and away from home with complementary probability $[1 - \phi_i]$. Wireless telephony service is equally available at home or away but not with perfect certainty or high quality. For instance, the cellular network may be unable to establish a connection in the user's location either because of carrier coverage area gaps or because of carrier signal weakness (as when a user is in a building). Let λ_i be a quality variable, measuring the probability that individual i connected to a mobile carrier's network and is successfully able to place and receive mobile calls. The size of λ_i will depend, among other factors, on the capacity of the local wireless network. Finally, we assume that individuals while at home utilize their landline telephone for calling family members and members of their community of interest.

Thus, the utility of i in a wireline-only world can be fully characterized by:

$$\mu_i = \sum_j \phi_i \phi_j (u_{ij} + v_{ij}). \tag{1}$$

Allowing for the possibility of wireless communications, we can now represent a consumer i's utility from telecommunications services more fully by:

[10] We abstract from the role that prices may play in rationing calling intensity. Specifically, because most wireless subscriptions are for "buckets" of minutes, the marginal price of an additional call is zero unless the subscriber has exhausted the minutes allotted in the bucket. We thus consider the effective marginal price of usage to be zero so that every urge to call is unconstrained by price.

$$\mu_i = \sum_j \phi_i\phi_j(u_{ij}+v_{ij}) + \sum_j [1-\phi_i]\lambda_i\phi_j(u_{ij}+v_{ij}) + \\ + \sum_j \phi_i[1-\phi_j]\lambda_j(u_{ij}+v_{ij}) + \sum_j [1-\phi_i]\lambda_i[1-\phi_j]\lambda_j(u_{ij}+v_{ij}), \quad (2)$$

[11]

where $j = 1, ..., n+k-1$.

Equation (2) represents the utility to i of all i to j communications, which is the sum of the utilities (1) from i's wireline to j's wireline; (2) from i's wireless to j's wireline; (3) from i's wireline to j's wireless; and (4) from i's wireless to j's wireless, respectively. Note, that if i does not have a landline, it is equivalent to $\phi_i = 0$; if i is not subscribed to a wireless service it is equivalent to $\lambda_i = 0$.

This specification highlights several salient features that we capture in our empirical analysis. First, equation (2) points to an important role of the mobility of both i and j in the realization of i's utility from wireless service subscription. For instance, note that as ϕ_i approaches 0, the value of the first and third expressions in equation (2) approach zero, respectively. That is, the ability of i to realize utility from communications with j while i is away from her home is contingent upon having a mobile subscription. Alternatively stated, the value of mobile subscriptions will increase the greater the likelihood that i and j are away from their home. If, on the contrary, ϕ_i is rather big, the value of the second and forth expressions in equation (2) approach zero. In other words, if i spends the majority of her time at her node, subscription to mobile service might not add extra value to i's utility.

Second, note that in the event j is not subscribed to a wireless service ($\lambda_j = 0$) it effectively eliminates the latter two terms in equation (1). If household member i particularly values communication with j and ϕ_j is low the marginal utility to i from j's subscription to a mobile service may therefore lead to inter-personal "side-payments" to support j's subscription even when, absent those payments, j would chose not to subscribe to a mobile service. Such side-payments are most frequent between family members. The value of λ_j also highlights a more general network externality effect. Specifically, the value to i of wireless subscription will depend on the ability to communicate with members of her family and community of interest even while those members are away from a landline telephone, thus making the value to i contingent upon j's subscription to the wireless network.

Finally, Equation (2) makes it apparent that variations in λ_i and λ_j, reflecting the quality

[11] We follow the convention first established by Rohlfs (1974, p. 20) in assuming that interrelationships between the demand for telecommunications services and other non-communications services purchased by consumers can be ignored. Similarly, we eschew (for the moment) a discussion of the effects of pricing on consumption patterns. We return to this below, however, in Section 2.2.

of the wireless networks subscribed to by i and j will affect i's utility from subscription to a wireless network. Lower values of λ_i and λ_j make it less likely, *ceteris paribus*, that i will find it in her interest to subscribe to a mobile network.

To summarize, for consumer i, the incremental utility associated with subscribing to wireless service depends on: (a) whether consumer i has a demand to communicate with other consumers ($j = 1 \ldots n + k - 1$) while i is away from her node; (b) the probability of consumer i being at her node at the time that i to j communications is desired;[12] (c) the ubiquity of wireless coverage; (d) the quality of wireless service relative to wireline service; (e) the network effect created by others' subscriptions to the telephone network; and, (f) the utility to consumer i of being reachable by the other consumers j when i is away from his node. Our empirical model will seek to capture these demand drivers.

2.2 Substitution Patterns: Price Considerations

Turning to the effects of pricing on consumer demand, our goal is to determine the economic relationship between wireline services and wireless services. In particular, we seek to determine whether access to wireless service serves as a complement to, or substitute for, access to wireline service. As such, the central questions are ones of consumers' responsiveness to price changes in nodal wireline services (N) and wireless services (W).[13] Wireline telephone service is typically priced as a lump-sum monthly payment with a zero marginal

[12]We abstract away from the potential for households to gain utility from asynchronous communications such as voicemail, email, video and file transmissions that are not received simultaneously. We also implicitly assume that the wireless device is "turned on" while individuals are away from their nodes rather than receiving a message and subsequently returning the call at a later time. Incorporating these considerations would involve discounting the utility from fully contemporaneous communications without any harm to the basic approach we adopt here. We also abstract away from the distinction between the called party being at her node from the called party being at any wired node. In our empirical analysis, however, we account separately for these possibilities.

[13]Our approach here shares a nomenclature with an independent literature in economic strategy that seeks to determine whether particular corporate strategies are substitutes or complements. For example, Braga and Wilmore (1991) examine the issue of the relationship of technological imports and in-house R&D efforts. Within this literature, key insights into questions of substitutability or complementarity are seen to arise from either observed positive or negative correlations in measures of the strategies themselves or in the errors of reduced-form regressions of the strategies. This approach has developed and been refined over the years by a number of contributions, including Milgrom and Roberts (1990), Arora and Gambardella (1990), Arora (1996), Athey and Stern (1998) Miravete and Pernias (2010), and Kretschmer, Miravete, and Pernas (2012). As noted by Arora (1996), this approach is necesitated by the absence of the 'price' of adopting particular strategies. Gentzkow (2007) extends this literature and builds explicit linkages between this general approach and the conventional approach toward substitutability/complementarity issues when price variation is unobserved. Fortunately, as described below, we are able to directly capture price variations across consumers for the various portfolio alternatives and are able to observe consumer reactions to those price variations. In this manner, our approach is more conventionally set within the standard microeconomic assessment of substitutability/complementarity based on observed consumer reactions to alternative prices.

price per minute of use.[14] Similarly, wireless telephone service pricing plans most typically incorporate allowances for a number of minutes that have a zero marginal price as long as the consumer's usage does not exceed the allowance. In these circumstances, the consumer's subscription will depend on a comparison of the monthly subscription fees of wireline and wireless services to the amount of consumer surplus enjoyed from wireline and wireless usage, after consumers have paid their respective monthly fixed charges.[15]

Let P_N represent the prevailing price of wireline telephone service in the household; and let P_{Wi} represent the prevailing price of wireless service for household member i. Individual households maximize the utility gained from wireline and/or wireless communications relative to the cost of these services for all household members:

$$\max\{\sum_i(\mu_i - P_{Wi}) - P_N\} \tag{3}$$

Based on the household's maximization problem stated by equation (3) we can estimate the probability of each household to subscribe to (1) no telephone (π_0), (2) wireline service (π_N), (3) wireless service (π_W), or (4) both wireline and wireless services (π_{NW}).

To generate insights into the degree of substitutability or complementarity of consumers' demand for wireline and wireless services we explore how the probabilities of subscription are affected by variation in the prices of wireline and wireless services. In this regard, we focus on the (subscription-based) quantities of wireline services ($Q_N = \pi_N + \pi_{NW}$) and wireless services ($Q_W = \pi_W + \pi_{NW}$). We can then define the economic relationship between nodal wireline and wireless services as:

$$\begin{aligned}
&\frac{\partial Q_W}{\partial P_N} = 0 - \text{Wireline and wireless services are independent,}\\
&\frac{\partial Q_W}{\partial P_N} > 0 - \text{Wireline and wireless services are substitutes,}\\
&\frac{\partial Q_W}{\partial P_N} < 0 - \text{Wireline and wireless services are complements.}
\end{aligned} \tag{4}$$

[14] We set aside here the *de minimis* portion of consumers who subscribe to local wireline telephone service on a usage basis.

[15] See Taylor (2002).

3 Empirical Setting and Data

To estimate consumer decisions regarding their portfolio of telecommunications choices, we begin with a unique micro-level database assembled by the National Center for Health Statistics (NCHS), which operates as part of the Centers for Disease Control (CDC). NCHS administers the National Health Interview Survey (NHIS) annually as the principal source of information on the health of the U.S. civilian non-institutionalized population. Interviewers visit households and collect data on roughly 75,000-100,000 individuals annually.[16] Our data are over the 2003-2010 period, with nearly 25,000 households surveyed each year. As shown in Appendix A, NHIS-surveyed households generally track U.S. population demographic characteristics closely.[17] Households are queried in this survey regarding their subscription to wireline and wireless telephone services. Of particular interest are questions about whether the household has no telephone, a wireline telephone only, a wireless telephone only, or a wireline telephone and (one or more) wireless telephones.

While the public use portion of the data are helpful, the specific locations of surveyed households remain confidential. By application to and approval from the NCHS, we gained access to the confidential household data maintained at a secure facility in Hyattsville, Maryland. Using household-level geocodes, we are able to link the NHIS survey data to location-specific data from several public data sources, including the Federal Communications Commission, the United States Census Bureau, the United States Bureau of Labor Statistics and the United States Department of Agriculture. We describe these other data sources below.

3.1 Data Overview and Summary Statistics

The combined dataset for empirical analysis includes 189,616 observations over the 2003-2010 period. Table 1 provides summary statistics on households' subscription to wireline and wireless services, while Figure 1 shows the evolution of households' portfolio choices over the 2003-2013 period.[18] Several characteristics of households' portfolio choices are noteworthy. First, the proportion of households not subscribed to any telephony service is small (about one percent) and remains so throughout the sample period. Second, the proportion of

[16] For a detailed overview, see $http://www.cdc.gov/nchs/nhis/about\_nhis.htm$.

[17] To provide additional assurance that our empirical analysis is not unduly affected by the sampling methods of the NCHS, we employ the sampling weights established by CDC as a robustness check to the estimations we report in Section 4. The results we report are substantively unchanged by the application of the sample weights.

[18] The extended publicly available data for 2011-2013 are available at http://www.cdc.gov/nchs/nhis/quest_data_related_1997_forward.htm. The data shown in Figure 1 are unweighted. Weighted observations yield essential the same pattern as what is reported here.

households subscribed exclusively to wireline service decreased dramatically from roughly 49 percent in 2003 to just under 9 percent in 2013. Third, the corresponding share of households subscribing exclusively to wireless telephony grew over the sample period from roughly four percent in 2003 to nearly 42 percent in 2013. Finally, households subscribing to both services grew at the beginning of the sample period from 46 percent to a peak of 61 percent in 2007 and has subsequently declined to 47 percent in 2013.

The data also reveal important subscription pattern differences by household income. Figure 2 shows the evolution of telephone portfolio choices for households that are below the poverty thresholds in each year. By 2013, the share of poor households subscribing to wireless services only (around 57 percent) was significantly higher than the share of all households subscribing to wireless services only (around 42 percent). Similarly, by 2013 poor households subscribed in larger proportions to wireline service only (roughly 13 percent) in comparison to all households (roughly 9 percent).

Finally, the data point to important changes in telephone portfolio choices by household age. Figure 3 shows that the movement to wireless-only consumption has been particularly dramatic for young households (household members less than 31 years old) over the 2003-2013 period. In 2003, nearly 13 percent of young households subscribed exclusively to wireless services and over 85 percent subscribed to either wireline service only or both wireline and wireless services. But by 2013, over 82 percent of young households subscribed only to wireless service, while the share subscribing to wireline only had fallen to approximately one percent and the share subscribing to both services had fallen to roughly 13 percent.

3.2 Variables

Our effort to capture variations in observed household telephone portfolio choices focuses on four categories of variables. First, based on the Section 2.1 discussion, we include variables that are designed to capture the degree to which household members are affiliated more closely with their domicile (node), or alternatively are considered more mobile. Second, we incorporate measures of the respective prices of wireline and wireless telephone service, along with measures of household income. Third, we include measures that seek to capture the wireless telecommunications quality relative to the wireline network. Finally, we include measures to account for demographic characteristics of households.[19] We provide a general overview of these variables below, but a more detailed set of variable definitions and sources is provided in Appendix B.

[19] As implied by equations (1)-(4) above, the conceptual possibility of network externalities may also drive consumer demand among telecommunications users. Because network subscription rates within our sample are very high (consistently in excess of 98 percent), we choose as a practical matter to not pursue these potential effects which are likely to be *de minimus* at subscription levels approaching 100 percent.

Nodal Variables Several variables are included to capture the degree to which household members are more (less) closely affiliated with their nodal domicile. Because older households typically spend a greater proportion of their time at home,[20] we include several age-related variables. We first account for whether the household includes a retired individual (*Retired Household*).[21] We next account for whether the household consists solely of individuals under age 31 (*Young Household*), between ages 31 and 45 (*Young-Middle Household*), between ages 45 and 64 (*Older-Middle Household*), or over age 64 (*Older Household*). We expect that older or retired households are more closely affiliated with their node and will therefore be more prone to subscribe to wireline service than wireless service. Conversely, we expect that younger households are attracted in greater proportions to wireless service, as it enhances their abilities to communicate while being "on the go". While more mobile lifestyles among younger households may be thought to create greater attraction to wireless telephony than older households, it is also possible that older consumers are leary of "new" technologies, and will remain loyal to wireline telephony longer than younger households. To allow for this potential, we also account for whether an older household is also wealthy (*Wealthy Retired Household*).[22] We expect that wealthier elderly households are more mobile and less intimidated by new technologies, thereby enhancing wireless telephony subscription.

We also account for household nodal demographics by including measures of whether the household has children (*Children*) and whether any children are students (*Student*). Our expectation is that parents place high priority on "anywhere, anytime" communications with children and students, and will accordingly have enhanced demand for wireless services relative to households without children and students. At the same time, children and students create greater attachment to the family domicile, so we also expect that children and students will create a greater propensity for the household to subscribe to wireline service.

A unique feature of our data is that it includes measures of the health of household members. To take advantage of this information, we account for potential health-related impacts on households' telephone portfolio choices. In particular, we account for households that have a health-impaired youth (*Limited Youth*) or health-impaired adult (*Limited Adult*). Our expectation for the former is that such households have a greater demand for "anywhere, anytime" communication and are therefore more inclined to include wireless telephony in their portfolio, while our expectation for the latter is that such households have a stronger nodal presence and corresponding need for wireline service.

[20] Bureau of Labor Statistics (2011).

[21] We alternatively substituted this variable with one that accounted for whether the surveyed household included a member that draws Social Security benefits. There was virtually no change in the subsequent empirical results.

[22] In an alternative specification, we accounted for the education level of the primary respondent in the retired home. The results are similar to those that we report below.

We also account for the working status of the household via several variables. We first account for the ratio of household members employed outside the home (*Ratio Working*). We suggest that work-related matters take household members away from their domicile, making nodal wireline service less attractive and wireless service more attractive. We also account for whether any household member is employed part-time *(Part-time Employed)*. Given the mobile nature of such households, we expect that part-time employment is associated with an enhanced propensity to subscribe to wireless service. But a household member that is only employed part-time signals greater attachment to the domicile, and therefore likely enhances wireline service demand. We also account for whether a member of the household has self-identified as a housewife (*Housewife*) to examine whether this creates a greater nodal presence and, hence, attraction to wireline services.

Given the efficiency gains from the wider reach [c.f., Jensen(2007)] and the security benefits of mobile telephony in rural areas, we include a measure of the degree to which the household is located in more sparsely populated areas. In particular, we include a variable to capture the population density of the county within which the household resides (*Population Density*). We expect that for a given wireless infrastructure quality level, the propensity of rural households to subscribe to wireless telephony will be enhanced.

Finally, we account for domicile ownership using an indicator variable that differentiates between households that own their home versus rent (*Own House*). Our expectation is that ownership signals greater nodal attachment, with a corresponding increase in the propensity toward wireline telephony services.

Price and Income Variables Prices are at the heart of demand theory. Accordingly, we include measures of the individual prices of wireline and wireless services. To capture variations in wireline service prices, we begin with 2002 data on the basic flat monthly charges by wire center throughout the U.S.[23] Because the areas served by wire centers are not typically contiguous with county boundaries, we use population weights within individual wire centers to construct a weighted price by county for residential landline service throughout the U.S. To update these data for the larger sample period, we utilize the Federal Communication Commission's (FCC) "Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service" (Reference Book). In particular, the Reference Book reports the results of an annual survey of local monthly fixed telephone rates for 95 cities throughout

[23]These data were graciously provided to us by Greg Rosston, Scott Savage and Bradley Wimmer. See Rosston, Savage and Wimmer (2008) for a detailed description. While many local telephone companies offer local measured service in which customers pay a smaller monthly subscription charge and (after a call or minute allowance) pay a marginal charge per minute or call, industry sources report that the percentage of customers who avail themselves of this option is *de minimus*. Accordingly, we focus on consumers' choices based on variations in flat monthly rates.

the U.S. The year-to-year values of Pearson correlations for prices in these cities are very high, averaging .96 across for the relevant time period, indicating that the principal source of wireline rate variation is captured by our spatial disaggregation of prices at the sample period beginning. Accordingly, *Wireline Price* is updated by the values of Consumer Price Index (CPI) for local exchange service for the 2003-2010 period.[24]

We also include the price of wireless telephone service subscription. While numerous wireless subscription plans exist, they most generally entail a flat rate charge for a "bucket" of minutes.[25] For consumers whose usage levels remain within the purchased bucket, the price can be taken as the average monthly expenditure for the service.[26] Data on the average monthly revenue per user (including roaming charges and long distance toll calling) were provided to us by the Cellular Telephone and Internet Association (CTIA). We rely upon *Wireless Industry Indices*, a semi-annual survey conducted by CTIA of its member companies. In the survey, data were received by companies representing over 95 percent of all U.S. wireless subscribers, and are provided for the 2003-2010 period. While wireless prices are typically geographically invariant, state and local taxes impose spatial variations in the prices paid by consumers in different locales. To capture these variations, we incorporate state and local tax data provided by the Committee on State Taxation (COST). The data are derived from a series of studies conducted by COST, beginning in 1999 and repeated thereafter every three years (i.e., 2001, 2004, 2007 and 2010),[27] which report the prevailing state sales tax rate inclusive of general sales taxes. Local tax rates for each state were taken to be the average between those imposed in the largest city and the capital city. Federal taxes were reported separately. Any flat fees (e.g., 911, Universal Service Fund) were converted to percentages based on average monthly residential bills. In the first two reports, a single tax rate was provided that blended the state and local taxes applied to wireline local and long distance service, and mobile service. In later reports, taxes levied specifically on wireless service were reported separately. After incorporating state and local taxation

[24]Robustness checks of our estimations that employed alternative price measures, such as measures of annual telephone CPI variations or CPI ratios for local and wireless telephone service, gave results that are very similar to those reported below.

[25]Our price measurement captures the fact that the prices of calling from a wireless or wireline telephone are invariant to the type of telephone being called. While the price for wireless calling is generally invariant to the identity of the carrier of the customer being called, during the timeframe of our data, a few plans involved differentially lower prices for consumers making calls to subscribers of the same wireless provider. We are unable to capture this variation.

[26]Because there are numerous wireless carriers offering service in the United States, each with a number of wireless pricing plans, our measure of the price of wireless service is a composite measure of these plans. While it would be ideal to access individual firms pricing plans and to yoke this information with subscription decisions of the individual households in our database, this level of granularity is unavailable. Accordingly, our measure necessarily glosses over the ability of households to endogenously adopt one pricing plan, or firm, over another.

[27]See COST (1999, 2002a, 2002b, 2005a, 2005b) and Mackey (2008, 2011).

variations, our measure of *Wireless Price* entails both spatial and inter-temporal dimensions over the relevant period.[28]

As is common in modern demand estimation, we consider the potential endogeneity of prices which in our case may most directly be thought to arise either from omission of relevant exogenous variables (or product characteristics) or from a causal feedback from observed demand on prices. In the case at hand, however, potential endogeneity concerns are tempered somewhat by two considerations. First, while a common source of endogeneity bias arises from the omission of relevant independent variables, our model includes a wide-ranging and substantial number of explanatory variables that may reasonably be thought to collectively mitigate this source of endogeneity bias. Second, in our case, feedback from observed demand on prices is mitigated by the particular price-setting mechanisms in the telecommunications industry. Specifically, wireline prices are determined by the regulatory process, which in large part is driven by supply-side (cost) considerations. This is most obviously true for traditional rate-base/rate-of-return regulation. It is also true, however, for price cap regulated firms, whose initial prices under price cap regulation were most often set by existing rates that were established under rate-of-return regulation. Subsequent price changes under price cap regulation have most typically been driven by changes in measures of general inflation (e.g., the CPI) and productivity changes, neither of which tend to be driven by market demand. Similarly, geographic variations in the price of wireless telephony are captured by variations in state and local tax differences, which are, again, not driven in any obvious way by market demand and are exogenous to the carriers. While these considerations help ameliorate endogeneity concerns, as described below we nonetheless incorporate econometric methods based on Rivers and Vuong (1988) and Petrin and Train (2010) to assure the integrity of the parameter estimates and their corresponding statistics.

Drawing on the NHIS survey data, we also include measures of household income. Household income is categorized relative to an annual poverty threshold using four dichotomous variables. Household income below the poverty threshold (*Income1*), between one and two times the poverty threshold (*Income2*), between two and four times the poverty threshold (*Income3*), and more than four times the poverty threshold (*Income4*) are relevant categories.

Quality and Network Effects Variables Consistent with Section 2, we seek to capture both intertemporal and geographic variations in the relative quality of wireline and wireless services. Given that wireline service has been engineered to very high levels with *de minimis* blocking rates over our sample timeframe, we principally focus our efforts on quality

[28] We examined alternative constructions of the wireless price variable in the estimations reported below with essentially no substantive differences from those reported here.

variations in wireless services. Wireless service quality is affected by both topographical characteristics of the local calling area and the extent of infrastructure build-out. We accordingly gathered data from the United States Geological Survey (USGS) on the extent to which the hilliness or mountainous nature of the local terrain may impair wireless communications quality. *Mountainous* is coded on a 21 point scale ranging from flat plains (1), to open low hills (13), and to high mountains (21). We also account for the provisional challenges of high quality wireless service poised by large bodies of water, and accordingly gathered data from the United States Department of Agriculture (USDA) to account for the percentage of the household's county that is water (*Water*).

As noted in Section 2, the quality of wireless services may suffer either from lack of geographic coverage or from insufficient capacity relative to demand (leading to dropped calls). Wireless industry infrastructure grew significantly over the 2003-2010 period, with corresponding increases in the ubiquity of coverage and call quality. To capture this variation, we include a measure of the number of cellsites deployed over time (*Cellsites*).[29] We also account for the potential "reflection problem" identified by Manski (1993) that can arise when the average behavior in a population influences the behavior of individuals within that population. In our case, the question arises whether the observed distribution of cellphones among an individual's "community of interest" might provide a network effect as identified in equation (2). We allow, alternatively, two variables to capture any such network effect. Our broader measure is the nationwide deployment of cellsites, which serves as a proxy for the ability of an individual to reach other mobile subscribers. A more narrow measure, in the spirit of Goolsbee and Klenow (2002) is the number of cellphone subscribers within the Economic Area of the household.

Finally technological changes over the past decade have brought notable and corresponding changes to the versatility (quality) of wireline telephony. Specifically, during the first decade of the 2000s, wireline broadband was increasingly deployed across the United States. Concurrent with the deployment of wireline broadband, providers of both telephone service and cable television began to introduce bundled offerings of these services with high-speed

[29]In the initial years of cellular telephony, cell sites were typically large stand-alone towers. Over time, providers have deployed quality and capacity enhancing antennae on large buildings, utility poles, water towers, etc., so that "towers" are no longer the most accurate measure of wireless capacity. We therefore draw upon a broader measure of cell sites made available by CTIA, which includes repeaters and other cell-extending devices but excludes microwave hops. Because the specific cell site locations are proprietary, we are unable to account for their geographic distribution. More recent deployments of wireless repeaters and antennae have greater coverage and capacity-enhancing characteristics than earlier vintage deployments. Also, wireless network capacity depends upon the "back-haul" capacity of cell sites which carry wireless traffic to the landline network. Increasingly, such "back-haul" is provided by high-capacity fiber which dramatically increases the ability of specific cell sites to handle larger volumes of voice, data and video traffic. Accordingly, our count of cell sites may underestimates the actual wireless capacity and quality increases over time.

internet access.[30] To account for the potential demand effects of this increased versatility of the wired connections into households, we introduce *Wireline Broadband* which measures the proportion of households within a state over time that subscribe to wireline broadband services.[31]

Demographic Variables Finally, the existing literature has identified a number of demographic characteristics that affect the likelihood that households subscribe to the "telephone" network. Riordan (2002) surveys this literature, and also independently verifies several demographic factors as contributing to households' propensities to subscribe to wireline service. We accordingly account for households' racial composition (*White, Black, Hispanic, Asian, Indian,* and *Chinese*), gender composition (*Female Household* and *Male Household*), and marital status (*Divorced*) as controls.

4 Estimation and Results

To provide a better understanding of consumers' selection of a portfolio of available telecommunications services, we first report correlations between household's subscription to wireline and wireless telephone services. The second column of Table 2 reports tetrachoric correlations for households' decisions to adopt wireless and wireline services, respectively.[32] These estimates represent simple correlations between households' decisions to adopt wireline services with their decisions to adopt wireless services (1 if "yes", 0 if "no"). The pattern of correlations is consistently negative: households that adopt wireless telephony are less likely to adopt wireline telephony ($\rho = -.53$). The observed correlations are statistically significantly different from zero at the .01 level. As seen in Table 2, moreover, this pattern of negative correlations holds not only for the entire sample of surveyed households but also within each sample year and across all income levels, with the largest negative correlations occurring in the lowest income households.

Table 2 also reports the partial correlation coefficients between wireline and wireless consumption, after controlling for a number of variables, including price, income, demographic

[30] See Prince and Greenstein(2013)

[31] As a robustness check, we also drew directly on state-level data collected by the FCC over the 2008-2010 period on households that explicitly subscribed to wireline telephony as part of a bundled offering. The results of this alternative estimation are substantively invariant to those reported in Section 4 below, but involve sacrificing approximately 100,000 observations over the 2003-2007 period. Accordingly, we report our the estimations using *Wireline Broadband* in Section 4 below. In addition to our measure of wireline broadband, we also sought to incorporate the potential demand effects of the emergence of wireless broadband. Unfortunately both the novelty of this phenomenon and inconsistent data collection methodologies by the FCC prohibited our use of such a measure in the estimations.

[32] Tetrachoric correlations are developed for two normally distributed variables that are both expressed as dichotomous. See Greene (2012), p. 741.

variables (*Female/Male Household, Black, Divorced*), nodal variables (*Young Household, Young-Middle Household, Older-Middle Household, Children, Student, Own House, Ratio Working, Part-Time Employed, Retired Household, Wealthy Retired Household, Housewife, Limited Youth, Limited Adult, Unrelated Adults, Population Density)*, and wireless telephony quality variables (*Cellsites, Water, Mountainous, Wireline Broadband*). Column 3 indicates that the relationship between wireline and wireless consumption remains negative ($\rho = -.37$) and is highly statistically significant (even after controlling for several other correlates). The negative correlations again hold not only for the entire sample but also for each year (with the exception of 2003) and income level, with the highest (negative) correlations observed at the lowest income levels.

While these simple correlations are consistent with the substitutability of wireline and wireless services, the presence of correlations of unobserved tastes and preferences across consumers may also account for these observed patterns. Consequently, it is necessary to parse out the effects of these correlations from the true substitutability or complementarity of the services in question. It is to that effort that we now turn. Our approach embodies two identification-enabling features. First, unlike Gentzkow (2007), we are able to explicitly account for consumer reactions to observed price variations. Second, our econometric approach explicitly accounts for the potential for observed correlations in the error structures for consumers who are making their telephone portfolio decisions.

To parametrically investigate the empirical relationship between wireline and wireless subscriptions, we employ several discrete choice models. In any discrete choice analysis, the first step is to identify the available choice set. For our purposes, we assume that both wireline and wireless services are in the choice set, as is the option to not subscribe to any telephone service.[33] As described in Section 2, we seek to understand the decisions of households to adopt (or not) either wireline or wireless service.

4.1 Bivariate Probit Model

We begin with a simple specification of household decisions to adopt (or not) wireline service and, potentially independently, adopt (or not) wireless service. The results of two probit regressions are reported in Model (a) of Table 3. The first regression estimates households' decisions to adopt wireline service, and the second regression estimates households' decisions to adopt wireless service. The key assumption underlying these probit estimations

[33]To test the validity of this assumption, we examined data in the 2003 Annual Report and Analysis of Competitive Market Conditions With Respect to Commercial Mobile Services published by the Federal Communications Commission. This report examines,*inter alia*, geographic patterns of wireless deployment in the United States. It presents data that mobile coverage, while not abundant with carriers in 2002, was geographically widespread.

is that the decisions to adopt wireline service and wireless service are unrelated. To test this proposition, we allow for the possibility that the error structures across these equations are related.[34] We subsequently estimate a bivariate probit model which yokes the decision to adopt (or not) wireline and wireless services, respectively, by accounting for common correlation (ρ) between the error structure in the two equations.[35] The estimation results are shown in Model (b) of Table 3, and reveal a strong negative correlation ($\rho = -.52$) in the error structure from the two equations that is significantly different from zero ($p = .01$). The hypothesis of independence of these decisions is therefore strongly rejected. The negative and statistically significant correlation indicates that positive random errors to the wireless subscription equation are associated with negative random errors to the wireline subscription equation. Because this association is, by construction, through the error structure no causality can be inferred. Moreover, as demonstrated by Miravete and Pernias (2010) any inferences regarding the substitutability or complementarity of the services based on correlations of the error terms is inapt. The results nevertheless strongly reject the hypothesis that these decisions are made independently, indicating that the bivariate model is prefered to the estimation of two independent probit equations.

To address the endogeneity issues mentioned above we implement Rivers and Vuong's (1988) two-stage conditional maximum likelihood (2SCML) estimation of the probit and bivariate probit models. In our case, the models are estimated using the following system of equations:

$$y_{it} = \sum_{j=N,W} \beta_j Price_{ijt} + \gamma_k X_{it} + \gamma_m Z_{ijt} + \epsilon_{it}, \tag{5}$$

$$\tilde{y}_{it} = \sum_{j=N,W} \kappa_j Price_{ijt} + \xi_k X_{it} + \xi_m Z_{ijt} + \tilde{\epsilon}_{it}, \tag{6}$$

where y_{it} and $\tilde{y}_{it}$ are dummy variables which equal to 1 if a household is subscribed to wireline (respectively, wireless) service at time t. $Price_{ijt}$ is the price faced by household i for service j at time t, X_{it} is an $k \times 1$ vector of demographic and nodal characteristics of household i in year t; Z_{ijt} is an $m \times 1$ vector of quality variables for household i for telephone option j ($j = N, W$) in year t and ϵ_{it} and $\tilde{\epsilon}_{it}$ are error terms.

Allowing for the potential endogeneity of $Price_{ijt}$, we first estimate

[34] See Greene (2012), p. 738.

[35] For an earlier application of the bivariate approach, see Augereau, Greenstein, Rysman (2006) who model Internet Service Providers' propensities to offer 56K service by utilizing an "X2" modem, a Flex modem, both or neither.

$$Price_{ijt} = \tau_k X_{it} + \tau_m Z'_{ijt} + v_{ijt}, \tag{7}$$

and recover the estimated residuals $\hat{v}_{ijt}$ from equation (12). This in turn allows us to estimate

$$y^{\star}_{it} = \sum_{j=N,W} \beta_j Price_{ijt} + \gamma_k X_{it} + \gamma_m Z_{ijt} + \sum_{j=N,W} \omega_j \hat{v}_{ijt} + \epsilon'_{it}, \tag{8}$$

$$\tilde{y}^{\star}_{it} = \sum_{j=N,W} \kappa_j Price_{ijt} + \xi_k X_{it} + \xi_m Z_{ijt} + \sum_{j=N,W} \theta_j \hat{v}_{ijt} + \tilde{\epsilon}'_{it}, \tag{9}$$

where Z'_{ijt} is an $(m+2) \times 1$ matrix which includes Z_{ijt} and two exclusion restrictions (*Telecommunications Wages*, *Mobile Penetration*).[36] Here $\beta_j, \omega_j, \kappa_j, \theta_j,\ j = N, W$ are parameters to be estimated, and τ_k, τ_m, γ_k, γ_m, ξ_k and ξ_m are vectors of parameters to be estimated. We assume that both (X_{it}, Z'_{ijt}, ϵ'_{it}, v_{ijt}) and (X_{it}, Z'_{ijt}, $\tilde{\epsilon}'_{it}$, v_{ijt}) are i.i.d; (v_{ijt}, ϵ'_{it}) and (v_{ijt}, $\tilde{\epsilon}'_{it}$) conditional on X_{it} and Z'_{ijt} have joint normal distributions with mean zero and finite positive definite covariance matrices.

In this case

$$y_{it} = \begin{cases} 1, & \text{if } y^{\star}_{it} > c, \\ 0, & \text{otherwise,} \end{cases} \tag{10}$$

and

$$\tilde{y}_{it} = \begin{cases} 1, & \text{if } \tilde{y_{it}}^{\star} > \tilde{c}, \\ 0, & \text{otherwise,} \end{cases} \tag{11}$$

where c and $\tilde{c}$ represent critical cutoff values that trigger household decisions to subscribe to wireline or wireless service, respectively.

For the bivariate probit model we allow correlation between ϵ'_{it} and $\tilde{\epsilon}'_{it}$ in the second step.

[36] Our exclusion restrictions seek to capture observable variables that may drive prices but which are not drawn from the demand side. Accordingly, we draw upon measures designed to capture cost variations (and hence indirectly prices) including a measure of telecommunications wages that varies by state and year and a measure of the density of mobile penetration by Economic Area which also varies by year.

That is,

$$\begin{pmatrix} \epsilon_{it}^{'} \\ \tilde{\epsilon}_{it}^{'} \end{pmatrix} | Price_{ijt}, X_{it}, Z_{ijt}^{'} \Bigg) \sim N \left[\begin{pmatrix} 0 \\ 0 \end{pmatrix}, \begin{pmatrix} 1 & \rho \\ \rho & 1 \end{pmatrix} \right], \tag{12}$$

where ρ captures the correlation in the errors across equations (13) and (14). The resulting estimates are consistent and asymptotically normally distributed. Our asymptotic covariance matrix of the 2SCML estimator is based on Rivers and Vuong (1988).[37]

After incorporating the interdependence of the wireline and wireless service subscription choice and accounting for endogeneity, the bivariate probit model performs quite well as shown in Table 3, Model (b). A comparison of the portfolio choices predicted by the model and those actually chosen indicates a good fit. The model correctly predicts 68 and 97 percent of households' portfolio decisions in the wireline and wireless equations, respectively. The specific parameter estimates also provide insight into the determinants of households' portfolio choices for telephony service. The nodal variables provide strong support for the concepts advanced in Section 2 above. In particular, households that are more closely attached to their domicile (node) are more likely to subscribe to wireline service and less likely to subscribe to wireless service. For example, households with a retired household member are significantly more likely to subscribe to wireline service and significantly less likely to subscribe to a wireless service. Other age-related variables that characterize household members (e.g., *Young Household* and *Young-Middle Household*) similarly reflect the greater propensity of younger and more mobile households to subscribe to wireless service, and the corresponding decrease in the propensity of these households to subscribe to wireline telephone service.

Households with different levels of work-related attachments are found to be attracted differentially to wireline and wireless services. In particular, *Ratio Working* increases the propensity to subscribe to wireless telephony and decreases the propensity to subscribe to wireline telephony. Households in which a member works part-time (*Part-Time Employed*) are more likely to subscribe to both wireline and wireless service, in comparison to other households. Households with a self-reported *Housewife* appear more more likely to subscribe to wireline service and less likely to subscribe to wireless service, though these results are statistically insignificant.

Households with a health-limited youth (*Limited Youth*) are no different than other house-

[37] See, in particular, Rivers and Vuong (1988) equations 4.7 and 4.11. Matrices incompatibility prohibits computation of the covariance matrix for recursive bivariate probit model, discussed below, which includes an additional explanatory variable. Nevertheless we provided estimation results from the second step and these are largely consistent with those obtained in the other estimations.

holds in their propensity to subscribe to wireline service, but as anticipated are significantly more likely to subscribe to wireless service than other households. By contrast, households with a health-limited adult (*Limited Adult*) are more likely to subscribe to wireline services and less likely to subscribe to wireless services than other households. Households with students (*Student*) have significantly higher propensities to subscribe to wireless telephony and have significantly lower propensities to subscribe to wireline service. The estimations also reveal that, *ceteris paribus*, households in more rural areas have higher demands for wireless services in comparison to households in more urban areas. Finally, the estimations indicate that home ownership (*Own House*) is strongly associated with subscription to both wireline service and wireless service.

The price and income parameters are also revealing. Consistent with standard demand theory, *Wireline Price* and *Wireless Price* negatively [and statistically significantly *(p = .01)*] impact the demand for wireline and wireless service, respectively.[38] Beyond the own-price impact, however, the estimations also reveal that the cross-price effects are positive and highly statistically significant. Changes in the price of wireline service positively impact the demand for wireless service, while changes in the price of wireless services positively affect the propensity to subscribe to wireline service. The estimations indicate that consumers view wireline and wireless telephone subscriptions as substitutes. While the nonlinear nature of the estimations prevents simple interpretations of marginal effects (ME), they are estimable.[39] Specifically, recalling that $Q_n = \pi_N + \pi_{NW}$ and $Q_W = \pi_W + \pi_{NW}$, we estimate the marginal price effects $\frac{\partial Q_N}{\partial P_N}$, $\frac{\partial Q_W}{\partial P_W}$, $\frac{\partial Q_N}{\partial P_W}$ and $\frac{\partial Q_W}{\partial P_N}$. The results are presented in Table 4, and indicate that the own-service marginal effects are both negative and statistically significant *(p=.01)*, while the cross-partial derivatives are both positive and highly significant *(p=.01)*.[40] From equation (9), this latter result again indicates that wireline and wireless services display substitutable rather than complementary characteristics over the 2003-2010 period.

[38]To account for the potential for heterogeneous responses of consumers across income and age categories, we alternatively included price interacted with income category and price interacted with age category. In some instances we found that younger people are less price-sensitive to the price of mobile service in the mobile equation. Estimates also provide modest indications that younger people are more price-sensitive with respect to the price of wireline service. We also find that lower income households are generally more price-sensitive than higher income households. Given the broad income and age categorizations, however, these results suffer from collinearity and are somewhat unstable. Accordingly, they are not reported here.

[39]In nonlinear models with single-index form conditional means, marginal effects are calculated using the formula $ME_j = \frac{\partial \pi_j}{\partial x_j} \times \beta_j$. In our case, marginal effects are calculated at mean values of independent variables. For the bivariate probit model, we calculate marginal effects for the following probabilities: $\pi_N, \pi_W, \pi_{NW}, \pi_0, \pi_{W|N}, \pi_{N|W}, \pi_N + \pi_{NW}, \pi_W + \pi_{NW}$. (Cameron and Trivedi (2010)).

[40]Our estimates are conservatively based on the assumption that consumers respond to any price stimulus within a single period. To the extent that consumers fail to fully equilibrate within a single period (due, for example, to the multiyear nature of some wireless contracts) our estimates may be seen as a lower bound on the true marginal effects.

Table 4 indicates that *Income* is an important determinant to wireline and wireless subscription. In each case, income increments for those below the poverty threshold to higher levels increase subscription to both wireline and wireless services. The marginal effect of an income shift from the lowest to the highest category results in about a six percent increase in the likelihood of wireline service subscription *(p=.01)* and about a 26 percent increase in the likelihood of wireless service subscription *(p=.01)*.

The quality and diffusion of wireless service are also found to affect consumers' telephony portfolio decisions. *Cellsites* is positive and highly significant *(p=.01)*, indicating as expected that quality improvements associated with greater coverage increases wireless telephony subscription. The *Cellsites* variable also captures the potential network effect of the impact of the increasing proliferation of the network on the likelihood that any household i will subscribe to wireless service.[41] Similarly, the diffusion of wireline broadband (*Wireline Broadband*) is seen to have enhanced the propensity to retain wireline telephone service and stem the move to wireless service. Finally, areas with more challenging topographies, such as mountains or large bodies of water, which reduce wireless service quality are found to reduce wireless subscription.

Among the most substantial changes in households' telephony portfolio over the 2003-2010 period, the shift away from "wireline-only" is arguably the most dramatic. As Figure 1 indicates, approximately 50 percent of all U.S. households subscribed exclusively to wireline telephony in 2003. That percentage had fallen to 12 percent by 2010. To explore this phenomena in more detail, we bifurcate the sample into an early period (2003-2006) and a later period (2007-2010).[42] Specifically, we decompose the aggregate marginal effects: $-\frac{\partial \pi_N}{\partial P_N} = \frac{\partial \pi_W}{\partial P_N} + \frac{\partial \pi_{NW}}{\partial P_N} + \frac{\partial \pi_0}{\partial P_N}$, permitting us to see how the marginal reaction of consumers to relative prices has evolved over time. Table 5 shows the decomposition results of the total marginal substitution effect associated with a change in the price of wireline service. In the 2003-2006 period, there is relatively moderate substitution directly away from wireline services. During this period, only about one-half of the marginal substitution from wireline-only customers was the result of households becoming wireless-only, with the other half seemingly trying out wireless telephony but not dropping their wireline service. By the 2007-2010 period, however, the marginal impact on wireline only households was largely toward a wireless-only portfolio choice. That is, the dominant marginal effect to any elevation of wireline prices in the later period was for households to "cut the cord" and go wireless-only.

[41] The geographic scope of any network effect is difficult to bound conceptually. Accordingly, in an alternative estimation we employed a more narrow geographic measure of the potential for network effects by including a measure of the extent of wireless subscription in the county in which the household is located. This approach, which parrots Goolsbee and Klenow (2002), yields similar results to those reported here.

[42] We find similar patterns emerge if alternative years are chosen for this bifurcation.

4.2 Mixed Logit Model

To this point, we have permitted households' decisions to adopt wireless and wireline telephony to be related, but not part of a single household decision-making process. To allow for this possibility, we utilize a mixed logit model. This model accounts for heterogeneity in consumers' preferences and relaxes the assumption of the independence of error terms in the utility specification, unlike a multinomial logit model. In our model we allow the price coefficient to vary randomly across consumers. We specify the price coefficient to be independently normally distributed. We also account for potential endogeneity of the prices.

A consumer faces four alternatives for a telephone: (1) no phone, (2) wireline only, (3) wireless only, or (4) both wireline and wireless, and chooses the alternative with the highest level of utility. The utility of option j ($j = N, W, NW$), which accordingly corresponds to the choice of wireline only (N), wireless only (W), or both phones (NW) can be written as:

$$U_{ijt} = V(Price_{ijt}, X_{it}, Z_{ijt}, \beta_i) + \epsilon_{ijt}, \tag{13}$$

where all variables have the same notation as described above in the Bivariate Probit Model section, β_i is a random price coefficient that represents taste of consumer i, and ϵ_{ijt} is the unobserved portion of utility.

To address the issue of potential endogeneity of prices, we follow Petrin and Train (2010), implementing a control function approach. The idea behind the control function approach is to derive proxy variables that condition on the parts of endogenous variables that are correlated with the unobserved utility ϵ_{ijt}. This approach can be implemented if the endogenous variables are regressed on all the exogenous variables that enter utility and some variables Y that do not directly enter utility, but which do impact the endogenous variables (these variables are called exclusion restrictions).

The control function approach is conducted in two stages. In the first stage, OLS regression of prices (wireline and wireless) on the exogenous explanatory variables and exclusion restrictions is implemented:

$$Price_{ijt} = f(X_{it}, Z'_{ijt}, Y_{ijt}) + v_{ijt}. \tag{14}$$

Then we recover the estimated residuals to use them as control functions in the estimation of mixed logit in the second stage.

$$\epsilon_{ijt} = CF(v_{ijt}; \lambda) + \tilde{\epsilon}_{ijt}, \tag{15}$$

where λ is the corresponding 3×1 vector of parameter of the control function. We specify the control function (CF) as linear in v_{ijt}; $\tilde{\epsilon}_{njt}$ are i.i.d. extreme value and independent of other regressors.

The utility function with the control function that generates the mixed logit model is specified as:

$$U_{ijt} = V(Price_{ijt}, X_{it}, Z_{ijt}, \beta_i) + \lambda v_{ijt} + \sigma\eta_{ij} + \tilde{\epsilon}_{ijt}, \tag{16}$$

where η_{ij} is i.i.d. standard normal. The model is a mixed logit, with mixing over the error components η_{ij} , whose standard deviation σ is estimated, as well as over the random elements of β_i.

Conditional of the CF, the probability that consumer i chooses alternative s is equal to

$$P_{is} = 1(U_{ist} > U_{ijt} \forall j \neq i) f(\beta_i, \tilde{\epsilon}_i) \phi(\eta_i) d\beta_i d\tilde{\epsilon}_i d\eta_i \tag{17}$$

Given that the error terms follow extreme value distribution, the mixed logit probability based on this utility is

$$P_{is} = \int \Big(\frac{e^{V_{is}(v_i, \nu_i, \eta_i)}}{\sum_{j=1}^{4} e^{V_{ij}(v_i, \nu_i, \eta_i)}}\Big) \phi(v_i)\phi(\nu_i)\phi(\eta_i) dv_i d\nu_i d\eta_i. \tag{18}$$

Table 6 provides the results of the Mixed Logit model, which are similar to those provided in the Bivariate Probit estimation of Table 3. The importance of both the household's nodal propensities as well as price and income are confirmed. The price that households face for their respective portfolio choice is negative and highly statistically significant, indicating that consumers are price sensitive across the various options as they consider their portfolio of telephone services. Consumers from the lowest income category are the most price sensitive. Similarly, the nodal variable parameter estimates from the Mixed Logit model are quite similar in nature to those generated in the Bivariate Probit model, providing reassuring robustness.

5 Conclusion

The introduction of new products or services with new technologies and characteristics presents a number of challenges to traditional demand analysis. Faced with this situation, consumers may replace or augment their existing consumption portfolios. In particular, the new product or service may serve as either a substitute or complement to the existing product or service. In this regard, the advent and diffusion of wireless telecommunications has radically altered traditional consumption patterns among consumers, creating a natural opportunity to consider telecommunications demand with a portfolio choice lens.

In this paper, we develop an economic framework capable of capturing the pattern and evolution of telecommunications consumers' portfolio consumption choices. In doing so, we provide several contributions that may serve as a platform for subsequent research. First, we formulate a portfolio choice framework for how households satisfy their communications needs. Second, within that portfolio choice model, we develop a theory of why (non-price) characteristics of households, especially related to their "nodal" versus mobile tendencies, affect their subsequent telephony portfolio choices. Third, the portfolio choice framework sheds considerable light on the "substitutes versus complements" issue that underpins competition and regulatory policies toward the telecommunications industry. Fourth, given our data window from 2003-2010, we are able to observe empirically how variations in the quality and ubiquity of the "new service" affects consumers' portfolio choices.

The empirical results provide considerable support for the approach that we have adopted. In particular, we find that variations in households' nodal characteristics serve as important drivers their portfolio choices of telephone service. Households that are more closely attached to their domiciles are more attracted toward wireline service, while households with more mobile lifestyles are more attracted to wireless telephony. The results also consistently and robustly reveal that wireline and wireless services have increasingly become substitutes. Variations in the quality and ubiquity of wireless telephony are found to be important determinants of wireless telephony subscription growth relative to wireline telephony over the 2003-2010 period.

Finally, our results may prove useful in a policy domain. At the most general level, our approach here may be seen as a platform for tracking the evolution of consumer responses to the emergence of new technologies. Understanding such responsiveness is crucial in the design of regulatory and competition policies. And, specifically, in its considerations of the appropriate level of regulation for wireline telephone services, the Federal Communications Commission has indicated that the issue of access substitution between wireline and wireless services is "critical" and a "difficult question."[43] While our study is generally directed at

[43]See Memorandum and Order, In the Matter of Petition of Qwest Corporation for Forbearance Pursuant

the more basic questions of the economic drivers of households' telephony portfolio choices, our results provide clear and robust indications of the access substitutability of wireline and wireless services. This substitutability indicates that regulatory policies designed that silo wireline and wireless services are no longer apt.

While advancing our understanding of households' portfolio choices, our research points toward next steps that hold the potential to paint a more complete picture of economic outcomes in the telecommunications industry. For example, our focus has been on the demand side of the evolving industry. By specifying and estimating a stylized supply-side model it may be possible to extend our results in several ways. For instance, with an appropriate specification of the supply side both the social welfare effects of the adoption of wireless services and the atrophying traditional fixed-line services could be evaluated. Also, by using knowledge of the cost structure it may be possible to conduct counter-factual simulations that could include, for instance, an examination of what pricing in wireline/wireless services would be in the absence of the other service. Additionally, such a more complete model would permit an identification of optimal pricing as done by Gentzkow (2007) in the provision of online and print newspapers. Our analysis here has also abstracted from a salient feature of the market for wireless telephony services; namely the durability of the hardware and consumer switching costs associated with early termination of wireless contacts. This suggests that subsequent research that considers intertemporal optimization in individual consumer decisions may provide substantial additional insights not afforded by our approach.

to 47 U.S.C. Section 160(c) in the Phoenix Metropolitan Area, WC Docket No. 09-135, Federal Communications Commission, p. 30.

APPENDIX A

COMPARISON OF NHIS AND THE US CENSUS BUREAU DEMOGRAPHICS

	General Demographic Characteristics: July 2006	NHIS Sample 2006	General Demographic Characteristics: July 2007	NHIS Sample 2007	General Demographic Characteristics: July 2008	NHIS Sample 2008	General Demographic Characteristics: July 2009	NHIS Sample 2009
SEX AND AGE								
Male	49.27%	48.28%	49.29%	48.35%	49.31%	48.35%	49.33%	48.19%
Female	50.73%	51.72%	50.71%	51.65%	50.69%	51.65%	50.67%	51.81%
Under 5 years	6.82%	7.37%	6.87%	7.71%	6.91%	7.50%	6.94%	7.37%
5 to 9 years	6.58%	7.79%	6.58%	7.79%	6.60%	7.70%	6.71%	7.90%
10 to 14 years	6.89%	7.69%	6.74%	7.81%	6.60%	7.50%	6.51%	7.65%
15 to 19 years	7.12%	7.46%	7.12%	7.54%	7.08%	7.38%	7.02%	7.50%
20 to 24 years	7.05%	6.63%	6.97%	6.49%	6.93%	6.50%	7.02%	6.19%
25 to 34 years	13.50%	13.29%	13.46%	13.31%	13.46%	13.47%	13.54%	13.15%
35 to 44 years	14.58%	14.64%	14.31%	14.44%	13.98%	14.01%	13.53%	13.89%
45 to 54 years	14.46%	14.06%	14.55%	14.14%	14.59%	14.22%	14.52%	14.28%
55 to 59 years	6.09%	5.66%	6.05%	5.54%	6.11%	5.95%	6.18%	5.91%
60 to 64 years	4.46%	4.31%	4.80%	4.34%	4.97%	4.63%	5.15%	5.05%
65 to 74 years	6.32%	6.10%	6.42%	6.04%	6.62%	6.10%	6.77%	6.26%
75 to 84 years	4.36%	3.77%	4.32%	3.72%	4.28%	3.84%	4.28%	3.67%
85 years and over	1.77%	1.22%	1.83%	1.13%	1.88%	1.21%	1.83%	1.18%
Median age (years)	36.4	34	36.6	34	36.8	34	36.8	35
18 years and over	75.37%	72.39%	75.50%	71.85%	75.68%	72.68%	75.72%	72.36%
21 years and over	71.18%	68.36%	71.31%	67.86%	71.43%	68.61%	71.41%	68.34%
62 years and over	15.08%	13.48%	15.24%	13.25%	15.41%	13.57%	15.79%	14.00%
65 years and over	12.45%	11.09%	12.56%	10.89%	12.78%	11.15%	12.89%	11.11%
18 years and over	75.37%	72.39%	75.50%	71.85%	75.68%	72.68%	75.72%	72.36%
Male	36.67%	34.25%	36.75%	33.89%	36.86%	34.33%	36.91%	34.04%
Female	38.71%	38.14%	38.75%	37.96%	38.82%	38.35%	38.81%	38.32%
65 years and over	12.45%	11.09%	12.56%	10.89%	12.78%	11.15%	12.89%	11.11%
Male	5.23%	4.80%	5.30%	4.73%	5.41%	4.77%	5.48%	4.90%
Female	7.22%	6.29%	7.26%	6.16%	7.37%	6.38%	7.41%	6.20%
RACE								
White	80.08%	66.94%	79.96%	67.29%	79.80%	66.62%	79.57%	66.15%
Black or African American	12.81%	16.18%	12.85%	15.51%	12.85%	15.59%	12.91%	15.75%
American Indian and Alaska Native	0.97%	0.89%	0.97%	1.16%	1.01%	1.10%	1.03%	0.81%
Asian	4.40%	6.35%	4.43%	5.88%	4.46%	6.30%	4.56%	6.41%
HISPANIC OR								
Hispanic or Latino (of any race)	14.80%	23.59%	15.09%	24.64%	15.44%	23.85%	15.77%	25.34%
Not Hispanic or Latino Total	85.20%	76.41%	84.91%	75.36%	84.56%	76.15%	84.23%	74.66%

APPENDIX B

VARIABLES DESCRIPTION AND SOURCE

DEPENDENT VARIABLES	***DESCRIPTION AND SOURCE***
Wireline	This variable is dichotomous, taking on a value of 1 if the surveyed household subscribed to wireline telephone service at the time of the survey, and is zero otherwise.
	Source: National Health Interview Survey, annual, 2003-2010.
Wireless	This variable is dichotomous, taking on a value of 1 if the surveyed household subscribes to wireless telephone service at the time of the survey, and is zero otherwise.
	Source: National Health Interview Survey, annual, 2003-2010.
NODAL VARIABLES	***DESCRIPTION AND SOURCE***
Retired Household	This variable is dichotomous, taking on a value of 1 if surveyed household includes retired person
	Source: National Health Interview Survey, annual, 2003-2010.
Housewife	This variable is dichotomous, taking on a value of 1 if surveyed household includes member who keeps the house
	Source: National Health Interview Survey, annual, 2003-2010.
Part-Time Employed	This variable is dichotomous, taking on a value of 1 if someone in surveyed household works 20 hours or less
	Source: National Health Interview Survey, annual, 2003-2010.
Limited Youth	This variable is dichotomous, taking on a value of 1 if surveyed household includes member who has health limitations and under age 31
Limited Adult	This variable is dichotomous, taking on a value of 1 if surveyed household includes member who has health limitations and above age 30
	Source: National Health Interview Survey, annual, 2003-2010.
Young Household	This variable is dichotomous, taking on a value of 1 if all members of surveyed household are under age 31
Young-Middle Household	This variable is dichotomous, taking on a value of 1 if all members of surveyed household are between ages 31 and 44
Older-Middle Household	This variable is dichotomous, taking on a value of 1 if all members of surveyed household are between ages 45 and 64
Older Household	This variable is dichotomous, taking on a value of 1 if all members of surveyed household are above age 65
	Source: National Health Interview Survey, annual, 2003-2010.
Wealthy Retired Household	This variable is dichotomous, taking on a value of 1 if all members of surveyed household are above age 65 and have ratio of family income to poverty threshold above 4
	Source: National Health Interview Survey, annual, 2003-2010.
Unrelated Adults	This variable is dichotomous, taking on a value of 1 if surveyed household includes only unrelated adults
	Source: National Health Interview Survey, annual, 2003-2010.
Children	This variable is dichotomous, taking on a value of 1 if surveyed household includes member under age 18
	Source: National Health Interview Survey, annual, 2003-2010.
Student	This variable is dichotomous, taking on a value of 1 if surveyed household includes students
	Source: National Health Interview Survey, annual, 2003-2010.
Own House	This variable is dichotomous, taking on a value of 1 if someone in surveyed household owns the home
	Source: National Health Interview Survey, annual, 2003-2010.
Ratio Working	Ratio of people in the surveyed household who work
	Source: National Health Interview Survey, annual, 2003-2010.
DEMOGRAPHIC VARIABLES	***DESCRIPTION AND SOURCE***

Female Household	This variable is dichotomous, taking on a value of 1 if the surveyed household includes only females, and is zero otherwise.
	Source: National Health Interview Survey, annual, 2003-2010.
Male Household	This variable is dichotomous, taking on a value of 1 if the surveyed household includes only males, and is zero otherwise.
	Source: National Health Interview Survey, annual, 2003-2010.
White	This variable is dichotomous, taking on a value of 1 if the surveyed household consists of white people only, and is zero otherwise.
Black	This variable is dichotomous, taking on a value of 1 if the surveyed household consists of Black/African American people only, and is zero otherwise.
Hispanic	This variable is dichotomous, taking on a value of 1 if the surveyed household consists of Hispanic people only, and is zero otherwise.
Asian	This variable is dichotomous, taking on a value of 1 if the surveyed household consists of Asian people only, and is zero otherwise.
Indian	This variable is dichotomous, taking on a value of 1 if the surveyed household consists of Indian people only, and is zero otherwise.
Chinese	This variable is dichotomous, taking on a value of 1 if the surveyed household consists of Chinese people only, and is zero otherwise.
	Source: National Health Interview Survey, annual, 2003-2010.
Divorced	This variable is dichotomous, taking on a value of 1 if surveyed household includes divorced member
	Source: National Health Interview Survey, annual, 2003-2010.
Population Density	Population density, county level.
	Source: U.S. Census Bureau, annual 2003-2010
PRICE AND INCOME VARIABLES	***DESCRIPTION AND SOURCE***
Wireline Price	*As discribed in the text, see p.11*
	Source: data was supplied by Greg Rosston, Scott Savage and Breadley Wimmer, who collected it for the purposes of the research in Rosston, Savage and Wimmer (2008), adjusted for years 2003-2009
Wireless Price	As discribed in the text, see p. 12
	Source: CTIA's Wireless Industry Report Indices, 2008
CPI for Wireless Telephone Services	Consumer price index for wireless telephone services
	Source: FCC "Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service", annual
CPI for Wireline Telephone Services	Consumer price index for wireline telephone services
	Source: FCC "Reference Book of Rates, Price Indices, and Household Expenditures for Telephone Service", annual
State and Local Taxes on Wireless Telephony	As discribed in the text, see p. 12
	Source: The Council on State Taxation (COST), years 2001, 2004, 2007, 2010
Income1	This variable is dichotomous, taking on a value of 1 if the surveyed household has family income below the poverty threshold
Income2	This variable is dichotomous, taking on a value of 1 if the surveyed household has a ratio of family income to poverty threshold between 1 and 2
Income3	This variable is dichotomous, taking on a value of 1 if the surveyed household has a ratio of family income to poverty threshold between 2 and 4
Income4	This variable is dichotomous, taking on a value of 1 if the surveyed household a has ratio of family income to poverty threshold is above 4
	Source: National Health Interview Survey, annual, 2003-2010.
QUALITY VARIABLES	***DESCRIPTION AND SOURCE***
Mountainous	Land Surface Form Typography code, ranges from 1 to 21. Higher value indicates more mountainous surface.
	Source: U.S. Department of Agriculture, Area Resource File, http://www.ers.usda.gov/Data/NaturalAmenities/

Water	Percent water area in the county
	Source: U.S. Department of Agriculture, Area Resource File, http://www.ers.usda.gov/Data/NaturalAmenities/
Cellsites	Number of registered cellsites
	Source: CTIA's Wireless Industry Report Indices, annual
Wireline Broadband	Number of residential connections over 200 kbps in at least one direction, by state
	Source: FCC Internet Access Services Report, 2004-2011
EXCLUSION RESTRICTIONS	***DESCRIPTION AND SOURCE***
Telecommunications Wages	Mean annual wage for Telecommunications Equipment and Line Installers and Repairers
	Source: Bureau of Labor Statistics, Department of Labor, 2003-2010
Mobile Penetration	Mobile wireless services penetration rate in a county
	Source: National Health Interview Survey, annual, 2003-2010.

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FIGURE 1
HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NONE
2003-2013

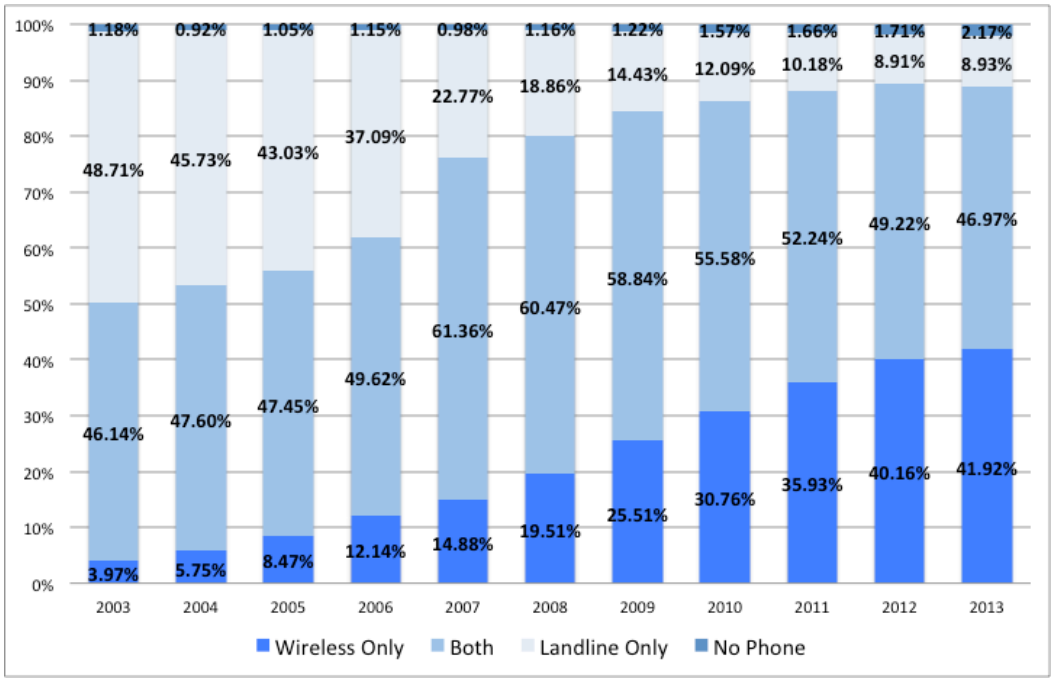

FIGURE 2
HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NONE
AMONG HOUSEHOLDS BELOW POVERTY THRESHOLD
2003-2013

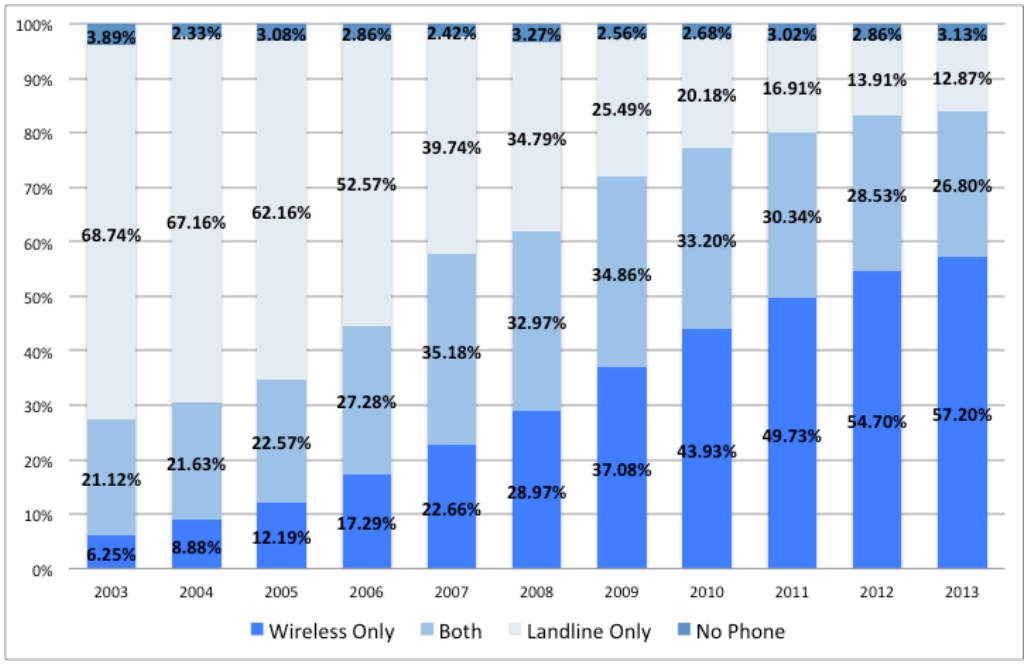

FIGURE 3
HOUSEHOLDS WITH WIRELINE, WIRELESS, BOTH OR NONE
AMONG HOUSEHOLDS WITH ALL MEMBERS UNDER AGE 31
2003-2013

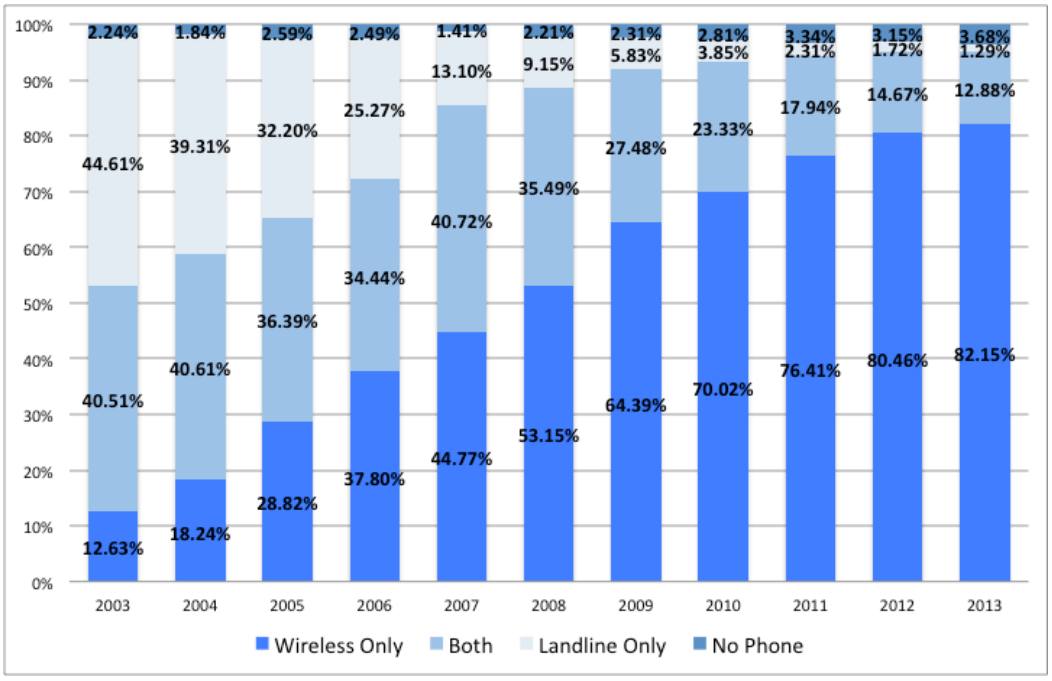

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TABLE 1
WIRELINE AND WIRELESS CONSUMPTION

Whole Sample		
Phone	***Frequency***	***Percent***
None	2,228	1.18%
Wireline Only	56,141	29.61%
Wireless Only	29,831	15.73%
Both	101,416	53.48%
Whole Sample	189,616	100.00%

TABLE 2
TETRACHORIC AND PARTIAL CORRELATIONS FOR WIRELINE AND WIRELESS CONSUMPTION

	Tetrachoric Correlation	***Partial correlation***
Full Sample	-0.5328*	-0.3720*
Year 2003	-0.3384*	0.0507*
Year 2004	-0.4651*	-0.0562*
Year 2005	-0.5196*	-0.1343*
Year 2006	-0.5457*	-0.2001*
Year 2007	-0.4519*	-0.138
Year 2008	-0.4452*	-0.1798*
Year 2009	-0.4433*	-0.1888*
Year 2010	-0.4098*	-0.2268*
Income1	-0.7187*	-0.6631*
Income2	-0.6836*	-0.6013*
Income3	-0.5724*	-0.4864*
Income4	-0.3859*	-0.4164*

*Significant at 1 percent.

TABLE 3

PARAMETER ESTIMATES FOR PROBIT AND BIVARIATE PROBIT MODELS

	Model (a)		Model (b)	
	Probit		Bivariate probit	
VARIABLES	***wireline***	***wireless***	***wireline***	***wireless***
Wireless				
Price				
Wireline Price	-0.0134*	0.0372***	-0.0101	0.0367***
	(0.00748)	(0.00607)	(0.00743)	(0.00606)
Wireless Price	0.0849***	-0.0611***	0.0826***	-0.0611***
	(0.00376)	(0.00295)	(0.00373)	(0.00294)
Income				
Income2	-0.0108	0.242***	-0.00989	0.240***
	(0.01480)	(0.01230)	(0.01480)	(0.01230)
Income3	0.137***	0.550***	0.120***	0.546***
	(0.01380)	(0.01170)	(0.01380)	(0.01170)
Income4	0.369***	0.859***	0.342***	0.849***
	(0.01530)	(0.01340)	(0.01530)	(0.01340)
Nodal				
Retired Household	0.465***	-0.168***	0.439***	-0.170***
	(0.02650)	(0.01820)	(0.02590)	(0.01820)
Young Household	-0.793***	0.432***	-0.795***	0.443***
	(0.01240)	(0.01230)	(0.01240)	(0.01230)
Young-Middle Household	-0.398***	0.264***	-0.411***	0.266***
	(0.01790)	(0.01640)	(0.01780)	(0.01640)
Older-Middle Household	0.0753***	0.0751***	0.0530***	0.0684***
	(0.01660)	(0.01290)	(0.01650)	(0.01290)
Student	-0.0786***	0.318***	-0.0617***	0.313***
	(0.01990)	(0.01810)	(0.02000)	(0.01800)
Housewife	0.0242	-0.00908	0.0129	-0.00926
	(0.01520)	(0.01180)	(0.01500)	(0.01170)
Part-Time Employed	0.146***	0.129***	0.142***	0.127***
	(0.01340)	(0.01160)	(0.01330)	(0.01160)
Ratio Working	-0.439***	0.397***	-0.423***	0.399***
	(0.02240)	(0.01750)	(0.02200)	(0.01750)
Limited Youth	0.000195	0.109***	-0.00185	0.108***
	(0.01510)	(0.01270)	(0.01490)	(0.01260)
Limited Adult	0.0877***	-0.0501***	0.0860***	-0.0495***
	(0.01570)	(0.01130)	(0.01540)	(0.01130)
Own House	0.538***	0.101***	0.528***	0.0941***
	(0.01040)	(0.00895)	(0.01040)	(0.00897)
Children	-0.125***	0.404***	-0.136***	0.398***
	(0.01950)	(0.01580)	(0.01940)	(0.01580)
Wealthy Retired Household	-0.156***	0.204***	-0.150***	0.209***
	(0.03470)	(0.01900)	(0.03470)	(0.01900)
Population Density	4.21e-06**	-1.25e-05***	3.51e-06*	-1.24e-05***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Quality controls				
Wireline Broadband	1.219***	-0.374***	1.157***	-0.395***
	(0.09780)	(0.07870)	(0.09700)	(0.07880)
Cellsites	-2.19e-05***	1.41e-05***	-2.13e-05***	1.42e-05***
	(0.00000)	(0.00000)	(0.00000)	(0.00000)
Wireline Price Residual	0.00702	-0.0304***	0.00371	-0.0299***
	(0.00750)	(0.00609)	(0.00745)	(0.00608)
Wireless Price Residual	-0.0519***	0.0391***	-0.0508***	0.0390***
	(0.00387)	(0.00304)	(0.00385)	(0.00303)
Rho (ρ)				-0.523***
				(0.00750)
Demographic controls	yes	yes	yes	yes
Other quality controls	yes	yes	yes	yes
Constant				
Observations	185,911	185,911	185,911	185,911

*Significant at 10 percent

**Significant at 5 percent

***Significant at 1 percent.

TABLE 4
MARGINAL PRICE AND INCOME EFFECTS ON CONSUMER CHOICES

	Wireline	***Wireless***
Own	$(\partial Q_N/\partial P_N) = -.0019^{***}$	$(\partial Q_W/\partial P_W) = -.0204^{***}$
Cross	$(\partial Q_N/\partial P_W) = .0152^{***}$	$(\partial Q_W/\partial P_N) = .0122^{***}$
Change from Income1 to Income4	$Q_N^{Income4} - Q_N^{Income1} = .0595^{***}$	$Q_W^{Income4} - Q_W^{Income1} = .2577^{***}$

***Significant at 1 percent.

TABLE 5
THE EVOLUTION OF CONSUMER SUBSTITUTION PATTERNS

N $(\partial\pi_N/\partial P_N)_{03\text{-}06} = -.0982^{***}$ $(\partial\pi_N/\partial P_N)_{07\text{-}10} = -.0588^{***}$	NW $(\partial\pi_{NW}/\partial P_N)_{03\text{-}06} = .0476^{***}$ $(\partial\pi_{NW}/\partial P_N)_{07\text{-}10} = .01168^{***}$
Off-the-grid*	W $(\partial\pi_W/\partial P_N)_{03\text{-}06} = .0471^{***}$ $(\partial\pi_W/\partial P_N)_{07\text{-}10} = .0489^{***}$

*The marginal impact of wireline prices on the likelihood of consumers shifting to the "off the grid" category is estimated to be essentially zero and is not shown here.
***Significant at 1 percent.

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TABLE 6
PARAMETER ESTIMATES FOR MIXED LOGIT MODEL

VARIABLES	***both***	***land***	***wireless***
Price		-0.013***	
		(0.002)	
*Price*Income2*		-0.003	
		(0.002)	
*Price*Income3*		0.001	
		(0.002)	
*Price*Income4*		0.002	
		(0.002)	
Price Residual		0.007***	
		(0.002)	
Income			
Income2	0.87***	0.29***	0.62***
	(0.230)	(0.079)	(0.180)
Income3	1.32***	0.38***	0.71***
	(0.218)	(0.083)	(0.173)
Income4	1.96***	0.40***	0.84***
	(0.230)	(0.098)	(0.184)
Demographic characteristics			
Retired Household	0.66***	1.08***	-0.46***
	(0.105)	(0.105)	(0.1124)
Young Household	-0.55***	-0.89***	0.72***
	(0.064)	(0.065)	(0.065)
Young-Middle Household	-0.36***	-0.55***	0.17*
	(0.092)	(0.092)	(0.093)
Older-Middle Household	-0.02	-0.02	-0.32***
	(0.080)	(0.080)	(0.083)
Student	0.78***	0.32***	0.75***
	(0.107)	(0.108)	(0.109)
Housewife	0.06	0.17**	-0.12
	(0.076)	(0.076)	(0.078)
Part-Time Employed	0.63***	0.36***	0.34***
	(0.087)	(0.088)	(0.088)
Ratio Working	0.28***	-0.08	0.70***
	(0.089)	(0.089)	(0.091)
Limited Youth	0.29***	0.06	0.19**
	(0.093)	(0.093)	(0.095)
Limited Adult	0.05	0.25***	-0.17**
	(0.075)	(0.075)	(0.078)
Own House	1.08***	0.75***	-0.01
	(0.058)	(0.058)	(0.059)
Children	0.22***	0.0398	0.14***
	(0.030)	(0.030)	(0.031)
Wealthy Retired Household	0.00	-0.17	0.03
	(0.232)	(0.233)	(0.245)
Population Density	0.00	0.00***	-0.01***
	(0.002)	(0.002)	(0.002)
Quality Controls			
Wireline Broadband	0.21	0.10	-1.32***
	(0.255)	(0.259)	(0.257)
Cellsites	0.06	-0.66**	3.49***
	(0.263)	(0.264)	(0.273)
Other Demographic Controls	*Yes*	*Yes*	*Yes*
Other Quality Controls	*Yes*	*Yes*	*Yes*
Year Dummies	*Yes*	*Yes*	*Yes*
Constant	4.044***	4.04***	-4.36***
	(0.418)	(0.418)	(0.472)
Observations	167,345	167,345	167,345

*Significant at 10 percent

*Significant at 10 percent
**Significant at 5 percent
***Significant at 1 percent.