

The FCC's Incentive Auction: Getting Spectrum Policy Right



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The spectrum policy debate must be informed by the *tradeoffs* inherent in spectrum aggregation: more (smaller) firms versus more robust wireless networks.

As the Federal Communications Commission (FCC) considers how to allocate the broadcasters' spectrum in the upcoming "incentive auction," it should be guided by economic principles designed to maximize *social benefits*. To date, the spectrum policy debate largely has been driven by considerations of the *private benefits* of carriers such as Sprint, T-Mobile/MetroPCS, U.S. Cellular, and other small carriers (collectively, the "smaller carriers.")¹

In April, the Department of Justice (DOJ) weighed into this debate by advocating "rules that ensure the smaller nationwide networks, which currently lack substantial low-frequency spectrum, have an opportunity to acquire such spectrum."² Although it is natural instinct to root for the little guy, ensuring the livelihood of smaller carriers is not an appropriate policy objective, as that would counsel a range of subsidies and tax credits for handpicked competitors. Indeed, maximizing the number of wireless competitors is not the appropriate objective either;³ using spectrum allocation as a tool for reducing wireless concentration would require divvying up the spectrum in such thin slices as to render the resulting allocation virtually useless. The problem with these narrow objectives is that, if pursued to their logical extreme, the resulting policies would sacrifice massive (and growing) economies of scale associated with providing the capacity needed to support mobile video, telemedicine, distance learning, and a host of other bandwidth-intensive applications that consumers and small businesses are demanding from their mobile devices.

The spectrum policy debate must be informed by the *tradeoffs* inherent in spectrum aggregation: more (smaller) firms versus more robust wireless networks. As wireless consumers increasingly demand that their wireless devices support bandwidth-intensive applications such as mobile video, the optimal allocation of spectrum tilts in favor of more robust wireless networks. Focusing narrowly on reducing wireless concentration could result in a spectrum allocation under which wireless carriers lack the incentive to deploy next-generation technologies. If policymakers fear that "too much" spectrum in the hands of any one carrier raises anticompetitive issues, there are several ways to address those concerns that do

not undermine investment in next-generation wireless broadband networks, and the attendant innovation that such investment engenders.

In this paper, we offer the FCC specific economic principles that should guide its spectrum policy. We begin by drawing on the FCC’s own impairment standard, which has governed FCC decision-making in similar “access” proceedings for inputs to a network, but has been mysteriously absent here.⁴ Assuming generously that promoting wireless competition is the proper objective—as opposed to promoting broadband competition in general—the FCC should determine whether smaller carriers would be impaired in their ability to compete effectively against the likes of AT&T and Verizon in the absence of “low-frequency spectrum” (defined as frequencies generally below 1 GHz). Impairment in this context would mean that, absent the “low-frequency spectrum,” the total costs of the smaller carriers’ networks would be inflated or the quality of their networks would be diminished to such an extent that the larger carriers could raise prices for wireless services above competitive levels. Clearly, smaller carriers would benefit from obtaining low-frequency spectrum at discounted prices, but that *private benefit* is not a sufficient basis for regulatory intervention. Fortunately, one can draw on a natural experiment that informs the impairment inquiry—namely, smaller carriers have been competing effectively for years without low-frequency spectrum. And there is no reason to conclude that their on-going capabilities to constrain wireless prices would be any less.

Next, we explain how a failure to recognize the oncoming inter-modal competition among wireless and wireline broadband-access technologies could lead policymakers to overstate the future role of the smaller carriers.⁵ When voice services were the primary offering of wireless networks and when regional network coverage was sufficient to compete, smaller carriers likely played an important role in disciplining wireless voice prices. As consumers increasingly demand that their wireless devices work everywhere and support the same set of applications as their wireline connections, the role of niche wireless providers with limited networks (in both a geographic and a capacity sense) likely will be diminished. Barring some other social objective that might be sacrificed,⁶ it would be a mistake to permit the narrow, self-interests of smaller carriers to dictate spectrum policy that has nationwide implications in broader product markets.

For these reasons, we conclude that the FCC should not prevent current owners of low-frequency spectrum from competing in the upcoming incentive auction. The most likely reason for their participating in the auction is not to hoard spectrum, as intimated by the DOJ,⁷ but instead to relieve capacity constraints that could force price increases to manage congestion. But that is beside the point. The decision of whether to steer low-frequency spectrum to smaller carriers at discounted prices should be informed by an impairment inquiry, not by speculation on how the larger carriers plan to use additional spectrum.

The FCC should determine whether wireless carriers without access to low-frequency spectrum would be impaired in their ability to compete effectively against rivals that own low-frequency spectrum.

Finally, we explain that even if the FCC believes incorrectly that (1) narrowly promoting wireless competition (as opposed to broadband competition) is the proper goal, *and* (2) the smaller carriers must have access to some low-frequency to compete effectively, there are less-restrictive alternatives to restricting auction participation that can achieve that narrow objective. For example, the FCC could conduct a post-auction review of spectrum holdings; if the agency deems that the allocation of low-frequency spectrum is too concentrated, it could compel a limited divestiture. Of course, depending on the results of the auction—for example, Sprint or T-Mobile (or both) winning significant shares of the low-frequency spectrum—the FCC might conclude that there is no further action warranted.

The Impairment Standard Revisited

Spectrum is an input in the production of wireless services; so too is programming in the production of video services, as are network elements such as loops and switches in the production of telephone services. The FCC should treat access to a certain type of spectrum—here, low-frequency spectrum—in the same way it has treated access to other inputs in other communications services. In particular, the FCC should determine whether wireless carriers without access to low-frequency spectrum would be impaired in their ability to compete effectively against rivals that own low-frequency spectrum. Effective competition would be undermined here if firms that possess significant holdings of low-frequency spectrum could raise prices above competitive levels and earn incremental profits.⁸ For reasons we discuss below, we think there would be no impairment.⁹

Throughout its regulatory history, the FCC has compelled network owners in various communications industries to grant access to certain “must-have” inputs to promote competition. For example, in its rules implementing the Cable Act of 1992 and in several orders approving cable mergers (of both the horizontal and vertical varieties), the FCC has required vertically integrated cable operators to grant access to affiliated, *must-have* programming such as regional sports at reasonable rates to rival video providers. The rationale for mandating access was that, by denying access to certain affiliated programming to a rival, a cable operator could induce a rival’s customers to “depart” from their video providers and thereby impair competition in the downstream market for video services.¹⁰ By contrast, a vertically integrated cable operator is under no obligation to make available affiliated content that does not amount to must-have programming (such as lifestyle or music-video networks).¹¹

Similarly, in its order implementing the Telecom Act of 1996,¹² the FCC required incumbent local exchange carriers to grant access at cost-based rates only to those network elements that, if withheld, would impair a rival’s ability to compete effectively. In implementing the Act, the FCC considered an access seeker (known as a competitive local exchange carrier) to be impaired when “the failure of an incumbent to provide access to a network element would decrease the quality, or in-

crease the financial or administrative cost of the service a requesting carrier seeks to offer. . . .”¹³

The policy question of whether low-frequency spectrum is a must-have input is directly relevant here: Mandating a rival’s access to network elements at regulated rates is analogous to steering spectrum to the smaller carriers at discounted rates¹⁴ via auction-participation rules. If AT&T and Verizon are permitted to acquire the entirety of the broadcasters’ spectrum at auction, then in some probabilistic sense,¹⁵ the smaller carriers might have to compete after the incentive auction without access to low-frequency spectrum *as they largely do today*.¹⁶ Would the smaller carriers be so impaired at that point that AT&T and Verizon could exercise market power? If the answer is no, then the FCC should not steer low-frequency spectrum to smaller carriers at discounted rates by restricting who can bid at auction.

Low-frequency spectrum is not a must-have input because it is largely fungible with high-frequency spectrum. As explained by one prominent network engineer, most usage of mobile broadband networks will occur within high-population densities, requiring networks to be designed for capacity rather than coverage; in these capacity-strained environments, low- and high-frequency spectrum “offer almost equivalent performance.”¹⁷ Moreover, although high-frequency spectrum must be combined with more equipment to achieve coverage (which most wireless networks already possess), high-frequency spectrum typically sells at a discount relative to low-frequency spectrum,¹⁸ rendering the two inputs largely fungible for the emerging LTE networks most carriers have announced they are building. Thus, there is no reason to treat low-frequency spectrum as if it were a must-have input. In this sense, low-frequency spectrum is more akin to switches in a telephone network or to lifestyle programming in the production of video services—two inputs not considered to be “must-have” under the impairment standard and thus are not subject to unbundling rules. Although both inputs are critical to the production process, a telephone (or video) provider could not impair competition by withholding a switch (or a lifestyle network) from its rivals. By the same logic, a wireless provider could not impair competition by acquiring all available low-frequency spectrum and then raising prices; if it tried such a strategy, its rivals would simply deploy high-frequency spectrum to defeat the price increase. Some might argue that high-frequency spectrum entails greater equipment expenditures,¹⁹ but because high-frequency spectrum sells at a discount relative to low-frequency spectrum, a carrier’s *total expenditures* would not necessarily be inflated. Accordingly, we are not persuaded by this argument.

Of course, the hypothetical contemplated above—in which a single wireless carrier monopolized all low-frequency spectrum—would require AT&T and Verizon to combine and purchase any residual low-frequency spectrum from Sprint and others. Because AT&T and Verizon are fierce rivals, even if they jointly acquired all available low-frequency spectrum, they would still face significant competition from each other, which would largely defeat the purpose of any hoarding strategy

of low-frequency spectrum. That two firms (plus a handful of others) possess the purported must-have input and compete in the same geographic markets further decreases the likelihood that competition would be impaired if smaller carriers were denied access to low-frequency spectrum.

Fortunately, the FCC does not have to build a sophisticated prediction model to determine whether Sprint, T-Mobile, and other smaller carriers would be impaired in their ability to compete effectively without access to low-frequency spectrum. It turns out that smaller carriers generally lack access to that flavor of spectrum, which provides a natural experiment to assess whether the impairment standard would be triggered.

Based on recent subscriber gains by Sprint, T-Mobile, and MetroPCS (before it was acquired by T-Mobile), the impairment standard likely would not be met. Despite its paucity of spectrum holdings in the low-frequency bands, Sprint's net additions for contract customers were up 18 percent in 2012.²⁰ Sprint will also be assisted by SoftBank's billions in investment dollars. And in the first quarter of 2013, T-Mobile enjoyed significant branded-customer growth,²¹ using its store of high-frequency spectrum to expand its network and improve speeds. The second quarter was even better: T-Mobile enjoyed its biggest growth spurt in four years, adding 1.1 million new subscribers (not counting subscribers from its recently completed merger with MetroPCS), a larger gain than that enjoyed by AT&T or Verizon.²² According to one analyst at UBS, in the final week of July, T-Mobile was gaining two subscribers from AT&T and Sprint for every one it lost to those carriers.²³ This sort of growth would not be possible if the spectrum powering Sprint's and T-Mobile's networks were vastly inferior to AT&T's and Verizon's. Although it is conceivable that the growth of these smaller carriers would have been even greater in a world with access to low-frequency spectrum, we are not aware of any evidence in support of that conjecture. And the future looks even brighter, as Sprint's and T-Mobile's Sprint LTE networks are catching up—reaching 250 million subscribers by 2014²⁴—eliminating a key competitive advantage AT&T and Verizon have enjoyed for the last two years.

Another indicator that competition would not be impaired is that wireless concentration—an admittedly fuzzy indicator of competition when it comes to wireless services—is not climbing. If access to low-frequency spectrum were essential, as the DOJ implies in its comments, then AT&T and Verizon would be running away with the wireless prize. In fact, U.S. wireless concentration as measured by the FCC has held steady since 2008; the HHI has been around 2,800, implying slightly less than four equal-sized firms per geographic area. Because the HHI has not increased significantly since 2008 (as would be the case if AT&T and Verizon were stealing market share), these data indicate that smaller carriers are not losing ground despite the fact that low-frequency spectrum is concentrated in the hands of two carriers.²⁵

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Perhaps the best indicator of the smaller carriers' prospects in the continued absence of low-frequency spectrum is the bidding war for Sprint that erupted between SoftBank and Dish Network. If Sprint's ability to compete was diminished due to its allegedly inferior spectrum, then these savvy investors would not be so bullish about Sprint's future. Put differently, Sprint's spectrum holdings are valued dearly in the marketplace despite their "high-frequency" nature. One might argue that SoftBank's bid (estimated at \$21.6 billion for just 78 percent of Sprint²⁶) was conditioned on Sprint's ability to secure low-frequency spectrum in the incentive auction, but that is highly speculative.

In sum, we conclude that Sprint, T-Mobile, and other smaller carriers are not impaired and would not be impaired by virtue of their lacking access to low-frequency spectrum. Because low-frequency spectrum is not a must-have input, there is no basis for restricting AT&T and Verizon from pursuing whatever spectrum resources they desire in the upcoming incentive auction. Even assuming smaller, regional carriers still have a role in the evolving competitive landscape—an issue we explore below—the FCC need not steer low-frequency spectrum to them, as competition appears to be robust given the current allocation of spectrum.

The Coming Inter-Modal Competition

The phrase "wireless competition" implies incorrectly that wireless carriers compete exclusively among themselves. Mobile connections are one of several ways in which a broadband customer accesses the Internet. According to a recent FCC report, the most common way a residential customer achieves download speeds considered "broadband" (in exceed of 3 Mbps) is via a cable connection (45 percent), followed by mobile wireless (33 percent), asymmetric DSL (15 percent), and fiber to the premises (7 percent).²⁷

New data suggests that wireless competes increasingly with wireline connections such as cable modem and DSL for broadband customers.²⁸ According to a consumer survey by Leichtman Research Group, hundreds of thousands of Americans canceled their home Internet service in 2012, taking advantage of the proliferation of Wi-Fi hot spots and fast new wireless networks accessible to smartphones and tablets. Indeed, more U.S. households stopped paying for home Internet subscriptions (and relied on wireless access instead) than cancelled their pay-television subscriptions (and relied on video over Internet services). That small carriers have a role in promoting "wireless competition" misses the larger point—namely, that competition is taking place among wireless and wireline broadband providers.

The coming inter-modal battle makes cost reduction and spectrum accumulation even more critical for wireless carriers. If they are going to compete effectively with wireline broadband providers, wireless carriers need to do everything possible to secure and exploit scale economies.²⁹ Moreover, if wireless consumers ex-

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pect wireless networks to offer bandwidth-intensive applications such as streaming video comparable to those offered on wireline networks, the accumulation of spectrum is even more critical.³⁰ Although the FCC seems reluctant to consider the role of wireless in the larger market for broadband services, the agency recognizes how economies of scale in the supply of wireless services permits cost savings in network equipment, which in turn lowers prices and spurs wireless adoption.³¹

The optimal scale of a wireless provider in the face of inter-modal competition could be significantly greater than the optimal scale under the old paradigm; as demand for bandwidth-intensive applications grows, spectrum aggregation produces even greater benefits for wireless carriers, including greater cost savings. To the extent that smaller carriers cannot support the bandwidth-intensive applications increasingly demanded by wireless customers, the competitive role of smaller carriers will likely wane. Whereas four of five carriers made sense when *wireless services* was the relevant market, two or three carriers might be preferred if *broadband services* are the relevant market. To borrow an analogy from video services, the optimal number of DBS providers would be greater than two (DIRECTV and Dish) if regulators incorrectly set out to promote “satellite competition.” Narrowly focusing on wireless competition—when wireless is one of several broadband technologies alongside fiber, cable, and satellite—is equally misguided.

How quickly will wireless overtake wireline broadband connections? Dish’s chairman is projecting that as many as a third of all Americans one day could find it more efficient to get their home Internet service wirelessly;³² Cisco IBSG recently projected that up to 15 percent of U.S. consumers could “cut their cord” in favor of a mobile data connection by 2016;³³ and Samsung recently predicted that mobile networks could supplant wireline broadband by 2020.³⁴

The oncoming battle between wireless and wireline Internet providers suggests that a more permissive attitude toward spectrum aggregation is in order. For those who cannot or will not recognize this inter-modal competition, they will view any increase in wireless concentration as bad news for consumers. Yet as the FCC acknowledges, the aggregation of subscribers (within limits that preserve competition) permits carriers to reduce costs, which spurs wireless adoption. The quest to promote “wireless competition”—which is simply code for ensuring the private welfare of specific companies—via spectrum policy could result in less competition where it matters most.

A Less-Restrictive Alternative

We have argued that (1) Sprint, T-Mobile and smaller regional carriers are not impaired without access to low-frequency spectrum; (2) even if they were, the role of smaller carriers will likely be diminished in a world with inter-modal competition. Whereas smaller carriers may have played an important role in disciplining

wireless voice prices for second- or third-generation wireless networks, the social benefits created by preserving niche carriers with limited footprints in an era of fourth- and fifth-generation networks are not obvious. Assuming we are correct, the policy implications become as clear as an azure sky of deepest summer—namely, permit all carriers to bid for the broadcasters’ spectrum on an equal footing. Even if the Commission rejects both arguments, there is still no economic basis for steering low-frequency spectrum to specific companies at bargain-basement prices³⁵ so long as there is a less-restrictive alternative that achieves the narrow objective of promoting wireless competition.

It is beyond the scope of this paper to enumerate all of the less-restrictive alternatives. But one reasonable alternative is for the FCC to evaluate spectrum holdings in light of the auction results, and determine whether a divestiture is necessary to preserve competition. Because the FCC already possesses this authority, there is no need for a new set of rules. In that contingency, we would advocate that the FCC employ an impairment test similar to the one described here. Finally, depending on the auction results, the FCC might conclude that no further action is warranted.

Conclusion

Promoting the livelihood of specific wireless carriers is not an appropriate basis for a regulator to intervene in an input market such as spectrum. There is no doubt that smaller carriers would benefit from getting access to more spectrum at bargain rates, even if their plan was to resell it to a larger company for a higher price at a later date. To motivate regulation, one must demonstrate that the companies the regulator is seeking to assist would be impaired in their ability to compete effectively without access to the input in question. Until that evidentiary burden is met, the optimal spectrum policy is to permit all carriers to bid freely in the incentive auction. Moreover, as wireless customers demand more of their wireless networks, the social benefits of preserving smaller carriers through any programs (including spectrum policy) are increasingly hard to fathom.

Endnotes

¹ See, e.g., Letter from T-Mobile, CCIA, NTCA, RTG, CCA, Compel, U.S. Cellular, C Spire,

² Ex Parte Submission of the United States Department of Justice, WT Dkt. No. 12-269, available at <http://apps.fcc.gov/ecfs/document/view?id=7022269624> [hereafter *DOJ Comments*].

³ See, e.g., Gerald R. Faulhaber, Robert Hahn & Hal Singer, 64(2) *Assessing Competition in U.S. Wireless Markets: Review of the FCC’s Competition Reports*, FED. COMM. L. J. 320-66 (2012), available at <http://www.repository.law.indiana.edu/cgi/viewcontent.cgi?article=1616&context=fclj> (explaining how a focus on static competition leads to sub-optimal policy).

⁴ The DOJ relegates the concepts of impairment to a single footnote. *Id.* at 14 n. 22 (“A lack of low-frequency spectrum may also impair the ability of a local or regional carrier to provide an additional, significant, competitive option in particular local areas.”). In the same paragraph, the DOJ argues that Sprint and T-Mobile have “a somewhat diminished ability to compete, particularly in rural areas where the cost to build out coverage is higher with high-frequency spectrum.” *Id.*

⁵ The DOJ allows for the possibility that the relevant market for analyzing spectrum issues could be different from definitions used to evaluate prior wireless mergers. *Id.* at 20 (“However, because markets are dynamic, so are definitions of antitrust product markets: as wireless services have expanded to include offerings such as broadband access, consumer demand for new services can dictate different relevant product markets.”).

⁶ Traditional social objectives that are invoked by those seeking regulatory intervention include localism or diversity. Yet we fail to see how either of those objectives is implicated here.

⁷ *DOJ Comments* at 11 (“Accordingly, the Commission should consider the potential that the acquisition of specific blocks of spectrum may have to foreclose or raise the costs of competitors in its policies on spectrum acquisition.”).

⁸ It bears noting that with one exception in 2009 when prices held steady, wireless prices have *declined every year* since the Bureau of Labor Statistics began tracking them in 1998. See Bureau of Labor Statistics, Series CUUR0000SEED03, *available at* <http://data.bls.gov/cgi-bin/dsrv>. That AT&T and Verizon have not been able to raise prices despite their low-frequency holdings implies that competition has not been impaired.

⁹ In a nod to the impairment standard, the smaller carriers claim that they would be “significantly disadvantaged from acquiring the spectrum resources in the auction they need to compete against those carriers.” *T-Mobile Letter, supra*. But we are not aware of any evidence of such impairment. For example, evidence could take the form of (1) inflated network costs inclusive of spectrum acquisition that (2) redounded to the harm of consumers via price increases by carriers with low-frequency spectrum.

¹⁰ See, e.g., Kevin Caves, Chris Holt, Hal Singer, *Multichannel Television Markets: A Study of Regional Sports Networks*, REVIEW OF NETWORK ECONOMICS (2013).

¹¹ See, e.g., Revision of the Commission’s Program Access Rules, Report and Order, Oct. 5, 2012, ¶12 (“... we find that extending a preemptive ban on exclusive contracts sweeps too broadly. Rather, this mixed picture justifies a case-by-case approach in applying our program access rules (consistent with the case-by-case inquiries we undertake in the terrestrial programming and program carriage contexts), with special account taken of the unique characteristics of Regional Sports Network (‘RSN’) programming.”).

¹² Section 251(d)(2) of the Act provided that, “[i]n determining what network elements should be made available for purposes of subsection (c)(3), the Commission shall consider, at a minimum, whether (A) access to such network elements as are proprietary in nature is necessary; and (B) the failure to provide access to such network elements would impair the ability of the telecommunications carrier seeking access to provide the services that it seeks to offer. See 47 U.S.C. § 251(d)(2).

¹³ First Order and Report, Implementation of the Local Competition Provisions in the Telecommunications Act, CC Dkt. No. 96-88, Aug. 8, 1996, ¶285. The list of network elements subject to mandatory unbundling rules was pared down by the D.C. Circuit in 2004, by which time the market for voice services had grown more competitive. *United States Telecom Association, et al. v. FCC & USA* (D.C. Cir. 2004).

¹⁴ See Robert J. Shapiro, Douglas Holtz-Eakin & Coleman Bazelon, The Economic Implications of Restricting Spectrum Purchases in the Incentive Auctions, April 30, 2013 (estimating that auction revenues would decline by as much as 40 percent if AT&T and Verizon were excluded), *available at*

http://www.gcbpp.org/files/Academic_Papers/EconImplicationsSpectrumAuctions.pdf?utm_source=WhatCounts+Publicaster+Edition&utm_medium=email&utm_campaign=IFS+Alert&utm_content=The+Economic+Implications+of+Restricting+Spectrum+Purchases+in+the+Incentive+Auctions [hereafter *Restricting Spectrum Purchases*].

¹⁵ Based on prior auctions, the likelihood that AT&T and Verizon would collectively acquire 100 percent of the broadcasters' spectrum is close to zero.

¹⁶ According to UBS, as of December 2011, Sprint had on average 18 MHz of low-frequency cellular/SMR spectrum nationwide. See UBS INVESTMENT RESEARCH, WIRELESS COMMUNICATIONS, at 3. In contrast, neither T-Mobile nor Leap has low-frequency spectrum. *Id.* Other smaller carriers with low-frequency holdings include CenturyLink and Windstream. *Id.* at 11.

¹⁷ Peter Rysavy, Low Versus High Radio Spectrum, HighTech Forum, Mar. 12, 2012, available at <http://www.hightechforum.org/low-versus-high-radio-spectrum>.

¹⁸ Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services, Fourteenth Report, 25 F.C.C.R. 11407 (May 20, 2010) ¶ 271 (“In the 2008 auction of 700 MHz spectrum, the average price for the 700 MHz spectrum was \$1.28 per MHz-pop. This unit price was more than twice the average price of \$0.54 per MHz-pop for AWS spectrum [at 1700 and 2100 MHz] auctioned in 2006.”).

¹⁹ *DOJ Comments* at 11 (“Also, a competitor’s lack of spectrum may require higher capital expenditures, such as having to build more cell towers, in order to provide competitive service.”).

²⁰ Sprint Quarterly Investment Update, Feb. 7, 2013, *available at* <http://investors.sprint.com/Cache/1001172363.PDF?Y=&O=PDF&D=&fid=1001172363&T=&iid=4057219>.

²¹ Brittany Hillan, *T-Mobile sees first branded customer growth increase since 2009*, SLASHGEAR, May 8, 2013, available at <http://www.slashgear.com/t-mobile-sees-first-branded-customer-growth-increase-since-2009-08280976/>.

²² Kevin Fitchard, Has the mobile balance shifted in T-Mobile and Sprint’s favor? UBS thinks so, GIGAOM, Aug. 14, 2013, available at <http://gigaom.com/2013/08/14/has-the-mobile-balance-shifted-in-t-mobile-and-sprints-favor-ubs-thinks-so/>.

²³ *Id.*

²⁴ *Id.*

²⁵ *16th Report* at 19.

²⁶ Keith Chrostowski, *Sprint and SoftBank make winning moves in fending off Dish*, THE KANSAS CITY STAR, July 2, *available at* <http://www.kansascity.com/2013/07/02/4324435/sprint-and-softbank-make-winning.html#storylink=cpy>.

²⁷ Internet Access Services: Status as of June 30, 2012, Chart 9, *available at* http://transition.fcc.gov/Daily_Releases/Daily_Business/2013/db0520/DOC-321076A1.pdf.

²⁸ Anton Troianovski, *Cord-Cutters Lop Off Internet Service More Than TV*, WALL STREET JOURNAL, May 29, 2013, available at <http://online.wsj.com/article/SB10001424127887324682204578513262440196772.html> [hereafter *Cord Cutters*].

²⁹ In its comments, the DOJ appears to diminish the importance of economies of scale in its comments. See *DOJ Comments* at 17 (“Notably, the economies of scale often present in wireless networks are significantly tempered compared to those the Department has encountered when analyzing competition among wireline networks, since it is easier and less costly to expand capacity over a fixed amount of spectrum than it is, for example, to reduce the cost of constructing the physical ‘last-mile’ link to each premises.”). That economies of scale for wireline networks could exceed those in wireless does not imply that wireless economies are trivial.

³⁰ See, e.g., Richard Clark, *Expanding Mobile Wireless Capacity: The Challenges Presented by Technology and Economics*, June 2013, available at http://papers.ssrn.com/sol3/papers.cfm?abstract_id=2197416 (estimating that without significantly increasing current spectrum allocations by 560 MHz over the 2014-2022 period, U.S. wireless capacity expansion will be inadequate to accommodate expected demand growth).

³¹ See Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, Mar. 21, 2013, at 122 (“When competing mobile wireless service providers deploy compatible network technologies, greater economies of scale in the production of both end-user devices and network infrastructure equipment can result, lowering the unit cost of handsets, chipsets, and other network equipment. This, in turn, may promote more rapid adoption of mobile wireless services, a greater variety of handsets, and more price competition.”) [hereafter *16th Report*].

³² *Cord Cutters*, *supra*.

³³ Cisco ISBG, *To Prevent 15% of Customers from Cord-Cutting, Fixed Broadband ISPs Consider WiFi Solutions to Deliver the Mobility Customers Seek*, Oct. 2011, available at http://www.cisco.com/web/about/ac79/docs/FastFacts/FastFacts_WiFi_Defense_againt_BB_Cord_Cutting_Oct2011.pdf.

³⁴ Dave Thier, *This Announcement From Samsung Should Have Cable Companies Quaking*, FORBES, May 13, 2013, available at <http://www.forbes.com/sites/davidthier/2013/05/13/this-announcement-from-samsung-should-have-cable-companies-quaking/>.

³⁵ See *Restricting Spectrum Purchases*, *supra*.

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