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**REDACTED—FOR PUBLIC INSPECTION**

August 27, 2018

**BY ECFS**

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

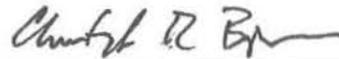
**Re: Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 18-197**

Dear Ms. Dortch:

In accordance with the *Protective Order* and *NRUF/LNP Protective Order* in the above-captioned proceeding,<sup>1</sup> DISH Network Corporation (“DISH”) submits the enclosed public, redacted version of its Petition to Deny, including supporting exhibits. DISH has denoted with **{{BEGIN HCI END HCI}}** and **{{BEGIN NRUF/LNP HCI END NRUF/LNP HCI}}** where Highly Confidential Information has been redacted. A Highly Confidential version of this filing is being simultaneously filed with the Commission and will be made available pursuant to the terms of the *Protective Order* and the *NRUF/LNP Protective Order*.

Please contact me with any questions.

Respectfully submitted,



Pantelis Michalopoulos  
Christopher Bjornson  
*Counsel for DISH Network Corporation*

Enclosure

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<sup>1</sup> Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations, *Protective Order*, WT Docket No. 18-197, DA 18-624 (June 15, 2018) (“*Protective Order*”); Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations, *NRUF/LNP Protective Order*, WT Docket No. 18-197, DA 18-777 (July 26, 2018) (“*NRUF/LNP Protective Order*”).

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**Before the  
FEDERAL COMMUNICATIONS COMMISSION  
Washington, DC 20554**

In the Matter of )  
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Applications of T-Mobile US, Inc. ) WT Docket No. 18-197  
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and )  
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Sprint Corporation )  
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Consolidated Applications for Consent to )  
Transfer Control of Licenses and )  
Authorizations )  
 )

**PETITION TO DENY OF DISH NETWORK CORPORATION**

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August 27, 2018

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**Exhibit C:** Declaration of Stephen Wilkus

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**PETITION TO DENY OF DISH NETWORK CORPORATION**

DISH Network Corporation (“DISH”)<sup>1</sup> respectfully petitions the Commission to deny the proposed merger of T-Mobile US, Inc. (“T-Mobile”) and Sprint Corporation (“Sprint”) (together, the “Applicants”) as currently constructed.<sup>2</sup> The transaction will create a four-to-three national mobile voice/broadband market, lead to excessive concentration in other relevant markets, and likely increase prices for consumers. The Applicants have not yet demonstrated that the merger, as currently proposed, would serve the public interest.

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<sup>1</sup> Subsidiaries of DISH include entities that hold licenses suitable for the provision of commercial wireless service, including AWS-4, AWS H Block, Lower 700 MHz E Block, and 600 MHz licenses. DISH’s subsidiaries also include a multichannel video programming distributor and an online video distributor, both of which compete with T-Mobile, which recently purchased Layer 3. For these and other reasons described herein, DISH is a party in interest under Section 309(d)(1) of the Communications Act. *See* 47 U.S.C. § 309(d)(1).

<sup>2</sup> *See* Public Notice, WT Docket No. 18-197, T-Mobile US, Inc., and Sprint Corporation Seek FCC Consent to the Transfer of Control of the Licenses, Authorizations, and Spectrum Leases Held by Sprint Corporation and Its Subsidiaries to T-Mobile US, Inc., and the *Pro Forma* Transfer of Control of the Licenses, Authorizations, and Spectrum Leases Held by T-Mobile US, Inc., and Its Subsidiaries, DA 18-740 (July 18, 2018).

**I. INTRODUCTION AND SUMMARY**

The Applicants seek to consolidate the national mobile voice/broadband market from four to three players. Economic analysis and empirical evidence demonstrate that, instead of enhancing competition, such consolidation is apt to thwart it. In seeking approval for this transaction, the Applicants must show that the proposed merger will not have anti-competitive effects, or that any such effects will be more than offset by the public benefits that it will produce. But, Sprint and T-Mobile have not yet met this burden, and much work needs to be done for them to carry it.

The Applicants appear to overstate the merger's impact on 5G deployment and in turn, its public interest benefits.<sup>3</sup> The Applicants have also failed to provide evidence regarding the merger's unilateral effects on competition. Among other outcomes, the transaction will likely result in estimated consumer price increases of 2.8-15.5%, or weighted average price increases of 4.2-10.4%. In other countries where the mobile voice/broadband market has experienced a four-to-three reduction, consumers have seen price increases of 14-20%. On top of these likely price increases, the transaction would also increase the risk of coordination in the industry, likely resulting in another 15-21% in post-merger price increases.

*Claimed Benefits.* The Applicants frame the merger as producing one primary public interest benefit: 5G deployment. They appear to argue that, without the merger, Sprint or T-Mobile would not be able to deploy a "world-leading" 5G network, and that "neither T-Mobile

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<sup>3</sup> DISH welcomes the FCC's detailed document requests to the Applicants, which will permit a more thorough review. *See* Letter from Donald K. Stockdale, Chief, Wireless Telecommunications Bureau, to Kathleen O'Brien Ham, T-Mobile US, Inc., WT Docket No. 18-197 (Aug. 15, 2018); Letter from Donald K. Stockdale, Chief, Wireless Telecommunications Bureau, to Vonya B. McCann, Sprint Corp., WT Docket No. 18-197 (Aug. 15, 2018).

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nor Sprint can win [the race to 5G] on its own.”<sup>4</sup> They add that, by making 5G possible for the combined company (“New T-Mobile”), the merger will trigger a chain reaction that will in turn unleash 5G deployments by New T-Mobile’s competitors, Verizon and AT&T.<sup>5</sup> According to the Applicants’ formulation, the case for approval of the merger largely disappears if that “cause-and-effect” link is not true—i.e., if the merger is not necessary for Sprint or T-Mobile to achieve a nationwide 5G network, and if AT&T and Verizon plan to deploy 5G regardless of the outcome of this transaction.

The Applicants’ claims in support of this merger and its chief supposed public interest benefit—the deployment of 5G—seem to be at odds with the pre-merger statements made by each company indicating that 5G deployment is both possible and anticipated, including:

- December 2017: “[T-Mobile] will be the only ones on the fast-track toward a real, mobile nationwide 5G network in 2020 – and have already started deploying 5G ready equipment.”<sup>6</sup>
- March 2018: “[Sprint has] the BEST spectrum and assets to build an incredible nationwide #5G network that our customers will love.”<sup>7</sup>

And, the facts on the ground suggest that each Applicant has the capability to deploy 5G on a standalone basis. Among other things:

- The Applicants acknowledge that they will not use the combined spectrum and cell sites of both companies. Rather, they say that New T-Mobile will have the option to use cell sites from each company, and that it will “retain[] a number of Sprint cell sites.”<sup>8</sup>

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<sup>4</sup> Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations, WT Docket No. 18-197, at 16 (June 18, 2018) (“Application”).

<sup>5</sup> *Id.* at 16-18.

<sup>6</sup> John Legere, *The Revolution Continues...*, T-Mobile Blog (Dec. 27, 2017), <https://www.t-mobile.com/news/legere-2018-predictions>.

<sup>7</sup> Marcelo Claire (@marcelclaire), Twitter (Mar. 9, 2018 12:24 PM), <https://twitter.com/marceloclaire/status/972206391858483201>.

<sup>8</sup> Application at 29-31 & n.87.

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- Each Applicant has reserves of spectrum today, including much of Sprint’s 2.5 GHz spectrum.
- The Applicants have not yet shown that the merger will be necessary for the transition to 5G. According to the Applicants, the merger will make possible the beginning of 5G services on some spectrum while legacy subscribers continue receiving LTE service on other spectrum.<sup>9</sup> But:
  - A transition is by definition transitory and any temporary needs likely could be covered by less restrictive alternatives than a merger.
  - Each company appears to be able to achieve such a transition, even assuming that simultaneous LTE and 5G services are necessary, standing alone by utilizing its unused spectrum.
  - The Applicants have failed to relate the 5G service they plan to provide to the spectrum they claim they need for such service. Among the three pillars that define 5G, only one, enhanced mobile broadband, requires large swaths of spectrum. The other two, ultra-reliable low-latency communications and massive machine type communications, are less spectrum-intensive.

In addition, the merger could likely produce harms associated with the complex integration of two large networks, including their underlying operations, and introduce the potential for degradation in the user experience. These risks dwarf those of the prior T-Mobile/MetroPCS consolidation. One unintended consequence could be delays in New T-Mobile’s 5G roll-out compared to the Applicants’ standalone plans.

The Applicants claim that the merger will *accelerate* 5G deployment by both New T-Mobile and its remaining competitors, AT&T and Verizon.<sup>10</sup> But, this claim ignores the competitive pressure that both companies are applying to the incumbents today. And, it undercuts the core justification for the merger, because it means that 5G deployment is possible even without this transaction. It also means that Dr. Evans’ calculation of the price decrease that

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<sup>9</sup> *Id.* at 36-39.

<sup>10</sup> *Id.* at 17.

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the merger is likely to produce is flawed. Dr. Evans’ analysis—which is based on the premise that the merger is *necessary* to make 5G possible at all—is not supportable:

- Dr. Evans does not analyze the transaction’s unilateral effects on competition. He assumes that the average revenue per unit (“ARPU”) will remain the same between 2017 and 2024, “consistent with T-Mobile’s business plans.”<sup>11</sup> But his assumption begs the core question to be answered: whether the increase in concentration brought about by the merger will lead to higher prices and therefore higher ARPU. Dr. Evans assumes no.
- The analysis echoes the Applicants’ cost-savings estimates without any verification. Dr. Evans simply takes the cost synergies given to him by the Applicants and translates them into purported price declines.
- Most of the price decrease estimated by Dr. Evans comes not out of the prices of the merged companies, but rather out of the prices of AT&T and Verizon, which would supposedly be spurred on to compete by the 5G deployment made possible by the merger. But Dr. Evans’ premise is that the progress achieved by Verizon and AT&T towards 5G to date is “tepid.”<sup>12</sup> That premise appears to be inaccurate. This inaccuracy in turn overstates the claimed benefits.
- DISH retained Professor David Sappington, Eminent Scholar, Department of Economics, University of Florida, and the Chief Economist of the FCC under Chairman Michael Powell. Professor Sappington demonstrates that any gains the merger might achieve are severely diminished if the merger merely accelerates a benefit, rather than serves as the only means for achieving it. He demonstrates, for example, that if the merger accelerates a benefit by five years, the gain from the merger is less than 10% of the corresponding gain the merger would deliver if it were the sole means of achieving the benefit.

The Applicants also highlight the merger’s impact on 5G deployment in rural areas. By utilizing Sprint’s 2.5 GHz spectrum, the Applicants’ claim that “small towns and rural communities will experience greater coverage and quality of service, increased capacity, and faster speeds.”<sup>13</sup> Elsewhere, however, Sprint and T-Mobile argue that, because of the

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<sup>11</sup> Declaration of David Evans ¶ 236 (June 18, 2018) (“Evans Declaration”) (attached as Exhibit G to Application).

<sup>12</sup> *Id.* ¶ 197.

<sup>13</sup> Application at 65.

propagation limitations of 2.5 GHz spectrum, without the merger, Sprint will “not be a major competitor in most of rural America in the foreseeable future.”<sup>14</sup> The Applicants have failed to explain this apparent contradiction: on the one hand, they note that 2.5 GHz spectrum will enhance rural deployment for New T-Mobile, while at the same time arguing that such spectrum inhibits 5G deployment for Sprint in those same parts of the country. It is therefore unclear from the Application how rural deployment can be credited as a benefit that would flow from this transaction.

*Market Definition.* Instead of directly addressing the unilateral effects that would likely result from the four-to-three market consolidation, the Applicants create an overly broad product market definition. They cite competition by mobile virtual network operators (“MVNOs”) as relevant players in the market.<sup>15</sup> But MVNOs are likely not effective competitors to facilities-based carriers in light of these operators’ dependence on their landlord carriers’ consent; indeed, they have proven inadequate in many other countries. Compared to the Big-4 providers’ national footprint, MVNOs also tend to be regionally focused (e.g., Comcast and Charter) or confined to a particular product sub-market (e.g. TracFone).

The Applicants also rely on the idea of converging broadband markets, even though they do not claim that landline ISPs will constrain the behavior of mobile carriers.<sup>16</sup> And, they make much of competition from Comcast and Charter, two essentially virtual carriers with modest offerings and nascent subscriber bases.<sup>17</sup>

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<sup>14</sup> *Id.* at 96.

<sup>15</sup> *Id.* at 114-16.

<sup>16</sup> *Id.* at 58-64.

<sup>17</sup> *Id.* at 105-11.

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Finally, the Applicants cite to DISH’s prospective wireless entry.<sup>18</sup> But, DISH will only be a competitor in the Internet of Things (“IoT”) market in the first phase of its network deployment. The Phase 1 network is expected to be deployed, and IoT service to commence, by March 2020. While DISH plans to aggressively upgrade and expand that network to full 5G in the future, the timing of the transition will crucially depend on, among other things, scarce inputs (e.g., radios, devices and chipsets) that the merger could make scarcer still.

*Competitive Effects.* Economic analysis and empirical data demonstrate that the increase in concentration to be produced by the merger will likely result in significant price increases. Professor Joseph Harrington, the Business Economics and Public Policy Department Chair at the University of Pennsylvania’s Wharton School, and the Brattle Group have calculated the county-specific spectrum concentration increases that would result from this deal. They conclude that New T-Mobile will be over the FCC’s spectrum screen in 1,996 of the nation’s 3,221 counties. Brattle also computed the Herfindahl-Hirschman Index (“HHI”) increases that would result from the merger at the national level. The findings? Before the merger, the HHI is 2,814, already in the “highly concentrated” category under the Horizontal Merger Guidelines (the “Merger Guidelines”). The post-merger HHI would increase 451 points to 3,265, creating a presumption that the merger is “likely to enhance market power” under the Merger Guidelines. Depending on the method used, the merger is estimated to produce price increases to each company’s prices ranging between 2.8% and 15.5% or weighted average increases to both companies’ prices ranging between 4.2% and 10.4%.

Empirical data from other countries that have experienced four-to-three reductions in the number of mobile carriers also confirm the likelihood of price increases. An econometric study

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<sup>18</sup> *Id.* at 112-14.

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of 25 countries found that “removing a disruptive player from a four-player market could increase prices by between 17.2% and 20.5% on average.”<sup>19</sup> Another study examining 33 countries found that an average four-to-three merger would lead to an “increase in the bill of end users by 16.3% when compared with a situation in which no merger had occurred.”<sup>20</sup> The Austrian competition regulator found that the four-to-three merger of Mobile Network Operators (“MNOs”) Orange Austria and H3G Austria resulted in inflation-adjusted price increases of 14 to 20% on average (and of 20 to 30% for prepaid plans).<sup>21</sup> A second study examining the same Austrian merger found as much as 90% price increases for some users.<sup>22</sup> Similarly, a study examining the four-to-three merger of T-Mobile and Orange in the Netherlands found the merger resulted in price increases between 10% and 17% compared to control countries.<sup>23</sup>

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<sup>19</sup> Ofcom, *A Cross-Country Econometric Analysis of the Effect of Disruptive Firms on Mobile Pricing* (Feb. 2016), <https://www.ofcom.org.uk/research-and-data/multi-sector-research/general-communications/disruptive-firms-econometrics>.

<sup>20</sup> Centre on Regulation in Europe, *Evaluating Market Consolidation in Mobile Communications* at 5-6 (Sept. 2015), [http://cerre.eu/sites/cerre/files/150915\\_CERRE\\_Mobile\\_Consolidation\\_Report\\_Final.pdf](http://cerre.eu/sites/cerre/files/150915_CERRE_Mobile_Consolidation_Report_Final.pdf). (“CERRE Mobile Consolidation Report”).

<sup>21</sup> Bundeswettbewerbsbehörde, *The Austrian Market for Mobile Telecommunication Services to Private Customers: An Ex-post Evaluation of the Mergers H3G/Orange and TA/Yesss!*, Sectoral Inquiry BWB/AW-393, Final Report at 3 (March 2016) [https://www.bwb.gv.at/fileadmin/user\\_upload/PDFs/BWB2016-summary-Ex-post\\_evaluation\\_of\\_the\\_mobile\\_telecommunications\\_market.pdf](https://www.bwb.gv.at/fileadmin/user_upload/PDFs/BWB2016-summary-Ex-post_evaluation_of_the_mobile_telecommunications_market.pdf) (“Bundeswettbewerbsbehörde Report”).

<sup>22</sup> RTR, *Ex-post analysis of the merger between H3G Austria and Orange Austria* (March 2016) [https://www.rtr.at/en/inf/Analysis\\_merger\\_H3G\\_Orange/Ex\\_post\\_analysis\\_merger\\_H3G\\_Orange\\_RTR.pdf](https://www.rtr.at/en/inf/Analysis_merger_H3G_Orange/Ex_post_analysis_merger_H3G_Orange_RTR.pdf).

<sup>23</sup> European Commission, *Ex-post analysis of two mobile telecom mergers: T-Mobile/tele.ring in Austria and T-Mobile/Orange in the Netherlands* at 68 (2015) [https://www.rtr.at/de/inf/Analysis\\_mobile\\_mergers/Ex-post\\_analysis\\_of\\_two\\_mobile\\_telecom\\_mergers.pdf](https://www.rtr.at/de/inf/Analysis_mobile_mergers/Ex-post_analysis_of_two_mobile_telecom_mergers.pdf) (“European Commission Ex-Post Analysis of Mergers in Austria and the Netherlands”).

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The merger would also increase the risk of coordination among the remaining players in the mobile voice/broadband market. While the Applicants do supply testimony on coordinated effects, they confine themselves to citing basic theoretical factors counseling against coordination—primarily the difficulty of detecting cheating. Professor Harrington and the Brattle Group have applied economic theory to the facts in this case. The mobile voice/broadband market is suitable for tacit collusion already, because of factors such as transparent pricing, lack of buyer power, lack of long-term contracts, and high barriers to entry. Nevertheless, tacit collusion remains difficult in today’s market, primarily because of the disparate market shares of the four players. In such an “asymmetrical market,” collusion is not in the smaller firms’ interests.

But the merger would result in a New T-Mobile with a market share comparable to that of AT&T and Verizon. New T-Mobile would therefore be much more aligned with the pricing incentives of these incumbents than it would be with T-Mobile or Sprint as standalone companies. This was exactly the concern articulated by the Italian regulator when the third and fourth largest carriers in that country (H3G and WIND) sought to merge.<sup>24</sup> For similar reasons, New T-Mobile likely will see its incentive to be a maverick reduced after the merger. In fact, the Applicants have noted that aggressive pricing has not resulted in a substantive decrease in the market share of AT&T and Verizon.<sup>25</sup> Therefore, instead of the “un-carrier,” New T-Mobile might act as an incumbent. DISH’s economists have also applied the model developed by the Applicants’ own economists to this transaction, and conclude that the Coordinated Price Pressure

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<sup>24</sup> European Commission, Case M.7758 Hutchison 3G Italy/Wind JV, Commission Decision ¶ 971 (Jan. 9, 2016), [http://ec.europa.eu/competition/mergers/cases/decisions/m7758\\_2937\\_3.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m7758_2937_3.pdf).

<sup>25</sup> Application at iii.

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Index (the maximum increase that any two companies are willing to initiate and match) will likely increase by 15-21%, depending on the company.

### II. STANDARD OF REVIEW

Under Section 310(d) of the Communications Act (“the Act”), the Commission must determine whether the proposed transaction will serve “the public interest, convenience, and necessity.”<sup>26</sup> In considering whether the Applicants have met this standard, the Commission first considers whether the transaction complies with specific provisions of the Act, other applicable statutes, and the Commission’s regulations. If so, then the Commission “considers whether the transaction could result in public interest harms by substantially frustrating or impairing the objectives or implementation of the Act or related statutes.”<sup>27</sup> In doing so, the Commission considers the evidence provided by the parties, Commission records, and third parties to the proceeding.<sup>28</sup>

As part of this assessment, the Commission takes a close look at the proposed transaction’s effect on competition. This analysis is informed by, but not limited to, traditional antitrust principles.<sup>29</sup> If the Commission identifies competitive harms that would be produced by

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<sup>26</sup> 47 U.S.C. § 310(d); *see also* Applications of Comcast Corporation, General Electric Company and NBC Universal, Inc. for Consent to Assign Licenses and Transfer Control of Licensees, *Memorandum Opinion and Order*, 26 FCC Rcd. 4238, 4247 ¶ 22 (2011) (“*Comcast/NBCU Order*”).

<sup>27</sup> Applications of Level 3 Communications Inc. and CenturyLink for Consent to Transfer Control of Licenses and Authorizations, *Memorandum Opinion and Order*, 32 FCC Rcd. 9581, 9585 ¶ 9 (2017) (“*CenturyLink-Level 3 Order*”).

<sup>28</sup> Applications of Charter Communications, Inc., Time Warner Cable Inc., and Advance/Newhouse Partnership for Consent to Assign or Transfer Control of Licenses and Authorizations, *Memorandum Opinion and Order*, 31 FCC Rcd. 6327, 6329 ¶ 2 (2016) (“*Charter/TWC Order*”) (“Our consent to the transfer of these licenses is based on a careful review of the economic, documentary, and other record evidence.”).

<sup>29</sup> *CenturyLink-Level 3 Order* at 9585 ¶ 9.

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a merger, then the Commission considers whether such harms can be addressed by appropriate conditions on the transaction.<sup>30</sup> The Commission does not even consider the potential benefits unless it has already found that any harms can be ameliorated through merger-specific conditions.<sup>31</sup>

These public interest benefits are drawn from the “broad aims of the Communications Act,”<sup>32</sup> which include a “deeply rooted preference for preserving and enhancing competition in relevant markets, accelerating private-sector deployment of advanced services, [and] ensuring a diversity of information sources and services to the public.”<sup>33</sup> And because the Commission must find that a transaction affirmatively serves the public interest, it must determine “whether a transaction would enhance, rather than merely preserve, existing competition.”<sup>34</sup> Importantly, all public interest benefits must be:

1. transaction specific—likely to occur as a result of the transaction but unlikely to be realized by other practical means having fewer anti-competitive effects;<sup>35</sup>
2. verifiable—both in likelihood and magnitude;<sup>36</sup> and

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<sup>30</sup> *Id.*

<sup>31</sup> *Id.* at 9586 ¶ 10. (“If the Commission has determined that a transaction raises no public interest harms or any such harms have been ameliorated by narrowly tailored conditions, the Commission next considers a transaction’s public interest benefits.”).

<sup>32</sup> *Comcast-NBCU Order*, 26 FCC Rcd. at 4248 ¶ 23

<sup>33</sup> *Id.* at 4248 ¶ 23.

<sup>34</sup> *Charter/TWC Order*, 31 FCC Rcd. at 6338 ¶ 29.

<sup>35</sup> Applications of AT&T Inc. and Deutsche Telekom AG for Consent to Assign or Transfer Control of Licenses and Authorizations, *Order*, 26 FCC Rcd. 16184, 16247 ¶ 124 (2011) (“AT&T/T-Mobile Staff Report”) (“Efficiencies that can be achieved through means less harmful to competition than the proposed merger . . . cannot be considered to be true pro-competitive benefits of the merger.”).

<sup>36</sup> *See Comcast-NBCU Order*, 26 FCC Rcd. at 4331 ¶ 226 (“The Applicants . . . are required to provide sufficient supporting evidence to permit us to verify the likelihood and magnitude of each claimed benefit. Benefits expected to occur only in the distant future are inherently more speculative than more immediate benefits.”).

3. for the benefit of consumers, and not solely for the benefit of the Applicants.<sup>37</sup>

The Applicants have not yet made this public interest benefit showing.

### III. BOTH SPRINT AND T-MOBILE ARE POTENTIAL 5G COMPETITORS THAT LIKELY CAN SUCCEED WITHOUT MERGING

#### A. T-Mobile Likely Does Not Need to Merge with a Competitor to Continue Its Outstanding Market Performance

T-Mobile bears no signs of a company that needs a market-consolidating merger to succeed. If anything, T-Mobile's performance in the years since its failed merger with AT&T demonstrates why a diverse mobile voice/broadband market with many players is good for consumers. T-Mobile stock is up, its customers are delighted, the incumbents have been forced to lower their prices due to T-Mobile's market disruptions, and it is investing in the technologies of the future.

*The un-carrier:* T-Mobile's "un-carrier" strategy has been widely successful and represented a complete turnaround for the company under CEO John Legere. In 2017, Legere celebrated five years as CEO and released a blog post to reflect on how much the company had changed. As Mr. Legere observed, when he first arrived, T-Mobile "didn't have much to celebrate. The AT&T merger had just collapsed, we were losing customers right and left, we had no iPhone, no LTE and we were ranked number 4 (out of 4) in customer service and market share."<sup>38</sup> But because T-Mobile had a "team passionate about their customers and committed to their values," the un-carrier movement "turned [the] company around and changed the wireless industry for good."<sup>39</sup>

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<sup>37</sup> *See id.*

<sup>38</sup> John Legere, *Un-Carrier is From the Inside Out!*, T-Mobile Blog (Sept. 26, 2017), <https://www.t-mobile.com/news/un-carrier-is-from-the-inside-out>.

<sup>39</sup> *Id.*

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As a result of T-Mobile’s focused approach to challenging the incumbents, the successes began to stack up. T-Mobile more than doubled its customer base (from 33 million at the end of 2012 to 76 million as of August 2018);<sup>40</sup> deployed a nationwide 4G LTE network; fielded “[m]ore than 600 million calls [] from our care organization as they reclaimed our reputation as the best in the business;” doubled its branded distribution and boasted 17,000 branded retail locations by the end of 2017; “[f]orced the industry to get rid of 2-year service contracts – now 170 million customers are free;” “[r]id the industry of \$1.6 billion [in] switching fees – making it easier to change carriers;” and “[g]ot rid of data buckets – now everyone can get an unlimited plan – thanks to T-Mobile.”<sup>41</sup> This is a lot to be proud of, and nothing in the Application explains why T-Mobile needs a merger to continue this impressive track record of success.

*Stock performance and profit:* T-Mobile was able to realize its un-carrier vision and rack up all the successes listed above while earning a profit and growing its stock price. The headline on the press release announcing T-Mobile’s first quarter 2018 financial results says it all: “T-Mobile Celebrates 5 Years as a Public Company with Record-Low Churn, Industry-Leading Customer Growth, and Strong Profitability.”<sup>42</sup> Its second quarter 2018 earnings release touted: “T-Mobile Delivers its Best Q2 Ever.”<sup>43</sup> T-Mobile reported 1.6 million total net additions,

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<sup>40</sup> Press Release, T-Mobile, *T-Mobile Delivers Its Best Q2 Ever* (Aug. 1, 2018), <http://investor.t-mobile.com/Cache/1001240724.PDF?O=PDF&T=&Y=&D=&FID=1001240724&iid=4091145>. (“T-Mobile Aug. 1, 2018 Press Release”). This number includes the Metro PCS acquisition in late 2012, which had 8.9 million subscribers at the time.

<sup>41</sup> *Id.*

<sup>42</sup> Press Release, T-Mobile, *T-Mobile Celebrates 5 Years as a Public Company with Record-Low Churn, Industry-Leading Customer Growth, and Strong Profitability*, (May 1, 2018), <https://www.t-mobile.com/news/q1-2018-earnings>.

<sup>43</sup> T-Mobile Aug. 1, 2018 Press Release.

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representing the 21st consecutive quarter with more than 1 million net additions.<sup>44</sup> T-Mobile’s growing customer base enjoys a 4G LTE network that covers 323 million people, with a target of 325 million people by year-end 2018.<sup>45</sup> Notably, the company’s “relentless focus on customer experience through increased investment in customer care, distribution expansion, and digital initiatives has strengthened [T-Mobile’s] customer growth and increased customer retention and satisfaction.”<sup>46</sup>

And, regardless of the merger, T-Mobile plans an “[a]ggressive deployment of 600 MHz in Q2 2018, augmenting existing low-band capabilities on 700 MHz,” and reported “17 quarters in a row with the fastest LTE network.”<sup>47</sup> T-Mobile has been able to acquire customers and expand its network while posting strong financial results. Among other things, it most recently reported “record-high” service revenues (up 7% to \$7.9 billion), increased total revenues (\$10.6 billion), and free cash of \$774 million.<sup>48</sup> Over a five-year period, T-Mobile’s stock has performed admirably, rising from approximately \$23 in July 2013 to over \$65 in August 2018—a gain of 182%.<sup>49</sup>

This is not a company that is afraid for its future or lacks a plan to continue its success.

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<sup>44</sup> *Id.*

<sup>45</sup> *Id.*

<sup>46</sup> T-Mobile US, Inc., Annual Report (Form 10-K), at 4 (Feb. 8, 2018) .

<sup>47</sup> T-Mobile Aug. 1, 2018 Press Release.

<sup>48</sup> *Id.*

<sup>49</sup> See Stock Chart, T-Mobile Investor Relations, <http://investor.t-mobile.com/Stock-Chart> (last visited Aug. 26, 2018).

**B. Sprint Has Plenty of Spectrum and Expertise to Challenge T-Mobile and the Other Incumbents as a Standalone Competitor**

While Sprint has not enjoyed the impressive rise that T-Mobile has, nothing in the Application proves that a market-consolidating merger is the only way, or even the best way, for Sprint to realize its potential. Sprint is already a healthy company, according to its most recent financial disclosures. Among other measures, Sprint touted 12 consecutive quarters of growth in postpaid customers, the lowest prepaid churn in more than three years, and adjusted EBITDA of \$3.3 billion—the highest in more than 11 years.<sup>50</sup>

In addition, Sprint has a treasure trove of spectrum that is highly suitable for 5G, and it could choose to build that spectrum out on its own. Sprint’s 2.5 GHz holdings in particular have become strategically important for 5G success<sup>51</sup> And, Sprint has noted that its “densification and optimization efforts are expected to continue to enhance the customer experience by adding data capacity, increasing the wireless data speeds available to our customers, and improving network performance for both voice and data services.”<sup>52</sup>

It is also far from clear that Sprint needs this merger to transition its network to 5G. Earlier in 2018, before announcing plans to merge with T-Mobile, Sprint aspired to lead the race to 5G in the United States, expecting “to launch mobile 5G, a true 5G mobile network in

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<sup>50</sup> See Sprint Corporation, FY Q1 2018 Results (Aug 1, 2018), [http://s21.q4cdn.com/487940486/files/doc\\_financials/quarterly/2018/Q1/02\\_1QFY18-Slides\\_Final.pdf](http://s21.q4cdn.com/487940486/files/doc_financials/quarterly/2018/Q1/02_1QFY18-Slides_Final.pdf).

<sup>51</sup> Sprint Corp., Q3 2017 Earnings Call Transcript, Fair Disclosure Wire (Feb. 2, 2018) (Maurice Claire, CEO: “I am very confident in Sprint’s future based on the competitive advantage that we will have with the deployment of 5G on our 2.5 spectrum.”).

<sup>52</sup> Sprint Corp., Annual Report (Form 10-K), at 26 (May 26, 2017) (“Sprint 2017 Annual Report”).

2019.”<sup>53</sup> Although the Applicants claim they can get to 5G faster and better if they do it together, a merger is not Sprint’s only option.

Sprint has also found success growing its subscriber base. Just a year ago, Sprint reported a “big step forward in the second year of [its] turnaround plan,”<sup>54</sup> with 42,000 new postpaid phone customers in the first quarter of 2017 and an impressive *doubling* of its postpaid subscriber growth in fiscal year 2016, with 930,000 more phone subscribers.<sup>55</sup> For the same quarter, Sprint announced that net operating revenues returned to growth and cost reductions accelerated, “leading to the highest operating income in a decade and a return to positive adjusted free cash flow.”<sup>56</sup> Here again, Sprint, backed by the resources of its parent SoftBank (which has assets exceeding 31 trillion yen or \$279 billion),<sup>57</sup> has not shown that it needs a merger to continue its track record of growth and reach its 5G aspirations.

**C. Merging T-Mobile and Sprint Means Customers Lose Out on Years of the Two Companies Competing Head-to-Head with Each Other and the Incumbents**

As discussed above, Sprint and T-Mobile have proven themselves to be strong, independent wireless competitors over the last five years, particularly regarding price and plan

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<sup>53</sup> Sprint Corp., Q3 2017 Earnings Call Transcript, Fair Disclosure Wire (Feb. 2, 2018)

<sup>54</sup> Press Release, Sprint, *Sprint Returns to Net Operating Revenue Growth, Near-Record Operating Income, and Positive Adjusted Free Cash Flow With Fiscal Year 2016 Results* (May 3, 2017), <http://investors.sprint.com/news-and-events/press-releases/press-release-details/2017/Sprint>Returns-to-Net-Operating-Revenue-Growth-Near-Record-Operating-Income-and-Positive-Adjusted-Free-Cash-Flow-with-Fiscal-Year-2016-Results/default.aspx>.

<sup>55</sup> *Id.*

<sup>56</sup> *Id.*

<sup>57</sup> Softbank Group, Financial Position, <https://www.softbank.jp/en/corp/irinfo/financials/results/highlights> (data for FY 2017).

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features.<sup>58</sup> For its part, T-Mobile has touted its position as the “un-carrier” by providing competitive offerings, including domestic and international unlimited data, talk, and text plans,<sup>59</sup> and Binge On, which provides unlimited video streaming for participating services.<sup>60</sup> Sprint has similarly disrupted the market with innovative offerings. For example, in January 2014, Sprint launched the “Family Plan” which allowed consumers to choose up to 10 phone lines to add to a group plan, with unique incentives and billing for each participant.<sup>61</sup> T-Mobile and Sprint have promoted themselves as low-cost providers and currently offer the cheapest unlimited data plans of the four nationwide wireless carriers.<sup>62</sup>

*Sprint and T-Mobile compete against each other.* Among other factors, Sprint and T-Mobile’s strength as independent companies comes from their efforts to attract and retain customers by competing head-to-head.<sup>63</sup> Their relationship has been characterized as one of

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<sup>58</sup> See e.g. Karissa Bell, *Say Goodbye to the Epic Twitter Feud Between T-Mobile, Sprint*, Mashable (Apr. 30, 2018), <https://mashable.com/2018/04/30/sprint-tmobile-merger-ceo-twitter-beef/#hNtDsbUJusqP> (describing and cataloging tweets from 2013 through 2018 that T-Mobile Chief Executive Officer John Legere wrote comparing Sprint and T-Mobile’s customer satisfaction, marketing promotions, network speed, and network reliability).

<sup>59</sup> See T-Mobile, *One Plan to Rule Them All.*, <https://www.t-mobile.com/our-story/un-carrier-history> (last visited Aug. 26, 2018); *Unlimited Video Streaming with Binge On*, T-Mobile, <https://www.t-mobile.com/offers/binge-on-streaming-video> (last visited Aug. 26, 2018).

<sup>60</sup> *Unlimited Video Streaming with Binge On*, T-Mobile, <https://www.t-mobile.com/offers/binge-on-streaming-video> (last visited Aug. 26, 2018).

<sup>61</sup> See Press Release, Sprint, *Sprint Redefines the Wireless Family with the New Sprint Family Plan* (Jan. 7, 2014), <http://newsroom.sprint.com/sprint-redefines-the-wireless-family-with-the-new-sprint-family-plan.htm>.

<sup>62</sup> See Patrick Holland, *T-Mobile, Verizon, AT&T, and Sprint Unlimited Plans Compared*, CNET (Aug. 9, 2018) <https://www.cnet.com/news/verizon-att-sprint-t-mobile-unlimited-data-plan-compared> (last visited Aug. 26, 2018).

<sup>63</sup> See Dan Frommer, *Blocking T-Mobile’s Last Big Merger Turned out Great for U.S. Consumers. So What’s Different Now?*, Recode (Apr. 30, 2018), <https://www.recode.net/2018/4/30/17302426/tmobile-sprint-merger-regulatory-approval->

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“largely competing against each other . . . since both are trying to lure customers away from the two giants of the industry”<sup>64</sup> Observers have noted that “when either drops the price of plans, or includes extra 4G data, the other matches the plans or betters them.”<sup>65</sup> As the Commission has recognized, consumers have directly benefitted from this competition in the form of lower prices and innovative offerings provided by the two carriers.<sup>66</sup> The following are just some examples of Sprint and T-Mobile competing for market share by changing services or products in response to each other’s offerings:

- On the same day in August 2016 that T-Mobile announced T-Mobile ONE, its unlimited plan,<sup>67</sup> Sprint announced the launch of its Unlimited Freedom plan.<sup>68</sup> Both plans offer unlimited video, gaming, and music streaming, as well as “unlimited nationwide 4G LTE data for most everything else[.]”<sup>69</sup>
- In August 2017, T-Mobile announced a new unlimited plan, which offers consumers aged 55 years and older two lines of unlimited talk, text, and 4G LTE

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[competition](#) (“T-Mobile and Sprint have been wasting a lot of money stealing customers from each other.”).

<sup>64</sup> [Chris Morris, \*What Would a T-Mobile Sprint Merger Mean for Customers\*, Fortune \(Sept. 22, 2017\), <http://fortune.com/2017/09/22/t-mobile-sprint-merger-customers>.](#)

<sup>65</sup> Joseph Hanlon, *5 Reasons to Choose T-Mobile Over Sprint*, WhistleOut (Nov. 5, 2015), <https://www.whistleout.com/CellPhones/Guides/reasons-to-choose-tmobile-over-sprint>.

<sup>66</sup> AT&T/T-Mobile Staff Report, 26 FCC Rcd. at 16198-16201 ¶¶ 21-25; Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, *Twentieth Report*, 32 FCC Rcd. 8968, 9002-04 ¶¶ 50-52 (2017) (“20th Mobile Wireless Competition Report”).

<sup>67</sup> See Press Release, T-Mobile, *Hello Un-carrier 12 ... R.I.P. Data Plans T-Mobile Goes All in on Unlimited*, (Aug. 18, 2016), <https://www.t-mobile.com/news/rip-data-plans> (“T-Mobile Aug. 18, 2016 Press Release”).

<sup>68</sup> Press Release, Sprint, *Sprint Launches Unlimited Freedom: Two Lines of Unlimited Talk, Text and Data for Just \$100– All on a Great Network – and the Best Price among All National Carriers*, (Aug. 18, 2016), <http://newsroom.sprint.com/sprint-launches-unlimited-freedom-two-lines-of-unlimited-talk-text-and-data-for-just-100-all-on-a-great-network-and-the-best-price-among-all-national-carriers.htm>.

<sup>69</sup> T-Mobile Aug. 18, 2016 Press Release.

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data for \$60.<sup>70</sup> In May 2018, Sprint announced an unlimited plan that offers consumers 55 years and older two lines of unlimited data, talk, text, and mobile hotspot data for \$70.<sup>71</sup>

- In February 2017, less than a week after T-Mobile announced that T-Mobile ONE would include HD video and 10 GB of high-speed hotspot data,<sup>72</sup> Sprint launched an unlimited plan with HD-quality video and a 10 GB mobile hotspot at a discounted rate.<sup>73</sup>
- In April 2018, T-Mobile launched T-Mobile ONE Military, which offers U.S. military, veterans, their families, and their small businesses “20% off the first line and [h]alf [o]ff up to five additional voice lines[,]” in addition to standard T-Mobile ONE features.<sup>74</sup> Three months later, Sprint launched its Unlimited Military plan, which offers veterans, active duty, and reserves of the U.S. armed forces “50 percent off family lines[.]”<sup>75</sup>
- In April 2018, soon after Sprint announced that its prepaid brand Boost was offering new customers a month of free unlimited data service,<sup>76</sup> T-Mobile

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<sup>70</sup> See Press Release, T-Mobile, *A New Reason to Get a Fake ID: Introducing T-Mobile ONE Unlimited 55+* (Aug. 6, 2017), <https://www.t-mobile.com/news/unlimited-55>.

<sup>71</sup> See Press Release, Sprint, *55+ Reasons to Switch to Sprint Now!* (May 17, 2018), <http://investors.sprint.com/news-and-events/press-releases/press-release-details/2018/55-Reasons-to-Switch-to-Sprint-Now/default.aspx>.

<sup>72</sup> See Diana Goovaerts, *T-Mobile Parries Verizon’s Unlimited Move with HD Video Upgrade, 2 Line Promo*, *Wireless Week* (Feb. 13, 2017), <https://www.wirelessweek.com/blog/2017/02/t-mobile-parries-verizons-unlimited-move-hd-video-upgrade-2-line-promo>.

<sup>73</sup> See Diana Goovaerts, *Following Verizon and T-Mobile, Sprint Springs for HD Video in Unlimited Plan Upgrade*, *Wireless Week* (Feb. 16, 2017), <https://www.wirelessweek.com/news/2017/02/following-verizon-and-t-mobile-sprint-springs-hd-video-unlimited-plan-upgrade>.

<sup>74</sup> Press Release, T-Mobile, *You’ve Got Our Backs, So We’ve Got Yours. T-Mobile Launches Extensive Military Support Initiative* (Apr. 18, 2018), <https://www.t-mobile.com/news/t-mobile-one-military> (“T-Mobile Apr. 18, 2018 Press Release”).

<sup>75</sup> Press Release, Sprint, *Sprint’s Industry-Leading Unlimited Plans Just Got Even Better! New Unlimited Plans Include Features Customers Love for the Best Price* (July 12, 2018), <http://newsroom.sprint.com/sprints-industry-leading-unlimited-plans-just-got-even-better-new-unlimited-plans-include-features-customers-love-for-best-price.htm> (“Sprint July 12, 2018 Press Release”).

<sup>76</sup> See Zach Epstein, *Sprint Is Giving Away a Month of Unlimited Prepaid Service – So Now T-Mobile Is Giving Away 2 Months*, *BGR* (Apr. 14, 2018), <https://bgr.com/2018/04/14/t-mobile-unlimited-plan-price-free-metropcs-offer>.

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announced that its prepaid MetroPCS brand would offer two months of free unlimited service and a MetroPCS phone to new customers.<sup>77</sup>

- In July 2018, Sprint debuted two tiers of unlimited plans: Unlimited Basic and Unlimited Plus. Unlimited Basic includes unlimited talk, text, and data as well as Hulu and a 500 MB mobile hotspot, while Unlimited Plus includes a premium Tidal subscription, 15 GB of 4G LTE mobile hotspot data, 10 GB of 4G LTE data in Canada and Mexico, and full HD video streaming on Sprint's 4G LTE network.<sup>78</sup> Two years earlier, in 2016, T-Mobile launched its own two-tier unlimited offerings: T-Mobile ONE, which offers unlimited talk, text, and high-speed data<sup>79</sup> and as of September 2017, Netflix,<sup>80</sup> and T-Mobile ONE Plus, which offers 20 GB of 4G LTE mobile hotspot data, unlimited HD streaming, and unlimited data abroad at double the speed of T-Mobile ONE.<sup>81</sup>

Consumers and the industry as a whole have benefitted from the direct competition between T-Mobile and Sprint.

Importantly, the companies' efforts have also forced AT&T and Verizon to respond with lower prices and more attractive offers. In 2008, Verizon's decision to introduce an unlimited wireless plan was spurred by Sprint's imminent announcement of its own unlimited wireless offer, which was then matched by AT&T within days.<sup>82</sup> In 2010, Sprint released the first 4G

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<sup>77</sup> See Press Release, T-Mobile, *Switch to MetroPCS Today and Get TWO Months Unlimited Data Free* (Apr. 12, 2018), <https://www.t-mobile.com/news/metropcs-two-months-free>.

<sup>78</sup> See Sprint July 12, 2018 Press Release.

<sup>79</sup> See T-Mobile Aug. 18, 2016 Press Release.

<sup>80</sup> See Press Release, *America's Best Unlimited Just Got Even Better – T-Mobile Now Includes Netflix on Us*, (Sept. 5, 2017), <https://www.t-mobile.com/news/tmobile-uncarrier-netflix>.

<sup>81</sup> See Amp Up T-Mobile ONE, T-Mobile, [https://www.t-mobile.com/cell-phone-plans?icid=WMM\\_TM\\_Q117TMO1PL\\_H85BRNKTDO37510](https://www.t-mobile.com/cell-phone-plans?icid=WMM_TM_Q117TMO1PL_H85BRNKTDO37510) (last visited Aug. 26, 2018); Press Release, T-Mobile, *T-Mobile Shakes Things Up with T-Mobile ONE Plus* (Dec. 20, 2016), <https://www.t-mobile.com/news/t-mobile-shakes-things-up-with-t-mobile-one-plus> (introducing T-Mobile ONE Plus in December 2016).

<sup>82</sup> Saul Hansell, *Verizon Stabs Sprint With Unlimited Wireless Plan* (Feb. 19, 2008), <https://bits.blogs.nytimes.com/2008/02/19/verizon-stabs-sprint-with-unlimited-wireless-plan>.

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phone in the United States, leading Verizon to respond with the Droid X.<sup>83</sup> More recently, AT&T matched Sprint's offer of a \$500 credit for customers buying the Galaxy S9.<sup>84</sup> The response to T-Mobile's consumer-friendly policies is similarly well-known. After dropping unlimited data plans three years earlier, "[in] response to T-Mobile's One plan, Verizon, AT&T, and Sprint all introduced or improved their unlimited data offerings."<sup>85</sup> And, since T-Mobile began introducing competitive no-contract plans in 2013, the "overall cost of wireless service has come down 19%."<sup>86</sup> Additional examples of Verizon's and AT&T's responses to T-Mobile's maverick behavior abound:

- *Military discounts*: In April 2018, T-Mobile offered the "biggest military discount in wireless," with 20% off a first line and 50% off additional lines.<sup>87</sup> In June 2018, Verizon followed with its own stepped-up military discount, offering its Go Unlimited plan "for \$30 per month per line for four lines—a savings of \$40 per month."<sup>88</sup>
- *Buy-One-Get-One-Free offers*: In January 2018, T-Mobile announced a buy-one-get-one free deal for major smartphone brands when a line is switched to T-Mobile.<sup>89</sup> In May

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<sup>83</sup> Jane McEntegart, *Droid X is Verizon's Answer to Sprint's EVO 4G* (June 16, 2010), <https://www.tomsguide.com/us/Droid-x-Verizon-Sprint-EVO-4G,news-7088.html> ("Verizon's answer to [Sprint's] HTC Evo 4G").

<sup>84</sup> Eric Zeman, PhoneScoop, *AT&T Matches Sprint's Samsung Galaxy S9 Offer* (Mar. 2, 2018), <https://www.phonescoop.com/articles/article.php?a=20293>.

<sup>85</sup> Chris Mills, *Everyone Loves Their Unlimited Data Plans*, BGR (Jan 22, 2018), <https://bgr.com/2018/01/22/best-unlimited-plan-verizon-vs-t-mobile-att>.

<sup>86</sup> Danielle Wiener-Bronner, *What T-Mobile-Sprint Deal Could Mean for Wireless Prices*, CNN (Apr. 30, 2018), <https://money.cnn.com/2018/04/30/technology/business/tmobile-sprint-wireless-rates/index.html>.

<sup>87</sup> T-Mobile Apr. 18, 2018 Press Release.

<sup>88</sup> Press Release, Verizon, *Now Military Families Can Save Even More with Verizon Unlimited*, (June 28, 2018), <https://www.verizon.com/about/news/now-military-families-can-save-even-more-verizon-unlimited>.

<sup>89</sup> Press Release, T-Mobile, *T-Mobile Unveils Major Smartphone Deals to Start the New Year Right* (Jan. 10, 2018), <https://www.t-mobile.com/news/bogo-offers>.

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2018, Verizon introduced its own buy-one-get-one-free deal.<sup>90</sup> In June, T-Mobile added the LG G7 to its buy-one-get-one-free deal.<sup>91</sup> One week later, Verizon matched T-Mobile's offer and added LG G7 to its deal.<sup>92</sup>

- *Senior discounts:* In August 2017, T-Mobile introduced an unlimited plan for consumers over the age of 55, offering two lines for \$60/month.<sup>93</sup> Verizon later matched T-Mobile's offer with its own plan for customers 55 years and older in Florida, offering an unlimited line for \$60/month and two unlimited lines for \$80/month.<sup>94</sup>

Without the presence of both companies as independent players in the market, consumers stand to lose out on the innovative offerings and lower prices that have resulted from this head-to-head competition.

#### **IV. THE APPLICANTS HAVE NOT YET MET THE BURDEN OF PROVING THE TRANSACTION WILL PRODUCE PUBLIC BENEFITS THAT OUTWEIGH THE LIKELY HARMS**

##### **A. 5G Deployment Likely Would Happen With or Without the Proposed Transaction, and Should Not Be Credited as the Transaction's But/For Benefit**

Each of the Applicants have claimed that they will deploy 5G networks as standalone companies. Indeed, both T-Mobile and Sprint have shown a commitment to being first to market

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<sup>90</sup> Chris Mills, *Verizon's New iPhone BOGO Deal Has Shockingly Little Fine Print*, BGR (May 7, 2018), <https://bgr.com/2018/05/07/verizon-iphone-deal-buy-one-get-one>.

<sup>91</sup> Chris Mills, *The LG G7 Isn't Even on Sale Yet, But T-Mobile Already Has a Buy-One-Get-One-Free Deal*, BGR (May 30, 2018), <https://bgr.com/2018/05/30/the-lg-g7-release-date-deals-t-mobile-vs-sprint-verizon>.

<sup>92</sup> Chris Mills, *Verizon is Matching T-Mobile's iPhone and Android Buy-One-Get-One-Free Deal Almost Exactly*, BGR (June 7, 2018), <https://bgr.com/2018/06/07/t-mobile-phones-deals-2018-vs-verizon>.

<sup>93</sup> T-Mobile Aug. 6, 2017 Press Release.

<sup>94</sup> Mike Dano, *Verizon Offers Response to T-Mobile's Unlimited Plan for Customers Over 55 Years of Age*, Fierce Wireless (Feb. 23, 2018), <https://www.fiercewireless.com/wireless/verizon-tests-response-to-t-mobile-s-unlimited-plan-for-customers-over-55-years-old>.

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with this next generation technology, a commitment that is consistent with both Applicants' positions as disruptors in the market.<sup>95</sup>

Before the merger, T-Mobile stated that it “will be the first to give customers the truly transformative, nationwide 5G network they deserve[.]”<sup>96</sup> It also announced it would “accelerate our 600 megahertz rollout in 2018, while laying the foundation for the country’s first nationwide 5G network by 2020.”<sup>97</sup> In its annual 10-K filing for 2017, the company explained that it is “rapidly preparing for the next generation of 5G services” by creating a “network that will allow us to deliver innovative new products and services with the same customer focused and industry disrupting mentality that has redefined wireless service in the United States.”<sup>98</sup>

Sprint, for its part, believes it has “the BEST spectrum and assets to build an incredible nationwide #5G network that our customers will love.”<sup>99</sup> And Sprint said pre-merger that “I

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<sup>95</sup> See e.g., T-Mobile US, Inc., Q4 2017 Earnings Call Transcript (Feb. 8, 2018), <https://seekingalpha.com/article/4145138-t-mobile-uss-tmus-ceo-john-legere-q4-2017-results-earnings-call-transcript> (“[A] blazing fast 4G LTE industry leader with a commitment on the books to launch the first nationwide 5G summary -- network.”) (“T-Mobile Q4 2017 Earnings Call”); Press Release, Sprint, News From Sprint at Mobile World Congress 2018, (Feb. 22, 2018), <http://newsroom.sprint.com/sprint-news-at-mobile-world-congress-2018.htm> (“Sprint MWC 2018 Announcement”) (“Sprint has boldly stated its commitment to building the nation’s first 5G mobile network in the first half of 2019[.]”) (“Sprint MWC 2018 Announcement”).

<sup>96</sup> See Alex Scroxton, MWC 2018: 5G Collaboration Dominates Agenda at Annual Mobile Fair, Computer Weekly.com (Feb. 28, 2018), <https://www.computerweekly.com/news/252435888/MWC-2018-5G-collaboration-dominates-agenda-at-annual-mobile-fair> (T-Mobile Chief Technology Officer Neville Ray).

<sup>97</sup> T-Mobile Q4 2017 Earnings Call.

<sup>98</sup> T-Mobile US, Inc., Annual Report (Form 10-K) at 4 (Feb. 8, 2018).

<sup>99</sup> Marcelo Claire (@marcelclaire), Twitter (Mar. 9, 2018 12:24 PM), <https://twitter.com/marceloclaire/status/972206391858483201>.

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have never seen a company with such a rich spectrum which is a sweet spot for 5G, I guess that gives us a tremendous opportunity for the years to come.”<sup>100</sup>

Before the merger, the Applicants also backed up their promises of 5G deployment with aggressive and independent capital buildout plans. T-Mobile announced plans to spend \$25.9 billion in CapEx through 2022,<sup>101</sup> and noted that its expenditures for 5G deployment in 2018 are “now expect[ed] to come in at the high end” of its estimated range of \$4.9 to \$5.3 billion.<sup>102</sup> Sprint indicated that it planned to spend between \$5 and \$6 billion on 5G in fiscal year 2018.<sup>103</sup> Sprint’s April 2018 network plan, as approved by its Board of Directors, **{{BEGIN HCI**

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<sup>100</sup> Transcript, *Sprint’s Management Presents at Deutsche Bank 2018 Media, Telecom & Business Services Conference* (Mar. 7, 2018), <https://seekingalpha.com/article/4154284-sprints-management-presents-deutsche-bank-2018-media-telecom-and-business-services?page=2> (comments of Sprint President and Chief Financial Officer Michel Combes).

<sup>101</sup> Application at 4.

<sup>102</sup> Declaration of Neville Ray ¶ 8 (June 18, 2018) (“Ray Declaration”) (attached as Appendix B to the Application); T-Mobile Q2 2018 Earnings Call Transcript (Aug. 1, 2018), <https://seekingalpha.com/article/4193405-t-mobile-us-inc-tmus-ceo-john-legere-q2-2018-results-earnings-call-transcript?page=2>.

<sup>103</sup> Sprint Corp., Q1 2018 Earnings Call Transcript (Aug. 1, 2018), <https://seekingalpha.com/article/4193250-sprint-s-q1-2018-results-earnings-call-transcript> (“Sprint Q1 2018 Earnings Call”).

<sup>104</sup> See Letter from Regina M. Keeney, Counsel for Sprint Corporation, to Marlene Dortch, Attachment 1, WT Docket No. 18-197 (July 31, 2018).

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These pre-merger plans, backed by the companies' respective spectrum holdings, and the realities of what 5G entails, demonstrate that both companies appear to have the spectrum assets and resources to deploy 5G networks on their own today, and any purported acceleration in network deployment or enhancement to network quality has not yet been proven by the Applicants. The burden is on the Applicants to show that their claimed benefits are both real and transaction-specific. To date, the Applicants have not done so, but DISH looks forward to the Applicants' response to the FCC's detailed document requests on these and other issues.

*Financing.* The first reason given by the Applicants regarding the 5G benefits of the merger is the supposed \$43.6 billion in synergies to be supposedly produced by their consolidation and subsequent investment in 5G deployments. But both Sprint and T-Mobile each have already committed to invest \$5-6 billion *annually* until 2020 into their respective 5G deployments. So the Applicants' projected combined spend appears to be merely the sum of what each intended to spend on its own. The Applicants do not show whether or how they will monetize these claimed synergies.

*Spectrum holdings.* 5G is meant to be a paradigm shift that includes more than just an increase in broadband speeds (which requires larger swaths of spectrum). The 5G concept also includes supporting vertical markets and other requirements that do not necessarily rely on more spectrum. An increase in broadband speeds alone does not necessarily require a 5G network and can be realized in other ways, as explained below.

Each of Sprint and T-Mobile appear to have access to enough spectrum—in quantity and in kind—to deploy 5G networks today. First, as demonstrated below, both companies hold significant amounts of nationwide or near-nationwide spectrum.

**National Average Spectrum Holdings by Carrier**

	Sprint	T-Mobile	New T-Mobile
600 MHz	0.0	30.8	30.8
700 MHz	0.0	10.1	10.1
SMR	13.8	0.0	13.8
PCS	37.9	28.9	66.8
AWS-1	0.0	36.8	36.8
AWS-3	0.0	3.3	3.3
BRS/EBS	134.7	0.0	134.7
<b>Total</b>	<b>186.4</b>	<b>109.8</b>	<b>296.2</b>

Note: New T-Mobile spectrum holdings assume no divestitures  
 Source: Spectrum holdings are Brattle estimates. Spectrum holdings are as of August 2018 and are based on data from the FCC Universal Licensing System.

T-Mobile has described its nationwide 600 MHz holdings as “staggering,”<sup>105</sup> and its “volume of mid-band spectrum” as “impressive.”<sup>106</sup> As the Applicants acknowledge, “in most markets, T-Mobile has 200 MHz, but in others the company has as much as 800 megahertz” of millimeter wave spectrum.<sup>107</sup> Together, these holdings “position[] T-Mobile to deliver a 5G network that offers BOTH breadth and depth nationwide.”<sup>108</sup> Sprint has also lauded its spectrum reserves, touting that it has “more spectrum deployed on LTE per consumer than any other carrier today” and is in “an enviable position with the best spectrum” that gives Sprint “a capital

<sup>105</sup> Press Release, T-Mobile, T-Mobile’s New 600 MHz Network Rollout Begins This Summer, (Jun. 14, 2017), <https://www.t-mobile.com/news/t-mobiles-new-600-mhz-network-rollout-begins-this-summer> (“[T-Mobile] now officially possesses a staggering average of 31 MHz of 600 MHz spectrum licenses across the nation, ... [this] gives the Un-carrier a massive volume of premium airwaves to meet customers’ growing demand for mobile data[.]”).

<sup>106</sup> Neville Ray, *Setting the 5G Record Straight: Announcing Plans for Nationwide 5G from T-Mobile*, T-Mobile Blog (May 1, 2017), <https://www.t-mobile.com/news/nationwide-5g-blog>.

<sup>107</sup> Application at 21 n.63.

<sup>108</sup> *Id.*

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intensity and capacity advantage relative to other players in the industry.”<sup>109</sup> In fact, Sprint has stated that it has the most spectrum bar none: “Sprint has more spectrum capacity than Verizon, AT&T and T-Mobile. We’re confident in our ability to serve our customers now and in the future, because we hold more spectrum capacity than any other carrier in the U.S. A lot more.”<sup>110</sup> In particular, Sprint has noted that its 2.5 GHz band spectrum “carries the highest percentage of Sprint’s LTE data traffic.” According to Sprint, the company has “significant additional capacity to grow the use of our 2.5 GHz spectrum holdings into the future,” and is therefore “well-positioned with spectrum holdings of more than 160 MHz of 2.5 GHz spectrum in the top 100 markets in the U.S.”<sup>111</sup>

Given these spectrum holdings, neither company appears to need all of its current spectrum to serve existing customer requirements. Each has fewer subscribers per MHz and fewer subscribers per cell site (and per MHz per cell site) than either of AT&T or Verizon:

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<sup>109</sup> Sprint Corp., Q1 2016 Earnings Call Transcript, Fair Disclosure Wire (July 25, 2016) (Marcelo Claure, Sprint President and CEO); Sprint Corp., Q2 2016 Earnings Call Transcript, Fair Disclosure Wire (Oct. 25, 2016) (Tarek Robbiati, Sprint CFO).

<sup>110</sup> John Saw, *In the Land of Unlimited Wireless, Spectrum is King*, Sprint Blog (Feb. 15, 2017), <http://newsroom.sprint.com/in-land-wireless-spectrum-is-king.htm>.

<sup>111</sup> Sprint 2017 Annual Report at 26.

**Table 1: Major Carriers’ Wireless Networks**

Carrier [1]	Population- Weighted Average MHz Holdings [2]	Percentage of Big Four Population Weighted Average MHz Holdings [3]	Cell Sites [4]	Total Subscriber Connections (thousands) [5]	Subscribers per MHz [6]	Subscribers / Cell Site [7]	Subscribers / MHz / Cell Site [8]	
AT&T	[A]	152.0	26.9%	67,000	134,875	887,139	2,013	13.2
Sprint	[B]	186.4	33.0%	50,000	59,515	319,298	1,190	6.4
T-Mobile	[C]	109.8	19.4%	59,417	71,455	650,790	1,203	11.0
Verizon	[D]	116.4	20.6%	58,300	145,859	1,253,549	2,502	21.5
<b>With Spectrum Cap</b>								
New T-Mobile - All Cell Sites	[E]	238.5	42.2%	109,417	130,970	549,140	1,197	5.0
New T-Mobile - 11,000 Retained Cell Sites	[F]	238.5	42.2%	70,417	130,970	549,140	1,860	7.8
<b>Without Spectrum Cap</b>								
New T-Mobile - All Cell Sites	[G]	296.2	52.5%	109,417	130,970	442,182	1,197	4.0
New T-Mobile - 11,000 Retained Cell Sites	[H]	296.2	52.5%	70,417	130,970	442,182	1,860	6.3

The following bands are included in this table: 600 MHz, 700 MHz, Cellular, SMR, PCS, H Block, AWS-1, AWS-3, AWS-4, WCS, BRS, and EBS. Small cells are not captured in the above chart.<sup>112</sup>

What does this mean? Each of Sprint and T-Mobile today likely can deploy 5G using a significant chunk of its spectrum while reserving enough of it for supporting their legacy 4G subscribers.

*Current Capacity.* As explained in the Harrington/Brattle Declaration, the Applicants seem to overstate the improvement in capacity that the merger will produce. **{{BEGIN HCI**

<sup>112</sup> Source: 20th Mobile Wireless Competition Report, Table II.B.1 and Table II.F.i; Declaration of Neville R. Ray, ¶ 31. Spectrum holdings are Brattle estimates. Spectrum holdings are as of August 2018 and are based on data from the FCC Universal Licensing System.

**END HCI}}**<sup>113</sup> And the coverage and capacity enhancements that will result from massive MIMO technology could allow the Applicants to deploy 5G systems on a stand-alone basis.

*The transition to 5G.* There is no “secret sauce” from the merger that will facilitate 5G deployment for either company. 5G mobile broadband networks require a combination of low-band and mid-band spectrum. Millimeter wave spectrum can also be used to augment capacity in high density zones. Importantly, the Applicants have failed to define which 5G service they are referring to for each benefit they claim the merger will bring. 5G includes a wide number of services with different spectrum requirements. Not all of these services require massive amounts of spectrum and speed. Many of the massive machine-type communications (“mMTC”) and ultra-reliable low-latency communications (“URLLC”) services envisioned as part of 5G can likely be supported through the use of low-and mid-band spectrum owned by T-Mobile and Sprint.

For example, T-Mobile could potentially combine its 600 MHz spectrum with its mid-band and millimeter wave holdings to reach a national subscriber base with a next generation network. The company already has plans to do precisely that: “The best way to launch a new technology is new, clear spectrum like 600 MHz, then re-use other spectrum bands for 5G over time. We are in a best position to execute on this strategy, and will drive the network evolution

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<sup>113</sup> See Joint Declaration of Joseph Harrington and The Brattle Group at 17-18 (attached as Exhibit B) (“Harrington/Brattle Declaration”).

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to 5G.”<sup>114</sup> As T-Mobile has acknowledged, the company can also augment network capacity by leveraging its 28/39 GHz holdings in urban areas to increase network capacity.<sup>115</sup> If T-Mobile feels the need for more capacity in regions beyond the large metropolitan areas in which it already holds millimeter wave spectrum, the company can always acquire additional millimeter wave, CBRS, and/or other spectrum rights from future spectrum auctions or the secondary markets. To this end, T-Mobile has indicated its intent to participate in the FCC’s upcoming auction of millimeter-wave spectrum for 5G deployment, and T-Mobile signed a \$3.5 billion deal with Nokia for end-to-end 5G solutions.<sup>116</sup> T-Mobile has also been active in the Commission’s rulemaking for CBRS and has indicated interest in that spectrum.<sup>117</sup>

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<sup>114</sup> Neville Ray, *5G Reality vs 5G Hype: The Un-Carrier vs the Carriers*, T-Mobile Blog (Jan. 16, 2018), <https://www.t-mobile.com/news/5g-ces-wrap-up>.

<sup>115</sup> T-Mobile Q2 2016 Investor Call Transcript, Fair Disclosure Wire (Aug. 18, 2016) (“And as you know, we have a swath of 28 GHz spectrum, which has already been tagged by the FCC for 5G use. So 5G is going to be, as you close out this decade, is going to be the major path for increasing material capacity on these networks.”) (Neville Ray, T-Mobile CTO); Karri Kuoppamaki, T-Mobile VP, Radio Network Technology, Remarks at Wells Fargo Securities 5G Forum (June 22, 2017) (“Spectrum is . . . not the only way to add capacity into the network. . . . [W]e have . . . 200 megahertz of 28 and 39 gigahertz spectrum covering about 100 million covered POPs, 7 out of the top 10 markets in the U.S. So that’s a good starting point for 5G as well when it comes to millimeter wave capability.”).

<sup>116</sup> Letter from Nancy Victory to Marlene Dortch, AU Docket No. 18-85, at 3 (July 23, 2018) (urging the FCC to allow T-Mobile to participate in the upcoming auction despite its pending merger with Sprint); Press Release, *T-Mobile and Nokia Ink \$3.5 Billion, Multi-year 5G Network Agreement* (July 30, 2018), <https://www.t-mobile.com/news/nokia-5g-agreement>.

<sup>117</sup> Kaleigh Rogers, *At the Behest of T-Mobile, the FCC Is Undoing Rules That Make it Easier for Small ISPs to Compete With Big Telecom* Motherboard (Jan 11, 2018), [https://motherboard.vice.com/en\\_us/article/ev5mm7/at-the-behest-of-t-mobile-the-fcc-is-undoing-rules-that-make-it-easier-for-small-isps-to-compete-with-big-telecom](https://motherboard.vice.com/en_us/article/ev5mm7/at-the-behest-of-t-mobile-the-fcc-is-undoing-rules-that-make-it-easier-for-small-isps-to-compete-with-big-telecom); T-Mobile US, Inc., Q2 2018 Earnings Call Transcript (Aug. 1, 2018), <https://seekingalpha.com/article/4193405-t-mobile-us-inc-tmus-ceo-john-legere-q2-2018-results-earnings-call-transcript> (“We’re very encouraged by the actions of the FCC on millimeter wave, their efforts and work on mid-band spectrum, be that CBRS or the C-band . . . And yes, for sure, we have material interest in participating in those auctions . . . It’s something that’s of keen interest to us at T-Mobile.”).

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Sprint, too, appears to have what it needs in hand for 5G. The carrier has exclusive licenses or leases for almost the entirety of the 2.5 GHz band. A white paper commissioned by Sprint to explain Sprint’s 5G spectrum position noted that Sprint “offers more nationwide population-weighted average spectrum capacity than AT&T, Verizon, and T-Mobile including more than 160 MHz of 2.5 GHz spectrum in the top 100 U.S. markets.”<sup>118</sup> Sprint can also use carrier aggregation technologies and the beamforming capabilities of the massive MIMO technology to combine its PCS and 2.5 GHz spectrum to extend the reach of its 5G network even further.

Specifically, “massive MIMO technology” can “deliver 4G LTE and 5G both separately and simultaneously on one radio.”<sup>119</sup> It can achieve not only capacity enhancements,<sup>120</sup> but also coverage enhancements.<sup>121</sup> The Sprint 5G white paper found that “massive MIMO could be a

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<sup>118</sup> Moor Insights & Strategy, *Sprint 5G: The Power to Enable Business Transformation* at 9 (April 2018), <https://business.sprint.com/wp-content/uploads/sites/2/2018/04/Sprint-5G-The-Power-to-Enable-Business-Transformation-Final-V4.13.2018....pdf> (“Sprint 5G White Paper”).

<sup>119</sup> Declaration of John C. Saw Declaration ¶ 20 (June 18, 2018) (attached as Appendix E to Application) (“Saw Declaration”). *See also* Sprint Q1 2018 Earnings Call (“Massive MIMO radios are software upgradable to 5G NR, allowing us to fully utilize our spectrum for both LTE and 5G simultaneously, while we enhance capacity even further with 5G and begin to support new 5G use cases”).

<sup>120</sup> Sean Kinney, *Sprint CTO: Massive MIMO ‘Secret Weapon’ in 4G and 5G Plans*, RCR Wireless News (March 5, 2018), <https://www.rcrwireless.com/20180305/carriers/sprint-cto-massive-mimo-secret-weapon-tag17> (“Massive MIMO capabilities will be available to Sprint customers using a phone with 2.5 GHz (Band 41) support, and the carrier is working with Qualcomm Technologies and device manufacturers on 5G NR support for 2.5 GHz targeted at the first half of 2019. Qualcomm’s new Snapdragon X50 includes Band 41 5G NR support. Sprint is working with multiple vendors on its massive MIMO activation. Last year the carrier worked with Samsung to test the equipment including a trial in Suwon, South Korea. Results saw an increase in channel capacity by some 300% and a boost in cell edge performance by 200%, according to the operator.”).

<sup>121</sup> Di Yong, *Massive MIMO is the Future of Wireless Networks* (June 21, 2017), <https://www.huawei.com/en/about-huawei/publications/winwin-magazine/28/massive-mimo->

key differentiator for Sprint relative to other tier one carriers in the United States because it can be easily deployed on high-band spectrum such as Sprint’s 2.5 GHz spectrum.”<sup>122</sup>

Finally, Sprint can similarly augment its existing spectrum holdings by acquiring millimeter wave spectrum that it has stated “is an important part of its strategy going forward.”<sup>123</sup> In fact, Sprint has expressed an active interest in the 24-28 GHz band.<sup>124</sup> It can also take advantage of unlicensed bands as T-Mobile is doing.<sup>125</sup>

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[2016](#) (“Massive MIMO’s 3D beamforming increases horizontal and vertical coverage capabilities. Previously, coverage in high-rise buildings required dedicated indoor networks. But now, Massive MIMO covers both high and low floors and can easily penetrate two walls.”).

<sup>122</sup> Sprint 5G White Paper at 9.

<sup>123</sup> Sprint Corp., Q4 2017 Earnings Call Transcript, Fair Disclosure Wire (May 2, 2018) (Sprint CEO Marcelo Claure: “[W]hat everybody needs to be aware is we plan to continue to operate 100% as stand-alone, and a millimeter wave spectrum is an important part of our strategy going forward.” Sprint CTO John Saw: “Millimeter wave, it provides a lot of bandwidth . . . It can provide therefore, a lot of capacity, and it complements our 2.5 GHz, sub-6 [GHz] 5G solution really well in areas where you need a lot of capacity, in hot zones and hotspots. I think it's very hard to build a 5G network on millimeter wave alone because that would drive a lot of capex in a lot of sites, but we view millimeter wave as something that we can add on as an overlay to 2.5 for hot zone purposes and hotspot purposes.”).

<sup>124</sup> See Sprint Corp., Petition for Expedited Declaratory Ruling or Waiver Regarding Joint Bidding and Request for Limited Waiver of Auction Form Rules, AU Docket No. 18-85, at 1-2 (Aug. 6, 2018) (requesting approval to participate in the 24 and 28 GHz auctions).

<sup>125</sup> See Press Release, Ericsson, *T-Mobile, Ericsson Exceed 1 Gbps With LAA Demo* (Dec. 5, 2017), <http://news.cision.com/ericsson/r/t-mobile--ericsson-exceed-1-gbps-with-laa-demo,c2408121> (“T-Mobile and Ericsson are first in the world to demonstrate speeds exceeding 1 Gbps using 12-layer Licensed Assisted Access technology . . . Neville Ray, Chief Technology Officer for T-Mobile, says: “T-Mobile has built the nation’s fastest LTE network by innovating and bringing new technologies to market for our customers. This LAA technology builds upon our deployments of 4x4 MIMO and 256 QAM and will give customers even greater access to near gigabit speeds in 2018.”); Monica Allevan, *Sprint Achieves 120-140 Mbps in LAA Deployment with SpiderCloud, Says LAA on Long-Term Road Map*, Fierce Wireless (Dec. 8, 2017), <https://www.fiercewireless.com/wireless/sprint-achieves-120-140-mbps-laa-deployment-spidercloud-says-laa-long-term-roadmap> (“Sprint’s been pretty quiet about its use of LAA or any unlicensed spectrum for that matter, but that appears to be changing as Sprint’s chief operating officer for technology, Günther Ottendorfer, tweeted that Sprint has successfully implemented LAA, achieving 120-140 Mbps. ‘We successfully implemented LAA (LicensedAssisted Access)

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There are also less restrictive 5G buildout alternatives to the merger. Alternative options include joint 5G network buildout strategies (e.g., a common RF base station grid and sharing of backhaul) and the use of technologies like Multi-Operator Core Network (“MOCN”). Sprint could negotiate and enter into leasing arrangements with T-Mobile and other parties in areas where it is not contemplating building out its 2.5 GHz spectrum for 5G, and T-Mobile could do the same where the demand exceeds the capacity supply of its 5G network. The Applicants could also enter into roaming and sharing arrangements, which could be either transitional or long-term, and which would maximize the use of the total capacity offered across the two networks.

But, what is most relevant here is what the Applicants do not say. They do not say that the spectrum and cell sites of both companies are necessary to deploy 5G. In fact, they admit the opposite—that not all of these resources will be necessary. They say that New T-Mobile will “have the option to use cell sites from each company,” and that it will “retain[] a number of Sprint cell sites.” Indeed, they invoke the excess capacity to be created by the merger as a reason why they will be under pressure to lower prices.

*Post-merger integration.* The Applicants’ estimated synergies and cost savings also rely on the successful integration strategy that T-Mobile implemented for MetroPCS. However, MetroPCS’s coverage was strictly regional. MetroPCS had only 22 MHz of combined downlink and uplink PCS and AWS spectrum in operating markets.<sup>126</sup> The impact of integrating up to 11 MHz of downlink spectrum into existing radio heads in terms of additional power and frequency

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with only 5 Mhz licensed spectrum & we achieved 120-140 Mpbs!,’ Ottendorfer tweeted today.”).

<sup>126</sup> MetroPCS, Investor Presentation (March 2013), <http://investor.t-mobile.com/Cache/1001182677.PDF?O=PDF&T=&Y=&D=&FID=1001182677&iid=4091145>.

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was small, and could be accommodated with T-Mobile's then-existing LTE infrastructure. In contrast, for both Sprint's 2.5 GHz and PCS bands, T-Mobile will need additional equipment for each of its projected 61,000 sites covering 300 million POPs nationwide. Given that T-Mobile does not own many of its towers, the need to undertake structural analysis of each tower based on existing equipment may limit actual deployment. At worst, deployment may not be possible; in other cases, structural enhancements to some of the towers will be required, resulting in delays and reduced synergies. Any reduction in synergies would likely translate into a lower investment in 5G than anticipated.

The Applicants have also not demonstrated how they will avoid adverse effects on the user experience during the integration of the two networks (covering low-band, mid-band and high frequency spectrum bands). Sprint's tale of integrating these bands into its own network is a cautionary one.<sup>127</sup>

*Other claims of data rate improvements and spectrum efficiencies.* The claimed gains in speed and capacity seem to be based on the premise that Sprint's 2.5 GHz spectrum will be deployed on all T-Mobile sites (61,000 as of 2017)<sup>128</sup> and T-Mobile's AWS-3 spectrum will be deployed on all retained Sprint sites (11,000) (out of Sprint's existing 46,000 sites) by 2021.<sup>129</sup> This appears speculative, given the significant integration challenges that history teaches occur when two large operators merge. Additionally, the Applicants present numbers for data rates, not necessarily for user experience. These latter numbers could be significantly different, especially when simultaneous users are active. It is also unclear what kind of device penetration

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<sup>127</sup> Saw Declaration ¶ 15.

<sup>128</sup> Ray Declaration ¶ 5 (attached as Appendix B to Application).

<sup>129</sup> Application at 29; Declaration of Michael Sievert ¶ 14 (attached as Appendix C to Application).

is likely by the end of 2021, as mass availability of 5G devices in 2021 is unknown. Finally, the Applicants’ technical declarations contain any number of assumptions that raise questions as to whether the spectrum efficiencies can actually be achieved.<sup>130</sup>

**B. Dr. Evans’ Analysis Is Flawed**

The Application seems to oscillate between a claim that the merger is *necessary* for any 5G deployment and the more modest argument that the combined company can deploy 5G more quickly and efficiently.<sup>131</sup> But the problem is that the Applicants’ quantification of the merger benefits assumes the more aggressive claim—that no merger means no 5G for either company—and credits the transaction with the entire benefit of nationwide 5G deployment by New T-Mobile and the response to it by Verizon and AT&T. In the face of the Applicants’ apparent concession that 5G likely would happen sooner or later, Dr. Evans’ postulated consumer price decrease evaporates.

Dr. Evans does nothing more than take the cost synergies given to him by the Applicants and translate them into price declines. As DISH’s expert, Professor Sappington, states in his Declaration, Dr. Evans adopts “without question the company’s projections of its post-merger capacity.”<sup>132</sup> In Professor Sappington’s words, Dr. Evans’ “unquestioning adoption of

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<sup>130</sup> Declaration of Stephen Wilkus (attached as Exhibit C).

<sup>131</sup> *Compare* Application at 18-19 and Application at 29-30 *with* Application at 48 (“Neither T-Mobile Nor Sprint Can Develop a Robust, Nationwide 5G Network on a Standalone Basis . . . [B]eyond the simple increase in capacity, New T-Mobile will be able to deploy a multi-faceted 5G network that combines T-Mobile low- and high-band spectrum with Sprint mid-band spectrum to provide the full array of features and improvements that the new 5G standard promises across the country.”).

<sup>132</sup> Declaration of David Sappington at 9 (attached as Exhibit A) (“Sappington Declaration”).

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predictions of large capacity increases for New T-Mobile” leads him to make “rosy predictions about the impact of the merger on the price of wireless data in 2024.”<sup>133</sup>

Dr. Evans has assumed ARPU will remain the same between 2017 and 2024, “consistent with T-Mobile’s business plans.”<sup>134</sup> But his assumption begs the core question to be answered: whether the increase in concentration brought about by the merger will lead to higher prices and therefore higher ARPU. Dr. Evans assumes no. Professor Sappington finds that “this assumption completely ignores the upward pressure on industry prices that increased concentration exerts,”<sup>135</sup> and that Dr. Evans fails “to account for the fact that a substantial increase in industry concentration is highly likely to place upward pressure on the price of wireless data.”<sup>136</sup> Most of the price decrease estimated by Dr. Evans comes not out of the prices of New T-Mobile, but rather out of the prices of AT&T and Verizon, which would supposedly be spurred on to compete by the 5G deployment made possible by the merger. Dr. Evans’s premise is that the progress achieved by Verizon and AT&T towards 5G to date is “tepid.”<sup>137</sup> That premise is likely inaccurate. This inaccuracy, in turn, overstates the claimed benefits to be provided by the merger.

Verizon and AT&T would of course deny that their 5G plans are “tepid,” as they are indeed aggressively touting their deployment plans. Verizon has indicated that “it is leading the race to deploy 5G technology in the United States – with plans to be first to market with both

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<sup>133</sup> *Id.*

<sup>134</sup> Evans Declaration ¶ 236.

<sup>135</sup> Sappington Declaration at 5.

<sup>136</sup> *Id.* at 3. *See also id.* at 4-5 (“[I]t would strain credibility to suggest that the proposed merger would reduce industry prices.”).

<sup>137</sup> Evans Declaration ¶ 197; Application at 49.

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fixed and mobile versions of 5G technology.”<sup>138</sup> Verizon will begin rolling out its 5G fixed residential broadband network in Sacramento, Los Angeles, Indianapolis, and Houston in the second half of 2018.<sup>139</sup> Verizon has also indicated its intent to deploy mobile 5G in “early 2019.”<sup>140</sup> Earlier this year, AT&T touted its “commitment to launching 5G and bringing massive broadband capacity online for mobile subscribers.”<sup>141</sup> AT&T has stated that it is planning a broad 5G deployment using its WCS, AWS-3 and the public safety 700 MHz spectrum.<sup>142</sup> To that end, AT&T has already announced that it will introduce mobile 5G to customers in a dozen cities (both large and small) this year, including Charlotte, Raleigh, Oklahoma City, Dallas, Atlanta and Waco.<sup>143</sup> AT&T will thus be the first carrier to launch mobile 5G in the United States, without the purported competitive pressure from a New T-Mobile.<sup>144</sup>

Dr. Evans’ analysis misses the mark for one more reason: the 2003-2017 capital expenditures boost that he claims the merger will *replicate* actually occurred in the midst of

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<sup>138</sup> Comments of Verizon, WT Docket No. 18-203, at 28 (July 26, 2018).

<sup>139</sup> Press Release, Verizon. *Verizon 5G Home Internet Service Coming to Indianapolis* (Aug. 14, 2018), <https://www.verizon.com/about/news/verizon-5g-home-internet-service-coming-indianapolis>. Verizon plans to include free YouTube TV and Apple 4K TV with the initial 5G residential broadband service in those cities.

<sup>140</sup> *Id.*

<sup>141</sup> Comments of AT&T Services, Inc., AU Docket No. 18-85, at 2-3 (May 9, 2018).

<sup>142</sup> Dan Jones, *For AT&T, 5G is a City Kitty, Not a Residential Fat Pipe*, LightReading (Aug. 8, 2018), <https://www.lightreading.com/mobile/5g/for-atandt-5g-is-a-city-kitty-not-a-residential-fat-pipe-/d/d-id/745211>.

<sup>143</sup> Press Release, *AT&T Bringing 5G to More U.S. Cities in 2018* (July 20, 2018), [http://about.att.com/story/5g\\_to\\_launch\\_in\\_more\\_us\\_cities\\_in\\_2018.html](http://about.att.com/story/5g_to_launch_in_more_us_cities_in_2018.html).

<sup>144</sup> *See* Comments of AT&T Services, Inc., WT Docket No. 18-203, at 14-15 (July 26, 2018) (“AT&T’s initial build-out will rely on 39 GHz millimeter wave spectrum that AT&T purchased from FiberTower in February, 2018. Moreover, AT&T is expanding its deployment of software-defined networking and related elements like white box and Network AI, which will support the massive data use 5G will bring.”).

competition that this merger likely will *eliminate*. Dr. Evans may be correct that these investments “led to the dramatic expansion in network capacity and decline in the price per GB of data.”<sup>145</sup> But competition was the spur: during the first part of 2003-13, there were five national carriers in existence. Capital expenditures by AT&T, Sprint, T-Mobile and Verizon actually peaked in 2013, the year that T-Mobile merged with MetroPCS.<sup>146</sup>

Professor Sappington calculates the adjustment to the Evans study that is warranted if the merger accelerates a benefit (e.g., a reduction in the price of wireless data), but is not the prerequisite to achieving that benefit. Professor Sappington demonstrates, for example, that if the merger simply accelerates a benefit by five years, the gain from the merger is less than 10% of the corresponding gain the merger would deliver if it were the sole means for achieving that benefit. This substantially discounted potential gain from the merger would then need to be weighed against its substantial likely harms.

**C. The Other Synergies and Benefits Claimed by the Applicants Are Speculative, Unsupported, and Not Merger-Specific**

In addition to the benefit claims related to 5G, the Applicants claim other synergies and benefits. They claim that the merger will provide an in-home wireless broadband solution.<sup>147</sup> They claim it will bring broadband to rural America.<sup>148</sup> They assert that the combined company will finally be able to enter the enterprise market in a significant way, including creating the opportunity for offering a range of commercial IoT applications.<sup>149</sup> The Applicants promise that

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<sup>145</sup> Evans Declaration ¶ 137.

<sup>146</sup> *Id.* at Exhibit 9, U.S. Wireless Carrier Capital Expenditures 2007-2017.

<sup>147</sup> Application at 58-64.

<sup>148</sup> *Id.* at 64-69.

<sup>149</sup> *Id.* at 71-76.

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New T-Mobile will bring disruption to the video marketplace.<sup>150</sup> Finally, the Applicants claim that New T-Mobile will create thousands of new jobs.<sup>151</sup>

But to date, these claims are speculative, unsupported, and not merger-specific. They are speculative in that they rely on the notion that scale is the only thing that has been missing in allowing the Applicants to achieve these results on their own. They are unsupported because the Applicants provide only conjecture instead of any factual basis that New T-Mobile will actually achieve its promised results. And they are not merger-specific because these purported benefits are happening now in the marketplace, will likely happen anyway with the advent of 5G, or could be realized with the Applicants taking appropriate action on their own.

The Applicants assert that New T-Mobile's 5G deployment will spur the creation of a mobile substitute for in-home non-wireless fixed broadband service.<sup>152</sup> But the Commission has found that mobile broadband is not a substitute for fixed broadband.<sup>153</sup> And even as mobile broadband speeds improve, so too will those of fixed broadband, which likely will maintain the imbalance between the two. The Applicants give no indication that their new *mobile wireless* (as

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<sup>150</sup> *Id.* at 76-80.

<sup>151</sup> *Id.* at 80-84.

<sup>152</sup> *Id.* at 58-64.

<sup>153</sup> *2018 Broadband Deployment Report*, 33 FCC Rcd. 1660, 1666 ¶ 18 (“[The Commission] disagrees with those that argue that mobile services are currently full substitutes for fixed service” because “there are salient differences between the two technologies.”); *19th Wireless Competition Report*, 31 FCC Rcd. at 10625 ¶ 133 (“[W]hile fixed and mobile broadband services may provide some overlapping capabilities, each service also has unique capabilities. It is also sometimes the case that mobile services and fixed services enhance the quality of one another. In fact, residential and business consumers alike often use mobile and fixed services in concert to, for example, off load reliance from cellular networks to Wi-Fi systems that are connected to the internet via a fixed service.”); *Id.* at 10625 ¶ 133 n.418 (“The *2016 Broadband Progress Report* concluded that fixed and mobile broadband are often used in conjunction with one another and, as such, are not functional substitutes: each service offers different capabilities to consumers, the services are marketed differently, and most consumers with the financial means choose to purchase both.”).

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opposed to fixed) network will be able to support the speeds needed for in-home applications in the future, or not exceed monthly data caps. And even if the Applicants' claim were true, it would be a generalized 5G benefit, not a merger-specific one. Further, this claim is unsupported and unverifiable because the Applicants provide no detail on the business plan for rolling out the service, the costs involved, or the time frame for doing so.

The Applicants also claim that the transaction holds great promise for rural America. Again, the Applicants have not yet provided support for how they will make this happen—no business plan, no timetable, no budget. The Applicants also lapse into an apparent contradiction for this claim: on the one hand, they claim that 2.5 GHz spectrum will enhance rural deployment for New T-Mobile;<sup>154</sup> on the other, they argue that Sprint's 2.5 GHz spectrum is inadequate and that Sprint, standing alone, will “not be a major competitor in most of rural America in the foreseeable future.”<sup>155</sup> It is therefore unclear from the Application how rural deployment can be credited as a benefit that would flow from this transaction.

The Applicants also assert that post-merger they will finally be able to enter the enterprise market due to New T-Mobile's scale and the 5G services it will offer.<sup>156</sup> But this is not merger-specific. Both T-Mobile and Sprint are starting to make inroads into that market today without the merger.<sup>157</sup> For example, T-Mobile is already using its millimeter wave and

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<sup>154</sup> Application at 65.

<sup>155</sup> *Id.* at 96.

<sup>156</sup> *Id.* at 71-76.

<sup>157</sup> See Kelly Hill, *T-Mobile US Keeps Cranking, Makes Enterprise Inroads*, RCR Wireless News (July 20, 2017), <https://www.rcrwireless.com/20170720/carriers/t-mobile-us-results-keeps-cranking-tag6>; James Anderson, *Sprint's Zscaler Partnership: What's the Carrier's Enterprise Play?*, Channel Partners (Feb. 26, 2018), <https://www.channelpartnersonline.com/2018/02/26/sprints-zscaler-partnership-whats-the-carriers-enterprise-play>; Edward Gately, *Sprint Ramps up Push into Federal, Public Sector*

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unlicensed spectrum and related technologies like Licensed Assisted Access (“LAA”) to compete in the enterprise market.<sup>158</sup> And the scale argument is speculative as scale does not address the likely reasons AT&T and Verizon have dominated the enterprise markets (i.e., their legacy wireline systems).<sup>159</sup>

The Applicants’ assertion that New T-Mobile will be able to become a significant player in the IoT market so that “everything in the house can be connected” is also unsupported. Many of the new use cases the Applicants cite, like connected drones, IoT services, and smart cities, do not necessarily or solely require large amounts of bandwidth and therefore a large amount of spectrum. Both Sprint and T-Mobile likely can offer these services on a stand-alone basis using their existing networks, or through aggregation with other spectrum allocated for specific services.

The Applicants further claim that they will disrupt the video distribution market. But this prospect is not merger-specific. T-Mobile already purchased Layer 3 in December 2017. In its words, Layer 3 is the “TV tech pioneer” that will “fuel” the “next phase in the un-carrier’s

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*Markets*, Channel Partners (Feb. 8, 2018), <https://www.channelpartnersonline.com/2018/02/08/sprint-ramps-up-push-into-federal-public-sector-markets>.

<sup>158</sup> Monica Allevan, *T-Mobile to Focus on LAA Rollout in Q1 of 2018*, Fierce Wireless (Nov. 13, 2017), <https://www.fiercewireless.com/wireless/t-mobile-to-accelerate-rollout-laa-q1-2018>.

<sup>159</sup> Sean Buckley, *VSG: AT&T, Verizon, Sepctrum Enterprise Take Dominant Spots in On-Net Fiber Business Connections*, Fierce Telecom (Aug. 2, 2017), <https://www.fiercetelecom.com/telecom/vsg-at-t-verizon-spectrum-enterprise-take-dominant-spots-net-fiber-business-connections> (reporting AT&T and Verizon as #1 and #2 provider of fiber for business services at the end of 2016 and noting the industry trend that “having a large arsenal of fiber is important to compete for business services.”).

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mobile video strategy.”<sup>160</sup> And, T-Mobile already plans to formally launch its video product later this year.<sup>161</sup>

The Applicants’ assertion that the merger will create jobs appears unrealistic. The parties are merging to achieve efficiencies and synergies, an endeavor that typically equates to job losses. To permit evaluation of their job creation claim, the Applicants need to produce business plan data showing what their planned headcounts as standalone companies will be if there is no merger. Otherwise, the benefit is unverifiable and cannot be viewed as a reason to support the transaction.

In any case, the Applicants’ analysis in support of their job creation claim is likely flawed. The main methodological error of Dr. Eisenach’s new jobs estimate echoes that of Professor Evans’ reduced price estimate: they both assume no 5G deployment by either company without the merger. Thus, Dr. Eisenach credits the merger with all of the jobs to be created by 5G. And, Dr. Eisenach does not balance jobs *lost* against jobs gained. Indeed, there is analysis showing that this merger will cost tens of thousands of jobs, undermining the claims of the Applicants and Dr. Eisenach. Specifically, the Communications Workers of America has estimated that the merger will cost at least 30,000 jobs due to the closure of retail stores and the elimination of staff from the two headquarters.<sup>162</sup> The Applicants would likely close 2,300

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<sup>160</sup> Press Release, T-Mobile, *T-Mobile is Going to Un-carrier Your TV* (Dec. 13, 2017), <https://www.t-mobile.com/news/tmobile-uncarrier-tv>.

<sup>161</sup> Daniel Frankel, *T-Mobile’s Binder: Video Service to Launch ‘This Year,’ Will Be Very, Very Disruptive*, Fierce Video (May 15, 2018), <https://www.fiercevideo.com/cable/t-mobile-video-service-to-launch-year-will-be-very-very-disruptive>.

<sup>162</sup> Press Release, Communications Workers of America, *CWA Analysis Shows Sprint-T-Mobile Merger Could Cause Massive Job Loss of More than 30,000 Jobs* (June 26, 2018), <https://www.cwa-union.org/news/releases/cwa-calls-on-sprint-and-t-mobile-make-binding-commitments-address-potential-job-loss>.

overlapping Sprint/T-Mobile stores and 2,750 prepaid stores.<sup>163</sup> Even assuming that Dr. Eisenach’s new jobs estimate is correct, that would still leave the merger with a net loss of over 6,000 jobs. New Street Research has likewise estimated 30,000 jobs lost as a result of the merger.<sup>164</sup> This analysis includes the jobs that will likely be lost from secondary cuts, such as suppliers and vendors who would no longer supply two independent companies.<sup>165</sup>

**V. THE APPLICANTS DEFINE THE RELEVANT MARKETS TOO BROADLY**

*Product Market.* The Applicants identify a broad single product market for the Commission to review: “a combined ‘mobile telephony/broadband services’ product market” that includes, without differentiation, both facilities-based and non-facilities-based carriers and resellers.<sup>166</sup> They then attempt to broaden that market still further by identifying a “converging broadband” market.<sup>167</sup> The Applicants’ formulations of the market ignore the differences between the four large facilities-based carriers and MVNOs—differences that have led the Commission not to consider MVNOs in its relevant precedent.

As for the Applicants’ reliance on “convergence,” if wireless carriers are ever capable of introducing competition to in-home, landline Internet Service Providers, that prospect is both too remote in time and irrelevant even when and if it comes to fruition. Similarly, the future entry by entities such as Comcast/Charter or DISH should not be credited as current competition against the Applicants. The time-frame for evaluating the unilateral effects of horizontal mergers is

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<sup>163</sup> *Id.*

<sup>164</sup> Mark Davis, *Could a Sprint Merger with T-Mobile Kill More Jobs than Sprint Has?*, Chicago Tribune (Oct. 10, 2017), <http://www.chicagotribune.com/business/ct-biz-sprint-t-mobile-merger-jobs-20171010-story.html>.

<sup>165</sup> *Id.*

<sup>166</sup> Application at 11.

<sup>167</sup> *Id.* at 12.

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generally two years.<sup>168</sup> While this is not a hard-and-fast rule, the hope that potential entry will come one day is certainly not enough. DISH, for its part, does plan to compete against the Applicants in the provision of 5G technologies, but the timing is uncertain, and DISH's ability to do so could be adversely impacted by the merger, as explained below.

The relevant product markets not only include the mobile voice/broadband market that the Applicants suggest, but also include distinct markets for facilities-based *prepaid* mobile broadband and voice services, as well as the markets for *wholesale* services provided by one carrier to another. Each of these services constitutes a separate product market, one in which there is even less competition than among the four large carriers in the facilities-based mobile voice/broadband market.

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<sup>168</sup> U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines §3.2 (1997) (“The Agency generally will consider timely only those committed entry alternatives that can be achieved within two years from initial planning to significant market impact.”); U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines § 9.1 (2010) (“In order to deter the competitive effects of concern, entry must be rapid enough to make unprofitable overall the actions causing those effects and thus leading to entry, even though those actions would be profitable until entry takes effect.”); *see also* *See F.T.C. v. Staples, Inc.*, 190 F. Supp. 3d 100, 133 (D.D.C. 2016) (“The relevant time frame for consideration in this forward looking exercise is two to three years.”); *United States v. Bazaarvoice, Inc.*, No. 13-cv-00133-WHO, 2014 WL 203966, at \*70 n.19 (N.D. Cal. Jan. 8, 2014) (“The Court agrees that two years is an appropriate time-frame in this case. Entry within two years is likely to undo the anticompetitive effects created by the merger such that the merger would be unprofitable, whereas entry beyond two years is not.”); *United States v. H & R Block, Inc.*, 833 F. Supp. 2d 36, 73 n.28 (D.D.C. 2011) (“For entry to be considered timely, it typically must occur within approximately two years post-merger.”); *F.T.C. v. ProMedica Health Sys., Inc.*, No. 3:11 CV 47, 2011 WL 1219281, at \*31 (N.D. Ohio Mar. 29, 2011) (noting that entry was not timely where “[i]t would take significantly longer than the two-year timeframe prescribed by the [2010] *Merger Guidelines*” to build a new hospital).

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*Geographic Market.* The Applicants are correct that the Commission needs to take into account more than just the discrete local markets where the Applicants hold licenses and “consider the effect of [the] transaction at the national level.”<sup>169</sup>

*Roaming and Wholesale Markets.* National wireless carriers offer network access via roaming and wholesale agreements, which operate with an additional factor not present in retail markets: buyers depend on the sellers, often for crucial inputs, even as they try to compete against the sellers. These markets thus must be included in the Commission’s transaction review.

**A. Only Facilities-Based Carriers Discipline Competition**

The national market for mobile voice/broadband services consists solely of nationwide, facilities-based competitors—AT&T, Verizon, T-Mobile, and Sprint. The Commission has reiterated this finding repeatedly, and with good reason.<sup>170</sup> Non-facilities-based operators are only as effective as their facilities-based landlords choose to let them be. Only facilities-based providers, who have both access to spectrum and the infrastructure to use it, can create capacity,

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<sup>169</sup> Application at 12 (citing Application of AT&T Inc. and Qualcomm Inc., *Order*, 26 FCC Rcd. 17589, 17605 ¶ 37 (2011)).

<sup>170</sup> See Applications of Deutsche Telekom AG, T-Mobile USA, Inc. and MetroPCS Communications, Inc. for Consent to Transfer of Control of Licenses and Authorizations, *Memorandum Opinion and Order and Declaratory Ruling*, 28 FCC Rcd. 2322, 2334-35 ¶ 37 (2013) (“*T-Mobile/MetroPCS Order*”) (“As in previous transactions, we exclude MVNOs and resellers from consideration when computing initial concentration measures, although we acknowledge that non-facilities-based service options may have an impact in the marketplace and in some instances may provide additional constraints against anticompetitive behavior.”); see also Applications of AT&T Inc. and Centennial Communications Corp., for Consent to Transfer Control of Licenses, Authorizations, and Spectrum Leasing Arrangements, *Memorandum Opinion and Order*, 24 FCC Rcd. 13915, 13936 ¶ 45 (2009).

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upgrade networks, or extend their network coverage.<sup>171</sup> And regional carriers cannot create the type of scale that allows their service offerings to influence the national consumer market in the way that the nationwide carriers can.<sup>172</sup>

Relying on one sentence in the Commission’s decision in the AT&T/Leap Wireless merger, the Applicants attempt to expand the definition of the product market to include MVNOs.<sup>173</sup> But in the *AT&T/Leap Order* the Commission was considering a merger between one of the big four national carriers (AT&T) and a regional facilities-based carrier that had a national reach only when its MVNO service was considered (Leap).<sup>174</sup> The Commission never determined, as the Applicants suggest, that MVNOs on their own can be a significant competitor or check on the four nationwide, facilities-based competitors. Indeed, the Commission has found exactly the opposite.<sup>175</sup>

The Applicants’ attempt to expand the field of competitors from four to nine is similarly unavailing. As discussed further below, none of the named “competitors” (TracFone, Comcast,

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<sup>171</sup> See *19th Wireless Competition Report*, 31 FCC Rcd. 10534, 10540 ¶ 9 (2016) (“Unlike facilities-based service providers, MVNOs do not engage in non-price rivalry by creating capacity through network investments, network upgrades, or network coverage.”).

<sup>172</sup> See Kevin Fritchard, *Squeezed by Wireless Giants, Have the Regional Mobile Carriers Just Given Up?*, Gigaom (July 30, 2013), <https://gigaom.com/2013/07/30/squeezed-by-wireless-giants-have-the-regional-mobile-carriers-just-given-up> (“Make of it what you will, but this is the mobile industry we’re getting stuck with: A mobile landscape divided between urban and rural with nationwide megacarriers dominating the cities and tiny regional providers surviving only in the towns and communities in between.”).

<sup>173</sup> Application at 11-12.

<sup>174</sup> Applications of Cricket License Company, LLC et al., Leap Wireless International, Inc., and AT&T Inc., for Consent to Transfer Control of Authorizations, Application of Cricket License Company, LLC and Leap License Co. for Consent to Assignment of Authorization, *Memorandum Opinion and Order*, 29 FCC Rcd. 2735, 2738 ¶ 6, 2749 ¶ 31 (2014) (“*AT&T/Leap Order*”).

<sup>175</sup> See *AT&T/Centennial Order*, 24 FCC Rcd. at 13936 ¶ 45.

Charter, DISH, and Google)<sup>176</sup> is a current facilities-based carrier, or even positioned to offer such competition in the near future.

### 1. TracFone

The Applicants cite TracFone as a source of competitive pressure post-merger. But while TracFone has had success as an MVNO, recently expanding through the acquisition of other prepaid MVNOs,<sup>177</sup> it has shown no desire to transform into a facilities-based provider. It holds no spectrum of note, nor seems inclined to do so.<sup>178</sup> Instead, TracFone leases capacity from Verizon, AT&T, Sprint, and T-Mobile.<sup>179</sup> If TracFone was a threat to facilities-based providers,

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<sup>176</sup> While not explicitly listing these companies in the product market section of the Application (*see* Section II-B), because precedent would not support their inclusion, they instead claim that these companies have “increasing competitive relevance.” Application at 102.

<sup>177</sup> Narayan Ammachchi, *America Movil Rebrands Telmex USA as Claro, Vows to Widen US Footprint*, Nearshore Analysis (June 8, 2018), <https://www.nearshoreamericas.com/america-movil-rebrands-telmex-usa-as-claro-vowing-to-widen-us-footprint> (“Two years ago, TracFone acquired Walmart Family Mobile business from T-Mobile. In addition, America Movil operates a number of similar prepaid brands in the United States, including Safelink, Straight Talk, and Total Wireless.”).

<sup>178</sup> TracFone recently asked the FCC not to ban MVNOs from Lifeline subsidies—hardly indicating an intent to upgrade its status. *See* Mike Dano, *Sprint, Tracfone, Others Implore Regulators Not to Ban MVNOs and Other Resellers from Lifeline*, Fierce Wireless (Feb. 23, 2018), <https://www.fiercewireless.com/wireless/sprint-tracfone-others-implore-regulators-not-to-ban-mvnos-and-other-resellers-from>.

<sup>179</sup> America Movil SAB de CV, Q4 2014 Earnings Call Transcript, Fair Disclosure Wire (Feb. 11, 2015) (Daniel Hajj, CEO: “And what we have been doing for the last years is we are committing traffic to the one that give us the better rates, and I think it’s more or less what we are going to do in the future. If it’s AT&T the one that give us good rates, it could be AT&T. If it’s Verizon, it’s Verizon. I think today the traffic is with the three operators; it’s with Verizon, with AT&T, and with T-Mobile. So, those are the three big ones that where we have the traffic, and we’re going to -- I think what’s going to be the most convenient for TracFone is what we’re going to do. We don’t have any change on that.”); America Movil SAB Q1 2013 Earnings Call Transcript (April 19, 2013), (“We are working with a lot of the carriers. We are working with AT&T, with Verizon, T-Mobile, and Sprint.”).

those providers could increase the cost of wholesale capacity to TracFone, or stop selling it at all.<sup>180</sup>

The Applicants also do not explain what would it take to migrate MVNO and prepaid customers from T-Mobile to the New T-Mobile network, as they have proposed for the twenty million plus MVNO customers on Sprint’s network. The Applicants also have not quantified either the impact on the experience of these users when 2.5 GHz is used only for 5G from 2021 onwards or the cost to the consumer in terms of handset exchange. Devices supporting new technologies are generally classified as high-tier devices and are generally not targeted towards prepaid or MVNO customers.

## **2. Comcast and Charter**

Comcast Xfinity Mobile, launched in May 2017, is not an independent facilities-based wireless service comparable to what is offered by Verizon, AT&T, Sprint, and T-Mobile. Instead, Comcast mostly operates as an MVNO in partnership with Verizon. While it uses its own Xfinity WiFi hotspots when available, the service largely relies on Verizon’s network.<sup>181</sup>

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<sup>180</sup> Roger Linguist, Chairman and CEO, MetroPCS Communications Inc., Remarks at the Sanford C. Bernstein Strategic Decisions Conference (June 4, 2010) (“Being a reseller hasn’t changed, I don’t think, over the past several decades or, at least, two decades. There’s -- you’re completely at the mercy of the carrier that’s selling you the bits and the -- or the bytes and the minutes. So I think it’s really the question about what the -- it’s not a question of what TracFone does, it’s a question of what does Verizon, AT&T, and T-Mobile and Sprint do. And that question can only be answered by how many degrees of separation do they want so that the cannibalization of their more treasured contract business doesn’t get impacted by what they end up doing selling minutes and bytes to the -- to these resellers. So I really think it’s a carrier question, not a TracFone question, and their margins will continue to be pressed, I believe. Because I think as this industry gets more competitive, that it’s not something that they, themselves, can control.”).

<sup>181</sup> See Comcast Corp., *XFINITY Mobile Broadband Disclosures*, <https://www.xfinity.com/mobile/policies/broadband-disclosures> (last visited Aug 26, 2018).

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Further, it is only available to existing Comcast internet customers.<sup>182</sup> This means that it is not available in 64.8% of the U.S. where Comcast does not offer internet service.<sup>183</sup> Nor does the service appear to be faring particularly well: Xfinity Mobile lost \$480 million in 2017 and \$374 million in the first half of 2018 alone.<sup>184</sup> The Applicants point to a report showing that 27% of Xfinity Mobile customers have switched from Verizon,<sup>185</sup> suggesting that “Comcast already is having a competitive impact on the leading wireless incumbents.”<sup>186</sup> But since Comcast pays Verizon for wholesale access to the latter’s network, this can hardly be seen as a competitive

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<sup>182</sup> See Comcast Corp., *The Xfinity Mobile Plan*, <https://www.xfinity.com/mobile>, (last visited Aug 26, 2018).

<sup>183</sup> See Service Provider Details, Provider Coverage Overlap and Population Coverage - Comcast Corporation, <https://broadbandmap.fcc.gov/#/provider-detail?hoconums=130317&direction=d> (data as of December 2016).

<sup>184</sup> Comcast Corp., Q4 2017 Earnings Call Transcript (Jan. 24, 2018), <https://www.cmcsa.com/static-files/80bfd80b-e421-43d8-b28b-1be5f1b871d8> (“Financially, we had a \$480 million EBITDA loss [in Xfinity Mobile] for 2017. And in 2018, wireless EBITDA losses could be a couple of hundred million dollars higher. . . .”); Comcast Corp., Q1 2018 Earnings Call Transcript (April 25, 2018), <https://www.cmcsa.com/static-files/fdafc0ba-9422-4659-ac3b-898fdaf1115c> (“An EBITDA loss of \$189 million associated with our newly launched wireless business.”); Comcast Corp. Q2 2018 Earnings Call Transcript (July 26, 2018), <https://www.cmcsa.com/static-files/f38b1112-4194-4a04-9975-30a367015ac5> (“The corporate and other segment results included an EBITDA loss of \$185 million for Xfinity Mobile.). In the Q4 2017 earnings call, Comcast indicated that it expects the losses on Xfinity Mobile to be “a couple of hundred million dollars higher” in 2018. Financial analysts are also singularly unimpressed by Xfinity Mobile’s performance. An industry analyst at BTIG wrote that, “we estimate Comcast’s cumulative Cash EBITDA losses from its wireless business have topped \$1.2 billion since the launch in May of last year, while subscriber growth has stagnated at 200,000 per quarter . . . Comcast’s subscriber growth once again fell well short of the 325,000 bogey we previously set as a level that would concern the wireless industry.” Mike Dano, *Comcast’s Xfinity Mobile Begins to Accelerate, but Analysts Remain Wary*, FierceWireless, (July 26, 2018), <https://www.fiercewireless.com/wireless/comcast-s-xfinity-mobile-begins-to-accelerate>.

<sup>185</sup> See Phil Britt, *Report Declares Comcast Quad Play ‘Firmly Rooted,’ With Verizon Being the Biggest Loser*, Telecompetitor (May 2, 2018), <https://www.telecompetitor.com/report-declares-comcast-quad-play-firmly-rooted-with-verizon-being-the-biggest-loser>. The same study also finds that “T-Mobile appears impacted the least, with 6% of Xfinity Mobile subscribers identifying them as their previous carrier.”

<sup>186</sup> Application at 110.

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threat to Verizon.<sup>187</sup> In the words of Verizon’s Chief Financial Officer: “That contract [with Comcast and Charter] . . . when you look at that contract in its entirety, absolutely, you go ahead and do that again. We think it’s a great contract.”<sup>188</sup>

Charter launched its own service, called Spectrum Mobile, only very recently (as of June 30, 2018), operating as an MVNO in partnership with Verizon.<sup>189</sup> Just like Xfinity Mobile, Spectrum Mobile is only available to Charter internet customers, meaning it is unavailable to 67.6% of the United States.<sup>190</sup>

Of course, before the Applicants asked the Commission for permission to merge, T-Mobile recognized the reality of these services and dismissed any putative competitive threat from cable companies. Shortly after Comcast first announced Xfinity Mobile, T-Mobile called it “the biggest non-announcement ever in the history of the wireless industry.”<sup>191</sup> They also called Xfinity Mobile “very irrelevant” and Charter “irrelevant squared.”<sup>192</sup>

The lack of concern for the entry of Comcast and Charter is not surprising. Comcast recently announced that it would lower the speed of its hotspots for customers on the “unlimited”

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<sup>187</sup> See Fran Shammo, Executive Vice President and Chief Financial Officer, Verizon Communications Inc., Remarks at the Bank of America Merrill Lynch Global Telecom & Media Conference, Fair Disclosure Wire (June 7, 2016) (“From Verizon Wireless’s perspective I’m perfectly fine with the MVNO [Comcast].”); Transcript, Verizon Communications Inc at UBS Global Media and Communications Conference, Fair Disclosure Wire (Dec. 5, 2017).

<sup>188</sup> Transcript, Verizon Communications Inc. at UBS Global Media and Communications Conference, Fair Disclosure Wire (Dec. 5, 2017).

<sup>189</sup> Press Release, Charter Communications, *Introducing Spectrum Mobile* (June 30, 2018), <https://newsroom.charter.com/news-views/introducing-spectrum-mobile>.

<sup>190</sup> See Service Provider Details, Provider Coverage Overlap and Population Coverage - Charter Communications, <https://broadbandmap.fcc.gov/#/provider-detail?hoconums=130235&direction=d> (data as of December 2016) (last visited Aug. 26, 2018).

<sup>191</sup> T-Mobile Q1 2017 Earnings Call Transcript (April 24, 2017). (John Legere, CEO: “[Xfinity Mobile] is confusing. It’s expensive. Nobody understands what it is.”).

<sup>192</sup> T-Mobile Q4 2017 Earnings Call.

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plan to 600 kbps.<sup>193</sup> Charter’s new plan is subject to the same limitation.<sup>194</sup> The Applicants highlight the fact that Comcast and Charter “formed a wireless cooperative agreement to compete together in wireless.”<sup>195</sup> This agreement, which ensures that both offerings remain geographically limited, can more accurately be characterized as an agreement for the two companies not to invade each other’s territory and is hardly promising for competition.<sup>196</sup> In addition to being subject to the same technical limitations, the two companies’ wireless plans are also priced identically.

### 3. DISH

The Applicants also name DISH as a competitor in the mobile voice/broadband market.<sup>197</sup> But while DISH is building a nationwide wireless network, the first phase of that network’s deployment will be devoted to narrowband IoT (“NB-IoT”). Specifically, DISH plans to deploy a NB-IoT network by March 2020 as Phase 1 of its wireless plans.<sup>198</sup> DISH’s planned

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<sup>193</sup> See Mike Dano, *Comcast’s Xfinity Mobile to Slow Video Streams, Hotspot Connection Speed*, FierceWireless, (July 2, 2018), <https://www.fiercewireless.com/wireless/confirmed-comcast-s-xfinity-mobile-to-slow-video-streams-hotspot-connection-speed>. Previously, Xfinity Mobile customers had access to 4G hotspots and 720p video resolution.

<sup>194</sup> See Chris Mills, *Spectrum Mobile’s Cheap Unlimited Plans Are Here, With A Lot of Fine Print*, BGR (July 5, 2018), <https://bgr.com/2018/07/05/spectrum-mobile-cheap-unlimited-plan-vs-verizon>.

<sup>195</sup> Application at 111.

<sup>196</sup> See Jon Brodtkin, *Comcast and Charter Agree not to Compete Against Each Other in Wireless*, Ars Technica, (May 8, 2017) <https://arstechnica.com/information-technology/2017/05/comcast-and-charter-agree-not-to-compete-against-each-other-in-wireless>.

<sup>197</sup> Application at 112.

<sup>198</sup> See American H Block Wireless L.L.C., Interim Construction Notification for H Block Licenses (May 14, 2018); Letter from Jeffrey Blum, Senior Vice President and Deputy General Counsel, DISH, to Marlene Dortch, Federal Communications Commission, GN Docket No. 17-183, at 2 (May 24, 2017); DBSD Service Limited, Gamma Acquisition L.L.C., and Manifest Wireless L.L.C.’s Consolidated Interim Construction Notification for AWS-4 and Lower 700 MHz E Block Licenses (Mar. 8, 2017).

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NB-IoT network presents the most efficient and promising technology to fulfill a growing demand for IoT connectivity in the near term and serve as a bridge to 5G in a future Phase 2, in part because NB-IoT is being considered as the 3GPP candidate for the massive connectivity requirement of 5G.<sup>199</sup>

In Phase 2, which DISH anticipates will follow after 3GPP Release 16 is standardized (expected in December 2019), and as DISH's plans for its other spectrum holdings develop (including the full clearing of its 600 MHz licenses, which the broadcasters are required to vacate by July 2020), DISH plans to upgrade and expand its network to support new use cases made possible through 5G technology. DISH believes that this approach will accommodate new partnerships and sharing models, including the potential to serve as a highly secure neutral host network to support industry verticals, including but not limited to logistics, healthcare, agriculture, and other connectivity use cases.

Not only is DISH not a current or near-term competitor to the facilities-based carriers, but this merger could adversely affect DISH's ability to enter the 5G mobile voice/broadband market. To offer a nationwide 5G service, DISH needs access to essential inputs, including radios, chipsets, devices, towers, crews, and backhaul. Among other things, New T-Mobile will likely be spending billions of dollars on radios, chipsets and devices, making it possible for it to use its new-found market power to customize radio solutions that would be less than ideal for DISH, or cause a delay in the DISH 5G solution. For example, DISH's solution for 600 MHz 5G is based on a standalone 5G NR solution, while the Applicants have said that New T-Mobile plans to deploy both LTE and 5G in 600 MHz. DISH is already facing challenges to prioritize a

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<sup>199</sup> In addition to other things, an important factor in DISH's technology selection for Phase 1 was the amount of nationwide uplink that it has available at this time to deploy – only 5 MHz at 1915-1920 MHz (H Block).

flavor of 5G that is suitable for a new-entrant against existing larger carriers with legacy deployments such as AT&T and Verizon; with New T-Mobile’s potential future influence, the headwinds could become stronger.

#### **4. Google**

Google’s Project Fi can hardly be called a competitor to T-Mobile and Sprint, as it is an MVNO using Sprint and T-Mobile themselves to provide its cellular network coverage.<sup>200</sup> Indeed, T-Mobile has declared that Project Fi has been “highly profitable” for T-Mobile.<sup>201</sup>

##### **B. Prepaid Voice and Broadband Is a Separate Market**

Within the mobile voice/broadband market, prepaid and postpaid services constitute separate product sub-markets. They have differentiated customer bases and distinct service offerings. T-Mobile recognizes this. It not only markets its pre- and post-paid services as distinct offerings, but services and support for such offerings are distinct as well. For example, T-Mobile recently announced a new customer service model, a “team of experts” designed to “take aim at the biggest pain point yet – the old, broken customer care model that has frustrated Americans for decades.”<sup>202</sup> That model, however, is only available for postpaid customers.<sup>203</sup> The reason for this differentiation is simple: postpaid services, even those that contain fixed-

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<sup>200</sup> Google Inc., *Project Fi Top Questions*, <https://fi.google.com/about/faq/#network-and-coverage-2> (“Project Fi has partnered with Sprint, T-Mobile, and U.S. Cellular, three of the leading carriers in the US, to provide our service.”) (last visited Aug. 26, 2018).

<sup>201</sup> Kif Leswing, *T-Mobile CEO John Legere: Google’s Project Fi Is ‘Highly Profitable for Us,’* International Business Times (July 9, 2015), <https://www.ibtimes.com/t-mobile-ceo-john-legere-googles-project-fi-highly-profitable-us-2001631>.

<sup>202</sup> Press Release, *T-Mobile’s Latest Un-carrier Move: Real People, Not Robots Introducing T-Mobile Team of Experts* (Aug. 15, 2018) <https://www.t-mobile.com/news/introducing-tex>.

<sup>203</sup> *Id.* (“Team of Experts is for our postpaid wireless customers.”).

price plans (whether unlimited or capped), are not an adequate alternative to prepaid plans for low-income, low-credit consumers.<sup>204</sup>

The prepaid market has been important in facilitating mobile wireless adoption among low-income and price sensitive consumers and seniors.<sup>205</sup> The variety of prepaid plans that are available as a result of competition and the targeted branding strategies the carriers employ give these consumer groups choice in finding a low-cost plan suitable for their needs.<sup>206</sup>

But, the prepaid market has witnessed significant consolidation in the last decade, with the acquisition of MetroPCS by T-Mobile and Cricket by AT&T.<sup>207</sup> It consists largely of three facilities-based carriers: AT&T, T-Mobile, and Sprint. While Verizon does offer some prepaid services, it does not have a significant prepaid presence.<sup>208</sup> In 2017, Verizon had 5.4 million

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<sup>204</sup> See Joint Declaration of Charles River Associates, Attachment A to Sprint Petition to Deny, WT Docket No. 11-65, at 22-23 (May 31, 2011) (“Prepaid and postpaid services tend to appeal to a different demographic segment. Prepaid users tend to be younger and have lower incomes. Because they do not require a credit check, prepaid plans may enable less credit-worthy consumers who do not qualify for postpaid plans to obtain wireless service.”).

<sup>205</sup> Marc Lifsher, *More Cellphone Users Switch to Prepaid Plans*, Los Angeles Times (Feb. 19, 2013), <http://articles.latimes.com/2013/feb/19/business/la-fi-0220-prepaid-cellphone-boom-20130220> (discussing the importance of prepaid service plans for price sensitive consumers); Jim Miller, *Low-Cost and Free Cell Phone Options for Seniors*, Huffington Post (July 10, 2014), [https://www.huffingtonpost.com/entry/low-cost-and-free-cell-ph\\_b\\_5575971](https://www.huffingtonpost.com/entry/low-cost-and-free-cell-ph_b_5575971) (discussing prepaid plans available for seniors who are cost conscious and only need a cell phone for emergencies and occasional phone calls).

<sup>206</sup> Philip Michaels, *No-Contract and Prepaid Phone Plan Guide: What You Need to Know*, Tom’s Guide (July 6, 2018), <https://www.tomsguide.com/us/no-contract-phone-plans,review-2489.html> (reviewing the various prepaid options available to American consumers and discussing the benefits of prepaid v. postpaid for consumers).

<sup>207</sup> Applications of Deutsche Telekom AG, T-Mobile USA, Inc. and MetroPCS Communications, Inc. for Consent to Transfer of Control of Licenses and Authorizations, Memorandum Opinion and Order and Declaratory Ruling, 28 FCC Rcd. 2322, (2013) (“*T-Mobile/MetroPCS Order*”); *AT&T/Leap Order*.

<sup>208</sup> Verizon’s former CFO admitted that Verizon is “really not competitive in that [prepaid] environment.” Verizon Communications, Inc., Q1 2016 Earnings Call, Fair Disclosure Wire (April 21, 2016).

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prepaid subscribers, compared to 9.0 million for Sprint, 15.3 million for AT&T and 20.7 million for T-Mobile. While Tracfone currently serves 23.1 million subscribers, its subscriber base in 2017 was reduced by more than 3 million from 2016—a four-year low. In addition, Tracfone cannot be considered an adequate alternative to the facilities-based carriers for the reasons described above. T-Mobile has dismissed TracFone as a competitor and any real threat to its prepaid service offerings, calling out another facilities-based provider, Sprint, as the competitive threat.<sup>209</sup>

The proposed transaction would thus result in an even greater increase in concentration in the prepaid, facilities-based market than in the mobile voice/broadband market, because of the large share of T-Mobile and the small share of Verizon in that market. Through this transaction the number one carrier would acquire the number three carrier (i.e. a 3 to 2 merger). But the Applicants say nothing about the merger’s competitive effects on prepaid services or about the potential harms to the low-income, low-credit consumers who rely on these services. And, the Applicants remain silent on the consumer impact of the migration of Sprint prepaid customers to

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<sup>209</sup> Braxton Carter, CFO, T-Mobile US, Remarks at UBS Global Media and Communications Conference (Dec. 5, 2016) (“You look at the MVNO space, very, very challenged. We all have visibility with TracFone being part of a public-reporting company and growth has completely stagnated there. And part of the issue is a true prepaid product, the economics don’t support deploying higher-end handsets. The return isn’t there to subsidize and the wherewithal to pay more for those handsets is not what other parts of the marketplace is. And as a result, they are becoming less and less relevant and more and more stressed from a pricing standpoint. We started last year doing a complete de-emphasizing of wireless wholesale activity with MVNOs. Not that we still don’t do some business there, but a completely derisking. One of the issues you are seeing go through the industry right now is significant changes coming to the government-subsidized prepaid offerings, which was driving a lot of the prepaid. And I did just read that Sprint is going to double down in that area going forward. Now, they are the only player out there that has owner economics and that is doing lifeline directly, but maybe that will help with their trajectory. But it is challenged, unless you have a model like a MetroPCS that is really what consumers want.”).

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T-Mobile's network. How will such a process work – and will consumers ultimately bear the expense or inconvenience?

Naturally, three-to-two mergers are disfavored. For example, in approving the AT&T/Dobson merger, the Commission required divestitures in “all the markets in which the acquisition will reduce the number of fully constructed operators from three to two” because “in any market in which the merger would reduce the number of competitors to two or fewer, a market with this degree of concentration presents a significant likelihood of successful unilateral effects and/or coordinated interaction even if the merged entity's market share is not especially high.”<sup>210</sup>

The same is true across other industries. The D.C. Circuit upheld the FTC's injunction blocking the merger of Heinz and Beech-Nut as it would have reduced the baby food market from three to two firms: “the anticompetitive effect of the merger is further enhanced by high barriers to market entry. The district court found that . . . new entry was ‘difficult and improbable.’ This finding largely eliminates the possibility that the reduced competition caused by the merger will be ameliorated by new competition from outsiders . . . As far as we can determine, no court has ever approved a merger to duopoly under similar circumstances.”<sup>211</sup> A court enjoined the proposed merger between Staples and Office Depot when it would have reduced the number of office superstores from three to two in 27 markets: “the merger would eliminate significant head-to-head competition between the two lowest cost and lowest priced

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<sup>210</sup> Applications of AT&T Inc. & Dobson Communications Corp., *Memorandum Opinion and Order*, 22 FCC Rcd. 20295, 20323 ¶ 56 (2007).

<sup>211</sup> *FTC v. H.J. Heinz Co.*, 246 F.3d 708, 717 (D.C. Cir. 2001).

firms in the superstore market [and] would result in the elimination of a particularly aggressive competitor in a highly concentrated market.”<sup>212</sup>

**C. The Commission Should Analyze the Markets for Roaming and Wholesale Services**

National wireless carriers offer network access at wholesale rates in two primary segments: MVNOs and wireless operators seeking additional network capacity or geographic coverage (roaming). The wholesale wireless market accounts for 20% of total mobile wireless connections.<sup>213</sup> In the roaming market, a carrier buys wholesale voice or data services from another to fill coverage gaps. MVNOs, as discussed above, purchase capacity from facilities-based carriers and re-sell mobile services to consumers. The relevant geographic markets for wholesale services are national and local.

The Commission should undertake a rigorous examination of the roaming and wholesale segments at issue in this transaction and determine whether consolidation is in the public interest. In doing so, the Commission should take into account an additional factor not present in the retail markets: the buyers depend on the sellers, often for crucial inputs, even as they try to compete against the sellers.

Only four providers currently provide any significant wholesale services, and post-merger, New T-Mobile will account for more than 60% of wholesale connections.<sup>214</sup> Roaming is an essential input for a potential entrant’s ability to compete in the mobile voice/broadband market. Therefore, an increase in concentration in that market is likely to raise the prices of these services, thereby raising the costs of additional market entry and reducing its likelihood.

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<sup>212</sup> *FTC. v. Staples, Inc.*, 970 F. Supp. 1066, 1083 (D.D.C. 1997).

<sup>213</sup> *20th Mobile Wireless Competition Report*, 32 FCC Rcd. 8968, 8978 ¶ 19 (2017).

<sup>214</sup> Harrington/Brattle Declaration at 41.

**VI. THE DEAL WILL RESULT IN EXCESSIVE INCREASES IN CONCENTRATION IN THE RELEVANT MARKETS**

**A. The Mobile Broadband Industry Has Reached a Tipping Point in Concentration**

In 2003, there were eight major national wireless carriers. If this merger is approved, only three will remain, leaving each of the remaining three carriers with more market share than even the *largest* carrier possessed in 2003:

**National Wireless Carriers, 2003<sup>215</sup>**

<b>Carrier</b>	<b>Number of Subscribers</b>	<b>Market Share</b>
Verizon	37.52 million	23.4%
Cingular	24.03 million	15%
AT&T	21.98 million	13.7%
Sprint	15.9 million	10%
T-Mobile	13.13 million	8.2%
Nextel	12.88 million	8%
Alltel	8.02 million	5%
Metro PCS <sup>216</sup>	977,000	.06%

**National Wireless Carriers, 2018 (showing in parentheses the carriers acquired)<sup>217</sup>**

<b>Carrier</b>	<b>Number of Subscribers</b>	<b>Market Share</b>
Verizon (Alltel)	151.48 million	35.3%
AT&T (Cingular)	143.83 million	33.5%
T-Mobile (MetroPCS)	74.02 million	17.3%
Sprint (Nextel)	53.6 million	12.5%

<sup>215</sup> Annual Report and Analysis of Competitive Market Conditions with Respect to Commercial Mobile Services, *Ninth Report*, 19 FCC Rcd. 20597, 20601 ¶ 5 & A-8 (2004) (reporting subscriber counts for top mobile operators and total US subscribers by year end 2003).

<sup>216</sup> While MetroPCS was not a national carrier in 2003, it became one by the time it merged with T-Mobile in March 2013 as the 5th largest wireless provider in the US. *See T-Mobile/MetroPCS Order*, 28 FCC Rcd. at 2324 ¶ 5.

<sup>217</sup> Mike Dano, *How Verizon, AT&T, T-Mobile, Sprint and More Stacked up in Q1 2018: The Top 7 Carriers*, FierceWireless (May 11, 2018), <https://www.fiercewireless.com/wireless/how-verizon-at-t-t-mobile-sprint-and-more-stacked-up-q1-2018-top-7-carriers>.

**National Wireless Carriers, 2018 (with T-Mobile/Sprint combined)**

<b>Carrier</b>	<b>Number of Subscribers</b>	<b>Market Share</b>
Verizon (Alltel)	151.48 million	35.3%
AT&T (Cingular)	143.83 million	33.5%
T-Mobile/Sprint	127 million	29.8%

Even with four national carriers, the mobile wireless industry is already a highly concentrated market.<sup>218</sup> The FCC recognized this when it approved the five-to-four Sprint/Nextel merger in 2005 and expressed skepticism about any further reduction among competitors in the wireless sector, explaining: “clearly, there is a point beyond which further consolidation would not be in the public interest.”<sup>219</sup>

**B. Four-to-Three Mergers Are Disfavored at Home and Abroad**

Competition authorities in the United States and abroad routinely step in to prevent four-to-three mergers because of the threats they pose to competition. The Commission and DOJ recognized these threats when they rejected the proposed AT&T/T-Mobile merger, finding it likely that the transaction, if consummated, would lead, among other things, to coordination among the remaining three wireless carriers.<sup>220</sup>

The Applicants try to differentiate the proposed merger from AT&T’s attempted purchase of T-Mobile in 2011. But, while AT&T is certainly larger than Sprint, the two

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<sup>218</sup> Jonathan Baker & Carl Shapiro, *Reinvigorating Horizontal Merger Enforcement*, AEI-Brookings Joint Center for Regulatory Studies, 45 & n.150 (June 2007), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1089198](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1089198) (“Baker and Shapiro”) (“[I]f the merger reduces the number of significant firms from, say, four to three, three to two, or two to one, that change in market structure alone may be enough to create a presumption that the merger would make coordination more likely or more effective. . . . A four-to-three merger is a natural break point for creating a presumption of harm to competition from coordinated effects based solely on the number of firms.”).

<sup>219</sup> *Sprint/Nextel Order* at 14035 ¶ 185.

<sup>220</sup> Applications of AT&T Inc. and Deutsche Telekom AG, 26 FCC Rcd. 16184, 16227 ¶ (2011); *United States v. AT&T et al.*, Complaint, 1:11-cv-01560 ¶ 36 (D.D.C. Aug. 31, 2011) (“DOJ AT&T/T-Mobile Complaint”).

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transactions have much in common. Both the Commission and the DOJ highlighted two aspects of the mobile voice/broadband market that posed substantial threats to competition: (1) the high barriers to entry, and (2) the elimination of a disruptive and value-driven carrier from the market.<sup>221</sup> The DOJ's Horizontal Merger Guidelines recognize that the type of merger most likely to enhance coordination is one that eliminates a disruptive player.<sup>222</sup>

It is little or no different this time around. A New T-Mobile likely would be less disciplined by competitive forces and better able to coordinate with the remaining industry players, likely leading to higher prices and less choice for consumers.<sup>223</sup> And, the harm here

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<sup>221</sup> *AT&T/T-Mobile Staff Report*, 26 FCC Rcd. at 16227 ¶ 76 (“The retail mobile wireless services market would be more vulnerable to coordination post-transaction. Features of this market make it likely that the remaining three nationwide providers would be able to reach a consensus on the terms of coordination (by identifying a mutually agreeable coordinated price), deter cheating on that consensus (by undercutting the coordinated price to steal high-margin business from its rivals), and prevent new competition in this market. Because these providers offer the same plans and charge the same prices nationwide, increased coordination would most likely take the form of raising the level of prices.”); DOJ AT&T/T-Mobile Complaint ¶ 36 (“The substantial increase in concentration that would result from this merger, and the reduction in the number of nationwide providers from four to three, likely will lead to lessened competition due to an enhanced risk of anticompetitive coordination. Certain aspects of mobile wireless telecommunications services markets, including transparent pricing, little buyer-side market power, and high barriers to entry and expansion, make them particularly conducive to coordination. Any anti-competitive coordination at a national level would result in higher nationwide prices (or other nationwide harm) by the remaining national providers, Verizon, Sprint, and the merged entity. Such harm would affect consumers all across the nation, including those in rural areas with limited T-Mobile presence. Furthermore, the potential for competitive harm is heightened given T-Mobile's recent decision to grow its market share via a ‘challenger’ strategy.”).

<sup>222</sup> See DOJ Horizontal Merger Guidelines § 2.1.5 (consideration of whether a merger may lessen competition by eliminating a maverick firm); see also Baker and Shapiro (“[I]f the merger reduces the number of significant firms from, say, four to three, three to two, or two to one, that change in market structure alone may be enough to create a presumption that the merger would make coordination more likely or more effective. . . . A four-to-three merger is a natural break point for creating a presumption of harm to competition from coordinated effects based solely on the number of firms.”).

<sup>223</sup> *Hospital Corp. of America v. FTC*, 807 F.2d 1381, 1387 (1986) (“The reduction in the number of competitors is significant in assessing the competitive vitality of the [relevant] market.

could be even greater in one key respect: the AT&T/T-Mobile deal would have produced asymmetrical market shares, which can be a deterrent to coordination in a three-player market, as the interests of the three remaining carriers are misaligned.<sup>224</sup> By contrast, the current transaction will result in roughly comparable market shares among the three remaining carriers.

### **1. DOJ in AT&T/T-Mobile**

The DOJ filed suit to enjoin the proposed merger of AT&T and T-Mobile on the grounds that the merger would substantially lessen competition.<sup>225</sup> Seven states joined the DOJ in the lawsuit. In its complaint, the DOJ was concerned that the merger would reduce the number of national carriers from four to three and eliminate competition between the two merging carriers.

In the words of the complaint:

- Eliminating “one of the four national competitors” would result “in a significant loss of competition.”<sup>226</sup>
- The disappearance of an independent fourth competitor would eliminate “important price, quality, product variety, and innovation competition” in the marketplace.<sup>227</sup>
- “Where there is significant substitution between the merging firms by a substantial share of consumers, anticompetitive effects are likely to result.”<sup>228</sup>
- Actual and potential competition between AT&T and T-Mobile would be eliminated.
- The acquisition would preempt a “disruptive” carrier that had been a clear threat to its larger rivals.<sup>229</sup>

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The fewer competitors there are in a market, the easier it is for them to coordinate their pricing without committing detectable violations of section 1 of the Sherman Act, which forbids price fixing.”)

<sup>224</sup> See *supra* Section VIII.B.

<sup>225</sup> See DOJ AT&T/T-Mobile Complaint.

<sup>226</sup> *Id.* ¶ 35.

<sup>227</sup> *Id.* ¶ 33.

<sup>228</sup> *Id.* ¶ 37.

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As a result, the DOJ found that prices would be higher and quantity of services would be lower, and innovation and product discovery would likewise suffer.

This transaction raises comparable concerns: it will likewise leave three national carriers in the market. It will also eliminate the now existing competition between T-Mobile and Sprint. The Applicants have not yet disclosed diversion rates, and thus it is unknown to what extent the diversion rates from Sprint to T-Mobile and vice-versa are proportionally greater than their respective market shares. But all public indications show that the competition between the two is robust<sup>230</sup> and suggest that it is even more intense than that between either carrier and the two larger market players. Finally, as discussed below, the transaction may mean that a maverick strategy is no longer in New T-Mobile's interests, and could result in incumbent-like conduct akin to what T-Mobile's affiliates exhibit in other three-player markets.

### 2. FCC in AT&T/T-Mobile

The FCC was also skeptical of the four-to-three market consolidation that the AT&T/T-Mobile transaction would have created. The Wireless Bureau recommended to the full Commission that the applications be designated for a hearing, a conclusion the full Commission did not have to make because the parties withdrew the applicaitons before a full agency vote. But the FCC released the Wireless Bureau's Staff Report. The Staff Report found, among other things, that:

- AT&T and T-Mobile “ignore[d] several potential competitive harms, ma[de] overly simplistic assumptions about the structure and conduct of the wireless industry, [and] overestimate[d] the benefits that would be passed onto consumers.”<sup>231</sup>

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<sup>229</sup> *Id.* ¶ 32.

<sup>230</sup> *See supra* Section III.

<sup>231</sup> *AT&T/T-Mobile Staff Report*, 26 FCC Rcd. at 16194 ¶ 13.

- The loss of competitive alternatives would give the merged company “a unilateral incentive to raise price on non-merging rivals, including Verizon Wireless and Sprint,”<sup>232</sup> and that the “GUPPI values for both AT&T and T-Mobile are above the level at which unilateral effects concerns are triggered by the antitrust authorities.”<sup>233</sup>
- The transaction raised the potential for coordination, noting that even tacit coordination must be avoided because “tacit coordination is feared by antitrust policy even more than express collusion as it is harder to detect and to prevent.”<sup>234</sup>

These quotes provide an accurate description of the possible impact of this merger, too. As explained below, it will likely increase the Gross Upward Pricing Pressure Index (“GUPPI”) measure of upward price pressure above the threshold level of concern and result in price increases. It also increases the risk of coordination.

### **3. Sprint in AT&T/T-Mobile**

Sprint was the fiercest opponent of the proposed AT&T/T-Mobile merger, filing both a Petition to Deny at the Commission and its own antitrust complaint in federal court.

Sprint’s filings explained that “competition among wireless providers takes place on a national level.”<sup>235</sup> Specifically, Sprint noted that “AT&T, Verizon, Sprint, and T-Mobile are distinguished from other wireless carriers by the nationwide service that their networks and spectrum assets allow them to provide to their subscribers. These four providers all have wireless networks that cover about 90 percent or more of the U.S. population.”<sup>236</sup>

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<sup>232</sup> *Id.* at 16212 ¶ 48.

<sup>233</sup> *Id.* at 16218 ¶ 56.

<sup>234</sup> *Id.* at 16226 ¶ 74.

<sup>235</sup> Petition to Deny of Sprint Nextel Corp., WT Docket No. 11-65 at ii (May 31, 2011) (“Sprint Petition to Deny AT&T/T-Mobile”).

<sup>236</sup> Complaint, *Sprint Nextel Corp. v. AT&T, Inc.*, No. 1:11-cv-01600 ¶ 98 (Sept. 6, 2011) (“Sprint AT&T/T-Mobile Complaint”).

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Sprint admitted that it “closely monitors the prices offered by Verizon, AT&T, and T-Mobile for their postpaid plans, but does not consider prices offered by smaller carriers in evaluating its own pricing plans. Verizon, AT&T, and T-Mobile demonstrate the same focus in their pricing behavior for postpaid plans.”<sup>237</sup> Sprint debunked the assertion that smaller carriers could compete effectively, noting that the “Application maintains that post-merger AT&T will face strong competition from small regional carriers and companies such as LightSquared, but the small carriers serve less than 3 percent of all post-paid subscribers and LightSquared offers no service today.”<sup>238</sup> Sprint also provided evidence that the market was limited to those four carriers because of targeted national advertising aimed by each of the carriers at the other three,<sup>239</sup> and the “four national carriers” control of “innovation in the wireless market ... with a national focus.”<sup>240</sup> Other market forces limiting competition to the four nationwide, facilities-based carriers included the pricing of “services and equipment on a national basis;” development, procurement, and offering of handsets nationally; national advertising; plan distribution through national chains; and national promotion campaigns.<sup>241</sup> Sprint also pointed to consumer demand as another reason: because “it is this nationwide service that consumers want and that wireless carriers strive to offer.”<sup>242</sup>

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<sup>237</sup> *Id.* ¶ 99.

<sup>238</sup> Sprint Petition to Deny AT&T/T-Mobile at 6.

<sup>239</sup> Sprint AT&T/T-Mobile Complaint ¶ 103.

<sup>240</sup> *Id.* ¶ 104.

<sup>241</sup> Sprint Petition to Deny AT&T/T-Mobile at 21.

<sup>242</sup> *Id.* at 20.

#### 4. Other Domestic Transactions

Four-to-three mergers are also disfavored in other industries. The FTC found that the four-to-three merger of rental car companies Hertz and Dollar Thrifty would permit the combined company to unilaterally exercise market power, increase the likelihood of coordinated interaction, and increase consumer prices.<sup>243</sup> The FTC only allowed the merger to proceed after mandating extensive divestitures, including requiring Hertz to sell its entire Advantage Rent-A-Car business and 29 additional airport locations.<sup>244</sup> The goal of the divestiture was to “replace the current and future competition that otherwise would have been lost as a result of the deal, while also eliminating the likelihood of coordinated interaction post-acquisition” by “enabl[ing] Advantage to become the fourth-largest car rental competitor in the United States.”<sup>245</sup>

Additional examples abound:

- *Anthem/Cigna & Aetna/Humana*: the DOJ sued to stop two proposed mergers in the health insurance industry that would otherwise have consolidated the “Big Five” health insurers in the United States to three.<sup>246</sup>
- *Alcan/Pechiney*: the DOJ opposed the merger: “by reducing the number of major North American producers of brazing sheet from four to three, this acquisition would substantially increase the likelihood that the combined firm will unilaterally increase, or that it and the other major competitor will tacitly or explicitly cooperate to

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<sup>243</sup> Hertz Global Holdings, Inc., *Complaint*, Docket No. C-4376, 2012 WL 5879801 \*1, \*3 (Nov. 15, 2012).

<sup>244</sup> Hertz Global Holdings, Inc., *Decision and Order*, Docket No. C-4376, 2013 WL 3756606 \*1, \*10 (July 10, 2013); Press Release, Federal Trade Commission, *FTC Requires Divestitures for Hertz’s Proposed \$2.3 Billion Acquisition of Dollar Thrifty to Preserve Competition in Airport Car Rental Markets* (Nov. 15, 2012), <https://www.ftc.gov/news-events/press-releases/2012/11/ftc-requires-divestitures-hertz-proposed-23-billion-acquisition> (“FTC Press Release”).

<sup>245</sup> *Id.*

<sup>246</sup> See Remarks of Attorney General Loretta Lynch (July 21, 2016) <https://www.justice.gov/opa/speech/attorney-general-loretta-e-lynch-delivers-remarks-press-conference-announcing-justice>.

increase, prices of brazing sheet to the detriment of consumers.”<sup>247</sup> The DOJ thus required divestiture of either Alcan or Pechiney’s brazing sheet business, thus maintaining a fourth competitor.

- *Koninklijke Ahold/Delhaize Group*: the DOJ found this merger to be presumptively unlawful, as it would reduce the number of meaningful supermarket competitors from four to three in 18 geographic markets.

## **5. International Regulators**

Nor are the regulators’ concerns about four-to-three consolidations unique to the United States. The European Commission (“EC”) blocked what would have been a four-to-three merger in the United Kingdom between the mobile operators O2 and Three.<sup>248</sup> The EC found that “the merged entity’s incentives to compete aggressively are likely to be significantly weaker than those of Three and O2 pre-Transaction.”<sup>249</sup> The EC linked the lack of competition post-merger specifically to the decline from four to three carriers:

the Transaction is likely to give rise to non-coordinated anti-competitive effects on the retail market for mobile telecommunications services in the United Kingdom. The anti-competitive effects would arise from a reduction of the number of MNOs from four to three and the elimination of the important competitive constraints that the Parties previously exercised upon each other and a reduction of competitive pressure on the remaining players on the market.<sup>250</sup>

Denmark mobile carriers TeliaSonera and Telenor were likewise forced to abandon their merger, which would have reduced the number of facilities-based carriers in Denmark from four

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<sup>247</sup> *United States v. Alcan, Inc., Alcan Aluminum Corp., Pechiney, S.A., and Pechiney Rolled Products, LLC*, Complaint, 1:03-CV02012, ¶ 3 (D.D.C. Sept. 29, 2003).

<sup>248</sup> European Commission, Case M.7612 – Hutchison 3G UK/Telefonica UK (Nov. 5, 2016), [http://ec.europa.eu/competition/mergers/cases/decisions/m7612\\_6555\\_3.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m7612_6555_3.pdf). Telefonica UK Ltd. is known as O2.

<sup>249</sup> *Id.* ¶ 906.

<sup>250</sup> *Id.* ¶ 1226. The EC also concluded that moving from four to three would have anti-competitive effects on the wholesale market. *Id.* ¶ 2313.

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to three, after the EC expressed competition concerns.<sup>251</sup> The EC found that in another four-to-three merger (between Italian mobile carriers H3G Italy and Wind/JV), “the reduction in the number of MNOs from four to three as a result of the Transaction is likely to contribute to facilitating and incentivising coordination.”<sup>252</sup> The EC only approved this transaction after the parties agreed to facilitate the entry of Iliad, a French facilities-based carrier, into the Italian market: “[this commitment,] which is structural in nature, . . . could create a fourth MNO capable of compensating for the loss of competition deriving from the Transaction (namely the elimination of H3G as an independent competitor) both in the retail and in the wholesale markets.”<sup>253</sup>

Similarly, in December 2012, the EC imposed facilities-based entry as a condition to approving the merger of Orange Austria and H3G, which would have left three carriers in Austria, including T-Mobile Austria: “a structural commitment is necessary to make up for the loss of competition, which would result from the Proposed Transaction . . . the right commitment should allow a new MNO entrant to acquire the divestment spectrum and be able to roll out LTE

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<sup>251</sup> See Press Release, European Commission, Statement by Commissioner Vestager on Announcement by Telenor and TeliaSonera to Withdraw from Proposed Merger (Sept. 11, 2015) [http://europa.eu/rapid/press-release\\_STATEMENT-15-5627\\_en.htm](http://europa.eu/rapid/press-release_STATEMENT-15-5627_en.htm) (“Based on the Commission's in-depth analysis and evidence gathered, we are convinced that the significant competition concerns required an equally significant remedy. This means the creation of a fourth mobile network operator.”).

<sup>252</sup> European Commission, Case M.7758 Hutchison 3G Italy/Wind JV, Commission Decision ¶ 971 (Jan. 9, 2016), [http://ec.europa.eu/competition/mergers/cases/decisions/m7758\\_2937\\_3.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m7758_2937_3.pdf). The EC also found that “the reduction of competition resulting from the Transaction in this already concentrated market, with high barriers to entry, may make it even more difficult than it already is today for MVNOs to obtain wholesale access on commercially attractive terms.” *Id.* ¶ 1343.

<sup>253</sup> *Id.* ¶ 1696. This was effectuated by substantial spectrum divestitures, a national roaming agreement, access to network sites, and an option to provide backhaul and interconnection during the transitional period, among other requirements. See *Id.* ¶ 1720-38.

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in competition with the remaining MNOs.”<sup>254</sup> Notably, entry from a new MVNO was not deemed sufficient, even though MVNOs typically have greater rights in Europe than in the United States.<sup>255</sup>

### C. The Merger Will Result in Spectrum Holdings Substantially in Excess of the Spectrum Screen

Spectrum is the core asset for a mobile broadband business.<sup>256</sup> Indeed, the Commission has found that “for there to be robust competition, multiple competing service providers must have access to or hold sufficient spectrum to be able to enter a marketplace or expand output rapidly in response to any price increase or reduction in quality, or other change that would harm consumer welfare.”<sup>257</sup> But the amount of spectrum available at any given time for such applications is finite. As a result, the Commission applies a spectrum “screen” to proposed

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<sup>254</sup> European Commission, Case No M.6497 Hutchison 3G Austria/Orange Austria ¶ 481 (Dec. 12, 2012), [http://ec.europa.eu/competition/mergers/cases/decisions/m6497\\_20121212\\_20600\\_3210969\\_EN.pdf](http://ec.europa.eu/competition/mergers/cases/decisions/m6497_20121212_20600_3210969_EN.pdf). The divestiture spectrum was reserved for a new entrant, under the condition that if no new entrant bid on the spectrum, the divested spectrum would revert to H3G. *Id.* at ¶ 526. Only the three incumbent providers participated in Austria’s 2013 spectrum auction, leaving Austria with three MNOs. RTR, Multiband Auction 2013: Comments on Essential Points of Criticism Addressed in the High-Court Proceedings, 1 (Dec. 18, 2014), [https://www.rtr.at/en/inf/Stellungnahme\\_Multiband\\_Auktion/Multiband\\_Auction\\_2013\\_Comments.pdf](https://www.rtr.at/en/inf/Stellungnahme_Multiband_Auktion/Multiband_Auction_2013_Comments.pdf). As explained below, the result has been significant price increases.

<sup>255</sup> See OECD, *Wireless Market Structures and Network Sharing*, OECD Digital Economy Papers, No. 243, at 72-73 (2014), [https://www.oecd-ilibrary.org/wireless-market-structures-and-network-sharing\\_5jxt46dzl9r2.pdf?itemId=%2Fcontent%2Fpaper%2F5jxt46dzl9r2-en&mimeType=pdf](https://www.oecd-ilibrary.org/wireless-market-structures-and-network-sharing_5jxt46dzl9r2.pdf?itemId=%2Fcontent%2Fpaper%2F5jxt46dzl9r2-en&mimeType=pdf) (discussing regulatory tools that have been deployed in European countries to facilitate MVNO market entry and growth, including mandatory wholesale access to MNO facilities as a condition of a merger or spectrum license, and finding that in the United States, “MVNOs are not viewed as providing robust competition to MNOs . . . they do not provide an effective competitive restraint on the four nationwide carriers.”).

<sup>256</sup> See *19th Wireless Competition Report*, 31 FCC Rcd. at 10572 ¶ 49 (“Spectrum is a critical input in the provision of mobile wireless services and affects if and when existing service providers and potential entrants will be able to expand capacity or deploy networks”).

<sup>257</sup> Policies Regarding Mobile Spectrum Holdings, *Report and Order*, 29 FCC Rcd. 6133, 6144 ¶ 17 (June 2014) (“*Mobile Spectrum Holdings Report and Order*”).

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transactions to “ensur[e] that sufficient spectrum is available for multiple existing mobile service providers as well as potential entrants,” finding that such balance “is crucial to promoting consumer choice and competition throughout the country.”<sup>258</sup>

The Commission’s “screen” tests for whether an entity would hold one-third or more of the total spectrum that is available for the provision of mobile voice/broadband services post-transaction.<sup>259</sup> The screen is applied on a market-by-market basis; spectrum in excess of the screen is indicative of potential competitive harm.<sup>260</sup> The Commission has also cautioned, however, that “it is a screen, not a safe harbor,” and therefore does “not limit its consideration of potential competitive harms solely to markets identified by its initial screen if it encounters other factors that may bear on the public interest inquiry.”<sup>261</sup> The denominator for the one-third calculation includes the following bands, appropriately weighted in accordance with the Commission’s methodology: 600 MHz, 700 MHz, Cellular, SMR, Broadband PCS, AWS-1, AWS-3, AWS-4, H Block, WCS, BRS, and EBS.<sup>262</sup>

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<sup>258</sup> *Id.*

<sup>259</sup> *Id.* at 6222 ¶ 227.

<sup>260</sup> The Commission has applied this screen since the proposed Cingular Wireless and AT&T Wireless merger in 2004. *See Applications of AT&T Wireless Inc. and Cingular Wireless Corporation For Consent To Transfer of Control of Licenses and Authorizations, Memorandum Opinion and Order*, 19 FCC Rcd. 21522, 21525 ¶ 4 (2004).

<sup>261</sup> *Mobile Spectrum Holdings Report and Order*, 29 FCC Rcd. at 6237 ¶ 277, 6229 ¶ 252. These factors can include the total number of rival service providers; the number of rival firms that can offer competitive nationwide service plans; the coverage by technology of the firms’ respective networks; the rival firms’ market shares; the combined entity’s post-transaction market share and how that share changes as a result of the transaction; the amount of spectrum suitable for the provision of mobile telephony/broadband services controlled by the combined entity; and the spectrum holdings of each of the rival service providers. *Id.* at 6238 ¶ 280.

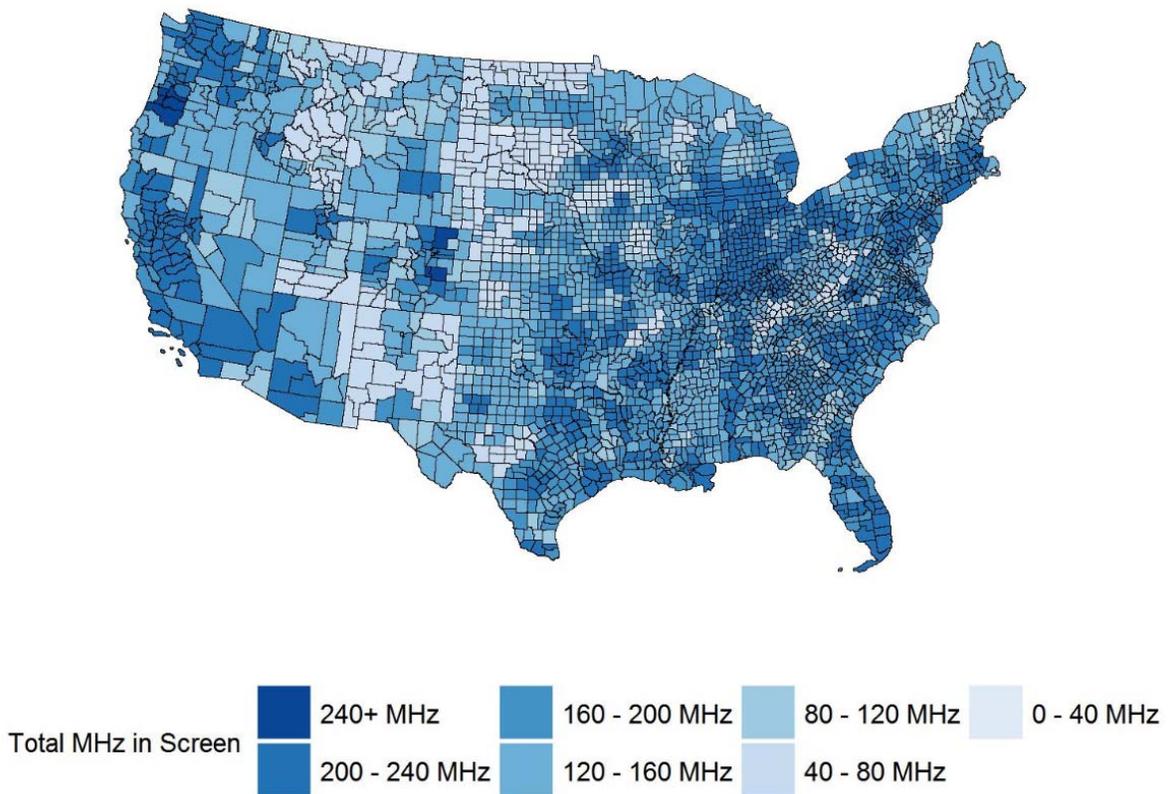
<sup>262</sup> *See Harrington/Brattle Declaration* at 94-97.

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The Brattle Group has conducted a granular county-by-county analysis of spectrum holdings. First of all, Sprint holds the most spectrum of all carriers in a number of counties and is the only carrier to hold more than 240 MHz in any county.<sup>263</sup>

The following maps show Sprint and T-Mobile’s standalone spectrum holdings:

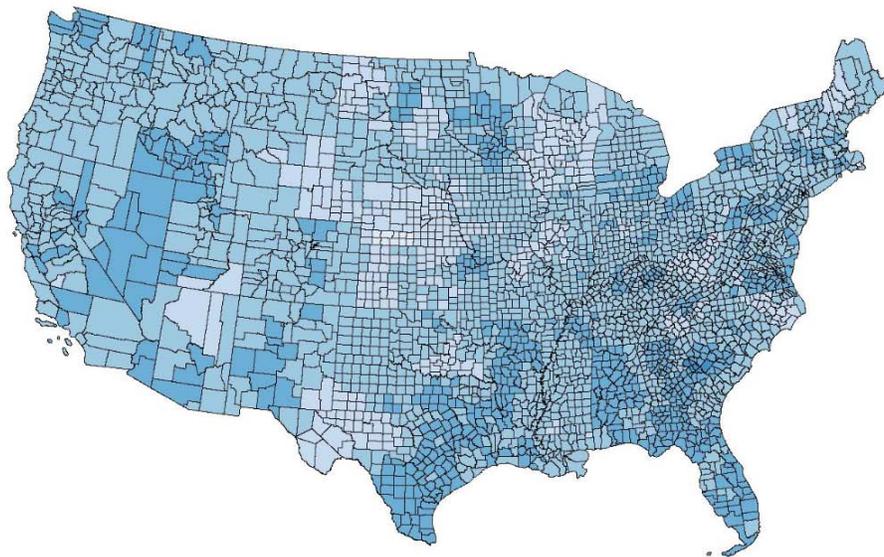
**Sprint Spectrum Holdings in Screen**



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<sup>263</sup> See *id.* at 102.

**T-Mobile Spectrum Holdings in Screen**

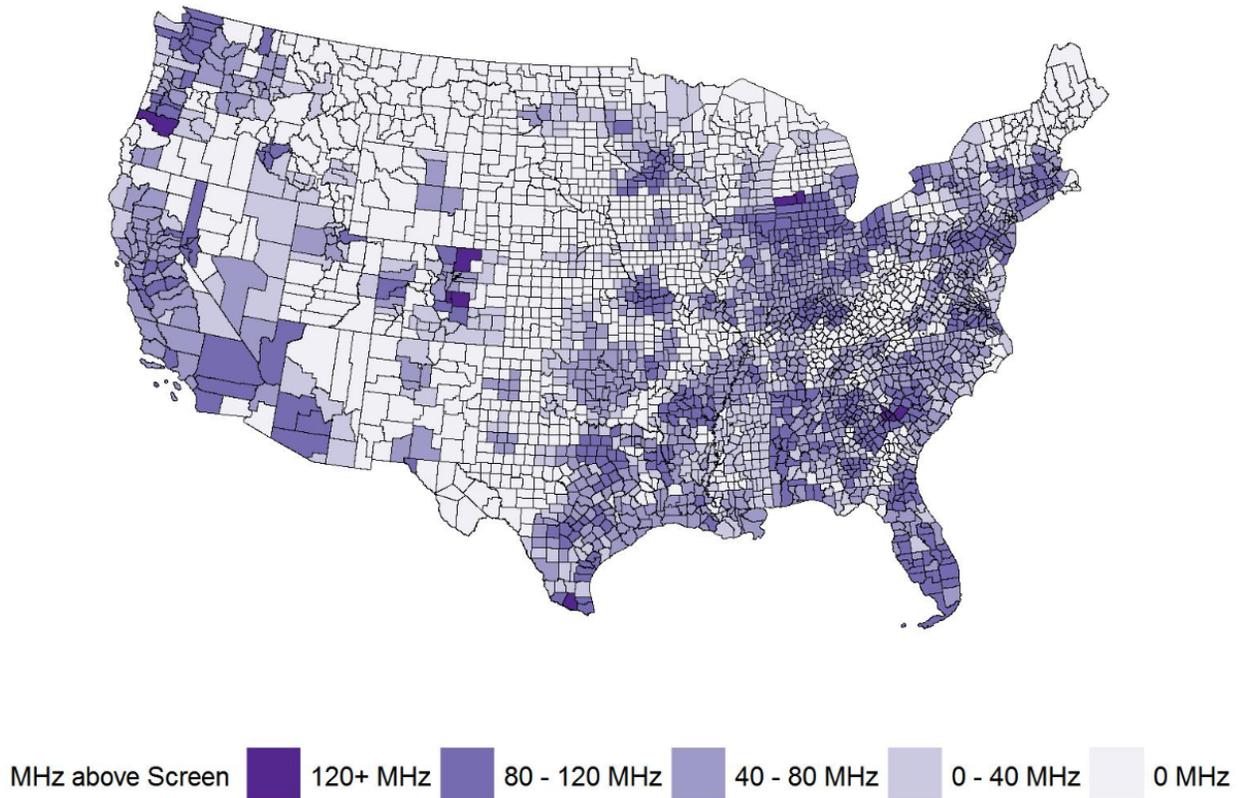


Second, Brattle finds that New T-Mobile would be over the screen threshold in 1,996 out of the nation’s 3,221 counties, or in 532 CMAs, covering all of the top 100 markets. By comparison, the rejected AT&T/T-Mobile merger would have caused AT&T to exceed the screen in 274 CMAs.<sup>264</sup> New T-Mobile would be over the screen across 90.2% of the country’s population and almost half of its land area.

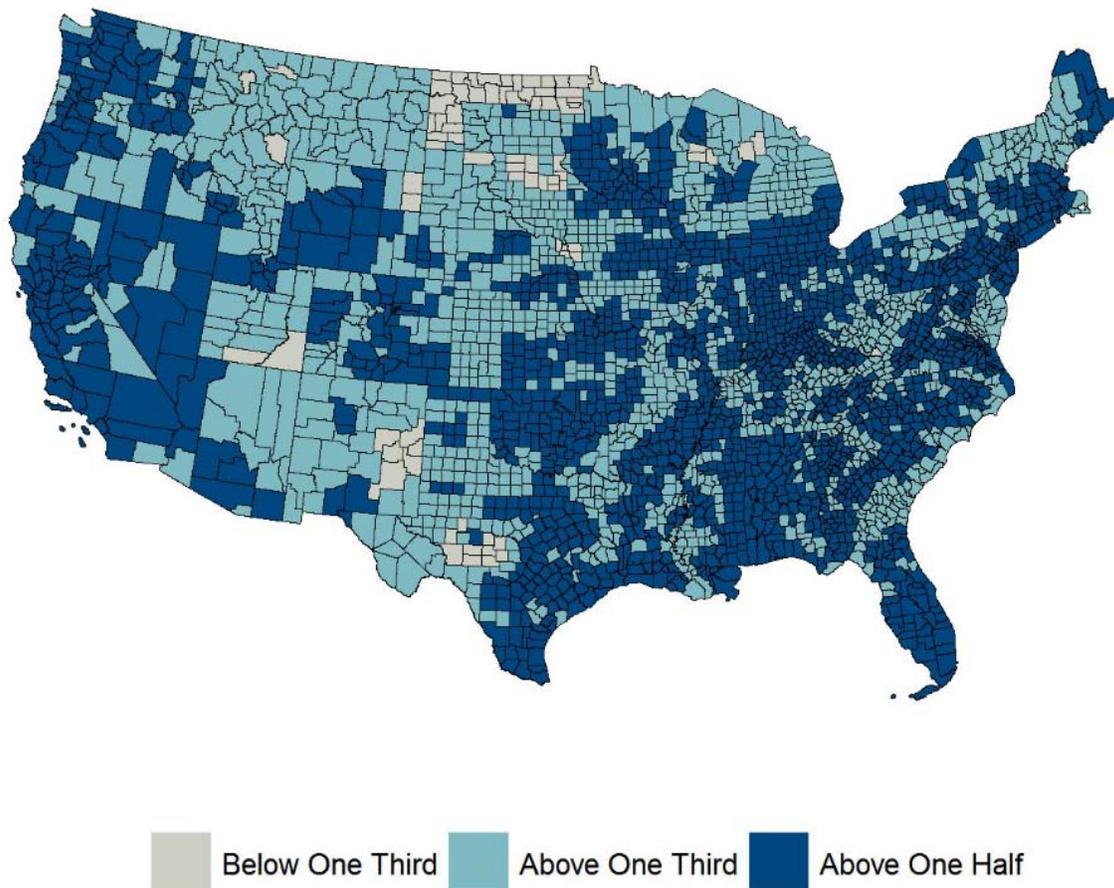
<sup>264</sup> AT&T/T-Mobile Staff Report, 26 FCC Rcd at 16211 ¶ 45.

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The following map shows where New T-Mobile spectrum holdings would be above the screen nationwide (*i.e.* the amount of spectrum that New T-Mobile would need to divest to stay below the screen):



The spectrum holdings share of New T-Mobile would of course be even greater when only the spectrum holdings of the Big 4 facilities-based carriers are considered. New T-Mobile would hold more than a third of that spectrum in 3,142 counties, and more than half in 1,712 counties, as shown in the following map:



In sum, New T-Mobile would trigger the spectrum screen in 532 CMAs, and exceed the screen by a population-weighted average of 67 megahertz per market. It would exceed the spectrum screen by at least 50 MHz in 315 CMAs, and by 100 MHz in 31 CMAs.

The Applicants seem to suggest that it would be inappropriate to include 2.5 GHz spectrum in the screen.<sup>265</sup> Sprint previously made this argument in the Mobile Spectrum Holdings proceeding, but it was rejected by the Commission.<sup>266</sup> The Applicants note that Sprint’s 2.5 GHz holdings would be redeployed as part of New T-Mobile’s 5G network. But the

<sup>265</sup> Application, Appendix J at 5.

<sup>266</sup> *Mobile Spectrum Report and Order*, 29 FCC Rcd. at 6184 ¶ 118 (“We will update the spectrum screen to *increase* the amount of 2.5 GHz spectrum.”) (emphasis added).

fact that 5G networks will use mid-band (as well as low-band) spectrum does not exempt these frequencies from a spectrum concentration analysis. The 2.5 GHz spectrum is still usable in 4G networks, {{BEGIN HCI

END HCI}}<sup>267</sup> Since the 2.5 GHz frequencies are substitutable for the rest of the frequencies included in the spectrum screen, there is no basis for excluding them or any other frequencies in the current spectrum screen from an analysis of concentration of spectrum holdings.

**D. The Merger Triggers a Dramatic Increase in HHI, Indicating Significant Threats to Competition**

The wireless industry has become increasingly concentrated over the past eight years. Today, the four national network operators have a combined market share of 99%. DISH's expert economists, Professor Harrington and the Brattle Group, have applied the well-known HHI to the mobile broadband industry today, and the industry after the proposed merger. The results mirror those of the spectrum screen analysis. Even before the merger, the HHI for the industry as a whole is *already at 2,814*, in the "highly concentrated" category under the Merger Guidelines. The post-merger HHI would *increase to 3,265*, an increase of *451 points*. This increase is more than twice the level that creates a presumption that the merger is "likely to enhance market power" under the Guidelines. More specifically, in the Guidelines' words:

Mergers resulting in a post-merger HHI between 1,500 and 2,500 (moderately concentrated) that involve an increase in the HHI of more than 100 points "potentially raise significant competitive concerns and often warrant scrutiny;

Mergers resulting in a post-merger HHI above 2,500 (highly concentrated) a) "potentially raise significant competitive concerns and often warrant scrutiny" if they involve an increase in the HHI of between 100 points and 200 points, and b) "will be presumed to be likely to enhance market power" if they involve an increase in the HHI of more than 200

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<sup>267</sup> See Harrington/Brattle Declaration at 17-18.

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points. This presumption may be rebutted with persuasive evidence demonstrating that the proposed merger “is unlikely to enhance market power.”<sup>268</sup>

Table 2 presents estimates of the concentration in the national mobile telephony/broadband markets before and after a potential Sprint/T-Mobile merger.

**Table 2: Herfindahl-Hirschman Index (HHI) Comparison for Potential Merger**

Provider	All Connections		Postpaid Connections		Prepaid Connections	
	Connections (millions)	Share	Connections (millions)	Share	Connections (millions)	Share
AT&T	141.6	33.8%	77.9	30.0%	24.7	26.4%
Verizon	145.3	34.7%	110.9	42.8%	11.0	11.8%
Sprint	54.6	13.0%	31.9	12.3%	22.6	24.2%
T-Mobile	72.6	17.3%	34.1	13.2%	34.6	37.0%
U.S. Cellular	5.0	1.2%	4.5	1.7%	0.5	0.6%
<b>Total</b>	<b>419.1</b>	<b>100.0%</b>	<b>259.3</b>	<b>100.0%</b>	<b>93.5</b>	<b>100.0%</b>
<b>New T-Mobile</b>	<b>127</b>	<b>30.3%</b>	<b>66</b>	<b>25.5%</b>	<b>57</b>	<b>61.2%</b>
<b>Pre-Merger HHI</b>	<b>2,814</b>		<b>3,057</b>		<b>2,793</b>	
<b>Post-Merger HHI</b>	<b>3,265</b>		<b>3,381</b>		<b>4,585</b>	
<b>Delta HHI</b>	<b>451</b>		<b>324</b>		<b>1,792</b>	

Sources: Carrier annual reports and Dennis Bournique, “Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator,” Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.

Notes: Total retail connections are estimated total retail connections for publicly traded facilities-based mobile wireless service providers (in thousands). Connections counts are for end of the year December 31. HHI is calculated as the sum of the squares of each firm’s market share.

Prepaid connections attribute MVNO connections to their host networks based on the number of wholesale connections estimated for each MNO.

The merger will produce an even larger concentration increase in the market to supply facilities-based service for prepaid connections. Specifically, Brattle estimates that the resulting HHI in that market will be 4,585, and the HHI change would be 1,792. And, in light of Verizon’s limited presence and interest in that market, the merger would all but create a facilities-based duopoly between New T-Mobile and AT&T. Indeed, New T-Mobile would dominate the market, as it would supply over 60% of connections (after accounting for the large

<sup>268</sup> DOJ Horizontal Merger Guidelines § 5.3.

number of MVNO connections that are hosted by the Applicants). The next largest supplier would be AT&T, at 26%, and together these two firms would account for more than 87% of all prepaid connections.

**VII. THE LIKELY OUTCOME OF THE MERGER IS HIGHER PRICES**

New T-Mobile would have lower incentives to engage in price and non-price competition. Antitrust authorities and economists use a set of standard tools to evaluate a merger's likely unilateral effect on the merged company's prices, including simple price pressure screens and more complex merger simulations.<sup>269</sup> DISH's economic experts have done what the Applicants have not and applied these tools to the proposed transaction. The results provide evidence that, even setting aside the increased risk of coordination, the most likely outcome of this proposed merger is unilateral price increases.<sup>270</sup>

**A. The Price Pressure Test Shows New T-Mobile Would Likely Increase Prices**

Pricing pressure screens, such as the GUPPI, provide a reliable indicator of the merging firms' incentive to raise prices following a merger. The GUPPI measures the value of sales that are diverted to one firm (or brand) measured in proportion to the lost revenues attributable to the reduction in unit sales resulting from the price increase by another firm (or brand). This ratio provides a metric for scoring the "upward pricing pressure" from the unilateral effects of a merger.

Professor Harrington and the Brattle Group calculated the results of the GUPPI test for Sprint and T-Mobile. The GUPPI scores for both Sprint (9.9%) and T-Mobile (9.2%) for retail

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<sup>269</sup> Harrington/Brattle Declaration at 41-54.

<sup>270</sup> *Id.* at 54.

postpaid services suggest that the merger would create significant upward pricing pressure, as both measures are well above the levels that are a reason for concern.<sup>271</sup>

**B. Merger Simulations Demonstrate New T-Mobile Would Likely Increase Prices**

Merger simulation models provide a quantitative assessment of the merger's unilateral effects on prices, market shares, and consumer welfare. Relative to simple concentration ratios and price pressure tests, merger simulation models involving a structural model of demand and supply have the advantage of taking into account realistic substitution patterns and competitors' responses to the price increase.

Professor Harrington and the Brattle Group conducted two merger simulations using the Antitrust Logit Model ("ALM" or "logit") and the proportionally calibrated Almost Ideal Demand System ("PC-AIDS"), two of the most commonly used calibrated demand models.<sup>272</sup> Both models share the same input requirements and assumptions about strategic behavior that are required to identify the initial pre-merger own-price and cross-price elasticities.

For each of the four carriers, the logit simulation reports pre-merger and post-merger volume market shares and monthly ARPU, along with the percentage changes in each.<sup>273</sup> The logit merger simulation results indicate that New T-Mobile will increase Sprint's prices by 5% for post-paid services and 7.3% for prepaid services, while T-Mobile prices would increase by somewhat lower percentages. The weighted average price increase for Sprint and T-Mobile combined would be 4.8% for post-paid services and 4.2% for prepaid services.<sup>274</sup> These price

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<sup>271</sup> *Id.* at 46.

<sup>272</sup> *Id.* at 49-55.

<sup>273</sup> *Id.* at 50-51.

<sup>274</sup> *Id.* at 51-53, Tables 21 and 22.

increases are expected to be accompanied by corresponding, albeit lower, price increases by AT&T and Verizon, as a result of the reduction in pricing pressure from the merged firm. In total, the price increases predicted by the model would *reduce consumer surplus* across the two retail segments by approximately *\$2.7 billion annually*.

DISH’s expert economists also evaluated the proposed merger using the PC-AIDS merger simulation, which computes pre-merger and post-merger revenue market shares and monthly ARPU, along with the percentage changes in each.<sup>275</sup> The PC-AIDS merger simulation results indicate that the merging entities would increase Sprint’s prices by 9.1% for post-paid service and 15.5% for prepaid services. T-Mobile prices would likely rise 8.5% and 8.2% for these services, respectively. The weighted average price increase for Sprint and T-Mobile combined would be 8.8% for post-paid services and 10.4% for prepaid services.<sup>276</sup>

**C. The Economic Predictions Are in Sync with Empirical Evidence of Other Four-to-Three Mergers in the Mobile Voice/Broadband Market**

In addition to econometric predictions, the Commission here has a test bed at its disposal—other countries that have seen the number of their facilities-based carriers reduced from four-to-three. An econometric study of 25 countries found that “removing a disruptive player from a four player market could increase prices by between 17.2% and 20.5% on average.”<sup>277</sup> Another study examining 33 countries found that an average four-to-three merger in

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<sup>275</sup> *Id.* at 52-53.

<sup>276</sup> *Id.* at 10, Table 1.

<sup>277</sup> Ofcom, *A Cross-Country Econometric Analysis of the Effect of Disruptive Firms on Mobile Pricing* at 17 (March 2016), <https://www.ofcom.org.uk/research-and-data/multi-sector-research/general-communications/disruptive-firms-econometrics>.

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the space would lead to an “increase in the bill of end users by 16.3% when compared with a situation in which no merger had occurred.”<sup>278</sup>

Austria is a case in point. While the EC had imposed a condition of facilities-based entry to mitigate the effects of the four-to-three merger of MNOs Orange Austria and H3G Austria, that condition did not materialize, as the spectrum earmarked for it reverted to H3G. The result? According to the Austrian competition regulator, inflation-adjusted price increases of 14% to 20% on average (and of 20% to 30% for prepaid plans).<sup>279</sup> The merger reversed a trend: before the merger, “prices for mobile telecommunication services had been falling for several consecutive years and were relatively low compared to other European countries.”<sup>280</sup> A second study examining the same Austrian merger found that “the merger had a significant and strong price increasing effect for smartphone users as well as for traditional users,” with prices increasing as much as 90% for some users.<sup>281</sup> The Austrian example is especially instructive for

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<sup>278</sup> Centre on Regulation in Europe Market Consolidation in Mobile Communications Report at 5-6. The study also found that mobile operators increased their investments post-merger by 19.3% after a four-to-three merger. *Id.* at 45. *See also* Directorate for Science, Technology and Innovation Committee on Digital Economic Policy, *Wireless Market Structures and Network Sharing*, OECD Digital Economy Papers, No. 243 at 17 (Jan. 2015), [https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP\(2014\)2/FINAL&docLanguage=En](https://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/ICCP/CISP(2014)2/FINAL&docLanguage=En) (“Competition in mobile markets benefits consumers by offering them better services, quality and price discipline. Particularly in countries with four or more mobile operators these benefits are visible through more competitive and more inclusive offers and services that are generally not available in countries with three mobile operators.”).

<sup>279</sup> Bundeswettbewerbsbehörde Report at 3.

<sup>280</sup> *Id.*

<sup>281</sup> RTR, *Ex-post Analysis of the Merger Between H3G Austria and Orange Austria* (March 2016) [https://www.rtr.at/en/inf/Analysis\\_merger\\_H3G\\_Orange/Ex\\_post\\_analysis\\_merger\\_H3G\\_Orange\\_RTR.pdf](https://www.rtr.at/en/inf/Analysis_merger_H3G_Orange/Ex_post_analysis_merger_H3G_Orange_RTR.pdf).

an additional reason: one of the three remaining players was T-Mobile’s affiliate, T-Mobile Austria.<sup>282</sup>

A T-Mobile affiliate was also a party to another four-to-three merger, this one in the Netherlands. A study examining the four-to-three merger of T-Mobile Nederland and Orange in that country found the merger resulted in price increases of between 10% and 17% compared to control countries.<sup>283</sup> Like T-Mobile US and T-Mobile Austria, T-Mobile Nederland is controlled by Deutsche Telekom.

Canada, too, is a cautionary tale. Canada is served by three national wireless providers, Rogers, Telus, and Bell Mobility.<sup>284</sup> Rogers has a 33% market share, and Telus and Bell both have a 28% market share.<sup>285</sup> These three companies control 89% of wireless subscribers and 91% of all wireless revenue in Canada as of 2016.<sup>286</sup> Canada’s telecom regulator (the CRTC) found that those limited urban areas with at least four wireless providers “generally had the

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<sup>282</sup> T-Mobile Austria is a wholly owned subsidiary of Deutsche Telekom AG, the largest shareholder of T-Mobile US. *Deutsche Telekom in Austria*, Deutsche Telekom <https://www.telekom.com/en/company/worldwide/profile/deutsche-telekom-in-austria-355854> (last visited Aug. 26, 2018).

<sup>283</sup> European Commission, *Ex-post Analysis of Two Mobile Telecom Mergers: T-Mobile/tele.ring in Austria and T-Mobile/Orange in the Netherlands* at 68 (2015), [https://www.rtr.at/de/inf/Analysis\\_mobile\\_mergers/Ex-post\\_analysis\\_of\\_two\\_mobile\\_telecom\\_mergers.pdf](https://www.rtr.at/de/inf/Analysis_mobile_mergers/Ex-post_analysis_of_two_mobile_telecom_mergers.pdf).

<sup>284</sup> Canada Radio Television and Communications Commission, *Communications Monitoring Report* at 301 (2017), <https://crtc.gc.ca/eng/publications/reports/PolicyMonitoring/2017/index.htm>.

<sup>285</sup> *Id.* Market share data as of 2016. New entrants’ penetration was only at 4% in 2012 and 5% in 2016. *Id.* at 329 (“Canada’s wireless service market is dominated by established carriers. These companies offer significantly more coverage and achieve higher subscriber penetration rates than the new entrants.”).

<sup>286</sup> *Id.* at 301-02.

largest variance between the lowest and highest prices reported, as well as the lowest prices.”<sup>287</sup>

Another study commissioned by the Canadian government found that Canada had the highest mobile broadband prices (for a plan of 2 GB to 5 GB) compared to the USA, Australia, France, Italy, UK, Germany and Japan.<sup>288</sup>

### **VIII. THE TRANSACTION WILL SIGNIFICANTLY INCREASE THE RISK OF COORDINATION**

As discussed above, the network operators remaining after the proposed merger (AT&T, Verizon, and New T-Mobile) would each have the incentive to raise prices individually (or “unilaterally”). However, the merger will also substantially increase the maximum price increase that carriers will be willing to initiate and match, hence increasing the risk of tacit collusion/coordination. It is well recognized that a “merger may diminish competition by enabling or encouraging post-merger coordinated interaction among firms.”<sup>289</sup> And this coordination need not be explicit to be harmful. Professor Harrington and the Brattle Group find that the merger would “substantively increase the likelihood of tacit collusion” among the remaining three carriers post-merger.

But, the Applicants’ experts, Professors Salop and Sarafidis, largely confine themselves to the theoretical proposition that the difficulty of detecting non-compliance deters cartel agreements in general. They have done little or no analysis as to whether and how this well-known theory applies to this transaction. The failure to engage in this analysis is all the more surprising because Salop and Sarafidis authored a paper that sets forth an econometric method

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<sup>287</sup> *Id.* at 314.

<sup>288</sup> Nordicity Group Ltd., *Price Comparison Study of Telecommunications Services in Canada and Select Foreign Jurisdictions* at 9 (Oct. 5, 2017), [https://www.ic.gc.ca/eic/site/693.nsf/vwapj/Nordicity2017EN.pdf/\\$file/Nordicity2017EN.pdf](https://www.ic.gc.ca/eic/site/693.nsf/vwapj/Nordicity2017EN.pdf/$file/Nordicity2017EN.pdf).

<sup>289</sup> Horizontal Merger Guidelines § 7.

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for estimating the increase in coordination risk of a merger. While this method is subject to a number of criticisms, it is important to note that here Salop and Sarafidis do not apply their own method. DISH’s economic experts have done so, and the results are not favorable for the Applicants. Indeed, Salop and Sarafidis’ own model shows the likelihood of increased coordinated effects post-merger.

**A. The Industry Is Suitable for Tacit Collusion, but Collusion Remains Difficult in the Current Market**

The mobile voice/broadband market is generally suitable for tacit collusion: prices are public and the carriers’ plans are similar; buyers—the individual consumers—lack power, and the barriers to entry are high. Nevertheless, coordination in the current four-player market is difficult, especially because the market shares and interests of the four players are misaligned. Specifically, as shown in the table below, each of AT&T and Verizon has a significantly higher share than each of T-Mobile and Sprint.

**Table 3: 2016 U.S. Wireless Provider Comparison**

Provider	2016 Market Share	Share of Total U.S. Population Covered	Share of Total U.S. Square Miles Covered	Total 5 Year Capital Investment	Total 10 Year Capital Investment	Average Monthly Churn	Average Subscription Life (Years)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
AT&T	32.4%	99.3%	71.7%	\$ 52,519,000,000	\$ 86,954,000,000	1.5%	6.1
Verizon Wireless	35.0%	97.3%	66.3%	\$ 51,762,000,000	\$ 89,273,000,000	1.2%	7.3
Sprint	14.3%	92.0%	27.5%	\$ 22,426,000,000	\$ 34,885,000,000	2.2%	4.3
T-Mobile	17.1%	95.1%	47.7%	\$ 20,885,000,000	\$ 36,333,000,000	1.7%	5.3

Sources: Estimated total connections, coverage data, and capital expenditure data from 2010 through 2016 from the Twentieth Mobile Wireless Competition Report, pp. 15, 48, and 80. Capital expenditure data from 2005 through 2009 from the Fifteenth Mobile Wireless Competition Report, p. 132. Churn data from UBS Wireless 411, p. 19.

Notes:

[B]: Market share based on estimated total connections as reported in the 20th Mobile Wireless Competition Report.

[C]: Share of total U.S. population covered by provider as reported in the 20th Mobile Wireless Competition Report.

[D]: Share of total U.S. square miles covered by provider as reported in the 20th Mobile Wireless Competition Report.

[E]: Sum of capital expenditures for each provider from 2012 through 2016 as reported in the 20th Mobile Wireless Competition Report.

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[F]: Sum of capital expenditures for each provider from 2007 through 2016 as reported in the 15th Mobile Wireless Competition Report and the 20th Mobile Wireless Competition Report. Capital expenditures from 2005 through 2009 are estimated based on Chart 30 in the 15th Mobile Wireless Competition Report.

[G]: Average monthly churn calculated as the geometric mean of monthly churn rates as reported in UBS Wireless 411.

[H]: Average subscription life, calculated as  $1 / \text{average monthly churn}$ . Figures based on monthly churn rates reported in UBS Wireless 411.

Given these positions, collusion is unlikely to be effective unless both AT&T and Verizon were to participate. Thus, the possible collusive arrangements in the pre-merger market are: (1) AT&T and Verizon colluding by themselves (i.e., without Sprint and T-Mobile), (2) AT&T and Verizon colluding with either Sprint or T-Mobile (but not both), or (3) AT&T and Verizon colluding with both Sprint and T-Mobile. We address each of these scenarios in turn.

First, collusion by AT&T and Verizon without Sprint and T-Mobile is likely to break down not long after it begins. This is because Sprint and T-Mobile typically sell at a discount compared to AT&T and Verizon. A coordinated price increase by AT&T and Verizon would provide a golden opportunity for T-Mobile and Sprint to further expand, and at even higher profit margins than in the past.

Second, collusion by AT&T, Verizon, and either Sprint or T-Mobile (but not both) suffers from a similar infirmity. For example, if Sprint colluded with AT&T and Verizon to raise prices, T-Mobile could then either maintain its price or increase its price by less than the rise in the prices by the other three network operators, resulting in a rise in T-Mobile's sales and market share because of the discount it would offer relative to the three other companies. Thus, the risk of mis-coordination is heightened in the current four-player market because of the uncertainty regarding whether Sprint or T-Mobile would participate.

Third, collusion among all four current network operators is unlikely because T-Mobile and Sprint are unlikely to participate in a collusive arrangement that would require freezing their market share. Even if T-Mobile were willing to participate, it is difficult for four firms to

coordinate without express communication. For example, if Sprint were willing to participate if the other three network operators were to do so, it may still not follow a price increase by Verizon or AT&T because it would be unsure that T-Mobile would follow. Even if all four network operators did want to participate in a collusive arrangement and were able to coordinate, such an arrangement would be highly unstable. Sprint or T-Mobile would be tempted to undercut Verizon or AT&T to increase market share, hoping that the three remaining firms would continue to collude. Sprint and T-Mobile's recent attempts to increase their market shares show that they are not content with their current market positions.

**B. The Merger Will Make Tacit Collusion Easier**

In the post-merger environment, however, tacit collusion would be easier. Professor Harrington and the Brattle Group find that the “merger would not only make tacit collusion significantly more likely, but that there would be a serious risk of tacit collusion in the post-merger market.”<sup>290</sup> The merger would likely lead to such coordinated effects because: (1) New T-Mobile would be more willing to collude with AT&T and Verizon than either standalone Sprint or T-Mobile; and (2) it would be less difficult for AT&T, Verizon, and New T-Mobile to coordinate than any grouping of the current four incumbents.

*T-Mobile would also have fewer incentives for maverick behavior.* As demonstrated in the above scenarios, one of the main obstacles to collusion in the pre-merger market is T-Mobile's maverick behavior. As described above and by Professor Harrington and the Brattle Group, T-Mobile has adopted a maverick strategy by foregoing short-term profits to gain more subscribers, market share, and profitability in the long run: “a maverick strategy is an investment where the cost of investment is lower short-run profit in the short term due to lower

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<sup>290</sup> Harrington/Brattle Declaration at 74.

revenues or higher costs, and the benefit of the investment is higher future profit from a large customer base.”<sup>291</sup> As explained in the Harrington/Brattle Declaration, “the future return from building a customer base is only realized when the firm starts charging higher prices to those locked-in customers.”<sup>292</sup> This rationale behind the maverick strategy explains why mavericks are rarely, if ever, market leaders but instead tend to be smaller firms.<sup>293</sup>

Merging with Sprint would largely eliminate the rationale for T-Mobile’s maverick behavior. Once it has obtained through the merger the higher market share that it has previously used competition to obtain, there would be little need for New T-Mobile to continue acting as a maverick. Indeed, with its larger customer base, it would be even more costly for New T-Mobile to be a maverick, because low prices would be more costly in terms of foregone lost profits on the larger customer base. It would instead be more rational for New T-Mobile to reap larger profits from those customers, rather than continue trying to gain market share.<sup>294</sup> New T-Mobile would likely act to increase its margins, by among other methods, engaging in tacit collusion with AT&T and Verizon.

**C. Salop and Sarafidis’ Own Model Shows an Increase of About 20% in the Risk of Coordinated Effects**

The Applicants’ own experts, Professors Salop and Sarafidis, have developed an index called the Coordinated Price Pressure Index (“CPPI”) to evaluate the proposed AT&T and T-

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<sup>291</sup> Harrington/Brattle Declaration at 68.

<sup>292</sup> *Id.*

<sup>293</sup> *Id.* at 69.

<sup>294</sup> *See id.* (“[A] maverick strategy of aggressive pricing is less attractive when a firm has a higher market share, as would be the case with New T-Mobile.”).

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Mobile merger.<sup>295</sup> The CPPI measures the maximum common price increase that a pair of firms are willing to initiate or match, holding the prices of all the other firms constant.

The following table shows the pre-merger and post-merger CPPI between the merging firms and the other national carriers.

**Table 4: The Coordinated Price Pressure Test**

Pre-Merger Coalition [A]	Pre-Merger CPPI [B]	Post-Merger CPPI [C]	Delta CPPI [D]
T-Mobile - Verizon	6.8%	21.9%	15.1%
T-Mobile - AT&T	8.8%	29.3%	20.5%
Sprint - Verizon	6.8%	21.9%	15.1%
Sprint - AT&T	8.8%	29.3%	20.5%

Sources: 20th Mobile Wireless Competition Report and UBS Wireless Telecommunications report released February 22nd, 2017. Company Annual Reports.

Notes:

[A]: Two-firm coalition.

[B]: CPPI for listed firm pair before Sprint/T-Mobile merger.

[C]: CPPI for listed firm pair after Sprint/T-Mobile merger.

[D]: Change in CPPI for listed firm pair due to Sprint/T-Mobile merger.

As shown in the table, the CPPI will increase by 15 to 21% depending on the company. In all cases, the post-merger CPPI is higher than the pre-merger CPPI, showing that the merger would increase the incentives to engage in tacit collusion.

## **IX. CONCLUSION**

For the foregoing reasons, the Commission should deny the transaction as currently proposed.

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<sup>295</sup> Serge Moresi, David Reitman, Steven Salop, & Yianis Sarafidis, *Gauging Parallel Accommodating Conduct Concerns with the CPPI* (2011), [https://papers.ssrn.com/sol3/papers.cfm?abstract\\_id=1924516](https://papers.ssrn.com/sol3/papers.cfm?abstract_id=1924516).

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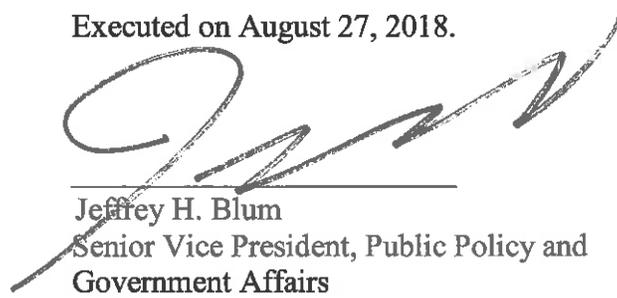
August 27, 2018

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**DECLARATION**

The foregoing has been prepared using facts of which I have personal knowledge or based upon information provided to me. I declare under penalty of perjury that the foregoing, except for those facts for which official notice may be taken and those that other parties have submitted to the Federal Communications Commission confidentially under the protection of the *Protective Order* in WT Docket No. 18-197, or otherwise, is true and correct to the best of my information, knowledge and belief.

Executed on August 27, 2018.



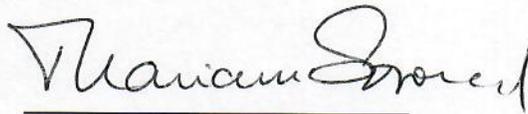
\_\_\_\_\_  
Jeffrey H. Blum  
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**DISH Network Corporation**

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**DECLARATION**

The technical material discussed in the foregoing Petition to Deny has been prepared using facts of which I have personal knowledge or based upon information provided to me. I declare under penalty of perjury that the foregoing Petition to Deny, except for those facts for which official notice may be taken and those that other parties have submitted to the Federal Communications Commission confidentially under the protection of the *Protective Order* in WT Docket No. 18-197, or otherwise, is true and correct to the best of my information, knowledge and belief.

Executed on August 27, 2018.

A handwritten signature in black ink, appearing to read "Mariam Sorond". The signature is written in a cursive style with a horizontal line underneath the name.

Mariam Sorond  
Vice President, Technology Development  
**DISH Network Corporation**

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## **Exhibit A**

### **Declaration of David E.M. Sappington**

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## Declaration of David E. M. Sappington

### I. Qualifications

My name is David Sappington. I hold the titles of Eminent Scholar and Director of the Public Policy Research Center, both at the University of Florida. Since earning my Ph.D. in economics from Princeton University in 1980, I have served on the faculties of the University of Michigan and the University of Pennsylvania and on the technical staff of Bell Communications Research. I have also served as the Chief Economist for the Federal Communications Commission and as the President of the Industrial Organization Society. I presently hold positions on the editorial boards of six major journals, including the *Journal of Regulatory Economics*, the *Rand Journal of Economics*, and the *Review of Industrial Organization*.

My research analyzes a broad range of issues in the field of industrial organization, with a focus on the design and implementation of regulatory policy. I have published more than one hundred and fifty articles in leading journals in the profession and have coauthored a book on *Designing Incentive Regulation for the Telecommunications Industry*. My curriculum vitae appears as an attachment to this report.

### II. Purpose, Primary Conclusions, and Outline of this Report

T-Mobile and Sprint propose to merge. The parties have hired Dr. David Evans in part to provide an estimate of how the merger would affect the price of wireless data in 2024.<sup>1</sup> The primary purpose of this report is to explain why Dr. Evans' study is incomplete and biased, and to identify some of the unsupported assumptions that underlie the study.

The study is incomplete because it fails to account for the well-documented and widely-accepted economic reality that a substantial increase in industry concentration generally leads to higher industry prices. Failure to account for this reality gives rise to predictions that are unduly rosy.

Dr. Evans' study is biased because its methodology predicts the proposed merger between T-Mobile and Sprint would substantially reduce the price of wireless data in the U.S. even if the merger did not increase the combined capacity of T-Mobile and Sprint, change the number of

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<sup>1</sup> Declaration of David S. Evans, Appendix G in *Description of Transaction, Public Interest Statement, and Related Demonstrations*, filed June 18, 2018 ("Evans Report").

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smartphone subscribers that any carrier serves, or change the industry-wide average revenue per smartphone subscriber. This flaw in the study undermines its utility.

Dr. Evans' study is further undermined by unsupported assumptions. For example, the study adopts without question projections that T-Mobile formulated for its proposed merger with Sprint. The study also relies upon unsubstantiated assumptions about the extent to which AT&T Wireless ("AT&T") and Verizon Wireless ("Verizon") will match the 5G investments of T-Mobile and, if the merger occurs, the resulting New T-Mobile.

The present report proceeds as follows. Section III reviews the methodology in Dr. Evans' study. Section IV explains why the study is incomplete. Section V identifies the bias in the study. Section VI reviews some of the unsupported assumptions in the study. Section VII concludes.

### III. The Basic Calculation in Dr. Evans' Study

The analysis in Dr. Evans' study essentially proceeds as follows.<sup>2</sup> First, industry practical capacity in 2024 is predicted,<sup>3</sup> both in the presence of the proposed merger and in its absence. Second, the number of wireless data subscribers in 2024 is estimated. Third, industry practical capacity per subscriber ( $k$ ) is calculated as the ratio of the predicted industry practical capacity to the estimated number of wireless data subscribers. Fourth, an industry-wide data average revenue per user ( $ARPU^d$ ) is estimated as a proxy for the predicted price of wireless data service in 2024 (and is assumed to be the same with and without the merger). Fifth, the ratio of data average revenue per user to capacity per subscriber ( $ARPU^d/k$ ) is calculated. Under the assumption that practical capacity is always fully utilized, the difference between  $ARPU^d/k$  without the merger and  $ARPU^d/k$  with the merger provides an estimate of the extent to which the merger will cause the industry-wide unit price of wireless data to decline (even though, by construction, industry subscribers,  $ARPU^d$ , and revenue do not change).

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<sup>2</sup> Appendix A to this report provides additional detail.

<sup>3</sup> Dr. Evans states that practical capacity is a measure of "the amount of data that a cellular network provides to users as a proportion of its . . . total capacity, given the engineering and business practicalities of running the network" (Evans Report, ¶ 209).

#### IV. Dr. Evans' Study is Incomplete

A credible estimate of the impact of the proposed merger on the price of wireless data must account for all of the likely major effects of the merger. The estimate that Dr. Evans provides in his declaration (“the Evans Report”) violates this important principle. It does so by failing to account for the fact that a substantial increase in industry concentration is likely to place upward pressure on the price of wireless data.

The proposed merger would substantially increase concentration in an industry that is already highly concentrated. The four major wireless carriers in the United States (AT&T, Verizon, T-Mobile, and Sprint) presently account for more than 98% of retail connections.<sup>4</sup> The corresponding Herfindahl-Hirschman Index of market concentration (“the HHI”) is 2,814,<sup>5</sup> which exceeds the 2,500 threshold that delineates a highly concentrated market.<sup>6</sup> The proposed merger is projected to increase the HHI to 3,266.<sup>7</sup> This increase of nearly 451 points (from 2,814 to 3,265) more than doubles the 100–200 point increase that “potentially raise[s] significant competitive concerns.”<sup>8</sup>

A well-regarded and widely-accepted principle of industrial organization is that a substantial increase in industry concentration typically leads to higher industry prices. As a classic textbook in industrial organization concludes: “Any realistic theory of oligopoly must take as a point of departure the fact that when market concentration is high, the pricing decisions of sellers are interdependent, and the firms involved can scarcely avoid recognizing their mutual interdependence. ... [W]e should expect oligopolistic industries to exhibit a tendency toward the maximization of collective profits, perhaps even approaching the pricing outcome associated with pure monopoly.”<sup>9</sup>

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<sup>4</sup> Declaration of Joseph Harrington, Coleman Bazelon, and Jeremy Verlinda (“Brattle Declaration”), Table 17.

<sup>5</sup> *Ibid.*

<sup>6</sup> U.S. Department of Justice and the Federal Trade Commission, *Horizontal Merger Guidelines*, Issued August 19, 2010, § 5.3.

<sup>7</sup> Brattle Declaration, Table 17.

<sup>8</sup> *Horizontal Merger Guidelines*, § 5.3.

<sup>9</sup> F. M. Scherer, *Industrial Market Structure and Economic Performance*. Second Edition. Boston, MA: Houghton Mifflin Company, 1980, p. 168.

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Empirical evidence confirms that increased industry concentration leads to higher industry prices in practice. In a recent comprehensive review of mergers in many industries, Professor John Kwoka concludes that increased industry concentration is associated with significantly higher prices whenever there are fewer than five major competitors.<sup>10</sup>

Increased industry concentration also is often associated with diminished industry innovation, both in general and in the wireless communications sector in particular. To illustrate, a study by the Organisation for Economic Co-operation and Development (OECD) observes that “in countries where there are a larger number of MNOs [mobile network operators], there is a higher likelihood of more competitive and innovative services being introduced and maintained. Particularly, a larger number of MNOs is often the source for innovative offers that challenge existing market wisdom and practices and a driver for the entire market to become more competitive.”<sup>11</sup> In particular, the OECD Report notes that innovation “is more likely in a market with at least four” mobile network operators.<sup>12</sup>

Antitrust authorities are well aware that increased industry concentration will often elevate prices and stifle innovation. Indeed, the authorities recognize that the anticompetitive effects of increased industry concentration can outweigh any efficiencies that a merger might foster. Specifically, the U.S. *Horizontal Merger Guidelines* state: “Even when efficiencies generated through a merger enhance a firm’s ability to compete, ... a merger may have other effects that may lessen competition and make the merger anticompetitive.”<sup>13</sup>

In light of the widespread recognition that mergers that substantially increase industry concentration are likely to place upward pressure on industry prices, it would strain credibility to suggest that the merger of T-Mobile and Sprint would reduce industry prices. Consequently, Dr. Evans adopts the most favorable assumption subject to this constraint. He assumes that the industry-wide *ARPU* will be the same in 2024 as it was in 2017 (\$43.93), regardless of whether the merger is

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<sup>10</sup> John Kwoka, “The Structural Presumption and the Safe Harbor in Merger Review: False Positives or Unwarranted Concerns?” Northeastern University discussion paper, February 2017 (forthcoming in the *Antitrust Law Journal*) (“the vast majority of mergers resulting in five or fewer significant competitors ... have anticompetitive consequences,” p. 47).

<sup>11</sup> OECD, “Wireless Market Structures and Network Sharing”, *OECD Digital Economy Papers*, No. 243, Paris: OECD Publishing, 2014 (<http://dx.doi.org/10.1787/5jxt46d3l9r2-en>) (“OECD Report”), p. 5.

<sup>12</sup> *Ibid*, p. 8.

<sup>13</sup> *Horizontal Merger Guidelines*, §10.

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permitted or precluded. This assumption completely ignores the upward pressure on industry prices that increased concentration exerts. This failure to account for well-recognized and well-documented economic forces renders the Evans Report seriously incomplete.

Dr. Evans recognizes that his analysis is incomplete, but declines to conduct a more complete analysis. He acknowledges that “I have not ... offered any opinion concerning the static unilateral effects of the Transaction resulting from the elimination of a competitor, nor have I conducted any analysis of the effect of the Transaction on static competition.”<sup>14</sup> This shortcoming of the analysis is of crucial importance, given the primacy of competitive effects relative to alleged efficiencies. As the *Horizontal Merger Guidelines* state, U.S. antitrust authorities “are mindful that the antitrust laws give competition, not internal operational efficiency, primacy in protecting customers.”<sup>15</sup>

Evidence submitted in the present merger proceeding indicates that Dr. Evans’ decision not to consider either the potential unilateral effects or the potential coordinated effects of the proposed merger constitutes an important omission.<sup>16</sup> The Brattle Declaration demonstrates that the proposed merger is likely to raise industry prices and reduce consumer welfare by billions of dollars even if all industry suppliers were to act independently following the merger. The Brattle Declaration further explains why the merger would enhance both the ability and the incentive of industry suppliers to coordinate their actions and thereby further increase industry prices and impose even greater harm on consumers.

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<sup>14</sup> Evans Report, ¶ 169.

<sup>15</sup> *Horizontal Merger Guidelines*, §10.

<sup>16</sup> The unilateral effects of a merger pertain to the effects (e.g., price increases) that can arise because of the increased industry concentration even if all industry suppliers act independently. The coordinated effects of a merger pertain to the effects that stem from increased tacit or explicit coordination among industry suppliers following the merger. See the Brattle Declaration for additional explanation and discussion.

## **V. Dr. Evans' Study Is Biased**

Although the Evans Report relies upon questionable assumptions, the basic logic it employs is relatively straightforward. The Report posits that the merger of T-Mobile and Sprint would increase their combined capacity which, in turn, would compel AT&T and Verizon to expand their capacities. Consequently, as long as the increased industry concentration caused by the merger does not place any upward pressure on the price of wireless data or reduce the carriers' incentives to fully deploy their expanded capacities, industry capacity necessarily increases, and the unit price of wireless data declines.

Given this basic logic, one would expect the methodology employed in the Evans Report ("the Evans methodology") to predict that the merger would have no impact on the unit price of wireless data if the merger did not increase the combined practical capacity of T-Mobile and Sprint. However, the Evans methodology provides a very different prediction under this "no merger efficiency" condition. Specifically, the methodology predicts the merger often will reduce the industry-wide unit price of wireless data even when this condition prevails.

This concerning feature of the Evans Report is recorded formally in the following proposition, which is proved in Appendix B to this report.

**Proposition.** Suppose the proposed merger of T-Mobile and Sprint would not change their combined practical capacity. Then the Evans methodology predicts that the merger would nevertheless reduce the industry-wide unit price of wireless data whenever Sprint's practical capacity per subscriber exceeds T-Mobile's practical capacity per subscriber.

The troubling conclusion in the proposition reflects the manner in which the Evans methodology estimates the practical capacities of AT&T and Verizon. For brevity, consider how the estimation proceeds for Verizon.<sup>17</sup> To estimate Verizon's practical capacity, the Evans Report first assumes that Verizon matches the practical capacity per subscriber of: (i) T-Mobile in the absence of the merger; and (ii) New T-Mobile in the presence of the merger. The Report then calculates Verizon's total practical capacity to be the product of the relevant practical capacity per subscriber (of either T-Mobile or New T-Mobile) and the number of smartphone subscribers that Verizon

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<sup>17</sup> The estimation for AT&T is analogous.

serves.

This procedure implies that the Evans methodology will predict different levels of industry practical capacity (and thus a different price for wireless data) whenever T-Mobile’s projected practical capacity per subscriber ( $k^T$ ) differs from New T-Mobile’s projected practical capacity per subscriber ( $k_m^{TS}$ ).<sup>18</sup> I now show that these two projections generally will differ even when the merger does not affect the combined practical capacity of T-Mobile and Sprint.

To do so, observe that T-Mobile’s projected practical capacity per subscriber ( $k^T$ ) is the ratio of its practical capacity ( $K^T$ ) to the number of subscribers it serves ( $s^T$ ), so  $k^T = \frac{K^T}{s^T}$ . Similarly, when the practical capacity of New T-Mobile is simply the sum of the individual practical capacities of T-Mobile ( $K^T$ ) and Sprint ( $K^S$ ), New T-Mobile’s projected practical capacity per subscriber ( $k_m^{TS}$ ) is the ratio of  $K^T + K^S$  to the sum of the numbers of subscribers that T-Mobile ( $s^T$ ) and Sprint ( $s^S$ ) serve.<sup>19</sup> Formally,  $k_m^{TS} = \frac{K^T + K^S}{s^T + s^S}$ . Now, to prove that  $k_m^{TS}$  generally differs from  $k^T$  even when the merger does not affect the combined practical capacity of T-Mobile and Sprint, observe that:

$$\begin{aligned} k_m^{TS} > k^T &\Leftrightarrow^{20} \frac{K^T + K^S}{s^T + s^S} > \frac{K^T}{s^T} \Leftrightarrow s^T [K^T + K^S] > K^T [s^T + s^S] \\ &\Leftrightarrow s^T K^S > s^S K^T \Leftrightarrow \frac{K^S}{s^S} > \frac{K^T}{s^T}. \end{aligned}$$

This analysis establishes that New T-Mobile’s projected practical capacity per subscriber exceeds T-Mobile’s projected practical capacity per subscriber even when the “no merger efficiency” condition holds if Sprint’s practical capacity per subscriber ( $\frac{K^S}{s^S}$ ) exceeds T-Mobile’s practical capacity per subscriber ( $\frac{K^T}{s^T}$ ). Averaging the larger Sprint capacity measure with the lower T-Mobile capacity measure produces a larger projected practical capacity per subscriber for New T-

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<sup>18</sup> The subscript “m” on  $k_m^{TS}$  indicates that the merger has taken place. The superscript “TS” denotes the combined operations of T-Mobile and Sprint.

<sup>19</sup>  $s^T$  is the number of subscribers that T-Mobile serves.  $s^S$  is the number of subscribers that Sprint serves. I follow the Evans Report here in assuming that New T-Mobile serves  $s^T + s^S$  subscribers.

<sup>20</sup> This symbol denotes “equivalence,” indicating that the relationship that precedes the symbol is true if and only if the relationship that follows the symbol is true.

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Mobile than for T-Mobile. Thus, the Evans methodology predicts the merger will induce AT&T and Verizon to increase their practical capacities per subscriber (in order to match the extent to which New T-Mobile's capacity per subscriber exceeds T-Mobile's capacity per subscriber) even when the merger does not increase the combined practical capacity of T-Mobile and Sprint. This prediction is driven entirely by the assumption that AT&T and Verizon follow T-Mobile or New T-Mobile (and ignore Sprint) when determining their per-subscriber network capacities.<sup>21</sup>

This questionable assumption leads the Evans methodology to predict that the proposed merger of T-Mobile and Sprint will reduce the unit price of wireless data even when the merger has no impact whatsoever on the combined practical capacities of T-Mobile and Sprint. Thus, the Evans methodology delivers a conclusion that is favorable to T-Mobile and Sprint even when the parties' alleged rationale for the conclusion does not hold.

It is concerning that the assumptions employed in the Evans Report, coupled with the bias in the Evans methodology, give rise to a prediction bias of substantial magnitude. This magnitude is characterized in the following Observation, which is proved formally in Appendix B to this report.

**Observation.** Given the assumptions employed in the Evans Report, the Evans methodology predicts that under the “no merger efficiency” condition specified in the Proposition, the merger would cause the industry-wide unit price of wireless data to decline by nearly {{BEGIN HCI    END HCI}} percent.

Dr. Evans might try to suggest that the Observation demonstrates the proposed merger would deliver benefits even if it does not increase the combined practical capacity of T-Mobile and Sprint. However, the Evans Report provides no hard evidence to support this suggestion. The Report focuses on how the proposed merger would substantially increase the combined capacity of T-Mobile and Sprint, and thereby (allegedly) compel AT&T and Verizon to match the greatly enhanced capacity of New T-Mobile. The Evans Report does not explain how a merger that has no impact whatsoever on the combined capacity of T-Mobile and Sprint would somehow compel AT&T and Verizon to increase their network capacities, as the Evans methodology predicts. In fact, the Evans Report acknowledges that AT&T and Verizon are unlikely to respond to relatively minor improvements to New T-Mobile's operations that it might secure from the merger. Specifically, the Report notes that “Verizon and AT&T give little attention to others' investments aimed at ‘catching

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<sup>21</sup> The discussion in Section VI.A below explains why this assumption is highly questionable.

up’.”<sup>22</sup>

Given the prediction bias identified in the Observation, Dr. Evans’ presumption that the merger would not increase the average revenue per subscriber in the wireless industry, and his unquestioning adoption of predictions of large capacity increases for New T-Mobile, it is not surprising that the Evans Report provides rosy predictions about the impact of the merger on the price of wireless data in 2024.

## **VI. Other Elements of Dr. Evans’ Study are Not Fully Supported**

The rosy predictions in the Evans Report reflect in part the incomplete and biased nature of the Report. The predictions also reflect questionable assumptions about the capacities of the nation’s wireless carriers and the extent to which these capacities will be utilized.

### **A. The Report’s Estimate of Industry Capacity Absent a Merger is Questionable**

As explained in Section V above, the Evans Report is biased because it assumes that in the absence of the proposed merger, AT&T and Verizon will match the practical capacity per subscriber of T-Mobile. The rationale for this assumption is far from apparent.

The Evans Report observes that in recent years, T-Mobile’s subscribers have consumed **{{BEGIN HCI      END HCI}}** percent of the carrier’s total capacity. The Report further asserts that T-Mobile provided to its subscribers “as much national total capacity as possible given the engineering and business practicalities of running the network.”<sup>23</sup> The Evans Report employs these observations to assume that T-Mobile’s practical capacity is **{{BEGIN HCI      END HCI}}** percent of its total capacity.

In practice, the fraction of a carrier’s total capacity that is actually used by subscribers depends on many factors. Relevant factors include the number of subscribers the carrier serves, subscriber data usage patterns, the carrier’s pricing policies, network service quality, and the carrier’s efficiency in deploying its resources. The nation’s wireless carriers differ on all of these dimensions. The Brattle Declaration documents the different numbers of subscribers the carriers serve and the different prices they charge.<sup>24</sup> The Declaration also reports that AT&T and (especially) Verizon presently employ their spectrum more intensively than T-Mobile does.

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<sup>22</sup> Evans Report, ¶ 230.

<sup>23</sup> *Ibid.*, ¶ 223.

<sup>24</sup> Brattle Declaration, § IV.A.1.

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Specifically, the Declaration identifies the number of subscribers that each of the major wireless carriers serves per MHz of spectrum it owns, after accounting for spectrum re-use, as measured by the number of towers deployed. Verizon is found to use its spectrum most intensively, serving 21.8 customers per MHz per cell site. The corresponding measure of intensity of spectrum use is 13.6 for AT&T, 11.0 for T-Mobile, and 6.3 for Sprint.<sup>25</sup>

In light of these differences among carriers and others, it is by no means apparent that AT&T and Verizon are likely to operate with precisely the same practical capacity per subscriber as T-Mobile if the merger does not occur.

**B. The Report’s Estimate of Industry Capacity Post-Merger Is Questionable**

As explained in Section III above, Dr. Evans’ estimate of the unit price of wireless data in 2024 is effectively the ratio of average revenue per subscriber (which is assumed to be unchanged by the merger) to predicted industry practical capacity per subscriber. Therefore, by construction, Dr. Evans’ estimate of the post-merger unit price of wireless data declines as predicted industry practical capacity per subscriber increases.

Dr. Evans secures a high estimate of industry practical capacity in part by assuming that if the proposed merger is consummated, AT&T and Verizon will expand their network capacities to ensure that they operate with the same practical capacity per subscriber as New T-Mobile. Dr. Evans provides limited justification for this assumption.

As explained in Section VI.A above, the Brattle Declaration finds that AT&T and Verizon presently employ their spectrum more intensively than T-Mobile does. The Declaration further observes that New T-Mobile is projected to employ its spectrum even less intensively than T-Mobile presently employs its spectrum. This is the case even if New T-Mobile manages the cell sites of Sprint and T-Mobile as the parties predict and even if the carriers divest their spectrum holdings that exceed relevant spectrum screens.<sup>26</sup> Thus, Dr. Evans appears to suggest that following the merger of T-Mobile and Sprint, AT&T and Verizon will employ their spectrum less intensively than they do presently. The rationale for this assumption is not apparent.

Dr. Evans’ own observations also raise doubts about his assumption that AT&T and Verizon will expand their capacities to secure the same practical capacity per subscriber as New T-Mobile.

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<sup>25</sup> *Ibid*, Table 28.

<sup>26</sup> The Brattle Declaration (Table 28) reports that even under these favorable conditions, New T-Mobile would serve only 7.8 subscribers per MHz of spectrum per cell site.

Dr. Evans acknowledges that “Verizon and AT&T have often ignored investments from T-Mobile and Sprint.”<sup>27</sup> He further notes that Verizon has announced a “slow deployment plan” for 5G.<sup>28</sup> Dr. Evans also reports that analysts believe that AT&T’s roll-out of 5G “will really be comprised of an enhanced 4.5G LTE and only later deploy a mobile network that meets 5G NR standards.”<sup>29</sup> In addition, Dr. Evans claims that “AT&T and Verizon do not have plans to deploy a strong 5G as rapidly as New T-Mobile would do so based on their public announcements.”<sup>30</sup>

Dr. Evans suggests that AT&T and Verizon may react aggressively to New T-Mobile’s (alleged) increase in network capacity because they may have, on occasion, responded to T-Mobile’s actions in the past. However, as noted above, Dr. Evans fails to consider the reduced competitive intensity fostered by increased industry concentration. Just as reduced competitive intensity can promote higher prices, it can also dull incentives for innovation and investment.<sup>31</sup>

### **C. The Report’s Estimate of New T-Mobile Capacity Is Questionable**

Dr. Evans secures a high estimate of New T-Mobile’s practical capacity in 2024 by adopting without question the company’s projections of its post-merger capacity. These projections were likely formulated knowing that they would be reviewed by the Department of Justice and the Federal Communications Commission in the present proceeding. Consequently, it would not be surprising if the projections were unduly optimistic.

Indeed, the Brattle Declaration observes that T-Mobile’s projections may exaggerate substantially the extent to which a merger of T-Mobile and Sprint would increase their combined practical capacity. The declaration explains that T-Mobile’s projections only consider **{{BEGIN HCI**

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<sup>27</sup> Evans Report, ¶ 229.

<sup>28</sup> *Ibid*, ¶ 193.

<sup>29</sup> *Ibid*, ¶ 194.

<sup>30</sup> *Ibid*, ¶ 231. The accuracy of all of these claims merits further investigation.

<sup>31</sup> *See*, for example Marc Ivaldi, Bruno Jullien, Patrick Rey, Paul Seabright, and Jean Tirole, *The Economics of Tacit Collusion*, Final Report for DG Competition, European Commission, March 2003 (“the EC Report”), §IV.2.

**END HCI}}**.<sup>32</sup> Thus, once one accounts more fully for the ways in which T-Mobile and Sprint can increase their practical capacity per subscriber other than through merger, the increase attributed to the merger declines significantly.

The projections of New T-Mobile’s capacity that Dr. Evans relies upon also may overstate actual capacity in 2024 by failing to account fully for unforeseen complications. If the proposed merger is consummated, Sprint and T-Mobile may well encounter unexpected difficulties in integrating their operations. It is notoriously difficult, if not impossible, for any company to anticipate every possible problem that could arise during a multi-year planning horizon.<sup>33</sup> Consequently, even unbiased long-term forecasts can be inaccurate.

Antitrust officials are well aware of the shortcomings of analyses that reflect potentially self-serving or even unbiased long-term forecasts. The *Horizontal Merger Guidelines* note: “Efficiencies are difficult to verify and quantify, in part because much of the information relating to efficiencies is uniquely in the possession of the merging firms. Moreover, efficiencies projected reasonably and in good faith by the merging firms may not be realized.”<sup>34</sup>

#### **D. The Assumption that Available Capacity Will be Fully Utilized Is Questionable**

Under the Evans methodology, a smaller level of utilized capacity translates into a higher estimate of the price of wireless data in 2024.<sup>35</sup> There are at least three reasons why the Evans Report may exaggerate post-merger capacity utilization in the nation’s wireless sector.

First, as explained in sections VI.A and VI.B above, the Brattle Declaration reveals that the nation’s wireless carriers presently operate under widely varying conditions, including very different levels of intensity of spectrum use. Consequently, it is not apparent why all carriers should

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<sup>32</sup> Brattle Declaration, § III.

<sup>33</sup> See, for example, Herbert A. Simon, *Models of Bounded Rationality, Volume 3: Empirically Grounded Economic Reason*, Cambridge, MA: The MIT Press, 1997.

<sup>34</sup> *Horizontal Merger Guidelines*, §10.

<sup>35</sup> As noted in Section III above, Dr. Evans assumes that available capacity is fully utilized to provide service to wireless subscribers. If available capacity is not fully utilized, then the predicted price of wireless data (estimated as the ratio of data ARPU to utilized industry capacity per subscriber) increases.

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necessarily be expected to fully employ all available practical capacity to serve customers if the merger is consummated.

Second, even if New T-Mobile somehow managed by 2024 to fully develop and implement the industry-leading service envisioned in the parties' Application,<sup>36</sup> consumers might take considerably longer to recognize T-Mobile's improved service. Consequently, New T-Mobile's capacity may not be fully utilized.<sup>37</sup>

Third, carriers may also strategically hold a portion of their network capacity in reserve in case it is needed to discipline deviations from collusive agreements. A carrier may be tempted to defect from a collusive agreement in order to attract more than the share of industry subscribers it has been assigned under the agreement. To punish such a defector, the non-defectors may implement promotions that attract back both the defector's newly-acquired subscribers and a substantial number of the defector's assigned subscribers.<sup>38</sup> To implement such punishment, the non-defectors must have on hand more capacity than is required to serve their assigned subscribers. Thus, carriers may rationally hold excess capacity rather than fully employ all of their available capacity, as Dr. Evans assumes.

For these reasons, among others, industry capacity may not be fully utilized. If post-merger practical capacity is not fully utilized, then the Evans methodology will exaggerate the extent to which the merger exerts downward pressure on the price of wireless data. This exaggeration in turn compounds the exaggeration that arises from Dr. Evans' assumption that the merger will not place any upward pressure on prices (as explained in Section IV).

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<sup>36</sup> *Description of Transaction, Public Interest Statement, and Related Demonstrations*, filed June 18, 2018.

<sup>37</sup> Such lags in consumer recognition could also dampen the perceived need of rivals to enhance their network capacity to match New T-Mobile's capacity.

<sup>38</sup> *See*, for example, the EC Report (§III.10) and Edward Green and Robert Porter, "Non-Cooperative Collusion under Imperfect Price Information," *Econometrica*, 52(1), January 1984, 87-100

### E. Merger Gains May Only Be Incremental

The Evans Report estimates the impact of the proposed merger on the price of wireless data in 2024. This focus on a particular point in time abstracts from the possibility that the merger might simply accelerate a reduction in the price of wireless data rather than constitute the only means to achieve the reduction.<sup>39</sup> The gains from a merger can be relatively small if the merger accelerates the arrival of a benefit, but the benefit will ultimately arrive in the absence of the merger.

To illustrate this conclusion, suppose initially that a merger is, in fact, the only way to achieve a perpetual annual benefit of magnitude  $B$  beginning  $t$  years from the present. In particular, if the merger is not permitted, then this benefit is never realized. Let  $r$  denote the relevant annual interest rate. Then the *exclusive* gain from the merger ( $E$ ) in this setting can be measured as the present discounted value of the perpetual annual benefit  $B$  beginning in  $t$  years. Formally:

$$E = \sum_{i=t}^{\infty} \frac{B}{[1+r]^i}.$$

Now suppose the merger merely accelerates the arrival of the perpetual annual benefit  $B$ . Specifically, suppose that if the merger does not occur, the perpetual annual benefit  $B$  begins  $t + d$  years from the present (so the arrival of the annual benefit is delayed by  $d$  years relative to the outcome when the merger is consummated). The *non-merger* gain in this setting can be measured as the present discounted value of the (delayed) perpetual annual benefit  $B$ . Formally:

$$N = \sum_{i=t+d}^{\infty} \frac{B}{[1+r]^i}.$$

Define the *incremental* gain from the merger ( $I$ ) to be the difference between the exclusive gain from the merger and the non-merger gain. Formally:

$$I = E - N = \sum_{i=t}^{\infty} \frac{B}{[1+r]^i} - \sum_{i=t+d}^{\infty} \frac{B}{[1+r]^i} = \sum_{i=t}^{t+d-1} \frac{B}{[1+r]^i}.$$

The ratio of the incremental gain from the merger to the exclusive gain from the merger ( $f_d$ ) is:

$$f_d = \frac{I}{E} = \frac{\sum_{i=t}^{t+d-1} \frac{1}{[1+r]^i}}{\sum_{i=t}^{\infty} \frac{1}{[1+r]^i}}.$$

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<sup>39</sup> It bears repeating that the predicted reduction in the price of wireless data ignores the widely-accepted economic principle that a substantial increase in industry concentration typically leads to higher industry prices.

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$f_d$  can be viewed as the fraction of the claimed benefit from a merger that can truly be attributed to the merger when, instead of being the sole cause of a perpetual annual benefit (as claimed), the merger simply accelerates the arrival of this benefit by  $d$  years.

Table 1 illustrates how  $f_d$  varies with  $d$  when the annual interest rate is 2 percent and when the merger ensures that a perpetual annual benefit of 100 begins in 2024.<sup>40</sup> To interpret the table, suppose the merger is claimed to be the only means to achieve this perpetual annual benefit. Further suppose that, in fact, the merger merely accelerates the arrival of this benefit by five years (so the perpetual annual benefit begins in 2029 if the merger does not occur). Then the actual (incremental) gain from the merger is only 9.43 percent of the claimed (exclusive) gain from the merger.<sup>41</sup>

**Table 1. Non-Merger ( $N$ ) and Exclusive ( $E$ ) and Incremental ( $I$ ) Merger Gains.<sup>42</sup>**

$d$	$E$	$N$	$I$	$f_d = I/E$
1	4,529	4,440	89	1.96%
2	4,529	4,353	176	3.88%
3	4,529	4,267	261	5.77%
4	4,529	4,184	345	7.62%
5	4,529	4,102	427	9.43%
6	4,529	4,021	507	11.20%
7	4,529	3,942	586	12.94%
8	4,529	3,865	663	14.65%
9	4,529	3,789	739	16.32%
10	4,529	3,715	814	17.97%

<sup>40</sup> The Evans Report (Table 20, p. 150) employs a 2 percent interest rate to calculate present discounted values.

<sup>41</sup> As the expression for  $f_d$  indicates, the value of  $f_d$  reported in Table 1 would not change if the presumed magnitude of  $B$  were changed.

<sup>42</sup> The entries for  $E$ ,  $N$ , and  $I$  in Table 1 are rounded to the nearest whole number. Consequently, the value for  $I$  in the table is not always precisely the difference between  $E$  and  $N$ .

## **VII. Conclusions**

In summary, the Evans Report is incomplete and biased, and employs assumptions that are not fully supported. The Report is incomplete because it fails to take any account of the well-documented and widely-accepted economic reality that a substantial increase in industry concentration generally promotes higher industry prices. The Report is biased because it predicts that the proposed merger of T-Mobile and Sprint would substantially reduce the price of wireless data in the U.S. even if the merger did not increase the combined practical capacity of T-Mobile and Sprint. The Evans Report also adopts without question projections provided by T-Mobile and Sprint and relies upon assumptions about industry investment that are not fully supported.

Finally, it should be noted that even if Dr. Evans' predicted decline in the price of wireless data somehow materialized, the decline would not be fully realized until 2024. In contrast, increased industry concentration threatens to increase industry prices immediately following the consummation of the merger. As the Evans Report implicitly acknowledges,<sup>43</sup> distant benefits can be outweighed by comparable (and even smaller) present harms.

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<sup>43</sup> Evans Report, ¶ 248, Table 20.

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**APPENDIX A**

This Appendix provides a more detailed summary of the calculations in the Evans Report. The calculations entail the following ten steps.

1. Estimate Total Capacity for T-Mobile and Sprint.<sup>44</sup>

A. Without the merger.

T-Mobile's total capacity: **{{BEGIN HCI** **END HCI}}**<sup>45</sup>

Sprint's total capacity: **{{BEGIN HCI** **END HCI}}**

B. With the merger.

New T-Mobile's total capacity: **{{BEGIN HCI** **END HCI}}**

2. Specify a Practical Capacity Utilization Rate ( $u$ ).

$u$  is assumed to be **{{BEGIN HCI** **END HCI}}** both with and without the merger.

3. Estimate Practical Capacity for T-Mobile and Sprint.

Estimated practical capacity is the product of estimated total capacity and the practical capacity utilization rate.

A. Without the merger.

T-Mobile's practical capacity: **{{BEGIN HCI** **END HCI}}**<sup>46</sup>

Sprint's practical capacity: **{{BEGIN HCI** **END HCI}}**

B. With the merger.

New T-Mobile's practical capacity: **{{BEGIN HCI** **END HCI}}**

4. Estimate the Number of Smartphone Subscribers.

Dr. Evans projects future growth in wireless subscriptions and smartphone penetration rates, and assumes that present market shares will not change over time. The resulting estimated number of smartphone subscribers by company are:

A. Without the merger.

**{{BEGIN HCI**

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<sup>44</sup> These estimates reflect T-Mobile's projections.

<sup>45</sup> EB denotes exabytes. One exabyte is one quintillion ( $10^{18}$ ) bytes.

<sup>46</sup> This number is reported as **{{BEGIN HCI** **END HCI}}** in Exhibit 14B in the Evans Report, apparently in error.

END HCI}}

B. With the merger.

{{BEGIN HCI

END

HCI}}

5. Estimate Practical Capacity Per Subscriber.

Practical capacity per subscriber ( $k$ ) is the ratio of practical capacity to the number of smartphone subscribers, converted to gigabytes (GB) per month.

Dr. Evans assumes that AT&T and Verizon will match T-Mobile's practical capacity per subscriber.

A. Without the merger.<sup>48</sup>

{{BEGIN HCI

END HCI}}

B. With the merger.

{{BEGIN HCI

END HCI}}

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<sup>47</sup> This number reflects a rounding approximation that appears in the Evans Report.

<sup>48</sup> The numbers that follow reflect rounding that is adopted to match the numbers reported in the Evans Report.

<sup>49</sup>  $\delta = 10^9$  is the factor that converts EB to GB.

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6. Estimate Practical Capacity for AT&T and Verizon.

The practical capacity for these companies is estimated to be the product of their estimated practical capacity per subscriber and their estimated number of smartphone subscribers.

- A. Without the merger.

**{{BEGIN HCI**

**END HCI}}**

- B. With the merger.

**{{BEGIN HCI**

**END HCI}}**

7. Calculate Industry Practical Capacity.

Industry practical capacity is the sum of the practical capacities of the industry suppliers.

- A. Without the merger.

**{{BEGIN HCI**  
**END HCI}}**

- B. With the merger.

**{{BEGIN HCI**  
**END HCI}}**

8. Calculate Industry Practical Capacity per Smartphone Subscriber.

Industry Practical Capacity per Smartphone Subscriber ( $k$ ) is the ratio of industry practical capacity to the total number of smartphone subscribers.

- A. Without the merger.

**{{BEGIN HCI**

**END HCI}}**

- B. With the merger.

**{{BEGIN HCI**

**END HCI}}**

9. Estimate Industry Data Average Revenue per User ( $ARPU^d$ ).

Industry Data Average Revenue per User is the product of estimated industry wireless ARPU and 0.90, the estimated fraction of time using a smartphone that is spent online.

Industry wireless ARPU both with and without the merger is assumed to be **{{BEGIN HCI**  
**END HCI}}** the industry wireless ARPU in 2017.

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**END HCI}}**

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10. Estimate the Price per GB of Mobile Data.

This estimate assumes that all practical capacity is used to serve subscribers.

A. Without the merger.

**{{BEGIN HCI**

**END HCI}}**

B. With the merger.

**{{BEGIN HCI**

**END HCI}}**

**APPENDIX B**

This Appendix provides a formal proof of the Proposition and the Observation stated in Section V above. The Proposition and the Observation are restated here for convenience.

**Proposition.** Suppose the proposed merger of T-Mobile and Sprint would not change their combined practical capacity. Then the Evans methodology predicts that the merger would nevertheless reduce the industry-wide unit price of wireless data whenever Sprint’s practical capacity per subscriber exceeds T-Mobile’s practical capacity per subscriber.

Proof. The proof proceeds employing the notation developed in Appendix A. Recall the following:

$K^A$ ,  $K^V$ ,  $K^T$ , and  $K^S$ , respectively, are the practical capacities of AT&T, Verizon, T-Mobile, and Sprint in the absence of a merger.

$K_m^A$ ,  $K_m^V$ , and  $K_m^{TS}$ , respectively, are the practical capacities of AT&T, Verizon, and New T-Mobile following the merger of T-Mobile and Sprint to form New T-Mobile.

$k^A$ ,  $k^V$ ,  $k^T$ , and  $k^S$ , respectively, are the practical capacities per subscriber of AT&T, Verizon, T-Mobile, and Sprint in the absence of the merger.

$k_m^A$ ,  $k_m^V$ , and  $k_m^{TS}$ , respectively, are the practical capacities per subscriber of AT&T, Verizon, and New T-Mobile following the merger.

$s^A$ ,  $s^V$ ,  $s^T$ , and  $s^S$ , respectively, are the number of smartphone subscribers for AT&T, Verizon, T-Mobile, and Sprint in the absence of a merger.

$s^A$ ,  $s^V$ , and  $s^{TS}$ , respectively, are the number of smartphone subscribers for AT&T, Verizon, and New T-Mobile in the presence of the merger.

The analysis in the Evans Report begins by specifying estimates for  $K^T$ ,  $K^S$ ,  $K_m^{TS}$ ,  $s^T$ , and  $s^S$ . These estimates are then employed to estimate practical capacities per subscriber for T-Mobile, Sprint, and New T-Mobile:

$$k^T = \frac{K^T}{s^T}, \quad k^S = \frac{K^S}{s^S}, \quad \text{and} \quad k_m^{TS} = \frac{K_m^{TS}}{s^{TS}}. \quad (1)$$

The Evans Report then assumes that: (i) if the merger does not occur, AT&T and Verizon will adopt the same practical capacity per subscriber that T-Mobile implements; and (ii) if the merger does occur, AT&T and Verizon will adopt the same practical capacity per subscriber that New T-Mobile implements. Formally:

$$k^A = k^V = k^T \quad \text{and} \quad k_m^A = k_m^V = k_m^{TS}. \quad (2)$$

Next, the Evans Report estimates the practical capacity of AT&T and Verizon to be the product of its practical capacity per subscriber and the number of its smartphone subscribers. Formally:

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$$K^A = k^A s^A = k^T s^A = \frac{K^T}{s^T} s^A = \frac{s^A}{s^T} K^T ; \quad (3)$$

$$K^V = k^V s^V = k^T s^V = \frac{K^T}{s^T} s^V = \frac{s^V}{s^T} K^T ; \quad (4)$$

$$K_m^A = k_m^A s^A = k_m^T s^A = \frac{K_m^{TS}}{s^{TS}} s^A = \frac{s^A}{s^{TS}} K_m^{TS} ; \text{ and} \quad (5)$$

$$K_m^V = k_m^V s^V = k_m^T s^V = \frac{K_m^{TS}}{s^{TS}} s^V = \frac{s^V}{s^{TS}} K_m^{TS} . \quad (6)$$

The second equality in each of equations (3) – (6) reflects equation (2). The third equality in each of equations (3) – (6) reflects equation (1).

The Evans Report then employs equations (3) – (6) to calculate industry practical capacity in the absence of the merger ( $K^I$ ) and industry practical capacity in the presence of the merger ( $K_m^I$ ). Formally:

$$K^I = K^T + K^S + K^A + K^V = K^T + K^S + \left[ \frac{s^A + s^V}{s^T} \right] K^T, \text{ and} \quad (7)$$

$$K_m^I = K_m^{TS} + K_m^A + K_m^V = K_m^{TS} + \left[ \frac{s^A + s^V}{s^{TS}} \right] K_m^{TS} . \quad (8)$$

The Evans Report assumes that the industry-wide data average revenue per user ( $ARPU^d$ ) is the same in the presence of the merger and in its absence. The Report also assumes that all practical capacity is utilized to serve subscribers, so the industry unit price of data is the ratio of  $ARPU^d$  to the industry capacity per subscriber. This industry capacity per subscriber is the ratio of industry capacity to the total number of smartphone subscribers ( $s^I = s^A + s^V + s^T + s^S$ ). Therefore, the Report estimates the industry unit price of data in the absence of the merger ( $P$ ) and the industry unit price of data in the presence of the merger ( $P_m$ ), respectively, to be:

$$P = \frac{ARPU^d}{\frac{K^I}{s^I}} \text{ and } P_m = \frac{ARPU^d}{\frac{K_m^I}{s^I}} . \quad (9)$$

Equation (9) implies that the Evans methodology predicts that the merger will reduce the price of wireless data if:

$$P_m < P \Leftrightarrow \frac{ARPU^d}{\frac{K_m^I}{s^I}} < \frac{ARPU^d}{\frac{K^I}{s^I}} \Leftrightarrow \frac{1}{K_m^I} < \frac{1}{K^I} \Leftrightarrow K_m^I > K^I . \quad (10)$$

In words, equation (10) states that the Evans methodology predicts the merger will reduce the unit price of wireless data if the merger increases industry practical capacity.

Now consider the maintained hypothesis that the merger does not affect the combined practical capacity of T-Mobile and Sprint, so:

$$K_m^{TS} = K^T + K^S . \quad (11)$$

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Equations (7), (8), (10), and (11) imply that under the specified “no merger efficiency” condition, the merger will reduce the unit price of wireless data even when it does not increase the combined practical capacity of T-Mobile and Sprint if:

$$K_m^I > K^I \Leftrightarrow K_m^{TS} + \left[ \frac{s^A + s^V}{s^{TS}} \right] K_m^{TS} > K^T + K^S + \left[ \frac{s^A + s^V}{s^T} \right] K^T \quad (12)$$

$$\Leftrightarrow \left[ \frac{s^A + s^V}{s^{TS}} \right] K_m^{TS} > \left[ \frac{s^A + s^V}{s^T} \right] K^T \Leftrightarrow \left[ \frac{1}{s^{TS}} \right] K_m^{TS} > \left[ \frac{1}{s^T} \right] K^T \quad (13)$$

$$\Leftrightarrow \left[ \frac{1}{s^T + s^S} \right] [K^T + K^S] > \left[ \frac{1}{s^T} \right] K^T \Leftrightarrow s^T [K^T + K^S] > [s^T + s^S] K^T \quad (14)$$

$$\Leftrightarrow s^T K^S > s^S K^T \Leftrightarrow \frac{K^S}{s^S} > \frac{K^T}{s^T}. \quad (15)$$

The first equivalence in expression (13) reflects equations (7) and (8). Expressions (13) and (14) reflect the maintained hypothesis that  $K_m^{TS} = K^T + K^S$ , as specified in equation (11).

Expression (15) implies that the Evans methodology predicts the merger will reduce the unit price of wireless data even under the “no merger efficiency” condition if Sprint’s practical capacity per subscriber ( $\frac{K^S}{s^S}$ ) exceeds T-Mobile’s practical capacity per subscriber ( $\frac{K^T}{s^T}$ ). The Evans Report estimates that **{{BEGIN HCI**

**END HCI}}** (16)

Expressions (15) and (16) demonstrate that the Evans methodology predicts the merger will reduce the unit price of wireless data even when the merger does not increase the combined capacity of T-Mobile and Sprint. ■

**Observation.** Given the assumptions employed in the Evans Report, the Evans methodology predicts that under the “no merger efficiency” condition specified in the Proposition, the merger would cause the industry-wide unit price of wireless data to decline by nearly **{{BEGIN HCI    END HCI}}** percent.

**Proof.** From equation (9), the ratio of the unit price of wireless data in the presence of the merger ( $P_m$ ) to the corresponding price in the absence of the merger ( $P$ ) is:

$$\frac{P_m}{P} = \frac{\frac{ARPUD}{S^I}}{\frac{ARPUD}{S^I}} = \frac{K^I}{K_m^I}. \tag{17}$$

From equations (7) and (8):

$$\frac{K^I}{K_m^I} = \frac{K^T + K^S + \left[ \frac{S^A + S^V}{S^T} \right] K^T}{K_m^{TS} + \left[ \frac{S^A + S^V}{S^TS} \right] K_m^{TS}}. \tag{18}$$

$K_m^{TS} = K^T + K^S$  and  $S^{TS} = S^T + S^S$  under the “no merger impact” conditions specified in the Proposition. Therefore, equation (18) implies that under these conditions:

$$\frac{K^I}{K_m^I} = \frac{1 + \left[ \frac{S^A + S^V}{S^T} \right] \frac{K^T}{K^T + K^S}}{1 + \frac{S^A + S^V}{S^T + S^S}}. \tag{19}$$

The Evans Report assumes **{{BEGIN HCI**

**END HCI}}** (21)

Equation (21) implies that under the “no merger efficiency” condition specified in the Proposition, the Evans Report predicts that the merger would cause the industry-wide unit price of wireless data to decline by approximately **{{BEGIN HCI                    END HCI}}**. ■

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\* \* \* \*

The foregoing declaration has been prepared using facts of which I have personal knowledge or based upon information provided to me. I declare under penalty of perjury that the foregoing is true and correct to the best of my current information, knowledge, and belief.

Executed on August 27, 2018

A handwritten signature in black ink, appearing to read 'David Sappington', is written over a horizontal line.

David Sappington  
Director, Robert F. Lanzillotti Public Policy  
Research Center  
University of Florida

**EXHIBIT B**

**Declaration of**

**Joseph Harrington**

The Wharton School, University of Pennsylvania

**Coleman Bazelon**

Principal, The Brattle Group

**Jeremy Verlinda**

Principal, The Brattle Group

**and**

**William Zarakas**

Principal, The Brattle Group

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# I. Introduction and Overview of Declaration

## A. Qualifications

**Professor Joseph Harrington** is the Patrick T. Harker Professor and chair of the Department of Business Economics and Public Policy at the Wharton School of the University of Pennsylvania. He has published more than 80 articles and his research has appeared in many leading journals including the *American Economic Review*, *Journal of Political Economy*, *Econometrica*, and *Management Science*.

Professor Harrington's research focuses on collusion and cartels, with the objectives of understanding collusive practices and designing competition policy to detect and deter collusion. This research has regularly been funded by the National Science Foundation. As this research resides at the interface of theory and practice, Professor Harrington has presented before more than a dozen competition authorities including those of Chile, the European Union, Japan, South Africa, and the U.S. He regularly gives short courses on collusion to practitioners in such venues as the CRESSE competition policy summer school, ICN, and at competition authorities.

Professor Harrington has given many keynote addresses on the topic of collusion and cartels including the Bayard Wickliffe Heath Memorial Lecture at the U. of Florida Levin College of Law, the Conference Policy Lecture at the European Conference in Competition & Regulation, and plenary talks at the annual meetings of the European Association for Industrial Economics (EARIE), Chilean Economics Association, and the German Economics Association. He has performed extensive service on editorial boards in the field of industrial organization including co-editor at the *RAND Journal of Economics* and the *International Journal of Industrial Organization*, and he is currently an editor at *Economics Letters* and associate editor at the *Journal of Industrial Economics* and the *Review of Industrial Organization*. Professor Harrington is also a previous President of the Industrial Organization Society (IOS). He has published two textbooks: *Economics of Regulation and Antitrust* (5th edition, MIT Press, 2018) with David Sappington and W. Kip Viscusi, and *Games, Strategies, and Decision Making* (2nd edition, Worth Publishers, 2015); and a recent monograph, *The Theory of Collusion and Competition Policy* (MIT Press, 2017). Professor Harrington's curriculum vitae is incorporated by reference.<sup>1</sup>

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<sup>1</sup> See <https://joeharrington5201922.github.io/pdf/Harrington-cv.pdf>.

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**Dr. Coleman Bazelon** is a Principal in the Washington, D.C. office of The Brattle Group, Inc. (“Brattle”). Brattle is an economic consulting firm providing expertise in a range of economic, litigation, and regulatory matters. He leads the Telecommunications, Internet, Media, Entertainment and Sports practice.

Dr. Bazelon has expertise in the areas of regulation and business strategies in the wireless, wireline, and video industry sectors. Much of his practice involves valuation of complex telecommunications assets. He has consulted and testified on behalf of clients in numerous telecommunications, Internet and media matters, ranging from wireless license auctions, spectrum management, and competition policy, to patent infringement and intellectual property valuation, video programming and distribution valuation, and broadband deployment. He also frequently advises regulatory and legislative bodies, including the U.S. Federal Communications Commission (“FCC” or “Commission”) and the U.S. Congress.

Prior to joining Brattle, Dr. Bazelon served as a Vice President with the Analysis Group, an economic and strategy consulting firm. He has also served as a Principal Analyst in the Microeconomic and Financial Studies Division of the Congressional Budget Office (“CBO”) where he researched reforms of radio spectrum management, estimated the budgetary and private sector impacts of spectrum-related legislative proposals, and advised on spectrum and other auction design and privatization issues for all research at the CBO.

Dr. Bazelon received his Ph.D. and M.S. in Agricultural and Resource Economics from the University of California at Berkeley. He also holds a Diploma in Economics from the London School of Economics and Political Science and a B.A. from Wesleyan University. His curricula vitae is incorporated by reference.<sup>2</sup>

**Dr. Jeremy Verlinda** is a Principal in the Washington, D.C. office of Brattle. He specializes in competition issues in both antitrust and regulatory contexts. He has provided and supported testimony in competition matters before U.S. district courts, federal regulatory agencies, and various state public utilities commissions, as well as before competition and regulatory agencies in Canada and Australia. He has particular expertise in network industries, including

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<sup>2</sup> See [http://files.brattle.com/files/14309\\_bazelon\\_brattle\\_cv\\_august\\_2018.pdf](http://files.brattle.com/files/14309_bazelon_brattle_cv_august_2018.pdf).

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telecommunications, media markets, energy markets, transportation, financial markets, health care, and advertising.

Dr. Verlinda has provided direct consulting services to firms around the world regarding antitrust risks associated with planned or potential acquisitions and also has assisted them with subsequent merger proceedings in front of the reviewing agencies. Dr. Verlinda has prepared white papers on vertical integration risk and co-authored a series of reports evaluating the competitiveness of the Canadian wireless telecommunications industry in joint filings with the Canadian Competition Bureau before the Canadian Radio-television and Telecommunications Commission.

Prior to joining The Brattle Group, Dr. Verlinda spent 8 years at the Antitrust Division of the U.S. Department of Justice, where his casework focused on monopolization claims in the payments and electricity industries, criminal price fixing in air cargo and financial markets, and merger analysis in the consumer goods, airlines, entertainment, and electricity industries. In electricity markets, Dr. Verlinda has particular expertise in merger simulation, including incorporation of system dispatch accounting for transmission grid and plant operating characteristics.

Dr. Verlinda received his Ph.D. in Economics from the University of California – Irvine. His curriculum vitae is incorporated by reference.<sup>3</sup>

**Mr. William Zarakas** is a Principal with The Brattle Group, an economics consulting firm, and is an expert on economic and regulatory matters in the telecommunications, media, and energy industries. He holds leadership positions in Brattle’s practices in telecommunications and energy.

Mr. Zarakas has provided expert reports and testimony before FCC with respect to: the economics and feasibility of deploying broadband networks; competitive analysis, notably concerning the market for business service data (“BDS”); analysis of network access and regulatory pricing; and pole attachments matters. He has also applied market share and churn analysis, cost models, horizontal and vertical foreclosure analyses, and bargaining modeling to

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<sup>3</sup> See <http://www.brattle.com/experts/jeremy-a-verlinda>.

telecom and media mergers, and has worked extensively on matters concerning the markets for and value of wireless spectrum.

Mr. Zarakas also leads Brattle’s work in the regulation of energy utilities, and has presented and testified on matters concerning regulatory frameworks, incentive and performance based regulation, and evolving utility platform and business models. In addition to his testimonies before the FCC, he has testified before the Federal Energy Regulatory Commission (“FERC”), the Securities and Exchange Commission (“SEC”), the Copyright Royalty Judges, the U.S. Congress, state regulatory agencies, arbitration panels, foreign governments, and courts of law.

Prior to joining The Brattle Group, Mr. Zarakas held senior positions at economic consulting firms and was an economist for the New York Power Authority. He holds masters and bachelors of arts degrees in economics from New York University and the State University of New York, respectively. His curriculum vitae is incorporated by reference.<sup>4</sup>

## B. Assignment

We have been asked by counsel for DISH to review the capacity projections for standalone Sprint and T-Mobile and for the post-merger entity (“New T-Mobile”), as provided by Neville Ray. In particular, we have been asked to assess the reasonableness of the projections and of the increase in projected capacity claimed as a result of the merger.

We have also been asked to evaluate the unilateral effects (i.e., the non-cooperative effects) that a merger between T-Mobile and Sprint, two of the four primary mobile network operators (“MNOs”), would likely have on the market for mobile voice/broadband services.<sup>5</sup> This analysis examines how the proposed merger would affect competition and therefore consumers based on the extent to which New T-Mobile may be able to profitably raise both its downstream, retail prices to subscribers as well as the wholesale prices that it charges to mobile virtual network operators (“MVNOs”).

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<sup>4</sup> See <http://www.brattle.com/experts/william-p-zarakas>.

<sup>5</sup> Following Commission precedent, we define the relevant product market as retail mobile voice/broadband services. At times, we employ the term “wireless” as shorthand.

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In addition to assessing the potential unilateral effects of the merger, we have been asked by DISH to evaluate the declaration of Professor Steven C. Salop and Dr. Yianis Sarafidis (“Salop/Sarafidis Declaration”), which provides Professor Salop and Dr. Sarafidis’ conclusions on whether the proposed transaction between T-Mobile and Sprint, if consummated, would lead to increased concerns about coordinated effects among the remaining cellular carriers. We also have been asked to provide our own analysis to determine whether the transaction may increase the likelihood of coordinated effects among the remaining carriers.

Finally, DISH has asked us to examine the Commission’s spectrum screen to identify markets in which New T-Mobile’s spectrum holdings would exceed the screen.

In performing these assignments, Dr. Harrington led the efforts on coordinated effects, Dr. Bazelon led the efforts on capacity projections and the spectrum screen and Dr. Verlinda led the efforts on unilateral effects.

### C. Summary of Findings

#### 1. The Applicants’ Claims of Improvement in 5G Capacity Appear to be Overstated

In his Declaration, T-Mobile’s Chief of Technology Officer Neville Ray projects a significant increase in 5G network capacity as a result of the merger. New T-Mobile is projected to provide {{BEGIN HCI

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## 2. Unilateral Incentives Arising from the Merger Will Likely Increase Wireless Prices

Unilateral effects concern the incentive for New T-Mobile to impose post-transaction price increases independent of a coordinated response from other mobile voice/broadband providers.<sup>6</sup> The merger would likely increase the profitability of a unilateral price increase strategy by eliminating Sprint and T-Mobile as an independent competitors for mobile voice/broadband subscribers. The incentives for New T-Mobile to unilaterally increase prices exist in each of the three segments we considered: retail postpaid wireless, retail prepaid wireless, and wholesale sales to downstream MVNOs who compete against Sprint and T-Mobile in the downstream retail segments.

We find that the merger will significantly consolidate the market to supply facilities-based mobile voice/broadband connections, both for the prepaid and postpaid segments as well as across all connections. The Herfindahl-Hirschman Index (“HHI”) is a widely accepted measure of industry concentration.<sup>7</sup> The current, pre-merger, HHI across all connections is already 2,814, which antitrust authorities regard as “Highly Concentrated.” If the Applicants merge, the HHI would become 3,265, an increase of 451 points. Both the concentration level and the increase due to the merger signify a merger that is presumptively likely to raise anticompetitive concerns.<sup>8</sup>

In addition to the assessment of concentration, we have examined the merger’s likely retail price effects using price screening tools designed to identify mergers that are likely to create significant

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<sup>6</sup> Such effects may account for the possibility of strategic responses by rival carriers, but they do not address so-called “coordinated effects”, i.e., the possibility that coordinated behavior among firms may become more sustainable post-merger, or that the prices achievable under coordinated behavior may be higher as a result of the merger.

<sup>7</sup> The HHI is calculated by squaring the market share of each firm competing in the market and then summing the resulting numbers. The HHI takes into account the relative size distribution of the firms in a market. It approaches zero when a market is occupied by a large number of firms of relatively equal size and reaches its maximum of 10,000 points in a monopoly.

<sup>8</sup> See U.S. Department of Justice & the Federal Trade Commission, Horizontal Merger Guidelines, § 5.2 (2010) (“Horizontal Merger Guidelines”).

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upward pressure on prices.<sup>9</sup> The gross upward pricing pressure index (“GUPPI”) screen measures the degree to which a merger creates upward pressure on the Applicants’ prices.

We also consider structural simulation models, which are designed to directly estimate the price increases resulting from the merger, accounting for strategic (unilateral) responses of rival carriers.<sup>10</sup> For the merger simulations we consider two possible demand systems for sensitivity: the Antitrust Logit Model (“ALM” or “logit”), and the Proportionally Calibrated Almost Ideal Demand System (“PC-AIDS”). The results of the price screens and merger simulations, summarized in Table 1 below, each indicate that a merger between T-Mobile and Sprint would likely result in higher retail prices in both the postpaid and prepaid segments.

**Table 1: Predicted Price Pressure Screens and Price Effects of the T-Mobile/Sprint Merger, by Segment**

	GUPPI	ALM	PC-AIDS
<b>Postpaid</b>			
Sprint	9.9%	5.0%	9.1%
T-Mobile	9.2%	4.6%	8.5%
<b>Combined</b>		<b>4.8%</b>	<b>8.8%</b>
<b>Prepaid</b>			
Sprint	7.6%	7.3%	15.5%
T-Mobile	4.4%	2.8%	8.2%
<b>Combined</b>		<b>4.2%</b>	<b>10.4%</b>

Sources: Twentieth Report, In the Matter of Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 17-69, FCC, September 27, 2017, p. 28 at footnote 130, [http://transition.fcc.gov/Daily\\_Releases/Daily\\_Business/2017/db0927/FCC-17-126A1.pdf](http://transition.fcc.gov/Daily_Releases/Daily_Business/2017/db0927/FCC-17-126A1.pdf), accessed August 23, 2018 (20<sup>th</sup> Mobile Wireless Competition Report.). John C. Hodulik, Batya Levi, Christopher Schoell, and Lisa L. Friedman, "Wireless 411: A difficult market asking for repair?" UBS, February 22, 2017 (UBS Wireless Report.). 2017 Company Annual Reports.

<sup>9</sup> See Farrell, Joseph, and Carl Shapiro. "Antitrust evaluation of horizontal mergers: An economic alternative to market definition." *The BE Journal of Theoretical Economics* 10, no. 1 (2010); Werden, Gregory J. "Unilateral competitive effects of horizontal mergers I: Basic concepts and models." (2010).

<sup>10</sup> See Werden, Gregory J., and Luke M. Froeb. "The effect of mergers in differentiated products industries: Logit demand and merger policy." *JL Econ. & Org.* 10 (1994): 407; Epstein, Roy J., and Daniel L. Rubinfeld. "Merger simulation: A simplified approach with new applications." *Antitrust LJ* 69 (2001): 883.

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Notes: “Combined” numbers are calculated as the subscriber-weighted average across Sprint and T-Mobile.

GUPPI denotes the “gross upward pricing pressure index.” ALM denotes the “antitrust logit model” and PC-AIDS denotes the “proportionally-calibrated almost ideal demand system”.

The retail GUPPI screen indicates that the merger would likely create significant upward pressure on New T-Mobile’s postpaid and prepaid prices.

We have also examined the price pressure screens for the overall market to supply network connections, using number porting data to inform the diversion rates from and to each of the two networks relative to other networks in response to a price change. We find that the GUPPI for all connections is about `{{BEGIN NRUF/LNP HCI        END NRUF/LNP HCI}}` for both the Sprint and T-Mobile networks, further supporting the HHI evidence that the increased concentration in this market is likely to be anticompetitive.<sup>11</sup>

The structural simulations for the retail segments quantify the likely price effects of the merger. These simulations predict that the merger would allow New T-Mobile to profitably increase its postpaid prices on average across the brands in the range of 4.8% to 8.8% and its prepaid retail prices in the range of 4.2% to 10.4%, with increases to each of Sprint’s and T-Mobile’s prices ranging from 2.8% to 15.5%. In general, Sprint-brand subscribers would be expected to see larger prices increases than T-Mobile-brand subscribers.

We have also examined the provision of wholesale wireless services to MVNOs. Consistent with the relatively less-constrained capacity (relative to AT&T and Verizon) of their networks,<sup>12</sup> T-Mobile and Sprint are important sellers of wholesale wireless services. We estimate that they provide network service for more than 60% of MVNOs’ subscribers through the wholesale network hosting contracts between the MVNOs and the merging firms.

As a consequence of T-Mobile and Sprint’s significant role in providing wholesale service as well as their share of the prepaid wireless segment, New T-Mobile will have significantly increased incentives to increase wholesale prices for MVNOs. We calculate increases in vertical “upward

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<sup>11</sup> See Table 20.

<sup>12</sup> See Table 28.

pricing pressure” index values of 22.7% for T-Mobile’s current wholesale contracts and 48.0% for Sprint’s current wholesale contracts.<sup>13</sup>

### 3. The Merger Is Likely to Increase the Incentive and Ability for Coordinated Behavior

The analysis in Section III provides evidence that a merger between the Applicants is likely to harm consumers because the network operators in the post-merger market—AT&T, Verizon, and New T-Mobile—would have the incentive to raise prices (“unilateral effects”). These estimated price effects assume that the network operators would independently choose prices to maximize their individual profits. There is the possibility, however, that prices may increase even more because the merger results in firms coordinating their prices, rather than choosing them independently. These “coordinated effects” are described in the Horizontal Merger Guidelines (“Merger Guidelines”) as the potential diminution of competition by “enabling or encouraging post-merger coordinated interaction among firms.”<sup>14</sup> Prices are higher because each firm acts in a less competitive manner with the anticipation that other firms will act similarly.

Our coordinated effects analysis of a merger between the Applicants is composed of three parts. The first part examines the suitability of the mobile voice/broadband market for tacit collusion.<sup>15</sup> A hospitable market for tacit collusion is a necessary condition for a merger to have coordinated effects. We find that the postpaid and prepaid retail segments are suitable for supporting tacit collusion and, therefore, tacit collusion could emerge under the right circumstances. In contrast, tacit collusion in the enterprise (corporations and governments) and wholesale markets is less likely.

T-Mobile has been widely recognized as a maverick in the mobile voice/broadband market, as reflected in aggressive pricing, innovative plan features, and the adoption of new technologies. The second part of our coordinated effects analysis examines the incentives for the merged firm to continue using a maverick strategy. We find that, under the merger as proposed, it likely

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<sup>13</sup> Both firms today have vertical upward pricing pressure in their wholesale contracts with MVNOs. The calculations here incorporate the increased incentives to raise prices arising from cross-brand recapture of retail prepaid subscribers that arise from the merger. See Table 25.

<sup>14</sup> Horizontal Merger Guidelines, p. 24. Section 7 covers “Coordinated Effects.”

<sup>15</sup> Explicit collusion, which is per se unlawful, is not considered here.

would be in the best interests of the merged firm to forego its maverick status and adopt a less aggressive strategy.

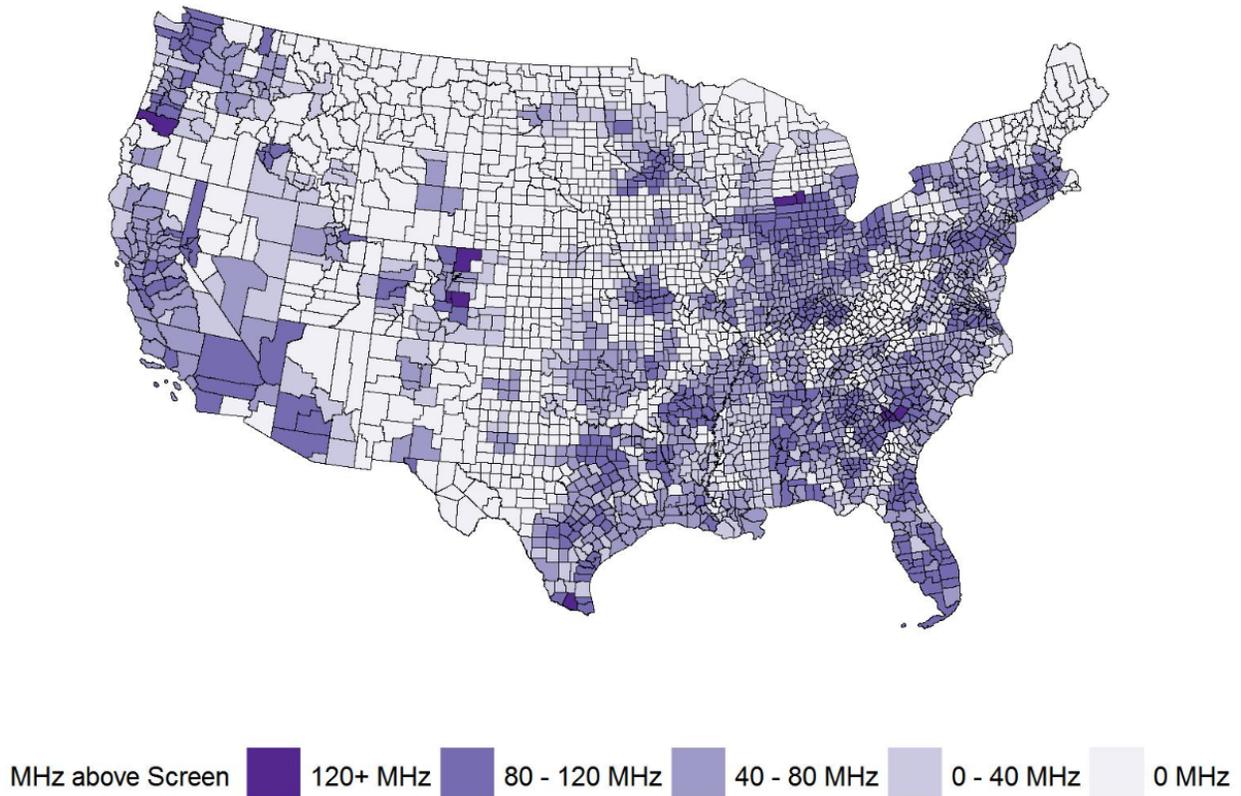
Having established that the retail segments of the mobile voice/broadband market are suitable for tacit collusion and that the merged firm is unlikely to continue with a maverick strategy, the third part of the coordinated effects analysis evaluates whether the merger would make tacit collusion significantly more likely. We find that while the current (pre-merger) market is suitable for tacit collusion already, such collusion is now unlikely due to certain obstacles, and that the merger alleviates those obstacles. Hence, a merger between the Applicants would be expected to have coordinated effects; that is, it would substantively increase the likelihood of tacit collusion. The merger not only makes tacit collusion substantively more likely, but there would be a serious risk of tacit collusion in the post-merger market.

#### 4. The Merger Triggers the FCC's Spectrum Screens in the Majority of Local Geographic Markets

In its competitive analysis of proposed secondary-market spectrum transactions, including proposed mergers, the FCC applies a spectrum screen to identify the local geographic markets in which carriers' spectrum holdings would potentially result in anticompetitive harm. The FCC has applied this screen since the proposed Cingular Wireless and AT&T Wireless merger in 2004.

New T-Mobile would significantly exceed the spectrum screen, particularly for mid-band spectrum. Figure 1 presents a heat-map of the amount of spectrum that New T-Mobile would have to divest to stay within the current spectrum screen limits. The affected areas include over 60% of counties in the U.S., home to more than 90% of the population.

Figure 1: Depth of New T-Mobile’s Spectrum Holdings above Spectrum Screen



#### D. Overview of Declaration

Section II of our declaration presents our analysis of the Applicants’ claims regarding the increase in 5G capacity resulting from the merger. Section III provides the details of our unilateral effects analysis. Section III.A provides an overview of the retail and wholesale markets for mobile voice/broadband services. Section III.B presents the results of standard market concentration screening. Section III.C describes our unilateral effects analysis of the retail postpaid and prepaid segments, while Section III.D discusses increases in unilateral incentives to raise prices in the wholesale market. Appendix A shows our calculations of network marginal costs and provides backup information on MVNO and host-network relationships.

Section IV provides the details of our coordinated effects analysis. Section IV.A assesses the suitability of the mobile voice/broadband market for tacit collusion. Section IV.B explores whether New T-Mobile would continue the maverick strategies that have been historically attributed to T-Mobile based on the merger as currently proposed. Section IV.C estimates the degree to which tacit coordination would be affected by the merger.

Section V provides the details of our spectrum screen analysis. Section V.A describes the history and current implementation of the spectrum screen policy, including the type and amount of spectrum included in the screen. Section V.C describes the detailed holdings of major MNOs. Section V.D applies the screen to these MNOs' current holdings and analyzes the implications of the Applicants' proposed merger.

## II. Claims of Improved 5G Capacity

The central benefit claimed from the merger of T-Mobile and Sprint is related to the *increase* in projected 5G capacity that will be provided by New T-Mobile over what would be provided without the merger. The claimed benefit from the forecasted increase in capacity has two parts. First, New T-Mobile is projected to provide significantly more 5G capacity than the sum of T-Mobile and Sprint would provide as independent companies. Second, the industry (Verizon and AT&T) is projected to respond to this increased capacity by providing significantly more 5G capacity than they apparently currently plan to. In fact, the claimed benefits of the merger turn on the accuracy and reliability of the forecasted *increase* in 5G capacity.

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<sup>16</sup> See Table 6.

<sup>17</sup> Mike Dano, "T-Mobile says it won't team with Sprint to bid in mmWave spectrum auction," FierceWireless, July 25, 2018, available <https://www.fiercewireless.com/wireless/t-mobile-says-it-won-t-team-sprint-to-bid-mmwave-spectrum-auction>, accessed August 20, 2018.

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## A. The 5G Network Models

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## B. Spectrum in the 5G Network Model

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<sup>18</sup> 5G Engineering Models for New T-Mobile, T-Mobile, and Sprint.

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END HCI}} Table 2 shows the total of existing spectrum holdings of Sprint and T-Mobile as well as the sum of those holdings if no divestitures were required.

**Table 2: Average Population Weighted Spectrum Holdings by Band**

	Sprint	T-Mobile	New T-Mobile
600 MHz	0.0	30.8	30.8
700 MHz	0.0	10.1	10.1
SMR	13.8	0.0	13.8
PCS	37.9	28.9	66.8
AWS-1	0.0	36.8	36.8
AWS-3	0.0	3.3	3.3
BRS/EBS	134.7	0.0	134.7
<b>Total</b>	<b>186.4</b>	<b>109.8</b>	<b>296.2</b>

Note: New T-Mobile spectrum holdings assume no divestitures.

Source: Spectrum holdings are estimates. Spectrum holdings are as of August 2018 and are based on data from the FCC Universal Licensing System, <http://wireless.fcc.gov/uls/index.htm?job=transaction&page=weekly>.

The Applicants claim that New T-Mobile should have more spectrum available for 5G than Sprint and T-Mobile separately because New T-Mobile would be able to combine legacy customers onto a single legacy-serving network instead of having to provide two independent networks to serve the legacy customers. This can be seen in the following table. {{BEGIN HCI

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<sup>21</sup> 5G Engineering Models and see, for instance, Ray Declaration, Table 2.



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## D. Relying on Currently Licensed Spectrum

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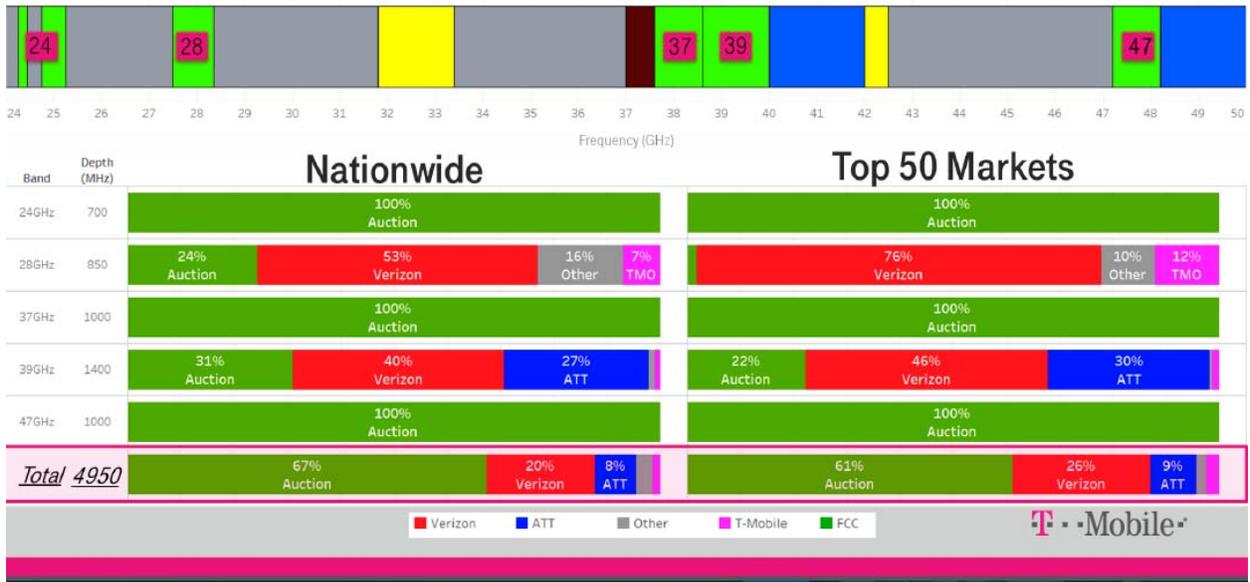
<sup>29</sup> See Table 5

Figure 2: 5G Spectrum Ownership and Availability

## Spectrum Frontiers

- ❑ The 24, 28, 37, 39, & 47 GHz bands should be auctioned together as quickly as possible
- ❑ With the limited amount of spectrum left in 28 and 39 GHz bands, auctioning only those bands will further entrench Verizon and AT&T at the expense of competition

■ Available  
■ Under Consideration  
■ Shared  
■ Not Included  
■ Core Satellite



Source: T-Mobile Ex Parte, page 7, April 3, 2018, <https://ecfsapi.fcc.gov/file/10403720515355/T-Mobile%20Ex%20Parte%2004032018.pdf>, accessed August 21, 2018.

Figure 3: T-Mobile’s MmWave Holdings, 28 GHz and 39 GHz

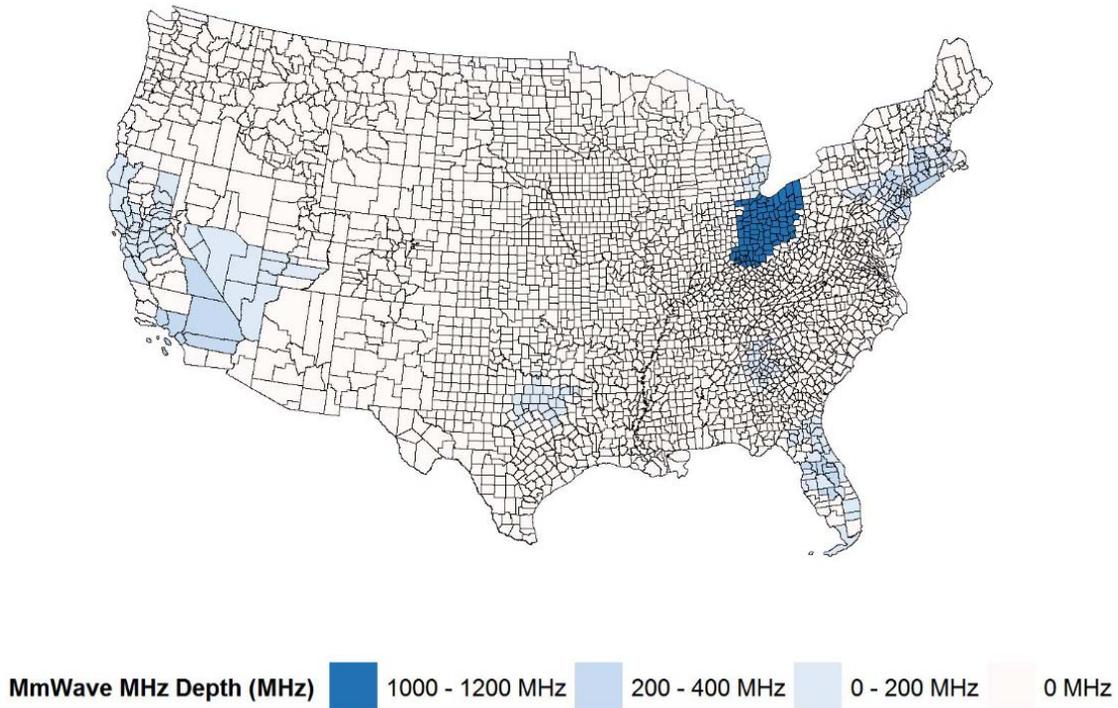


Table 5: Average Population Weighted MmWave Holdings

	T-Mobile	Sprint	AT&T	Verizon
MmWave	114.4	1.1	296.0	1299.1

Source: Spectrum holdings are Brattle estimates. Spectrum holdings are as of August 2018 and are based on data from the FCC Universal Licensing System, <http://wireless.fcc.gov/uls/index.htm?job=transaction&page=weekly>.

Notes: All holdings are radio service codes LD and UU. Average population weighted holdings reflect average depth of holdings across all counties. AT&T holdings may be understated because licenses with undefined markets are dropped.

There are active, public discussions about whether or not Sprint and T-Mobile can bid in the upcoming millimeter wave auctions – FCC Auction #101 (28 GHz) and #102 (24 GHz) – later this

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year as one bidder or two.<sup>30</sup> Both companies are planning to expand their millimeter wave holdings making a network projection based on only existing holdings unrealistic.

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The following table lists the mid- and high-band spectrum that is currently expected to be auctioned by the Commission. It seems unlikely after advocating for these bands that New T-Mobile, much less standalone Sprint and T-Mobile, would forgo adding any of these frequencies to their networks.<sup>31</sup>

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<sup>30</sup> See, e.g., Sprint Corp., Petition for Expedited Declaratory Ruling or Waiver Regarding Joint Bidding and Request for Limited Waiver of Auction Form Rules, AU Docket No. 18-85, at 4 (Aug. 6, 2018) (requesting clarification that Sprint’s merger agreement with T-Mobile is not considered a joint bidding arrangement for purposes of the upcoming millimeter wave auctions); Letter from Nancy Victory, Counsel to T-Mobile, to Marlene Dortch, FCC, AU Docket No. 18-85, at 4-5 (Aug. 6, 2018) (requesting confirmation, or alternatively a waiver, that T-Mobile’s merger agreement with Sprint does not bar T-Mobile from participating independently in the upcoming millimeter wave auctions).

<sup>31</sup> For instance, see Peter Rysavy, “Industry Voices—Rysavy: Midband spectrum for 5G is needed now,” FierceWireless, August 13, 2018, available <https://www.fiercewireless.com/5g/industry-voices-rysavy-mid-band-spectrum-for-5g-needed-now>, accessed August 20, 2018; Scott Bergmann, “The Growing Need for Mid-Band Spectrum,” CTIA, June 15, 2018, available <https://www.ctia.org/news/the-growing-need-for-mid-band-spectrum>, accessed August 20, 2018.

**Table 6: Spectrum Pipeline**

Band [1]	Frequencies [2]	Quantity [3]	Auction Date [4]
<u>Mid-Band Spectrum</u>			
3.5 GHz CBRS	3550 - 3700 MHz	Max 70 MHz licensed	Est. Late 2019 - Beyond
2.5 GHz EBS	2496 - 2690 MHz	18-114 MHz	Est. 2020 - Beyond
3.5 GHz	3450 - 3550 MHz	100 MHz	Est. 2020 - Beyond
C Band	3700 - 4200 MHz	100+ MHz	Est. 2021
NOAA Meteorological Spectrum	1675 - 1680 MHz	5 MHz	Beyond 2020
<i>Sub-total Mid-Band Spectrum</i>		293-389 MHz	
<u>High-Band Spectrum</u>			
28 GHz Band	27.5 - 28.35 GHz	850 MHz	November 2018
24 GHz Band	24.25 - 24.45 GHz 24.75 - 25.25 GHz	700 MHz	Est. Late 1Q 2019/2Q 2019
37 GHz Band	37.6 - 38.6 GHz	1,000 MHz	Est. Late 2019 - Beyond
47 GHz Band	47.2 - 48.2 GHz	1,000 MHz	Est. Late 2019 - Beyond
39 GHz Band	38.6 - 40.0 GHz	1,400 MHz	Est. 2020 - Beyond
42 GHz Band	42.0- 42.5 GHz	500 MHz	Est. 2020 - Beyond
<i>Sub-total High-Band Spectrum</i>		5,450 MHz	

Source: Robert Kaminski, "Spectrum Auction Tracker," Capital Alpha, June 6, 2018; Report and Order, In the Matter of Policies Regarding Mobile Spectrum Holdings and Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, WT Docket No. 12-269 and Docket No. 12-268, FCC, June 2, 2014, ¶¶ 122-125, available [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-14-63A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-63A1_Rcd.pdf), accessed August 23, 2018.

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### III. Unilateral Effects

#### A. Overview of Retail and Wholesale Mobile Voice/Broadband Markets

Mobile voice/broadband services consists of voice, text, and data communication services (such as broadband Internet access) using radio-frequency transmissions which allow consumers to communicate without being in a fixed location. Mobile voice/broadband services are offered today on a variety of devices, including smartphones, mobile hotspots, tablets and e-readers.

“Facilities-based” service providers offer mobile voice/broadband services using their own network facilities. To offer services, these providers must acquire radio spectrum licenses from the FCC and deploy a network of radio transmitters and receivers over telecommunications towers and smaller sites. Facilities-based providers also need to provide “backhaul” from each site to the rest of the network and interconnect with the networks of other carriers through wired connections. Facilities-based providers may operate throughout the nation, or operate as a multi-regional, regional, or local network supplementing their coverage areas through roaming agreements with other service providers. Below, we use the terms MNO and “service provider” interchangeably to refer to facilities-based service providers.

In addition to MNOs, a number of MVNOs purchase wireless services from network operators in a wholesale market and resell these services to consumers.

Table 7 provides a summary of the estimated total number of connections across segments of the mobile voice/broadband market.

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**Table 7: U.S. Wireless Connections by Segment, 2014-2017**

	2014	2015	2016	2017
<b>Connections (millions)</b>				
Postpaid	237.9	248.3	254.1	259.3
Prepaid (including MVNO)	88.4	93.3	96.7	93.5
Connected Devices	37.9	51.5	63.1	66.4
<b>Total Connections</b>	<b>364.1</b>	<b>393.1</b>	<b>413.9</b>	<b>419.1</b>
<b>Year-Over-Year Growth</b>				
Postpaid		4.4%	2.3%	2.1%
Prepaid (including MVNO)		5.5%	3.7%	-3.3%
Connected Devices		36.0%	22.5%	5.1%
<b>Total Year-Over-Year Growth</b>		<b>8.0%</b>	<b>5.3%</b>	<b>1.3%</b>
<b>Segment Share</b>				
Postpaid	65.3%	63.2%	61.4%	61.9%
Prepaid (including MVNO)	24.3%	23.7%	23.4%	22.3%
Connected Devices	10.4%	13.1%	15.3%	15.8%
<b>Total Segment Share</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Sources: 2014 - 2017 Company Annual Reports; Dennis Bournique, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018; Dennis Bournique, "Fourth Quarter, 2016 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 14, 2017, available <https://www.prepaidphonenews.com/2017/02/fourth-quarter-2016-prepaid-mobile.html>, accessed August 15, 2018; Dennis Bournique, "Fourth Quarter, 2015 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 17, 2016, available <https://www.prepaidphonenews.com/2016/02/fourth-quarter-2015-prepaid-mobile.html>, accessed August 15, 2018; Dennis Bournique, "Fourth Quarter, 2014 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2015, available <https://www.prepaidphonenews.com/2015/02/fouth-quarter-2014-prepaid-mobile.html>, accessed August 15, 2018.

Notes: Connection counts are end of the year December 31. 2014 – 2016 Sprint and T-Mobile Prepaid (including MVNO) connection counts were adjusted to not include Lifeline connections.

Assumed that Sprint and T-Mobile had a constant ratio of Lifeline customers between 2014 and 2016.

Total wireless connections in the U.S. have increased by 1% to 8% annually between 2014 and 2017, to approximately 419 million connections in 2017. In 2017, 62% of connections were postpaid subscription plans, 22% were prepaid connections (including MVNO subscribers), and connected devices—connections that are not associated with a consumer or business phone

account—accounted for the remaining 16%.<sup>32</sup> Non-phone devices such as tablets and mobile hotspots for which customers purchase wireless service directly from the wireless carriers appear to be included in postpaid and prepaid rather than connected devices.<sup>33</sup>

## 1. The Retail Market

Retail mobile voice/broadband services may be broadly divided into postpaid and prepaid wireless services. With a postpaid contract, the carrier checks the subscriber’s credit record and generally bills the subscriber on a monthly basis, with fees assessed in the event of late payment. Unlike a postpaid plan, prepaid subscribers do not undergo a credit check. Instead, with prepaid plans the subscriber must “recharge” the account before using it. Recharges come in a range of prices with varying inclusions, and the subscriber is free to switch plans with each repurchase. While the FCC in previous merger reviews has considered a combined **product market** of retail wireless services that includes both postpaid and prepaid plans, this declaration also separately examines the prepaid and postpaid segments within the retail mobile voice/broadband product market.<sup>34</sup>

With respect to the delineation of relevant **geographic markets**, our analysis focuses on a broad national market. In its recent review of the proposed AT&T/T-Mobile merger, Commission staff concluded that, while local markets may be relevant, it is also appropriate to consider a relevant

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<sup>32</sup> As we discuss below, connected devices include session-based tablets, internet-connected cars, and other non-phone devices which access mobile wireless networks without a phone number attached to it. Eighteenth Report, *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 15-125, FCC, December 23, 2015, pp. 10-11, available <https://docs.fcc.gov/public/attachments/DA-15-1487A1.pdf>, accessed August 23, 2018

<sup>33</sup> T-Mobile US, Inc., Form 10-K for the Fiscal Year Ended December 31, 2016, p. 33; AT&T Inc., Form 10-K for the Fiscal Year Ended December 31, 2016, p. 6; Verizon Communications, Inc., Form 10-K for the Fiscal Year Ended December 31, 2016, “Management’s Discussion and Analysis of Financial Condition and Results of Operation.” Sprint Corp., Form 10-K for the Fiscal Year Ended March 31, 2017, p. 36.

<sup>34</sup> FCC’s Staff Analysis and Findings, *In the Matter of Applications of AT&T Inc. and Deutsche Telekom AG For Consent To Assign or Transfer Control of Licenses and Authorizations*, WT Docket No. 11-65, FCC, November 29, 2011, ¶30-41, available [https://apps.fcc.gov/edocs\\_public/attachmatch/DA-11-1955A2.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DA-11-1955A2.pdf), accessed August 6, 2018 (FCC Staff Report).

geographic market that is national in scope.<sup>35</sup> In support of that conclusion, FCC staff noted that prices and service plan offerings “do not vary for most providers across most geographic markets where they sell services. In particular, the four nationwide facilities-based providers of retail wireless services (AT&T, Verizon Wireless, Sprint, and T-Mobile) set the same rates for a given plan wherever they sell service and do not alter the plans they offer depending on the location.”<sup>36</sup>

*a. Postpaid Wireless Service*

The four national wireless carriers dominate the postpaid wireless service segment. Table 8 shows the number of postpaid wireless subscribers and the corresponding shares among the national carriers, annually from 2014 to 2017.

**Table 8: Postpaid Subscribers and Segment Share, 2014 - 2017**

	2014	2015	2016	2017
<b>Postpaid Subscribers (millions)</b>				
AT&T	75.8	77.1	77.8	77.9
Verizon	102.1	106.5	108.8	110.9
Sprint	29.9	30.9	31.7	31.9
T-Mobile	25.8	29.4	31.3	34.1
U.S. Cellular	4.3	4.4	4.5	4.5
<b>Total</b>	<b>237.9</b>	<b>248.3</b>	<b>254.1</b>	<b>259.3</b>
<b>Postpaid Market Share (%)</b>				
AT&T	31.9%	31.1%	30.6%	30.0%
Verizon	42.9%	42.9%	42.8%	42.8%
Sprint	12.6%	12.4%	12.5%	12.3%
T-Mobile	10.9%	11.8%	12.3%	13.2%
U.S. Cellular	1.8%	1.8%	1.8%	1.7%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Sources: 2014 - 2017 Company Annual Reports

Notes: Subscriber counts are end of the year December 31.

As shown in Table 8 and Table 13, AT&T and Verizon are the two largest carriers—accounting for roughly 73% of 2017 postpaid subscribers—while Sprint and T-Mobile have nearly identical

<sup>35</sup> *Id.*, ¶¶33-34.

<sup>36</sup> *Id.*, ¶41.

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numbers of postpaid subscribers and combined account for roughly 26% of 2017 postpaid subscribers.

*(1) Pricing*

Service offerings and pricing are two critical dimensions along which network operators compete to retain their existing customers and attract new customers. All four national wireless carriers currently offer plans that provide unlimited talk, text, and data. Verizon, AT&T, and Sprint continue to offer plans with mobile data limits, while T-Mobile offers only unlimited data plans.

It is standard in the wireless industry to summarize pricing based on ARPU. This number reflects the blend of individual subscriber prices paid, averaged across all of the carrier’s subscribers in the segment. We rely on ARPU as the primary measure of pricing.

Table 9 presents postpaid ARPUs from company annual filings and earnings reports.<sup>37</sup> As shown in the table, the ARPU for Sprint and T-Mobile is currently similar for postpaid wireless services (\$46.14 and \$46.97, respectively), while AT&T is higher at \$52.51 and Verizon slightly lower, at \$43.45.<sup>38</sup>

**Table 9: Postpaid Average Revenue per Unit, 2014 - 2017**

Provider		2014	2015	2016	2017
AT&T	[1]	\$60.60	\$56.88	\$54.57	\$52.51
Verizon	[2]	\$55.70	\$51.22	\$47.01	\$43.45
Sprint	[3]	\$60.18	\$53.86	\$50.59	\$46.14
T-Mobile	[4]	\$49.44	\$47.68	\$47.47	\$46.97
U.S. Cellular	[5]	\$56.75	\$54.50	\$46.96	\$44.38

<sup>37</sup> Some carriers include more than one ARPU measure, where a distinction is drawn in billings that include collections for phone payment plans versus the portion of billings that relates just to the wireless service. The ARPU values shown in this declaration are based on the service portion of billings.

<sup>38</sup> In AT&T’s quarterly earnings statements for 2018, it provides an overall postpaid ARPU, which it had not included in earlier statements (and has not provided retroactively). In Q1 2018 this value was \$47.79. Based on our understanding of the ARPU figures presented for the other carriers in Table 9, this postpaid ARPU for AT&T may be more directly comparable. Our merger simulation analyses rely on this Q1 2018 postpaid ARPU figure for AT&T.

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Source: 2014 - 2017 Company Annual Reports; 2015 and 2017 AT&T Financial and Operation Results.

Notes: Verizon Postpaid ARPU is calculated by dividing Average Revenue Per Account, not including recurring device payment billings, (ARPA) by retail Postpaid connections per account. T-Mobile and U.S. Cellular ARPU calculated by dividing postpaid revenues by number of months in the given period (12). AT&T values are based on its quarterly earnings statements based on reported values for “Postpaid ARPU (Historical Accounting Method)”. Sprint values are based on its quarterly earnings statements based on reported values for “Nine Months Ended December 31, Postpaid ARPU”.

Table 10 presents the current pricing for standard unlimited data postpaid plans for each of the national carriers. Pricing for single-line plans is equivalent for Sprint and AT&T, with Verizon charging the highest price and T-Mobile charging the lowest price. For multiple-line plans, T-Mobile’s prices are lower than the other three national carriers.<sup>39</sup>

**Table 10: Adjusted Current Unlimited (Postpaid) Plan  
Pricing per Line for National Wireless Providers**

		One Line	Two Lines	Three Lines	Four Lines
AT&T	[1]	\$70	\$63	\$49	\$40
Verizon	[2]	\$75	\$65	\$50	\$40
Sprint	[3]	\$70	\$60	\$50	\$45
T-Mobile	[4]	\$59	\$51	\$40	\$34

Sources: Websites for Verizon, AT&T, T-Mobile, and Sprint; Scott Mackey, Joseph Bishop-Henchman, and Scott Drenkard, "Wireless Taxes and Fees in 2017," Tax Foundation, November 2017, p. 3 at Table 1, available <https://files.taxfoundation.org/20171108112327/Tax-Foundation-FF567.pdf>, accessed August 23, 2018.

Notes: Includes “autopay” discounts, and excludes taxes, and fees. Prices as of August 17, 2018.

[1] - [2]: Prices for standard-level unlimited plan.

[3]: Prices for only unlimited plan. Lower price for three and four line plans includes temporary promotional discount.

[4]: Prices for only unlimited plan, less average wireless taxes and fees of 18.46% per Tax Foundation. As advertised, T-Mobile plan prices include taxes and fees.

### *(2) Incremental Costs and Profitability*

<sup>39</sup> Prices for AT&T and Verizon are for standard unlimited plans; top-level unlimited plans have higher prices. Prices for Sprint are for an “Unlimited Plus” plan which offers comparable service to the other three carriers; Sprint also offers an “Unlimited Basic” plan which is less expensive than the “Unlimited Plus” plan.

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A review of the four MNOs' financial reports indicates that AT&T and Verizon have higher EBITDA margins than do Sprint and T-Mobile. However, the fact that Verizon and AT&T face lower costs *on average* does not imply that they also face lower *marginal* costs. That Verizon and AT&T have lower average costs may reflect the fact that the two carriers have used up much of their spectrum and cell site capacity, so that their marginal cost to meet additional demand may be higher than either Sprint or T-Mobile. For example, Verizon and AT&T serve significantly more subscribers on any given cell than do Sprint or T-Mobile.<sup>40</sup> As a consequence, unless they acquire more spectrum, when adding capacity to their networks, they would have to rely more heavily on cell splitting—deploying additional cell sites to increase the reuse of their existing spectrum—than Sprint and T-Mobile who likely have greater flexibility to deploy spectrum to add capacity.

We have calculated the incremental costs necessary to add one million new subscribers, while keeping the quality of the service unaltered. These calculations also account for the observation that Sprint and T-Mobile have more unused spectrum than AT&T and Verizon.<sup>41</sup>

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<sup>40</sup> See Table 28.

<sup>41</sup> Table 28 shows that AT&T and Verizon have substantially more subscribers per MHz of owned spectrum compared to Sprint and T-Mobile.

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**Table 11: Estimated Marginal Capital Costs of Adding One Million Subscribers, by Network**

		AT&T	Verizon Wireless	Sprint	T-Mobile
Share of Subscribers added by Building Towers	[1]	80%	80%	20%	20%
Share of Subscribers added by Deploying Radios	[2]	20%	20%	80%	80%
<b>Tower Costs</b>					
Subscribers Added by Building New Towers	[3]	800,000	800,000	200,000	200,000
Maximum Population Per Cell Site	[4]	4,756	5,473	5,787	5,250
Additional Towers	[5]	168	146	35	38
Cost Per Tower	[6]	\$500,000	\$500,000	\$500,000	\$500,000
Marginal Cost of Additional Towers	[7]	\$84,112,782	\$73,091,500	\$17,281,599	\$19,046,095
<b>Radio Costs</b>					
Subscribers Added by Adding New Radios	[8]	200,000	200,000	800,000	800,000
Maximum Population Per Cell	[9]	4,756	5,473	5,787	5,250
LTE Channels	[10]	4	4	2	2
Population Per Radio Channel	[11]	1,189	1,368	2,893	2,625
Market Share by Service Revenue	[12]	33%	37%	14%	16%
Subscribers Per Radio Channel	[13]	395	507	410	408
Additional Radios	[14]	507	394	1,950	1,959
Cost of Adding a Radio	[15]	\$20,000	\$20,000	\$20,000	\$20,000
Marginal Cost of Additional Radios	[16]	\$10,139,141	\$7,884,436	\$39,008,528	\$39,173,065
<b>Total</b>					
Marginal Capital Cost of Adding One Million Subscribers	[17]	\$94,251,923	\$80,975,936	\$56,290,127	\$58,219,159

Sources & Notes: Note that Verizon is even more spectrum-constrained than AT&T. For simplicity, we have assumed that the two are equally spectrum constrained.

[1], [2], [6], [10], [15]: Assumption.

[3]: [1] x 1,000,000.

[4], [9]: Calibrated using the share of U.S. land area covered by each carrier, the cell radius of a 700 MHz cell site, and each carrier's total cell sites. Note that Sprint does not have 700 MHz spectrum. 20<sup>th</sup> Mobile Wireless Competition Report, p. 74 and 80; Tony Melone, "Wells Fargo Securities: Technology, Media & Telecom Conference," Verizon, November 10, 2010, accessed September 26, 2013; Colin Chandler, "CDMA 2000 and CDMA 450", ITU, December 3, 2003, available [https://www.itu.int/ITU-D/tech/events/2003/slovenia2003/Presentations/Day%203/3.3.1\\_Chandler.pdf](https://www.itu.int/ITU-D/tech/events/2003/slovenia2003/Presentations/Day%203/3.3.1_Chandler.pdf), accessed August 23, 2018; Census Bureau, "National Counties Gazetteer File," United States Department of Commerce, available <http://www.census.gov/geo/maps-data/data/gazetteer2010.html>, accessed August 23, 2018.

[5]: [3] / [4].

[7]: [5] x [6].

[8]: [2] x 1,000,000.

[11]: [9] / [10].

[12]: 2016 wireless total service revenue as reported in company filings. AT&T, Verizon, Sprint, and T-Mobile assumed to make up the entire market.

[13]: [11] x [12].

[14]: [8] / [13].

[16]: [14] x [15].

[17]: [7] + [16].

As the table shows, the marginal capital costs for Sprint and T-Mobile are significantly lower than those for AT&T and Verizon. Sprint's and T-Mobile's ability to build out their networks mostly by adding radios rather than by building new towers leads to a majority of their marginal

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capital costs accruing through less expensive radio additions that put to use unused spectrum. At the individual level, these calculations suggest that Sprint and T-Mobile have a marginal capital cost of \$59 dollars per subscriber, compared with \$81 and \$94 for Verizon and AT&T.<sup>42</sup>

In addition to the marginal capital costs of expanding its network, a carrier adding one million subscribers would incur additional operating costs, costs to acquire those subscribers and replace subscribers who leave through normal churn, and increased general and overhead costs. Table 12 presents the incremental costs of acquiring and serving one million additional subscribers for each of the national carriers.

**Table 12: Long-Run Incremental Costs, Margins, and Implied Elasticities by Wireless Provider, 2017**

Wireless Providers	Monthly Marginal Cost	ARPU	Margin	Implied Elasticity
[A]	[B]	[C]	[D]	[E]
AT&T	\$18.01	\$52.51	66%	-1.52
Verizon	\$19.07	\$43.45	56%	-1.78
Sprint	\$23.49	\$46.14	49%	-2.04
T-Mobile	\$21.16	\$46.97	55%	-1.82

Sources & Notes:

[B]: Present value of the incremental costs per connection of adding one million connections. See Appendix A.

[C]: Verizon Postpaid ARPU is calculated by dividing Average Revenue Per Account, not including recurring device payment billings (ARPA) by retail Postpaid connections per account. T-Mobile and U.S. Cellular ARPU calculated by dividing postpaid revenues by number of months in the given period (12). AT&T ARPU is based on its quarterly earnings statements based on reported values for “Postpaid ARPU (Historical Accounting Method)”. Sprint value is based on its quarterly earnings statements based on reported values for “Nine Months Ended December 31, Postpaid ARPU”.

[D]:  $([C] - [B]) / [C]$ .

[E]:  $-1 / [D]$ .

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<sup>42</sup> Calculated by dividing the marginal capital cost by 1,000,000 subscribers. In Appendix A, we calculate the amortized cost of maintaining network quality for the added subscribers over the period 2017 to 2031. On a monthly basis, the marginal capital cost portion of the amortized incremental cost of a single subscriber ranges from \$1 to \$2 across the four MNOs.

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Because carriers incur marginal capital costs to grow the network to accommodate incremental customers for many years, it is appropriate to amortize the capital costs and calculate the discounted incremental cost per customer. The resulting all-in incremental cost varies by approximately 20%, ranging from \$23.49 per month for Sprint to \$18.01 per month for AT&T. Details on the full model are presented in Appendix A.

When compared with the monthly ARPU, Sprint has the lowest margin, at 49%, while AT&T has the highest margin, at 66%.<sup>43</sup> Verizon and T-Mobile currently have similar estimated margins, at 56% and 55% respectively. The calculated margins can be used to infer the own-price elasticities of demand for each provider based on the Lerner Index, which links the elasticity of demand for a profit maximizing firm to the inverse of the mark-up of price over marginal cost.<sup>44</sup> The implied elasticities in Table 12 range from -1.52 for AT&T to -2.04 for Sprint. These own-price elasticities are in line with the limited evidence in the literature.<sup>45</sup>

### *b. Prepaid Wireless Service*

The offering of both postpaid and prepaid plans is one way in which wireless carriers may be able to target different customer segments that have differing preferences for pricing, phone options, and contract types within the broader retail mobile voice/broadband market. Prepaid service plans allow customers to avoid the credit checks required for postpaid plans and to purchase fixed calling and data plan amounts such that when the number of calls or amount of data purchases is reached, the service becomes unavailable until the customer purchases more calling minutes or data.<sup>46</sup>

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<sup>43</sup> Under the alternative AT&T ARPU of \$47.79 (see footnote 38), AT&T's margin would still be highest among the MNOs, at approximately 62%.

<sup>44</sup> A firm's own-price demand elasticity measures the percentage change in the quantity demanded for that firm "caused" by a percentage change in the firm's price. A firm's price-cost margin equals -1 times the inverse of its own-price elasticity. See Lerner, A. "The Concept of Monopoly and the Measurement of Monopoly Power." *Review of Economic Studies*, *Review of Economic Studies*1934 (1934), pp. 157–75.

<sup>45</sup> One study estimated own-price elasticities of -1.4 to -2.6 for Verizon and -1.7 to -2.6 for AT&T. See Sinkinson, Michael. "Pricing and entry incentives with exclusive contracts: Evidence from smartphones." (2014), available <https://ssrn.com/abstract=2391745>, accessed August 23, 2018.

<sup>46</sup> Many prepaid providers offer plans that largely mimic the services offered by postpaid plans (e.g., unlimited text and calling) with the primary difference being how the plans are financed and the credit check requirement for postpaid service.

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In addition to the postpaid plans sold under their marquis brands, the four national carriers also sell prepaid plans, both under their marquis brands (e.g., T-Mobile One Prepaid) and/or under a dedicated brand, such as Cricket Wireless (owned by AT&T) or MetroPCS (owned by T-Mobile). Table 13 below provides a summary of carrier presence over time in the prepaid segment. However, unlike the postpaid segment, where the MNOs account for nearly all subscribers, MVNOs, particularly TracFone, are significant providers of prepaid wireless service plans.

**Table 13: Prepaid Connections and Segment Share, 2014-2017**

	2014	2015	2016	2017
<b>Prepaid Connections (millions)</b>				
AT&T	11.0	11.6	13.5	15.3
Verizon	6.1	5.6	5.5	5.4
Sprint	15.5	14.7	11.8	9.0
T-Mobile	16.3	17.6	19.8	20.7
U.S. Cellular	0.3	0.4	0.5	0.5
TracFone	26.0	25.7	26.1	23.1
Other MVNO	13.0	17.8	19.5	19.4
<b>Total</b>	<b>88.4</b>	<b>93.3</b>	<b>96.7</b>	<b>93.5</b>
<b>Prepaid Market Share (%)</b>				
AT&T	12.4%	12.4%	14.0%	16.4%
Verizon	6.9%	6.0%	5.6%	5.8%
Sprint	17.6%	15.7%	12.2%	9.6%
T-Mobile	18.5%	18.9%	20.5%	22.1%
U.S. Cellular	0.4%	0.4%	0.5%	0.6%
TracFone	29.4%	27.6%	27.0%	24.7%
Other MVNO	14.7%	19.0%	20.2%	20.8%
<b>Total</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>	<b>100.0%</b>

Sources: 2014 - 2017 Company Annual Reports; Dennis Bournique, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018; Dennis Bournique, "Fourth Quarter, 2016 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 14, 2017, available <https://www.prepaidphonenews.com/2017/02/fourth-quarter-2016-prepaid-mobile.html>, accessed August 15, 2018; Dennis Bournique, "Fourth Quarter, 2015 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 17, 2016, available <https://www.prepaidphonenews.com/2016/02/fourth-quarter-2015-prepaid-mobile.html>, accessed August 15, 2018; Dennis Bournique, "Fourth Quarter, 2014 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2015, available <https://www.prepaidphonenews.com/2015/02/fouth-quarter-2014-prepaid-mobile.html>, accessed August 15, 2018.

Notes: Connection counts are end of year December 31. Other MVNO calculated by subtracting TracFone prepaid connection counts from the sum of AT&T, Verizon, Sprint, and T-Mobile's total wholesale connections count.

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As shown in the table, TracFone accounts for the largest share of prepaid subscribers (24.7%), while T-Mobile is the largest MNO in the segment (22.1%). Sprint accounts for almost 10% of prepaid subscribers. Table 14 below provides a summary of ARPU for prepaid wireless plans across carriers.

**Table 14: Prepaid Average Revenue per Unit, 2014 - 2017**

Provider	2014	2015	2016	2017
AT&T	N/A	N/A	N/A	N/A
Verizon	N/A	N/A	N/A	N/A
Sprint	N/A	\$33.39	\$34.46	\$37.67
T-Mobile	\$37.10	\$37.68	\$37.92	\$38.69
U.S. Cellular	\$33.98	\$35.72	\$34.38	\$33.16
TracFone	\$20.65	\$20.26	\$21.24	\$22.83

Sources: 2014 - 2017 Company Annual Reports.

Notes: Sprint ARPU numbers are end of year March 31, while the other carriers' ARPU numbers are end of year December 31. U.S. Cellular ARPU is calculated by a weighted average of all quarterly Prepaid ARPU estimates in the given year. T-Mobile and TracFone prepaid ARPU is calculated by dividing prepaid revenues by the number of months in the given period (12). Sprint ARPU is from their annual reports.

By comparison to prices for postpaid plans shown in Table 9 above, it is evident that the ARPU for postpaid service exceeds the prepaid ARPU by more than \$12, or a little more than 30%. Although prepaid ARPU information is not available from public SEC filings for AT&T and Verizon, there is a clear difference in ARPU for prepaid plans between Sprint and T-Mobile (approximately \$38), which operate national networks, and TracFone (approximately \$23), which fills its network needs through wholesale agreements with the national carriers. Although TracFone is the largest seller of prepaid plans (in comparison to both facilities-based carriers and the other MVNOs), this pricing differential suggests either cost or quality (such as plan data allowances) differences in TracFone's offerings versus the national network carriers that have been persistent over time. Indeed, T-Mobile's CFO has recognized that TracFone is "becoming less and less relevant and more and more stressed from a pricing standpoint."<sup>47</sup>

For the four national, facilities-based carriers, as with postpaid plans, the incremental costs for prepaid customers are made up of the incremental network infrastructure costs required to add

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<sup>47</sup> Braxton Carter, CFO, T-Mobile US, Inc., Remarks at UBS Global Media and Communications Conference, Fair Disclosure Wire (Dec. 5, 2016).

subscribers as well as additional operating costs, costs to acquire those subscribers and replace subscribers who leave through normal churn, and increased general and overhead costs. For the MVNOs, such as TracFone (and its various subsidiary brands), while they incur incremental operating costs from adding new subscribers, there are no incremental network infrastructure costs to be incurred to maintain network quality when adding subscribers. Instead, the MVNOs purchase network access for their subscribers on the wholesale market from the facilities-based carriers. Further discussion of such costs is presented below.

## 2. The Wholesale Market

As mentioned above, MVNOs purchase wireless services from network operators in a wholesale market and resell these services to consumers. At least 58 independently owned MVNO brands are currently active in the U.S.,<sup>48</sup> with an estimated 42.5 million connections.<sup>49</sup> As shown in Table 13, above, TracFone, the largest MVNO with approximately 23 million connections, alone accounts for approximately 25% of prepaid wireless connections and over half of all MVNO connections.

Table 15 summarizes U.S. MVNO brands and agreements by host network. As the table illustrates, 25 out of the 58 MVNO brands reviewed operate under multiple agreements with national network operators. Sprint and T-Mobile appear to be more active in the wholesale market, being party to respectively 27 and 30 MVNO agreements, and 14 MVNO brands have agreements with both Sprint and T-Mobile. Further details on U.S. MVNO brands are provided in Appendix B.

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<sup>48</sup> For the purposes and analyses included in this section we have reviewed 58 independently owned MVNOs, excluding those owned and operated by one of the four national network operators.

<sup>49</sup> See Table 13, summing TracFone and Other MVNOs.

**Table 15: U.S. MVNO Market Overview Excluding Facilities Based Providers**

<b>Brands</b>	<b>Count</b>
Total U.S. MVNO Brands	58
MVNO Owners with Multiple Brands	3
<b>MVNO Agreements by Carrier</b>	
AT&T	18
Verizon	23
Sprint	27
T-Mobile	30
U.S. Cellular	1
Multiple Carrier Agreements	25
Agreements with Sprint and T-Mobile	14

Sources: "List of United States Mobile Virtual Network Operators," Best MVNO, available <https://bestmvno.com/mvnos/>, accessed August 23, 2018; "Online database of MVNOs," MVNO Directory, available <http://www.blog.mvnodirectory.com>, accessed August 23, 2018. Marc Lagace, "Complete List of Sprint MVNOs," *Android Central*, April 14, 2017, available <https://www.androidcentral.com/complete-list-sprint-mvnos>, accessed August 23, 2018; "Complete List of Verizon Wireless MVNOs," *Android Central*, April 12, 2017, available <https://www.androidcentral.com/complete-list-verizon-mvnos>, accessed August 23, 2018; Mike Tanasychuk, "Complete List of AT&T MVNOs," *Android Central*, May 8, 2017, available <https://www.androidcentral.com/complete-list-att-mvnos>, accessed August 23, 2018; Marc Lagace, "Complete List of T-Mobile MVNOs," *Android Central*, May 3, 2017, available <https://www.androidcentral.com/complete-list-t-mobile-mvnos>, accessed August 23, 2018.

Notes: This is not an exhaustive list of active MVNOs in the U.S.

Among the host networks, Sprint and T-Mobile account for a large fraction of the wholesale market. Table 16 below provides a summary of T-Mobile and Sprint’s wholesale business as reported in their respective annual reports. Based on our estimates of the number of the wholesale connections, Sprint and T-Mobile (combined) account for more than 60% of wholesale connections (i.e., 26.6 million of the estimated 42.5 million connections).

**Table 16: T-Mobile and Sprint’s Wholesale Business as Reported in 2017 Annual Reports**

Provider	Connections (millions) [A]	Revenue (USD millions) [B]	ARPU [C]
Sprint	13.4	\$1,179	\$7.35
T-Mobile	13.3	\$1,102	\$6.92
<b>Total</b>	<b>26.6</b>	<b>\$2,281</b>	<b>\$7.13</b>

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Sources: Sprint 2017 Q4 10-Q; Sprint 2015 Q4 10-Q; T-Mobile 2017 Annual Report; T-Mobile 2015 Annual Report.

Notes:

[A]: Connection counts are calculated by averaging 2016 and 2017's end of the year wholesale connection counts. Connection counts do not include Lifeline customers.

[B]: Sprint's 9-month wholesale revenue is multiplied by 1.33 to estimate their 12-month wholesale revenue.

[C]:  $([B] / [A]) / 12$ .

As seen in the table, wholesale prices charged to MVNOs may represent a significant fraction of MVNO retail (prepaid) prices. For example, T-Mobile's and Sprint's average wholesale ARPU of \$7.13 would be more than 30% of TracFone's prepaid ARPU.<sup>50</sup>

### B. Market Share Screening of the T-Mobile/Sprint Merger

Among facilities-based carriers, the merger would combine the third and fourth largest suppliers of wireless service in the U.S. As shown in Table 17, Sprint and T-Mobile currently account for 13% and 17% of total wireless connections, respectively. New T-Mobile would account for approximately 30%, and become close in size to AT&T and Verizon, which have shares of 34% and 35%, respectively. Most importantly, a Sprint/T-Mobile merger would yield a more symmetric market structure, resulting in three dominant carriers accounting for roughly one-third of wireless connections each.

The analysis of market shares and concentration levels in the relevant product and geographic markets is a useful starting point for assessing the effect of a proposed merger. As explained above, the FCC considers retail mobile voice/broadband connections as the relevant product market. Following that precedent, we calculate concentration based on the supply of facilities-based wireless connections, attributing MVNO connections to their host networks.<sup>51</sup> In subsequent sections we separately consider competitive effects of the merger in the retail market and its postpaid and prepaid segments, as well as in the wholesale market.

Competition agencies measure concentration using the Herfindahl Hirschman Index ("HHI"), which is the sum of squared shares across market participants. When using the HHI, agencies consider both the post-merger level of the HHI and the increase in the HHI resulting from the

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<sup>50</sup> Calculation:  $\$7.13 / \$22.83 = 31.2\%$ .

<sup>51</sup> FCC Staff Report, ¶ 41.

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merger. According to the Merger Guidelines, markets are classified as “Moderately Concentrated” if the pre-merger HHI is between 1500 and 2500, and “Highly Concentrated” if the pre-merger HHI is above 2,500.<sup>52</sup> The Merger Guidelines further indicate that:<sup>53</sup>

- Mergers resulting in a post-merger HHI between 1,500 and 2,500 (moderately concentrated) that involve an increase in the HHI of more than 100 points “potentially raise significant competitive concerns and often warrant scrutiny”;
- Mergers resulting in a post-merger HHI above 2,500 (highly concentrated) a) “potentially raise significant competitive concerns and often warrant scrutiny” if they involve an increase in the HHI of between 100 points and 200 points, and b) “will be presumed to be likely to enhance market power” if they involve an increase in the HHI of more than 200 points. This presumption may be rebutted with persuasive evidence demonstrating that the proposed merger “is unlikely to enhance market power.”

Under the Merger Guidelines, the market for supplying facilities-based wireless communications in the United States is already highly concentrated. Table 17 presents concentration metrics for this market before and after a potential Sprint/T-Mobile merger.

**Table 17: Market Shares and HHI Screens Based on 2017 Total Connections**

Provider	All Connections		Postpaid Connections		Prepaid Connections	
	Connections (millions)	Share	Connections (millions)	Share	Connections (millions)	Share
AT&T	141.6	33.8%	77.9	30.0%	24.7	26.4%
Verizon	145.3	34.7%	110.9	42.8%	11.0	11.8%
Sprint	54.6	13.0%	31.9	12.3%	22.6	24.2%
T-Mobile	72.6	17.3%	34.1	13.2%	34.6	37.0%
U.S. Cellular	5.0	1.2%	4.5	1.7%	0.5	0.6%
<b>Total</b>	<b>419.1</b>	<b>100.0%</b>	<b>259.3</b>	<b>100.0%</b>	<b>93.5</b>	<b>100.0%</b>
<b>New T-Mobile</b>	<b>127</b>	<b>30.3%</b>	<b>66</b>	<b>25.5%</b>	<b>57</b>	<b>61.2%</b>
<b>Pre-Merger HHI</b>	<b>2,814</b>		<b>3,057</b>		<b>2,793</b>	
<b>Post-Merger HHI</b>	<b>3,265</b>		<b>3,381</b>		<b>4,585</b>	
<b>Delta HHI</b>	<b>451</b>		<b>324</b>		<b>1,792</b>	

Sources: 2017 Company Annual Reports; Dennis Bournique, “Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator;” Prepaid Phone News, February 19,

<sup>52</sup> Horizontal Merger Guidelines, p. 19.

<sup>53</sup> *Ibid.*

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2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.

Notes: Total retail connections are estimated total retail connections for publicly traded facilities-based mobile wireless service providers (in thousands). Connections counts are for end of the year December 31. HHI is calculated as the sum of the squares of each firm's market share.

Prepaid connections attribute MVNO connections to their host networks based on the number of wholesale connections estimated for each MNO.

As shown in Table 17, before the merger the HHI is already 2,814, which is in the “Highly Concentrated” range according to the Merger Guidelines. Were Sprint and T-Mobile to merge, the HHI would increase to 3,265, an increase of 451 points. Both the level of concentration post-merger and its potential increase due to the merger raise competitive concerns according to the Merger Guidelines standards.

Table 17 also shows the relative differences in the concentration of suppliers of postpaid versus prepaid connections. New T-Mobile will account for approximately 25% of postpaid connections and over 60% of prepaid connections in the U.S.<sup>54</sup> The pre-merger supply of postpaid connections is relatively concentrated with an HHI of 3,057, while the pre-merger supply of prepaid connections is somewhat less concentrated (but nevertheless “highly concentrated” vis-à-vis the Merger Guidelines) at 2,793. However, due in part to Verizon’s relatively smaller supply of prepaid connections, the change in concentration (1,792) is much higher for the supply of prepaid connections in comparison to postpaid connections (324). Not only will New T-Mobile be the dominant supplier of facilities-based prepaid connections, over 87% of that market segment will be supplied by just two firms: New T-Mobile and AT&T.

### C. Unilateral Effects in the Retail Segments

As indicated above, the proposed merger would combine the third and fourth largest nationwide service providers in the U.S., potentially resulting in harm to competition in both the retail and wholesale markets for mobile voice/broadband services by effectively lowering the incentives for price and non-price competition, increasing the likelihood of coordination and likely resulting in higher prices. This section focuses on the unilateral pricing effects of the merger using standard tools considered by antitrust authorities and practitioners.

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<sup>54</sup> We attribute the retail connections of the MVNOs to their host networks based on the number of wholesale connections for each MNO.

In subsection 1-a below we present the results of various pricing pressure tests for both the postpaid and prepaid segments, as well as a combined analysis of all connections. Pricing pressure tests such as the GUPPI provide a useful preliminary screen for the potential incentives for merger-induced price increases as well as the magnitude of the required cost efficiencies needed to eliminate those incentives. The data needed to perform the GUPPI are relatively modest, consisting primarily of information on firms' price-cost margins and an estimate of diversion ratios, which measure the amount of sales captured by one substitute product as a proportion of the amount of sales lost by the product for which price is increased.

In subsection 1-b below we present the results of various merger simulation predictions for both the postpaid and prepaid segments. Merger simulation models provide a quantitative assessment of the merger's unilateral effects on prices, shares, and consumer welfare. Relative to the price pressure tests, merger simulation models have the advantage of factoring into the analysis realistic substitution patterns and competitors' responses to the price increase. They also provide direct price predictions, which, although predicated on simplifying assumptions about consumer demand, nevertheless provide additional information relative to the price pressure tests.

## 1. Price Pressure Tests

A core concern with any horizontal merger is that the reduction in competition between the Applicants will result in higher prices for consumers. Before the merger, if Sprint raises its price, some customers will choose to switch to products sold by other carriers, including T-Mobile. After a merger with T-Mobile, however, if Sprint were to raise its prices, the customers who would otherwise switch to T-Mobile will likely remain customers of the merged firm. This "recapture" of customers makes increasing prices more profitable for the merged firms than when they operate independently.<sup>55</sup> Below we describe the GUPPI test and identify the necessary data sources to implement it. We then present results in the context of the proposed T-Mobile/Sprint merger.

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<sup>55</sup> Horizontal Merger Guidelines, p. 20.

*a. The Gross Upward Price Pressure Index*<sup>56</sup>

The GUPPI measures the value of sales that are diverted to one firm (or brand) measured in proportion to the lost revenues attributable to the reduction in unit sales resulting from the price increase by another firm (or brand). This ratio provides a metric for scoring the “upward pricing pressure” from the unilateral effects of a merger. The GUPPI does not take merger synergies into account.

The following formula estimates the percentage change in Firm 1’s price following a merger between Firm 1 and Firm 2:

$$GUPPI_1 = D_{12} \times m_2 \times \frac{P_2}{P_1},$$

where:

- $D_{12}$  is the diversion ratio between Firm 1 and Firm 2 (number of customers who leave Firm 1 for Firm 2 divided by the total number of customers who leave firm 1);
- $m$  is the variable profit margin for Firm 2 as a fraction of revenue; and
- $P_2 / P_1$  is the price of Firm 2 relative to Firm 1.

The diversion ratio is the percentage of customers one firm loses when it increases prices who substitute to the other merging firm’s product. For example, if Firm 1 increases prices and loses 100 customers, 50 of whom switch to Firm 2, 30 of whom switch to Firm 3, and 20 of whom choose some other option, then the diversion ratio between Firm 1 and Firm 2 ( $D_{12}$ ) is  $50/100 = 0.5$ . That is, 50% of the customers that would leave Firm 1 are recaptured if Firms 1 and 2 are combined.

We approximate diversion ratios between Sprint and T-Mobile for the postpaid segment using data on gross subscriber additions.<sup>57</sup> Gross subscriber additions are measured as the number of

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<sup>56</sup> Farrell, Joseph, and Carl Shapiro. “Antitrust evaluation of horizontal mergers: An economic alternative to market definition.” *The BE Journal of Theoretical Economics* 10, no. 1 (2010).

<sup>57</sup> Ideally, because diversion is technically based on responses to price changes, it is best estimated using variation in prices and shares over time, possibly in response to exogenous shocks (such as cost increases or new taxes). Such information is not available here, so we pair information on gross

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new subscribers each firm adds within a given period. With these data, the diversion ratio between Firm 1 and Firm 2 is approximated by:

$$D_{\text{Pre},12} = \frac{[\text{Gross number of subscribers gained by Firm 2}] \times [\text{Assumed Recapture Rate}]}{\text{Gross number of subscribers gained by all firms EXCEPT Firm 1}}$$

UBS Global Research provides gross additions for 2016 for the four national carriers as well as US Cellular, the largest regional carrier in the U.S.<sup>58</sup> Using these data and the equation above we can calculate diversion ratios.

The “Assumed Recapture Rate” accounts for the percentage of consumers who will switch to an “outside option” in response to a price increase by one firm.<sup>59</sup> The recapture rate is defined as the fraction of customers that leave a firm due to a price increase that do not exit the wireless segment. The 80% recapture rate is consistent with other studies of the mobile voice/broadband markets and is also consistent with the FCC’s review of the AT&T/T-Mobile merger application.<sup>60</sup>

Because we lack reliable data on gross subscriber additions in the prepaid segment, we calculate our prepaid diversion ratios based on the assumption that customers that divert from one firm are distributed across the other firms in proportion to their relative subscriber shares. Based on this assumption, the prepaid diversion ratio between Firm 1 and Firm 2 is approximated by:

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subscriber additions with an assumption of proportionality, similar to the share proportionality that results when consumer demand is based on the logit model.

<sup>58</sup> UBS Wireless Report.

<sup>59</sup> This outside option includes customers who switch to a small regional provider not included in the analyses as well as those who choose to purchase a wireless plan of any kind.

<sup>60</sup> For example, the FCC’s staff report, describes the Applicants’ (AT&T/T-Mobile’s) assumption of a 60% recapture rate as too low stating “Our simulations show that the Applicants’ unsupported assumption about the rate at which customers would abandon wireless services leads the economic model to overstate the benefits of this transaction.” FCC Staff Report, ¶ 152

Besen, Kleter, Moresi, Salop and Woodbury also adopt an 80% recapture rate for their published analysis of the AT&T – T-Mobile USA wireless merger. See Besen, Stanley M., Stephen D. Kleter, Serge X. Moresi, Steven C. Salop, and John R. Woodbury. "An economic analysis of the AT&T-T-mobile USA wireless merger." *Journal of Competition Law and Economics* 9, no. 1 (2013): 23-47.

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$$D_{\text{Post},12} = \frac{[\text{Share Firm 2}] \times [\text{Assumed Recapture Rate}]}{1 - [\text{Share Firm 1}]}$$

The variable profit margin as a fraction of revenue can be calculated as the profit earned divided by total revenue. In Appendix A we calculate long-run marginal costs for each firm on a per subscriber basis and use this along with each firm’s ARPU to calculate the variable profit margin.<sup>61</sup> The relative price is the ratio of the prices for each of the merging firms. To calculate this ratio, we use each provider’s postpaid ARPU.

*b. Test Results*

Table 18 presents the results of the GUPPI test for Sprint and T-Mobile within the postpaid segment. The postpaid segment GUPPI scores for both Sprint (9.9%) and T-Mobile (9.2%) suggest that the merger would likely create significant upward pricing pressure.

**Table 18: Pricing Pressure Tests for Postpaid**

		Diversion	Gross	Price	Price Incremental	Gross Upward	
		Ratio	Margin %	(\$/unit)	Ratio	Pricing	
		[A]	[B]	[C]	[D]	[E]	
		[F]					
Sprint	[1]	19.8%	49.1%	\$46.14	1.02	\$23.49	9.9%
T-Mobile	[2]	17.0%	54.9%	\$46.97	0.98	\$21.16	9.2%

Sources: 20th Mobile Wireless Competition Report; UBS Wireless Report.

[A]: Diversion ratios are constructed based on annual postpaid gross additions.

[B]:  $([C] - [E])/[C]$ .

[C]: 2017 Company Annual Reports; See Table 9.

[D]:  $(\text{merging partner ARPU})/(\text{own ARPU})$ .

[E]: See Appendix A.

[F]:  $[F_1] = [A_1] \times [B_2] \times [D_1]$  and  $[F_2] = [A_2] \times [B_1] \times [D_2]$ ; where subscripts denote rows [1] or [2].

Table 19, shown below, presents the results of the GUPPI test for Sprint and T-Mobile within the prepaid segment. The prepaid segment GUPPI for both Sprint (7.6%) and T-Mobile (4.4%), although lower than their counterparts in the postpaid segment, suggests that the merger would likely create significant upward pricing pressure in the prepaid segment, too.

<sup>61</sup> See Table 12.

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**Table 19: Pricing Pressure Tests for Prepaid**

		Diversion Ratio	Gross Margin %	Price (\$/unit)	Price Ratio	Incremental Cost	Gross Upward Pricing Pressure
		[A]	[B]	[C]	[D]	[E]	[F]
Sprint	[1]	19.6%	37.7%	\$37.67	1.03	\$23.49	7.6%
T-Mobile	[2]	9.9%	45.3%	\$38.69	0.97	\$21.16	4.4%

Sources: 20th Mobile Wireless Competition Report; UBS Wireless Report.

[A]: Diversion ratios are constructed based on subscriber counts published in Company Annual Reports; See Table 13.

[B]:  $([C] - [E])/[C]$ .

[C]: 2017 Company Annual Reports; See Table 14

[D]:  $(\text{merging partner ARPU})/(\text{own ARPU})$ .

[E]: See Appendix A.

[F]:  $[F_1] = [A_1] \times [B_2] \times [D_1]$  and  $[F_2] = [A_2] \times [B_1] \times [D_2]$ ; where subscripts denote rows [1] or [2].

The pricing pressure tests above calculate diversion ratios from information on gross subscriber additions and subscriber shares, each of which relies upon a diversion-by-share assumption. Porting data available in this proceeding allows for calculations of the fraction of wireless phone numbers that port to a given network from a given network, which can be used as an alternative proxy for the true diversion ratio values. Because these data do not distinguish among service type, the resulting diversion ratios provide estimates of diversion across all connections. We combine these “all connection” diversion ratios with corresponding ARPU values for each carrier<sup>62</sup> to estimate the upward pressure indexes for the broad market, which includes all mobile voice/broadband services. Table 20 presents the resulting GUPPI. The GUPPI screen is higher in this broader analysis than they were in either of the corresponding postpaid or prepaid analyses.

<sup>62</sup> Calculated as all wireless service revenue divided by total connections, divided by 12 months per year.

Table 20: Pricing Pressure Tests for All Connections Using Porting Data

{{BEGIN NRUF/LNP HCI

END NRUF/LNP HCI}}

Notes:

[A]: Diversion ratios are constructed based on LNP Data.

[B]:  $(([C]-[E])/[C])$ .

[C]: Based on 2016 wireless revenues and connections from Company Annual Reports.

[D]:  $(\text{Merging partner ARPU})/(\text{own ARPU})$ .

[E]: See Appendix A.

[F]:  $[F_1] = [A_1] \times [B_2] \times [D_1]$  and  $[F_2] = [A_2] \times [B_1] \times [D_2]$ ; where subscripts denote rows [1] or [2].

## 2. Merger Simulation

Our merger simulation models competition among cellular services providers based on a differentiated “Bertrand” model of competition. The Bertrand competition assumption is the typical basis of merger simulation. Under this assumption, each firm sets prices to maximize profits, taking account of the strategic, but non-collusive pricing decisions of its competitors. Under standard Nash Bertrand equilibrium, no firm can increase its profits by unilaterally changing the price of brands under its control.

When high frequency transaction level data, such as scanner data, are available, demand models can be estimated econometrically. In many instances, including with this transaction, estimating a demand system is not feasible. When demand estimation is not possible, the data required to specify, or calibrate, a merger simulation model can be lessened by adopting additional assumptions regarding the nature of demand and by imposing a condition that the firms’ pricing decisions strictly adhere to the Nash Bertrand equilibrium assumption.

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The ALM and the PC-AIDS models are two of the most commonly used calibrated demand models. Both models share the same structural assumptions and input requirements to identify the initial pre-merger own-price and cross-price elasticities.<sup>63</sup>

The substantive difference between the ALM and the PC-AIDS simulation models is in the assumed curvature of each demand system. That is, the two simulation models differ in terms of the effect a change in the price of a given product will have on the own and cross elasticities of demand for the merging products and close substitutes. The ALM model assumes that demand curves are relatively flat (little curvature) compared to the PC-AIDS model, which implies that the logit demand curves become more elastic than the PC-AIDS demand for a given price change. This implies that the ALM model will produce lower unilateral price effect predictions than its PC-AIDS counterpart. As a consequence, the two models provide useful insight on likely lower and upper bounds for the expected price effects of the merger.

Our postpaid segment modeling assumes that the facilities-based wireless carriers (AT&T, Verizon, Sprint, T-Mobile, and U.S. Cellular, which we have conservatively included) offer a single differentiated product each, at a single national price before the merger. Our prepaid segment modeling conservatively includes TracFone as a participant in addition to four of the five national wireless carriers.<sup>64</sup> The prepaid segment modeling also includes the other MVNOs as a competitive fringe of non-strategic participants.<sup>65</sup> Inputs for both segments include shares and prices for each carrier, as well as the incremental cost information as shown in Table 8 above. To determine shares, we consider mobile voice/broadband services in each segment as the relevant product.<sup>66</sup> Aggregate elasticities and the “size” of the outside option for each segment are

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<sup>63</sup> One exception is that the logit model requires sales volume shares for all brands whereas the PC-AIDS model utilizes revenue shares for calibration.

<sup>64</sup> U.S. Cellular has a very small presence in the prepaid segment (roughly 0.5% of subscribers) and is not included in our prepaid simulations.

<sup>65</sup> In our ALM modeling the competitive fringe of MVNOs is strictly non-strategic, while in our PC-AIDS modeling the competitive fringe is composed of many very small, but strategic firms.

<sup>66</sup> Consistent with economic theory, the logit model is calibrated using sales volume shares and the PC-AIDS model is calibrated based on brands' revenue shares.

determined endogenously within the models.<sup>67</sup> As shown above, we calculate carriers' post- and prepaid ARPUs as our approximation of prices for each segment.

*a. ALM Simulation Results*

Results from our national-level postpaid logit merger simulation are presented in Table 21.<sup>68</sup> For each of the four carriers, the table reports pre-merger and post-merger volume shares and monthly ARPU along with the percent changes in each. Under the assumption of logit demand, merger simulation results indicate that New T-Mobile would likely increase prices by 5%, while the corresponding price increases for AT&T and Verizon would be 0.3% and 0.5%, respectively. These price increases would be expected to reduce the number of postpaid subscribers by about 2 million and the corresponding consumer surplus by about \$2.1 billion (annually).

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<sup>67</sup> The logit model calibration of shares and estimated markups leads to an implied aggregate elasticity of -0.55 for the postpaid segment and we use the same value for the prepaid segment. These elasticities are consistent with values seen in prior analysis of mobile wireless mergers. For example, Moresi et al employ an elasticity of -0.5.

The subsequent PC-AIDs simulations take the initial aggregate elasticities imputed from the Logit model as given and calibrate using segment prices, shares, and an estimate of Sprint's margin.

See Besen, Stanley M., Stephen D. Kletter, Serge X. Moresi, Steven C. Salop, and John R. Woodbury. "An economic analysis of the AT&T-T-mobile USA wireless merger." *Journal of Competition Law and Economics* 9, no. 1 (2013): 23-47.

<sup>68</sup> The system of equations derived from the model under standard assumptions is an over-identified system; there are more model equations than parameters to be calibrated. See Werden, Gregory J., and Luke M. Froeb. "The effects of mergers in differentiated products industries: Logit demand and merger policy." *JL Econ. & Org.* 10 (1994): 407. This is because for postpaid services we have all carriers' ARPU, incremental costs and subscriber counts, which leaves only the price sensitivity parameter and the market elasticity to be calibrated. Industry priors are employed to pin down the set of equations that will be used for the calibration. See Besen, Stanley M., Stephen D. Kletter, Serge X. Moresi, Steven C. Salop, and John R. Woodbury. "An Economic Analysis Of The AT&T-T-Mobile USA Wireless Merger." *Journal of Competition Law and Economics* 9, no. 1 (2013): 23-47. Then, for the merger simulation, incremental costs that are consistent with the logit model are calculated and used.

**Table 21: Postpaid Merger Simulation Results for 2017, Assuming Logit Demand**

Carrier	Pre-Merger Subscriber Share [A]	Post-Merger Subscriber Share [B]	Change in Subscriber Share [C]	Pre- Merger ARPU [D]	Post- Merger ARPU [E]	Pct Chg ARPU [F]
AT&T	30.0%	30.8%	0.8%	\$47.79	\$47.93	0.3%
Verizon	42.8%	43.7%	1.0%	\$43.45	\$43.66	0.5%
Sprint	12.3%	11.4%	-0.9%	\$46.14	\$48.47	5.0%
T-Mobile	13.2%	12.3%	-0.9%	\$46.97	\$49.14	4.6%
U.S. Cellular	1.7%	1.8%	0.1%	\$44.39	\$44.40	0.0%
Combined	100.0%	100.0%	0.0%	\$45.56	\$46.21	1.4%
Market Elasticity	-0.55	-0.57				
Total Subscribers (millions)	259	257				
Industry Revenue (millions)	\$141,779	\$142,575				
Consumer Surplus Loss (millions)		-\$2,116				

Sources: 20th Mobile Wireless Competition Report, p. 15; 2017 Company Annual Reports.

Notes: Post-merger results produced from simulation. Marginal costs calculated by Brattle. See Table 12.

[A]: Share of total connections in 2017 calculated from 2017 Company Annual Reports See Table 8.

[C]: Post-merger share as estimated by simulation.

[C]:  $([B] - [A]) / [A]$ .

[D]: Postpaid ARPU for 2017 from 2017 Company Annual Reports. See Table 9.

[E]: Estimated post-merger price produced from simulation.

[F]:  $([E] - [D]) / [D]$ .

"Market" Elasticity estimated from logit model calibration and post-merger simulation.

Total postpaid subscribers from Company Annual Reports. Change in subscribers calculated from simulation.

Industry postpaid revenues calculated as (ARPU x Subscribers) across 4 carriers.

Consumer Surplus Loss calculated from simulation.

Results from our national-level prepaid logit merger simulation are presented in Table 22.<sup>69</sup> For each of the major prepaid networks,<sup>70</sup> the table reports pre-merger and post-merger volume

<sup>69</sup> Given the available data the calibration of the model collapses to solving an exactly identified system of equations derived from the model under standard assumptions. See Werden, Gregory J., and Luke M. Froeb. "The effects of mergers in differentiated products industries: Logit demand and merger policy." *JL Econ. & Org.* 10 (1994): 407. These standard equations are used together with the data available which consists of the ARPU for Sprint, T-Mobile, and TracFone the incremental costs for AT&T, Verizon, Spring, T-Mobile, and the subscriber count for each carrier's prepaid service, to calibrate for the values of model parameters that are not available as data (missing prices and

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shares and monthly ARPU along with the percent changes in each. Under the assumption of logit demand, the merger simulation results indicate that New T-Mobile would likely increase prices in the prepaid segment by 2.8% (T-Mobile) to 7.3% (Sprint), or approximately 5.0% on average across the two brands, while the corresponding price increases for AT&T, Verizon, and TracFone would be 0.2%, 0.0%, and 0.1% respectively. These price increases would be expected to reduce the number of prepaid subscribers by about 0.86 million and the corresponding consumer surplus by about \$0.6 billion (annually).

**Table 22: Prepaid Merger Simulation Results for 2017, Assuming Logit Demand**

Carrier	Pre-Merger Subscriber Share [A]	Post-Merger Subscriber Share [B]	Change in Subscriber Share [C]	Pre-Merger ARPU [D]	Post-Merger ARPU [E]	Pct Chg ARPU [F]
AT&T	16.4%	17.0%	0.6%	\$33.05	\$33.11	0.2%
Verizon	5.8%	6.0%	0.2%	\$32.82	\$32.83	0.0%
Sprint	9.6%	8.1%	-1.5%	\$37.67	\$40.43	7.3%
T-Mobile	22.1%	21.2%	-1.0%	\$38.69	\$39.78	2.8%
TracFone	24.7%	25.5%	0.8%	\$22.83	\$22.92	0.4%
Other MVNOs	21.3%	22.2%	0.9%	\$31.58	\$31.58	0.0%
Combined	100.0%	100.0%	0.0%	\$31.89	\$32.16	0.9%
Market Elasticity	-0.55	-0.58				
Total Subscribers (000s)	93,466	92,618				
Industry Revenue (000s)	\$35,767,399	\$35,744,860				
Consumer Surplus Loss (000s)		-\$576,840				

Sources: 20th Mobile Wireless Competition Report, p. 15; 2017 Company Annual Reports.

Notes: Post-merger results produced from simulation. Marginal costs calculated Brattle. See Table 12. Pre-merger ARPU for AT&T and Verizon calculated from model calibration.

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incremental costs, the market elasticity, and price sensitivity parameter). These calibrated parameters, data, and equations are then used together to simulate the merger scenario.

While our prepaid merger simulations include an MVNO presence via TracFone, we do not attempt to model the effect in the prepaid segment from the consolidation of Sprint and T-Mobile as wholesale suppliers to MVNOs, nor do we attempt to model in this simulation any vertical pricing effects. As explained further below, each of these effects would tend to induce higher wholesale prices for MVNOs as a result of the merger, further increasing the overall price effect in the downstream, prepaid wireless segment.

<sup>70</sup> Our analysis includes TracFone in the prepaid segment as an important retail brand, although it is not a facilities-based carrier. As indicated above, TracFone is the largest of the MVNOs, possibly accounting for over half of all wholesale purchases.

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Marginal cost for TracFone calculated from model calibration. Other MVNOs ARPU calculated as the weighted average ARPU for Sprint, T-Mobile, and TracFone.

[A]: Share of total connections in 2017 calculated from Company Annual Reports. See Table 13.

[B]: Post-merger share as estimated by simulation.

[C]:  $([B] - [A]) / [A]$ .

[D]: Prepaid ARPU for 2017 from Company Annual Reports and model calibration.

[E]: Estimated post-merger price produced from simulation.

[F]:  $([E] - [D]) / [D]$ .

“Market” Elasticity estimated from logit model calibration and post-merger simulation.

Total prepaid subscribers from 2017 Company Annual Reports; “Other MVNOs” includes U.S. Cellular. Change in subscribers calculated from simulation.

Industry prepaid revenues calculated as (ARPU x Subscribers) across 5 carriers.

Consumer Surplus Loss calculated from simulation.

### *b. PC-AIDS Postpaid & Prepaid Simulation Results*

Results from our national-level postpaid PC-AIDS merger simulation are presented in Table 23. For each of the four carriers, the table reports pre-merger and post-merger revenue shares and monthly ARPU, along with the percent changes in each. The PC-AIDS merger simulation results indicate that New T-Mobile will increase postpaid prices by approximately 9%, while the corresponding price increases for AT&T and Verizon would be 1.9% and 2.1%, respectively. These price increases are expected to reduce the number of postpaid subscribers by almost 5 million.

**Table 23: Postpaid Merger Simulation Results for 2017, Assuming PC-AIDS Demand**

Carrier	Pre-Merger	Post-Merger	Change in	Pre-Merger	Post-Merger	Pct Chg
	Revenue Share	Revenue Share	Revenue Share	ARPU	ARPU	
	[A]	[B]	[C]	[D]	[E]	[F]
AT&T	31.5%	32.2%	0.7%	\$47.79	\$48.68	1.9%
Verizon	40.8%	41.6%	0.8%	\$43.45	\$44.37	2.1%
Sprint	12.5%	11.7%	-0.8%	\$46.14	\$50.33	9.1%
T-Mobile	13.6%	12.8%	-0.8%	\$46.97	\$50.96	8.5%
U.S. Cellular	1.7%	1.7%	0.0%	\$44.39	\$44.98	1.3%
Combined	100.0%	100.0%		\$45.61	\$47.23	3.6%
Market Elasticity	-0.55	-0.55				
Total Subscribers (000s)	259,303	254,214				
Industry Revenue (000s)	\$141,779,340	\$144,314,466				

Sources: 20th Mobile Wireless Competition Report, p. 15 and 2017 Company Annual Reports.

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Notes: Post-merger results produced from simulation. The model is calibrated using Sprint's marginal cost estimate shown in Table 12.

[A]: Total revenue shares are based on 2017 subscriber shares and 2017 Postpaid ARPU. 2017 Company Annual Reports. See Table 8 and Table 9.

[B]: Post-merger segment share as estimated by simulation.

[C]:  $([B] - [A]) / [A]$ .

[D]: Postpaid ARPU for 2017 from Company Annual Reports. See Table 9.

[E]: Estimated post-merger price produced from simulation.

[F]:  $([E] - [D]) / [D]$ .

Aggregate Elasticity estimated from logit model calibration and post-merger simulation.

Industry postpaid revenues calculated as (ARPU x Subscribers) across 4 carriers.

Results from national-level prepaid PC-AIDS merger simulation are presented in Table 24. For each of the four carriers, the table reports pre-merger and post-merger revenue shares and monthly ARPU along with the percent changes in each. The PC-AIDS merger simulation results indicate that New T-Mobile will increase prepaid prices by approximately 15.5% and 8.2% for the Sprint and T-Mobile brands, respectively, while the corresponding price increases for AT&T, Verizon, and TracFone would be approximately 2% each. These price increases are expected to reduce the number of postpaid subscribers by approximately 2 million.

**Table 24: Prepaid Merger Simulation Results for 2017, Assuming PC-AIDS Demand**

Carrier	Pre-Merger Revenue Share [A]	Post-Merger Revenue Share [B]	Change in Revenue Share [C]	Pre-Merger ARPU [D]	Post-Merger ARPU [E]	Pct Chg ARPU [F]
AT&T	17.0%	17.8%	0.8%	\$33.05	\$33.81	2.3%
Verizon	5.9%	6.3%	0.3%	\$32.82	\$33.50	2.1%
Sprint	11.4%	9.6%	-1.8%	\$37.67	\$43.52	15.5%
T-Mobile	26.9%	25.6%	-1.3%	\$38.69	\$41.88	8.2%
TracFone	17.7%	18.5%	0.8%	\$22.83	\$23.36	2.3%
Other MVNOs	21.1%	22.2%	1.1%	\$31.58	\$32.21	2.0%
Combined	100.0%	100.0%		\$32.45	\$33.78	4.1%
Market Elasticity	-0.55	-0.55				
Total Subscribers (000s)	93,466	91,362				
Industry Revenue (000s)	\$35,767,399	\$37,816,005				

Sources: 20th Mobile Wireless Competition Report, p. 15 and 2017 Company Annual Reports.

Notes: Post-merger results produced from simulation. The model is calibrated using Sprint's marginal cost estimate shown in Table 12.

[A]: Total revenue shares are based on 2017 subscriber shares and 2017 Postpaid ARPU. Company Annual Reports. We model Other MVNO's as 15 equally sized brands. See Table 13 and Table 14.

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[C]: Post-merger segment share as estimated by simulation.

[C]:  $([B] - [A]) / [A]$ .

[D]: Prepaid ARPU for 2017 from Company Annual Reports. See Table 14.

[E]: Estimated post-merger price produced from simulation.

[F]:  $([E] - [D]) / [D]$ .

Aggregate Elasticity estimated from logit model calibration and post-merger simulation.

Total prepaid subscribers from 2017 Company Annual Reports. Change in subscribers calculated from simulation.

Industry prepaid revenues calculated as (ARPU x Subscribers) across carriers.

### 3. Conclusions on Unilateral Effects in Retail Market

Both the price pressure screens and the more complex merger simulations provide consistent evidence indicating that a Sprint/T-Mobile merger would likely result in unilateral price increases. While the GUPPI price pressure screen provides a qualitative assessment of the likely price effects, the results from preliminary merger simulations indicate that New T-Mobile would increase its prices in the range of 4% to 10% following the merger.

#### D. Unilateral Effects in the Wholesale Market

As shown in Table 13, TracFone and at least 58 other MVNOs account for approximately 45% of prepaid subscribers. We estimate that Sprint and T-Mobile account for over 60% of wholesale connections to MVNOs.<sup>71</sup> Given the MVNOs' relatively large share of prepaid wireless connections, the important role that Sprint and T-Mobile play in supplying MVNOs with network access, and the fact that prepaid MVNOs compete against Sprint and T-Mobile in the retail prepaid segment, we evaluate the effect of the merger on New T-Mobile's unilateral pricing incentives to raise its prepaid rivals' wholesale costs.

We assess New T-Mobile's incentives to increase wholesale prices using a Vertical Gross Upward Pricing Pressure Index ("vGUPPI") screen.<sup>72</sup> The vGUPPI screens evaluate the incentives to

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<sup>71</sup> Dennis Bourne, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.

Sprint and T-Mobile accounted for 13.6 million and 13.9 million of wholesale connections, respectively. AT&T and Verizon accounted for roughly 15 million wholesale connections combined.

<sup>72</sup> Moresi, Serge, and Steven C. Salop. "vGUPPI: Scoring unilateral pricing incentives in vertical mergers." *Antitrust LJ* 79 (2013): 185.

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foreclose using prices.<sup>73</sup> Our analysis focuses on the “upstream vGUPPI”, which measures T-Mobile and Sprint’s upstream pricing incentives in selling to downstream MVNOs that compete against Sprint and T-Mobile in the retail prepaid segment. The vGUPPI calculation weighs the incremental value from diverted downstream sales against the lost wholesale revenues resulting from the input price increase.

Because both Sprint and T-Mobile already compete in both vertical segments (i.e., the wholesale and prepaid retail segments), we focus on New T-Mobile’s incremental change in incentives to raise MVNOs’ costs relative to the pre-merger, standalone incentives of Sprint and T-Mobile. That is, we focus on New T-Mobile’s incentive to raise wholesale prices for (pre-merger) T-Mobile MVNO partners as a result of recapture of retail prepaid revenue through Sprint’s wholesale MVNO partners, an incentive which was absent when T-Mobile was determining prices with its MVNO partners. And we also focus on New T-Mobile’s incentive to raise wholesale prices for (pre-merger) Sprint MVNO partners as a result of recapture of retail prepaid revenue through T-Mobile’s wholesale MVNO partners, an incentive which was absent when Sprint was determining prices with its MVNO partners.

Our analysis considers two measures of vGUPPI: The first is a simple vGUPPI screen that assumes that the targeted MVNO retailer (e.g., TracFone) is unable to switch to an alternative wholesaler in response to a wholesale price increase from either Sprint or T-Mobile. The second vGUPPI calculation accounts for the targeted MVNO’s ability to find an alternative host network in response to New T-Mobile’s wholesale price increases.

Like the horizontal GUPPI presented above, the vGUPPI is the product of a diversion ratio, a profit margin and a price ratio.<sup>74</sup> The vGUPPI calculation that accounts for input substitution requires additional inputs related to Sprint and T-Mobile’s wholesale margins and the MVNO’s ability to pass through cost increases to consumers. Publically available information that would allow us to estimate Sprint and T-Mobile’s wholesale margins and allow us to estimate the MVNO’s pass-through rate is not available. Thus, we assume that Sprint and T-Mobile earn a

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<sup>73</sup> The traditional vertical arithmetic focuses on foreclosure through non-price means (e.g., refusals to deal).

<sup>74</sup> Moresi, Serge, and Steven C. Salop. "vGUPPI: Scoring unilateral pricing incentives in vertical mergers." *Antitrust LJ*79 (2013): 185.

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gross margin percentage on their wholesale sales to MVNOs that is equal to the margin the MVNO earns on its retail prepaid sales. Our analyses further assumes that the MVNO has a pass-through rate of 0.5 – implying that a \$1 increase in its costs results in a \$0.50 increase in the retail prices the MVNO charges its customers. Higher pass-through rates would imply higher vGUPPI values.

The results of both vGUPPI screens are presented in Table 25. For this analysis, we examine the vGUPPI based on ARPU information for TracFone, which, prior to the merger, has contracts with both T-Mobile and Sprint. Both screens indicate that New T-Mobile would have significant increases in its incentives to raise the wholesale prices on TracFone’s wholesale contracts.

**Table 25: vGUPPI Calculation for TracFone**

Item	Quantity of Interest	Source	
[A.1]	Diversion Ratio - TracFone to Sprint		10%
[A.2]	Diversion Ratio - TracFone to T-Mobile	<i>Diversion ratios assume proportional diversion of prepaid subscriber shares.</i>	24%
[B.1]	Retail Prepaid Margin - Sprint		41%
[B.2]	Retail Prepaid Margin - T-Mobile	<i>See horizontal GUPPI margin table for prepaid segment.</i>	45%
[C.1]	Price - Sprint		\$37.67
[C.2]	Price - T-Mobile	<i>See Logit &amp; PC-AIDS results tables for prepaid segment.</i>	\$38.69
[C.3]	Price - Tracfone		\$22.83
[D.1]	Wholesale Price - Sprint to Tracfone		\$7.35
[D.2]	Wholesale Price - T-Mobile to Tracfone	<i>Wholesale prices are from Table 12.</i>	\$5.91
[E.1]	vGUPPIu w/out Input Substitution - Sprint	$(([A.2] \times [B.2] \times [C.2] / [D.1])$	<b>55.4%</b>
[E.2]	vGUPPIu w/out Input Substitution - T-Mobile	$(([A.1] \times [B.1] \times [C.1] / [D.2])$	<b>26.8%</b>
[F.1]	<i>Tracfone Pass Through Rate</i>	Assumed	50.0%
[F.2]	<i>Demand elasticity: Retail</i>	From Prepaid Logit Model Calibration	-0.825
[F.3]	<i>Tracfone Gross Margin</i>	From Prepaid Logit Model Calibration	0.777
[G.1]	vGUPPIu with Input Substitution - Sprint	$(([A.2] \times [B.2] \times [C.2] / [D.1]) / (1/[F.3] + [F.2][F.1][D.1]/[C.3])$	<b>48.0%</b>
[G.2]	vGUPPIu with Input Substitution - T-Mobile	$(([A.1] \times [B.1] \times [C.1] / [D.2]) / (1/[F.3] + [F.2][F.1][D.2]/[C.3])$	<b>22.7%</b>

Note: See Moresi, Serge, and Steven C. Salop. "vGUPPI: Scoring unilateral pricing incentives in vertical mergers." *Antitrust LJ* 79 (2013): 185.

## IV. Coordinated Effects

### A. The Mobile Voice/Broadband Market Is Suitable for Tacit Collusion

The mobile voice/broadband market can be partitioned into retail (postpaid and prepaid), enterprise (corporations and governments), and wholesale segments. This discussion will focus on the retail segments, particularly the postpaid segment.

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A market is suitable for tacit collusion if it is conducive to firms coordinating on a stable collusive arrangement. There is a well-accepted set of market traits that determines a market's suitability for establishing and maintaining collusive prices.<sup>75</sup> One such market trait is transparent pricing, meaning that firms can easily and quickly observe rival firms' prices. Transparent pricing is instrumental to firms coordinating on supracompetitive prices, such as through the use of price leadership. Transparent pricing is also instrumental to stability, as the maintenance of supracompetitive prices requires that firms are able to monitor other firms for compliance and then quickly retaliate with lower prices. When prices are transparent, detection of a deviation is quick and retaliation can be swift.

The stability of a collusive arrangement also requires controlling potentially disruptive forces such as large buyers and the supply of firms not part of the collusive arrangement. Large buyers can disrupt attempts by firms to enact common price increases by threatening not to buy, finding alternative sources of supply, or representing a sizeable chunk of market demand that is sufficient to induce discounting or other forms of chiseling on a price agreement. Even if all firms comply with setting supracompetitive prices, collusion can be undermined by entry into the market and the expansion of fringe suppliers. The loss of sales to entrants and fringe suppliers can cause colluding firms to lower their prices to reclaim sales, which could destabilize a collusive arrangement.

In the context of the proposed merger between AT&T and T-Mobile in 2011, the Antitrust Division of the U.S. Department of Justice recognized that the wireless market was suitable for collusion because of “transparent pricing, little buyer-side power, and high barriers to entry and expansion.”<sup>76</sup> Regarding those market traits, little has changed in the last six years and, as a result, the wireless retail market (both postpaid and prepaid) remains suitable for tacit collusion.

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<sup>75</sup> These traits can be found in Motta, Massimo. *Competition policy: theory and practice*. Cambridge University Press, 2004, Chapter 4.2.

<sup>76</sup> “Certain aspects of mobile wireless telecommunications services markets, including transparent pricing, little buyer-side market power, and high barriers to entry and expansion, make them particularly conducive to coordination.” Complaint, *U.S. v. AT&T Inc., T-Mobile USA, Inc., and Deutsche Telekom AG*, 1:11-cv-01560, 2011 U.S D.D.C., August 31, 2011, ¶ 36.

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Transparent pricing is present in the retail market because firms post their prices online and in stores, and they extensively advertise them.<sup>77</sup> In 2016 alone, the four national wireless carriers collectively spent over \$9 billion on advertising.<sup>78</sup> While firms primarily disseminate price and plan information to inform consumers, rival firms will also easily and quickly learn those prices and plans. This price transparency is further enhanced by a general policy of nationwide pricing by network operators.<sup>79</sup>

In addition, the plans that network operators offer have become more similar since 2011. Currently, AT&T, Sprint, T-Mobile, and Verizon all offer plans that provide unlimited talk, text, and data. All providers offer plans that provide high-speed LTE data, and each carrier slows the data speed of high usage customers during periods of congestion.<sup>80</sup> Verizon and AT&T also offer lower-tier unlimited plans which are subject to such congestion-related data speed reductions regardless of monthly usage. The frequency of network congestion is likely to vary across providers, and even with these selective speed reductions, all users are likely to experience slower speeds during congested periods. All four carriers' top-tier unlimited plans include "mobile hotspots" which allow a customer to use their device as a Wi-Fi network for other

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<sup>77</sup> Sprint, for example, lists prices for all four national carriers on its website, along with a comparison of other plan features. "Sprint Unlimited data, talk & text cell phone plans," Sprint, available <https://www.sprint.com/en/shop/plans/unlimited-cell-phone-plan.html?ECID=vanity:unlimited>, accessed August 6, 2018.

<sup>78</sup> In 2016, AT&T spent \$3.8 billion on advertising, while Verizon spent \$2.7 billion, Sprint spent \$1.1 billion, and T-Mobile spent \$1.7 billion. See 20<sup>th</sup> Mobile Wireless Competition Report, ¶ 67.

<sup>79</sup> Nineteenth Report, *In the Matter of Implementation of Section 6002(B) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions with Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 16-137, FCC, September 23, 2016, fn. 227, [https://apps.fcc.gov/edocs\\_public/attachmatch/DA-16-1061A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DA-16-1061A1.pdf), accessed August 23, 2018 (19<sup>th</sup> Mobile Wireless Competition Report).

<sup>80</sup> Verizon's and AT&T's thresholds are 22 GB/month, Sprint's and T-Mobile's are 50 GB/month. See "Unlimited Data Plans," AT&T, available <https://www.att.com/plans/unlimited-data-plans.html>, accessed August 18, 2018; "Unlimited," Verizon, available <https://www.verizonwireless.com/plans/verizon-plan/>, accessed August 17, 2018; "Sprint Unlimited data, talk & text cell phone plans," Sprint, available <https://www.sprint.com/en/shop/plans/unlimited-cell-phone-plan.html?ECID=vanity:unlimited>, accessed August 6, 2018; and "T-MobileONE," T-Mobile, available [https://www.t-mobile.com/cell-phone-plans?icid=WMM\\_TM\\_Q117TMO1PL\\_H85BRNKTD037510](https://www.t-mobile.com/cell-phone-plans?icid=WMM_TM_Q117TMO1PL_H85BRNKTD037510), accessed August 6, 2018.

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internet-capable devices, though each carrier limits usage in some way.<sup>81</sup> Except for Sprint, each carrier also offers some form of international calling or roaming in their plans.<sup>82</sup> The similarity in plans makes coordination on prices easier. In sum, transparency with respect to prices (as well as plan features) is present in the retail market, and that is a market trait conducive to tacit collusion.

There is little buyer-side power in the retail market because buyers are largely individual consumers. In reviewing the AT&T/T-Mobile proposed merger, Commission staff found that transparent pricing and minimal buyer power are present in the retail market (and are conducive to collusion):

The transparency of prices (firms post and publicize them to market their plans), small size of individual retail transactions relative to the size of the market, and the common use of contracts by postpaid customers, make it likely that cheating on a coordinated consensus would be detected rapidly and matched (or otherwise punished).<sup>83</sup>

The market has become more suitable for tacit collusion on prices since 2011 because the four network operators have not used long-term service contracts since late 2015. Hence, the consequences of a punitive price war (in response to a firm having undercut the collusive price) will be more severe, for those lower prices will apply not just to new customers but also to many of a firm's existing customers. The threat of such a price war will then be a more effective deterrent, and that makes for a more stable collusive arrangement.

Collusion in the mobile voice/broadband market is also facilitated by high barriers to entry by facilities-based service providers and barriers to expansion by fringe suppliers (which include resellers and MVNOs). Entry by a facilities-based service provider is difficult, as it would require

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<sup>81</sup> Verizon and AT&T reduce speed after 22 GB/month, Sprint and T-Mobile after 50 GB/month. See “Unlimited Data Plans,” AT&T, accessed August 18, 2018, <https://www.att.com/plans/unlimited-data-plans.html>; “Unlimited,” Verizon, accessed August 17, 2018, <https://www.verizonwireless.com/plans/verizon-plan/>; “Sprint Unlimited data, talk & text cell phone plans,” Sprint, accessed August 6, 2018, <https://www.sprint.com/en/shop/plans/unlimited-cell-phone-plan.html?ECID=vanity:unlimited>; and “T-MobileONE,” T-Mobile, accessed August 6, 2018, [https://www.t-mobile.com/cell-phone-plans?icid=WMM\\_TM\\_Q117TMO1PL\\_H85BRNKTDO37510](https://www.t-mobile.com/cell-phone-plans?icid=WMM_TM_Q117TMO1PL_H85BRNKTDO37510).

<sup>82</sup> Plan details for each carrier were collected from the carriers' websites on August 6, 2018.

<sup>83</sup> FCC Staff Report, ¶ 77.

a massive investment in spectrum and physical infrastructure. A facilities-based entrant would first need access to spectrum. Consequently, access to spectrum is a significant barrier to entry.

Even if an entrant could potentially acquire sufficient spectrum, the cost to acquire that spectrum would be high. The average spectrum holdings for the four largest providers are 141.1 MHz, and the minimum spectrum holdings for a national provider are 109.8 MHz.<sup>84</sup> The preferred deployment of LTE networks is in 20 MHz channels. Even assuming a new entrant would be able to deploy more efficiently than incumbents (that is, with no legacy 2G or 3G networks using some of their spectrum), an entrant would likely need at least 40 MHz, but possibly as much as 60 MHz or 80 MHz, depending on its market ambitions.<sup>85</sup> A national network of cell sites would require around 50,000 sites.<sup>86</sup> Other network infrastructure, customer acquisition costs, and overhead would require additional up-front costs.

A second source of entry is from fringe supply in the form of resellers and MVNOs which, rather than own a network, lease parts of the networks of network operators. However, absent new regulations or merger conditions, fringe supply would not be an effective constraint on the setting of supracompetitive prices by the network operators because the network operators *control* the cost and quality of service and the capacities of MVNOs.<sup>87</sup>

MVNOs need access to the networks of the network operators and, therefore, network operators can control how much those suppliers can expand. Even when given access, network operators control the form of that access (as MVNO contracts with MNOs do not necessarily include “core control”) which affects the quality of service and limits the type of services that can be provided by the MVNO. Finally, network operators set the wholesale prices that are charged to resellers and MVNOs for access. If the contractual relationship between an MVNO and a network

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<sup>84</sup> See Table 28.

<sup>85</sup> A potential entrant interested in achieving only 5% of the market may in principle operate its network using only 20 MHz of LTE spectrum. However, as the target market share increases, more spectrum will be needed to effectively compete in quality with the other carriers.

<sup>86</sup> AT&T, Verizon, Sprint, and T-Mobile all have more than 50,000 cell sites as of 2015. John C. Hodulik, Batya Levi, Lisa L. Friedman, and Christopher Schoell, “UBS Evidence Lab: Switching intent on the rise,” UBS, Version 59, March 2, 2016, Figure 75.

<sup>87</sup> The FCC does not regulate the terms of MVNO agreements. As the following discussion suggests, this implies that network operators can effectively control the type, quantity, and price of the services that an MVNO can offer.

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operator ties the wholesale price paid by the MVNO to the retail prices set by the network, then any rise in retail prices due to collusion would automatically translate into higher wholesale rates, and that would limit the expansion of MVNOs. With all of these instruments at their disposal, network operators can prevent fringe supply from being a disruptive force if network operators were to collude.

A market's suitability for tacit collusion could also depend on the extent of switching costs faced by consumers. Switching costs refer to the costs that a consumer incurs to change its supplier.<sup>88</sup> The presence of switching costs causes a firm's demand to be less sensitive to its price because a firm's existing customers are less inclined to leave and rival firms' customers less inclined to come. In the mobile voice/broadband market, switching costs are the costs associated with a consumer changing his or her provider.

Switching costs affect the stability of a collusive arrangement. On the one hand, higher switching costs mean that a firm undercutting the collusive price will lure fewer customers from rival firms. That makes deviation less attractive and, therefore, collusion more stable. On the other hand, once having lured those customers through a price cut, switching costs will keep them with the firm and that enhances the profits from each customer taken from a rival firm; hence, deviation is more attractive and, therefore, collusion is less stable. The net effect of higher switching costs on the stability of tacit collusion is ambiguous.

Consider the costs from switching providers in the mobile voice/broadband market. As in any market, there are the time and psychological ("hassle") costs of researching different providers, contacting the current provider to end service, and contracting with the new provider to begin service.<sup>89</sup> Potentially more significant are termination fees associated with exiting a contract early. However, these have fallen as the industry has moved away from long-term contracts. Before 2013, customers who received subsidized phones faced early termination fees if they wanted to change providers prior to the conclusion of their contract term. Since all the national carriers have stopped requiring long-term contracts, customers are able to move between carriers

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<sup>88</sup> Farrell, Joseph, and Paul Klemperer. "Coordination and lock-in: Competition with switching costs and network effects." *Handbook of industrial organization* 3 (2007): 1967-2072.

<sup>89</sup> These "hassle costs" of switching have been estimated at around \$40-\$88. Weiergräber, Stefan. "Network effects and switching costs in the US wireless industry." (2014); Sonley, Laura. "Consumer Switching Costs in Mobile Telecommunications." PhD diss., Carleton University Ottawa, 2014.

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without facing early termination fees. However, for customers who opt to purchase a phone using an installment plan, the remaining balance on the phone must be paid off if the customer switches to a different provider.<sup>90</sup>

Given that switching costs have declined, one would expect the incidence of customers changing their wireless provider to increase. However, this has not been the case in the U.S. where subscriber “churn”—which measures the proportion of customers who leave their current provider in a given time period—has been generally steady or declining for each of the national carriers between 2012 and 2016.<sup>91</sup> Over this time period, churn rates for Verizon, AT&T, and Sprint have remained relatively flat, while the churn rate for T-Mobile has fallen by half. In 2011, T-Mobile had the highest churn rate in the industry, with over 3.5% of its customers leaving each month compared to 2.25% for Sprint, and 1.2%-1.4% for Verizon and AT&T. By 2016, T-Mobile’s churn rate was only 1.7% compared to Sprint’s 2.18% and Verizon and AT&T’s 1.25%-1.5%.<sup>92</sup> These figures indicate that wireless customers have been no more likely, and, in the case of T-Mobile, significantly less likely, to switch wireless providers today than they were when early termination fees and long term contracts imposed relatively higher switching costs.

Between 2014 and 2016, T-Mobile’s network quality improved substantially relative to AT&T and Verizon.<sup>93</sup> A potential explanation for the declining churn rates for T-Mobile relative to the other carriers is due to this narrowing of the quality gap between the providers’ services. By 2016 the difference in network coverage between T-Mobile, Verizon, and AT&T was substantially smaller than it was in the early 2010s. This decline in the quality differential along with the convergence in pricing illustrated in Table 9 has reduced the difference between providers in terms of both price and quality. Prior to these shrinking differences, consumers could select a

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<sup>90</sup> T-Mobile, “Equipment Installment Plan (EIP),” available <https://support.t-mobile.com/docs/DOC-1674>, accessed August 6, 2018.

<sup>91</sup> Seventeenth Report, *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 13-135, FCC, December 18, 2014, p. 15, available [https://apps.fcc.gov/edocs\\_public/attachmatch/DA-14-1862A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DA-14-1862A1_Rcd.pdf), accessed August 6, 2018 (17<sup>th</sup> Mobile Wireless Competition Report.); 20<sup>th</sup> Mobile Wireless Competition Report, p. 18.

<sup>92</sup> 17<sup>th</sup> Mobile Wireless Competition Report, p. 15; 20<sup>th</sup> Mobile Wireless Competition Report, p. 18.

<sup>93</sup> “State of Mobile Networks: USA (February 2016),” *OpenSignal*, available <https://opensignal.com/reports/2016/02/usa/state-of-the-mobile-network>, accessed August 15, 2018.

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lower-price but lower-quality network from Sprint or T-Mobile or they could opt for a higher-price, higher-quality network in AT&T or Verizon. If consumers' preferences between price and quality change over time, or if customers experience a shock in terms of price increases or unexpected quality issues that might induce them to switch wireless providers. The convergence of price and quality among the carriers could reduce the incentive for current subscribers to change providers and thus explain how the absence of a rise in churn rates is consistent with lower switching costs.

The Salop/Sarafidis Declaration argues that the presence of switching costs makes tacit collusion among firms in the mobile phone industry difficult.<sup>94</sup> However, given the ambiguous effect of switching costs on the stability of collusion and that switching costs have declined in the mobile voice/broadband market, our conclusion is that switching costs are not a significant factor when evaluating the suitability of the mobile voice/broadband market for tacit collusion.

In sum, transparent pricing makes it feasible for firms to coordinate on supracompetitive prices and to monitor for compliance with those prices. Little buyer-side power and high barriers to entry and expansion of fringe supply are conducive to the stability of a collusive arrangement. We conclude that the postpaid and prepaid retail segments are suitable for tacit collusion.

Before concluding our evaluation of the retail mobile voice/broadband market, it is worth noting a comparable market for which there was evidence of tacit collusion. Paul MacAvoy studied the market for long-distance telephone services in the late 1980's and early 1990's.<sup>95</sup> Like wireless, this market involved telecommunication services and was characterized by transparent pricing, little buyer-side power, high entry barriers, and some switching costs. During the period of the MacAvoy study, the long-distance telephone services industry was dominated by three firms—AT&T, Sprint, and MCI—and, if the Applicants' merger were to occur, so would the wireless industry with AT&T, New T-Mobile, and Verizon. Professor MacAvoy concluded that pricing behavior is “consistent not with price competition but rather with emerging tacit collusion

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<sup>94</sup> Salop/Sarafidis Declaration, ¶82.

<sup>95</sup> MacAvoy, Paul W., “Tacit Collusion Under regulation in the Pricing of Interstate Long-Distance Telephone Services,” *Journal of Economics & Management Strategy* 4, no. 2 (1995): 147-185.

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among AT&T, MCI, and Sprint.”<sup>96</sup> At a minimum, this study suggests that tacit collusion is plausible in the mobile voice/broadband market.

Turning to the enterprise (corporations and governments) and wholesale (MVNOs) markets, our assessment is that they are distinctly less suitable for tacit collusion. The most substantive obstacle to tacit collusion on prices is the lack of transparent pricing. Given that customers in those markets are not small, enterprise customers can use RFPs and consultants to negotiate prices, which means that prices are confidential and not public information.<sup>97</sup> Given that a firm cannot then easily and quickly learn of rival firms’ prices in the enterprise and wholesale markets, coordination on prices is difficult, as is monitoring for compliance.<sup>98</sup> Secondly, the fact that some buyers in the enterprise and wholesale markets are large introduces a potential source of instability due to buyer power (though there have been many successful episodes of collusion when there is significant buyer power).

However, barriers to entry to the enterprise and wholesale markets are probably at least as high as with retail markets. Furthermore, MVNOs are generally even less of a factor in the enterprise market than in the retail market, because governments and businesses often want the broader coverage that only national network operators are able to deliver. There is the possible exception that regional operators (like U.S. Cellular) may be able to effectively compete for small businesses and governments that mostly need regional coverage. The wholesale market is currently only supplied by the four network operators and there is no meaningful source of alternative supply.

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<sup>96</sup> MacAvoy, Paul W., “Tacit Collusion Under regulation in the Pricing of Interstate Long-Distance Telephone Services.” *Journal of Economics & Management Strategy* 4, no. 2 (1995): p. 147.

<sup>97</sup> Jarrett, Douglas, “Understanding the Business Deal in Wireless and Wireline Services Agreements,” *Beyond Telecom Law Blog*, May 23, 2011, available <https://www.beyondtelecomlawblog.com/understanding-the-business-deal-in-wireless-and-wireline-services-agreements/>, accessed August 6, 2018.

<sup>98</sup> Cartels in markets such as the enterprise wireless market, where price transparency is lacking, often coordinate on a market allocation scheme (e.g., each firm is allocated a sales quota) and then monitor it with respect to sales. Thus, sales monitoring replaces price monitoring. See Harrington Jr, Joseph E. “How do cartels operate?” *Foundations and Trends® in Microeconomics* 2, no. 1 (2006): 1-105; Marshall, Robert C., and Leslie M. Marx, *The Economics of Collusion: Cartels and Bidding Rings*. MIT Press, 2012. While coordinating and monitoring a market allocation scheme is feasible when firms engage in express communication, it is not clear how effectively it could be done using more tacit means.

In conclusion, the determinative factor in the enterprise and wholesale markets is the lack of transparent pricing and, on those grounds, the enterprise and wholesale markets do not appear particularly suitable for tacit collusion.

## B. Would the Merged Firm be a “Maverick”?

### 1. T-Mobile’s Maverick Strategy

For years, T-Mobile has been viewed as a maverick firm disrupting the industry to the benefit of consumers.<sup>99</sup> In its review of the proposed AT&T/T-Mobile transaction, Commission staff noted T-Mobile’s history of acting as a maverick,<sup>100</sup> introducing innovations related to customer usage, pricing, and network improvements.

Over the years, T-Mobile has introduced many innovations that provide its subscribers with various forms of unlimited calling and data use.<sup>101</sup> With respect to pricing innovations, T-Mobile was the first nationwide carrier to eliminate the typical two-year contract and offer month-to-month postpaid plans without early termination fees (2008) and to allow subscribers who were not on a long-term contract to pay for a new device in interest-free installments (2008).<sup>102</sup> In addition, T-Mobile also caused other carriers to accelerate network improvements, such as deployment of High Speed Packet Access (“HSPA+”): T-Mobile was the first carrier to deploy HSPA+ throughout its network, which caused AT&T to accelerate its own deployment.<sup>103</sup> The

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<sup>99</sup> For a discussion of mavericks in the context of merger analysis, see Horizontal Merger Guidelines, Sections 2.1.5, 5.3, and 7.1.

<sup>100</sup> FCC Staff Report, ¶ 24.

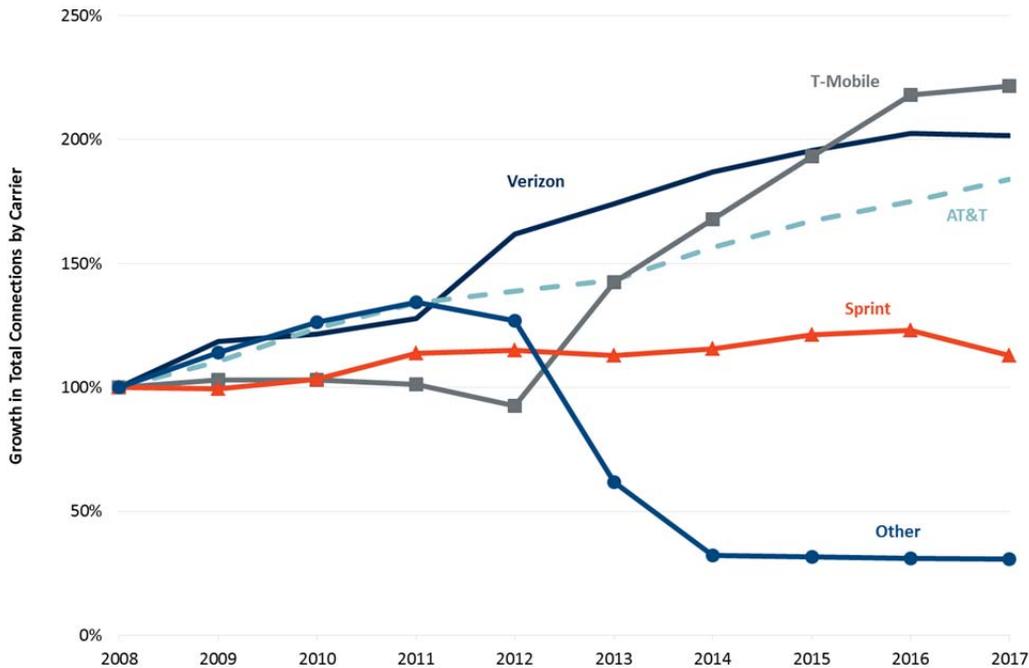
<sup>101</sup> For example, T-Mobile was the first carrier to offer unlimited Wi-Fi calling to customers who subscribed to its Hotspot data plans through its Unlimited Hotspot Calling (2007) and T-Mobile Hotspot @Home (2008) offerings. It also was the first carrier to allow subscribers who reached their monthly data cap to continue using data (albeit, at slower speeds) without incurring overage fees (2010), and the first carrier to extend unlimited sharing in family plans to text and data allowances (2011). See FCC Staff Report, ¶ 24.

<sup>102</sup> T-Mobile also offered customers a prepaid plan without an up-front deposit, at the same rates as postpaid subscribers pay through its Flex Pay plan in 2008. FCC Staff Report, ¶ 24.

<sup>103</sup> HSPA+ was the technology for GSM providers, such as AT&T and T-Mobile, prior to the development of Long Term Evolution (LTE) networks. Fifteenth Report, *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile*

success of T-Mobile’s strategy can be seen in its higher rate of customer growth. As shown in Figure 4, T-Mobile has seen its total number of wireless connections more than double since 2012, at a pace faster than any other carrier.

**Figure 4: Growth in Total Wireless Connections by Provider, 2008-2017**



Sources: Sixteenth Report, *In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services*, WT Docket No. 11-186, FCC, March 21, 2013, p. 55, available [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-13-34A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-13-34A1_Rcd.pdf), accessed August 23, 2018 (16<sup>th</sup> Mobile Wireless Competition Report.); 19<sup>th</sup> Mobile Wireless Competition Report, p. 11; 20<sup>th</sup> Mobile Wireless Competition Report, p. 15; Dennis Bournique, “Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator,” Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.

In recent years, T-Mobile has continued to disrupt the market by improving its service offerings, often causing other national carriers to follow. Notably, T-Mobile was the first carrier to

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*Services*, WT Docket No. 11-103, FCC, June 24, 2011, pp. 76 and 243-244, available <https://docs.fcc.gov/public/attachments/FCC-11-103A1.pdf>, accessed August 22, 2018 (15<sup>th</sup> Mobile Wireless Competition Report).

reintroduce unlimited data offerings in 2016 and included taxes and fees in the plan’s advertised price.<sup>104</sup> However, its competitive pressure on prices has decreased, likely reflecting the improvement of its network and the parallel increase in its market share.<sup>105</sup>

## 2. New T-Mobile Would Have Reduced Incentives for a Maverick Strategy

The impact of this proposed merger could well turn on whether or not the merged firm continues to be a maverick. We first describe the possible rationales for T-Mobile having been a maverick and then explain why those rationales may no longer be relevant after a merger with Sprint.

A maverick is a “firm that plays a disruptive role in the market to the benefit of customers.”<sup>106</sup> T-Mobile’s decision to be a maverick reflects a decision to adopt a strategic plan to compete aggressively. To be able to predict whether New T-Mobile would be a maverick, it is necessary to determine why T-Mobile has chosen to be a maverick and whether that rationale would persist after a merger with Sprint.

A plan of aggressive competition is costly to a firm, whether it means lower revenues from lower prices or higher cost from unlimited plans and any other feature of its offerings that serve to attract consumers. At its most basic level, as the Salop/Sarafidis Declaration notes,<sup>107</sup> T-Mobile’s maverick strategy is about foregoing some short-run profit in order to gain more subscribers,

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<sup>104</sup> Tara Donnelly, “T-Mobile’s Unlimited Family Plan Deal: 4 Lines for the Price of 3,” *WhistleOut*, September 9, 2016, available <https://www.whistleout.com/CellPhones/News/t-mobile-unlimited-family-plan-deal-4-lines-for-the-price-of3>, accessed August 6, 2018; Chaim Gartenberg, “Why Every US Carrier Has a New Unlimited Plan,” *The Verge*, February 17, 2017, <https://www.theverge.com/2017/2/17/14647870/us-carrier-unlimited-plans-competition-tmobile-verizon-att-sprint>, accessed August 18, 2018.

<sup>105</sup> T-Mobile’s current unlimited plan pricing and T-Mobile’s pricing of a single smartphone plan including the Equipment Installment Plan are in line with the pricing of similar plans by Verizon and AT&T. Also, in recent years T-Mobile has significantly improved the quality of its network, and its market share has increased by nearly 40% since 2014. See “State of Mobile Networks: USA (February 2016),” *OpenSignal*, available <https://opensignal.com/reports/2016/02/usa/state-of-the-mobile-network>, accessed August 15, 2018; Table 8.

<sup>106</sup> Horizontal Merger Guidelines, p. 3.

<sup>107</sup> Salop/Sarafidis Declaration, ¶ 56.

more sales, more market share, and ultimately greater profits. A maverick strategy is an investment, where the cost of investment is lower short-run profit in the short term due to lower revenues or higher costs, and the benefit of the investment is higher future profits from a large customer base.

The higher future profit can come from demand-side or supply-side effects. The demand-side effect is most likely due to switching costs. The relevance of switching costs is that, all else the same, it is easier for a firm to retain an existing customer than to attract new customers because existing customers must overcome switching costs to leave, while new customers either face no switching costs (if they are new to the market) or incur switching costs to come (if they are currently being supplied by another provider). As switching costs cause existing customers to be “locked in” to some degree, existing customers are less responsive to the firm’s price than are potential new customers. While the firm would then like to charge existing customers a higher price than new customers, that is not done in practice and is generally not feasible (though a firm might be able to offer some initial enticements to a new customer).<sup>108</sup> In deciding on its price, a firm balances a desire to price higher in order to earn more profit from existing customers, with a desire to price lower in order to attract new customers. The more existing customers that a firm has relative to the number of potential new customers (for which market share is a good proxy), the more its price decision is driven by extraction of profit from existing customers rather than attracting new customers. Hence, *a firm’s optimal price is increasing its market share*, which is a crucial property of a market in which customers face some switching costs, such as the mobile voice/broadband market.<sup>109</sup> T-Mobile has been pursuing a maverick strategy of low pricing in order to build up its customer base. That makes sense given its low market share (compared to AT&T and Verizon) for then the gain in new customers more than offsets the foregone revenue from existing customers. It is essential to emphasize that the future return from building a customer base is only realized when the firm starts charging higher prices to those locked-in customers.

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<sup>108</sup> When multi-year term contracts were offered, they were able to price discriminate between existing and new customers, especially in a market like wireless with rapidly declining unit prices.

<sup>109</sup> “[A] firm with more locked-in customers has more incentive to charge a high price to exploit them, and so sets high prices with greater probabilities than its rival.” Farrell, Joseph, and Paul Klemperer. “Coordination and lock-in: Competition with switching costs and network effects.” *Handbook of Industrial Organization* 3 (2007): 1967-2072.

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On the supply-side, there could be scale economies from serving more customers. For example, economies of scale may be achieved by adding customers and spectrum to an existing network, because individual cell sites will be able to serve more customers reducing the average cost per customer.<sup>110</sup> Scale economies are also present when marketing and advertising expenses and also customer care and marketing costs are spread over a larger customer base.

In summary, the takeaway from the preceding discussion is that T-Mobile's past aggressive conduct reflects a strategic decision to forego short-run profit in exchange for expanding its customer base which will contribute to higher future profit. How would a merger with Sprint affect those rationales for T-Mobile's maverick strategy? Like any investment, a maverick strategy is a temporary foregoing of profits to yield higher profits in the future. The investment is not intended to last forever, but rather only to persist until success (it delivers the intended higher profits) or failure (it is determined not to be a worthwhile investment). Thus, a maverick firm likely will not continue being a maverick once it has become a major firm in the market for, having achieved that status, it is time to cash in on the investment. This is why mavericks are rarely, if ever, market leaders or among the largest firms in a market, but tend to be smaller, less well-established firms.

A merger with Sprint would achieve the goal of T-Mobile's maverick strategy, which is to expand its customer base in order to reap demand-side and supply-side benefits. Not only is the goal reached, but it becomes far more costly to continue to compete aggressively. The larger customer base after the merger would make low prices more costly in terms of foregone profits on that base. It is more sensible to price high in order to reap larger profits on those customers, rather than price low to attract new customers. As already explained above, a firm's optimal price is increasing in its market share. For that reason, a maverick strategy of aggressive pricing is less attractive when a firm has a higher market share, as would be the case with New T-Mobile. With the demand-side and supply-side benefits realized from the expansion of its customer base as a result of the merger, it would not be optimal for New T-Mobile to employ a maverick strategy, just as it is not optimal for AT&T and Verizon to use a maverick strategy. Rather, it would be

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<sup>110</sup> This is true because the costs associated to each cell site include the tower costs and radio equipment costs. If only additional spectrum is used to serve new customers, then the average cost per customer will go down as the number of customers increase, because tower costs will be divided by a larger customer base.

better for New T-Mobile to stop trying to grow market share and instead focus on increasing margins as, for example, would be done by likely engaging in tacit collusion with AT&T and Verizon.

Consistent with this view, the Salop/Sarafidis Declaration notes that T-Mobile is pursuing a strategy of investing in a larger customer base in the present in order to enjoy higher future profits, and refer to it as “penetration pricing.”<sup>111</sup> It is well recognized that penetration pricing can be a profitable strategy because the firm undertaking it can later raise prices on customers once a sufficiently large customer base has been established.<sup>112</sup>

That New T-Mobile would not use a maverick strategy and instead act like AT&T and Verizon in the post-merger market is consistent with Table 28, which shows that the merged firm would be very similar to AT&T and Verizon in terms of total subscriber connections, spectrum holdings, and cell sites. New T-Mobile would have total subscriber connections of 135 million compared to 145 million and 131 million for AT&T and Verizon, respectively.<sup>113</sup> The coverage of the three network operators would be at least 95% of the U.S. population, and the low-band spectrum holdings of New T-Mobile would be almost exactly that of AT&T.<sup>114</sup>

The Salop/Sarafidis Declaration claims that the merged firm will maintain and reinforce T-Mobile’s current reputation as the disruptive “Un-carrier” on the grounds that (quoting Peter Ewens) “squandering such a successful Un-carrier business strategy for small incremental profits would be a financial and business disaster for the long-term success of New T-Mobile.”<sup>115</sup> If New T-Mobile, along with AT&T and Verizon, raised prices as part of tacit collusion, it is true that their customers would not be pleased, just as no customers are pleased with higher prices. But where would they go? There is no other “Un-carrier” to which customers can turn. The lack of

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<sup>111</sup> Salop/Sarafidis Declaration, ¶ 56.

<sup>112</sup> Spann, Martin, Marc Fischer, and Gerard J. Tellis. “Skimming or penetration? Strategic dynamic pricing for new products.” *Marketing Science* 34, no. 2 (2014): 235-249.

<sup>113</sup> See Table 28.

<sup>114</sup> See 20<sup>th</sup> Mobile Wireless Competition Report, Appendix III: Table III.D.ii. Assuming there are no divestitures, New T-Mobile would have far more high-band spectrum than either AT&T or Verizon. See Section V.

<sup>115</sup> Salop/Sarafidis Declaration, ¶ 24 (quoting Declaration of Peter Ewens, ¶ 8).

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that option for its customers gives New T-Mobile the incentive to replace a maverick strategy with a more accommodating strategy with AT&T and Verizon.

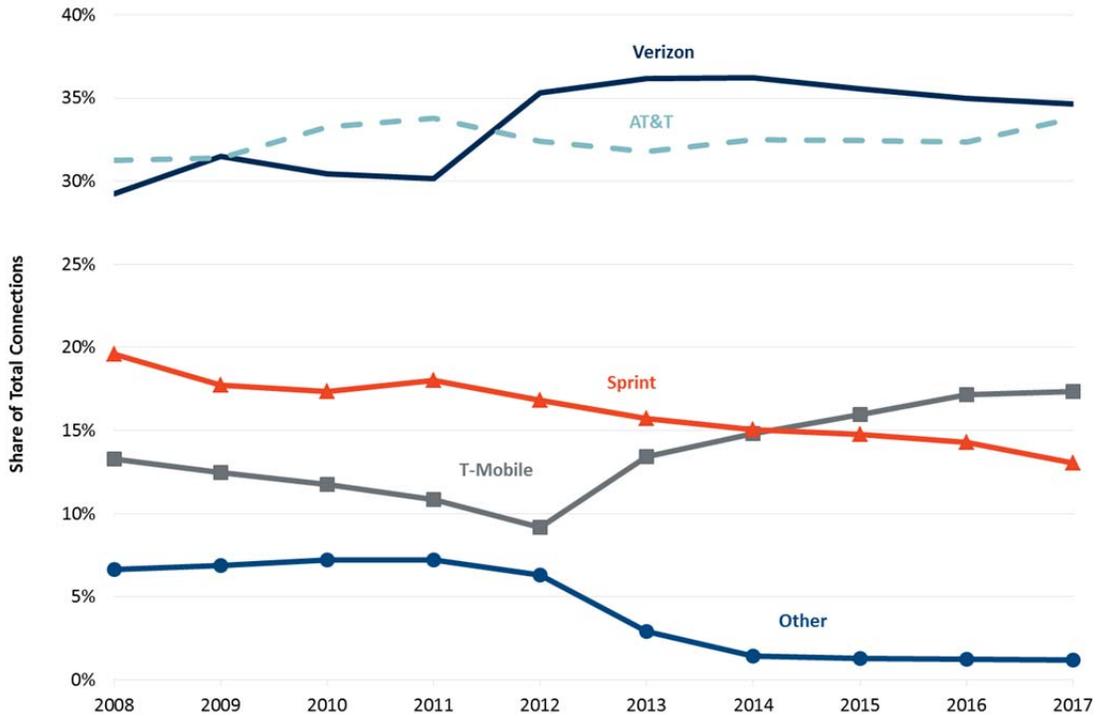
Even if the rationale for T-Mobile using a maverick strategy remained relevant for New T-Mobile, it would not be in the best interests of New T-Mobile to pursue it because of a likely aggressive response from AT&T and Verizon. A maverick strategy can be rational only as long as the other firms do not respond in kind. If they were to respond in kind, then a firm has foregone profits without gaining market share. It makes little sense for a firm to reduce its price when it will cause rival firms to reduce their prices, and thereby thwart its attempt to attract more customers. In that situation, a maverick strategy has lower profit margins without gaining customers. Given that AT&T and Verizon would be likely to match an aggressive strategy of the comparably-sized New T-Mobile, the merged firm would be choosing between intense competition (and little change in market share) and modest competition or collusion (and little change in market share). The latter is more attractive and is made even more so with the enhanced prospect of collusion as a result of the merger.

The Salop/Sarafidis Declaration observes that T-Mobile continued with a maverick strategy after it acquired MetroPCS in 2013, and then comments that it is a good predictor of how T-Mobile would behave after merging with Sprint. Such a prediction is not warranted because the acquisitions are very different in size and character. As seen in Figure 5 below, MetroPCS accounted for less than 5% of total wireless connections.<sup>116</sup> While the acquisition of MetroPCS led to an immediate jump in T-Mobile's connection share, in 2013 T-Mobile (post-acquisition) still remained the fourth largest firm, lagging just behind Sprint (at more than 15% share) and much smaller than AT&T and Verizon (both greater than 30%).

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<sup>116</sup> MetroPCS is part of "Other" in Figure 5. Specifically, in 2012 FCC data indicate that MetroPCS held 2.7% of all wireless connections.

Figure 5: Share of Total Wireless Connections by Provider, 2008-2017



Sources: 16<sup>th</sup> Mobile Wireless Competition Report, p. 55; 19<sup>th</sup> Mobile Wireless Competition Report, p. 11; 20<sup>th</sup> Mobile Wireless Competition Report, p. 15; Dennis Bournique, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator;" Prepaid Phone News, February 19, 2018, <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.

Compare the MetroPCS acquisition to the proposed merger between T-Mobile and Sprint. T-Mobile’s market share would rise from 17.3% to 30.3% (see Table 17), which would make it comparable in size to AT&T (33.8%) and Verizon (34.7%). Furthermore, Sprint owns considerably more spectrum than MetroPCS had. There is really no comparison between T-Mobile acquiring MetroPCS and merging with Sprint. The MetroPCS acquisition was just one of many steps to grow T-Mobile’s customer base towards becoming a major player in the mobile voice/broadband market. The merger with Sprint is a quantum leap that achieves the goal of being a major player. With such a quantum leap, one should expect a change in a firm’s strategy, and not simply a continuation of what was done in the past.

In conclusion, T-Mobile has been pursuing a maverick strategy to gain advantages from building its customer base and, having achieved that goal as a consequence of the merger, it likely would

not be profitable for it to continue to use a maverick strategy. Furthermore, AT&T and Verizon are unlikely to accommodate New T-Mobile acting as a maverick because its size would make it more of a threat. A merger between the Applicants likely would not result in a maverick, but rather a firm whose size is comparable to AT&T and Verizon and whose interests are well-aligned with those of AT&T and Verizon. Such a market structure is conducive to collusion.

### C. Would a Merger Between the Applicants Have Coordinated Effects?

As stated in the Merger Guidelines: “an acquisition eliminating a maverick firm in a market vulnerable to coordinated conduct is likely to cause adverse coordinated effects.”<sup>117</sup> Section IV.A discussed how the prepaid and postpaid mobile voice/broadband retail market is “vulnerable to coordinated conduct.” Section IV.B.2 noted that it would not be in the best interests of New T-Mobile to use a maverick strategy and, therefore, a merger between the Applicants likely would mean “eliminating a maverick firm.” According to the Merger Guidelines, the combination of these two conditions suggests that a merger between the Applicants would have coordinated effects. The objective of this section is to evaluate the applicability of that claim to the Applicant’s proposed merger.

Coordinated effects occur when a merger facilitates market conduct to move from competition to collusion. For collusion to arise, three conditions must be satisfied.<sup>118</sup> First, enough firms in a market must want to collude, which is referred to as the “participation” condition. Second, there must exist a stable collusive arrangement. Referred to as the “stability” condition, it ensures that if firms are able to replace competitive prices with collusive prices, then those higher prices will persist over time; that is, there is not an incentive for one or more firms to undermine the collusive arrangement (e.g., by undercutting the collusive price). Third, even if firms want to collude (“participation”) and can collude (“stability”), there is still the matter of transiting from competition to collusion. Firms must be able to orchestrate a coordinated shift from competition to collusion. Referred to as the “coordination” condition, it is especially relevant when firms do not engage in express communication, which is the presumption we will be making.

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<sup>117</sup> Horizontal Merger Guidelines, p. 25.

<sup>118</sup> Harrington Jr, Joseph E., “Thoughts on Why Certain Markets are More Susceptible to Collusion and Some Policy Suggestions for Dealing with Them,” In *Background Paper, OECD Global Forum on Competition*, 2015.

Our coordinated effects analysis of a merger between Sprint and T-Mobile will take account of whether the merger would make it more likely that the participation, stability, and coordination conditions are satisfied and, therefore, whether tacit collusion is substantively more likely as a result of the merger.

Section IV.A made the case that the retail market is suitable for tacit collusion. However, just because a market is suitable for tacit collusion, it does not follow that tacit collusion is likely to emerge. For there to be a serious risk of tacit collusion, there must be an appropriate market structure; that is, a configuration of firms, with regard to their number and traits, that make them inclined to want to collude and to be able to tacitly coordinate on a collusive arrangement. This section takes account of the mobile voice/broadband market structure in assessing whether a merger between Sprint and T-Mobile would likely have coordinated effects. Our conclusion is that it likely would.

Our approach to evaluating whether a merger between Sprint and T-Mobile would have coordinated effects has three steps. First, we note that there are some serious impediments in the pre-merger market that make tacit collusion difficult to achieve. The pre-market configuration of firms is not particularly conducive to tacit collusion emerging. Second, we discuss how a merger between Sprint and T-Mobile would alleviate those impediments and, therefore, would significantly increase the likelihood of tacit collusion. Third, we argue that the merger would not only make tacit collusion significantly more likely, but that there would be a serious risk of tacit collusion in the post-merger market.

### 1. Tacit Collusion Remains Difficult in the Pre-Merger Market

As noted, for tacit collusion to occur in a market, three conditions must be satisfied: participation, stability, and coordination. First, enough firms in a market must want to collude (participation). Second, there must exist a stable collusive arrangement (stability). Third, firms must be able to orchestrate a coordinated shift from competition to collusion (coordination). With those conditions in mind, the possible collections of firms in the pre-merger market and the likelihood of tacit collusion given the current market structure are assessed.

AT&T and Verizon are currently the dominant firms in the mobile voice/broadband market, as shown by Table 26. AT&T and Verizon each has a share of estimated total connections that is about double that of Sprint or T-Mobile, and combined they account for approximately two-

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thirds of total connections. The capital investment over the last five years was 130% to 150% higher for AT&T and Verizon than for Sprint and T-Mobile. In terms of customer performance, AT&T and Verizon have lower churn rates and longer average subscription duration. Given their dominant position in the mobile voice/broadband market, collusion is unlikely to be effective unless both AT&T and Verizon were to participate. Therefore, the relevant candidate collusive arrangements in the pre-merger market are: (1) AT&T and Verizon colluding by themselves (that is, without Sprint and T-Mobile); (2) AT&T and Verizon colluding with either Sprint or T-Mobile (but not both); and (3) AT&T and Verizon colluding with both Sprint and T-Mobile.

**Table 26: 2016 U.S. Wireless Provider Comparison**

Provider	2016 Market Share	Share of Total U.S. Population Covered	Share of Total U.S. Square Miles Covered	Total 5 Year Capital Investment	Total 10 Year Capital Investment	Average Monthly Churn	Average Subscription Life (Years)
[A]	[B]	[C]	[D]	[E]	[F]	[G]	[H]
AT&T	32.4%	99.3%	71.7%	\$ 52,519,000,000	\$ 86,954,000,000	1.5%	6.1
Verizon	35.0%	97.3%	66.3%	\$ 51,762,000,000	\$ 89,273,000,000	1.2%	7.3
Sprint	14.3%	92.0%	27.5%	\$ 22,426,000,000	\$ 34,885,000,000	2.2%	4.3
T-Mobile	17.1%	95.1%	47.7%	\$ 20,885,000,000	\$ 36,333,000,000	1.7%	5.3

Sources: Estimated total connections, coverage data, and capital expenditure data from 2010 through 2016 from the 20<sup>th</sup> Mobile Wireless Competition Report, pp. 15, 48, and 80. Capital expenditure data from 2005 through 2009 from the 15<sup>th</sup> Mobile Wireless Competition Report, p. 132. Churn data UBS Wireless Report, p. 19.

Notes:

[B]: Market share based on estimated total connections as reported in the 20<sup>th</sup> Mobile Wireless Competition Report.

[C]: Share of total U.S. population covered by provider as reported in the 20<sup>th</sup> Mobile Wireless Competition Report.

[D]: Share of total U.S. square miles covered by provider as reported in the 20<sup>th</sup> Mobile Wireless Competition Report.

[E]: Sum of capital expenditures for each provider from 2012 through 2016 as reported in the 20<sup>th</sup> Mobile Wireless Competition Report.

[F]: Sum of capital expenditures for each provider from 2007 through 2016 as reported in the 15<sup>th</sup> Mobile Wireless Competition Report and the 20<sup>th</sup> Mobile Wireless Competition Report. Capital expenditures from 2005 through 2009 are estimated based on Chart 30 in the 15<sup>th</sup> Mobile Wireless Competition Report.

[G]: Average monthly churn calculated as the geometric mean of monthly churn rates as reported in UBS Wireless Report.

[H]: Average subscription life, calculated as 1 / average monthly churn. Figures based on monthly churn rates reported in UBS Wireless Report.

Collusion on price by AT&T and Verizon without Sprint and T-Mobile would be difficult because it would be likely to violate the stability condition. If Sprint and T-Mobile were not part of the collusive arrangement, then in response to coordinated price increases by AT&T and Verizon, Sprint, and T-Mobile would be expected not to follow those increases and sell at a

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discount to AT&T and Verizon. Consumers have exhibited a willingness to switch and that increased discount would induce some customers to move from AT&T and Verizon to Sprint and T-Mobile. The evolution of T-Mobile's market share is supportive of this point. From 2013 to 2017, T-Mobile expanded its share of total connections from approximately 13% to approximately 17% in 2017.<sup>119</sup> Furthermore, Sprint and T-Mobile have the excess capacity to serve a substantive increase in demand. This is shown in Table 28, which notes that both Sprint and T-Mobile have fewer subscribers per cell than either AT&T or Verizon, as well as larger spectrum holdings than either AT&T or Verizon. And, as shown in Table 11, the estimated marginal capital costs per subscriber are only \$56 and \$58 for Sprint and T-Mobile, respectively, compared to \$81 and \$94 for Verizon and AT&T, respectively. Thus, Sprint and T-Mobile are in a good position to expand their subscriber base should AT&T and Verizon enact coordinated price increases.

T-Mobile not only has the capacity to expand supply, its conduct in recent years has revealed a desire and an ability to expand. In March 2013, T-Mobile launched its "Un-carrier" initiative, which started the industry trend of moving away from long-term contracts and data overage charges, and returning to unlimited data plan offerings.<sup>120</sup> Prior to its aggressive "Un-carrier" strategy, T-Mobile's subscriber base was not growing significantly.<sup>121</sup> However, beginning in 2013, T-Mobile began to gain large numbers of subscribers, and by 2015 and into 2016 it had the largest net subscriber additions of any national carrier.<sup>122</sup> A coordinated price increase by AT&T and Verizon would provide a golden opportunity for T-Mobile to further expand, and at even higher profit margins than in the past. In sum, the loss of sales that AT&T and Verizon would experience from implementing a common price increase without the participation of Sprint and T-Mobile is likely to make collusion untenable. Collusion by AT&T and Verizon would leave too much capacity controlled by firms not party to the collusive arrangement.

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<sup>119</sup> See Figure 5 and Table 17.

<sup>120</sup> 17<sup>th</sup> Mobile Wireless Competition Report, p. 69.

<sup>121</sup> From 2008 to 2012, T-Mobile averaged 850,000 net additions per year. See 16<sup>th</sup> Mobile Wireless Competition Report, p. 14.

<sup>122</sup> From 2013 to 2016, T-Mobile averaged 7.27 million net additions per year. See 20<sup>th</sup> Mobile Wireless Competition Report, p. 17.

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Collusion by AT&T, Verizon, and either Sprint or T-Mobile (but not both) is unlikely because it would violate the participation condition and could also violate the coordination condition. Consider, say, Sprint tacitly colluding with AT&T and Verizon, and all three firms implementing a coordinated price increase. T-Mobile could then either maintain its price or increase it less than the rise in the prices by the other three network operators, which would result in T-Mobile's sales and market share rising due to the discount it is offering relative to its competitors. This shift of sales from AT&T, Verizon, and Sprint to T-Mobile would be especially severe for Sprint as Sprint's customers have been found to be more sensitive to T-Mobile's prices. As shown in Figure 5, T-Mobile's share of connections has been steadily climbing since 2013 while Sprint's connection share has steadily dropped (and over this same period AT&T and Verizon experienced little change in their shares).<sup>123</sup> Anticipating a loss in sales and market share, Sprint would not want to participate in coordinated price increases with AT&T and Verizon. Hence, the participation condition for Sprint is likely to be violated if collusion were only to involve AT&T, Verizon, and Sprint. An analogous argument holds if instead collusion were only to involve AT&T, Verizon, and T-Mobile. In that case, it is T-Mobile's participation condition that would be violated. In conclusion, we do not believe that collusion on price in the pre-merger market among AT&T, Verizon, and either Sprint or T-Mobile would occur because not all of the firms would want to participate.

Even if AT&T, Verizon, and either Sprint or T-Mobile did want to participate in a collusive arrangement, which we have argued would probably not be the case, the coordination condition is likely to be violated. Though it can be feasible for three firms to tacitly coordinate, the risk of mis-coordination is heightened in the current market because of the uncertainty regarding whether Sprint or T-Mobile would participate. That uncertainty could deter any of the network operators from taking the lead on price as part of tacit collusion. Thus, even if Sprint (or T-Mobile) were willing to collude with AT&T and Verizon, coordination would be another obstacle to collusion.

Finally, there is the case of all four network operators colluding. Collusion by AT&T, Verizon, Sprint, and T-Mobile is unlikely because it would violate the participation and coordination conditions, and could also violate the stability condition. The participation condition would

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<sup>123</sup> Given that AT&T and Verizon gained market share through acquisitions of MVNOs and resellers, that their market share are largely unchanged indicates that they also lost some market share to T-Mobile.

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likely be violated for T-Mobile. T-Mobile's maverick strategy is consistent with a goal of growing market share. That means it is unlikely to participate in a collusive arrangement that would require freezing its market share, which is typically implicit or explicit in a collusive arrangement.<sup>124</sup> T-Mobile's past conduct is inconsistent with it participating in the typical collusive arrangement.

Even if T-Mobile were willing to participate, which seems unlikely, it is difficult for four firms to coordinate without express communication. The prospect of coordination failure is heightened by the uncertainty regarding whether T-Mobile wants to participate. For example, even if Sprint were willing to participate if the other three network operators were to do so, it may still not follow a price increase by, say, AT&T because it is unsure that T-Mobile would follow, and Sprint may not want to risk losing market share to T-Mobile; and if it is uncertain that Sprint and T-Mobile would follow a price increase, it becomes risky for either AT&T or Verizon to lead on price. Tacit collusion among four firms is inherently challenging and that is made more so when there is uncertainty regarding whether all firms want to collude. For this reason, the coordination condition is unlikely to be satisfied.

Even if all four network operators did want to participate in a collusive arrangement to raise prices and were able to coordinate, there is a reasonable chance that the stability condition would be violated. Sprint or T-Mobile could be tempted to undercut price in order to pick up market share, hoping that the three remaining firms would continue to collude. Collusion is fragile when some firms are discontent with their market shares, and Sprint's and T-Mobile's

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<sup>124</sup> Some examples of cartels in which the market allocation involved maintaining market shares prior to collusion include those in the markets for citric acid, organic peroxides, sorbates, and zinc phosphate; see European Commission decisions reported in Harrington Jr, Joseph E., "How do cartels operate?" *Foundations and Trends® in Microeconomics* 2, no. 1 (2006): 1-105. There are also documented episodes in which a firm discontinued its participation in a collusive arrangement because of its expressed desire to increase its market share. Some examples include cement, choline chloride, and lysine; see Harrington, Joseph E., Kai Hüscherlath, Ulrich Laitenberger, and Florian Smuda, "The discontent cartel member and cartel collapse: The case of the German cement cartel," *International Journal of Industrial Organization* 42 (2015): 106-119.

recent attempts to increase their market shares reveal that they are not content with their market positions.<sup>125</sup>

Summarizing our assessment of the likelihood of tacit collusion in the pre-merger environment, we find:

- Collusion by only AT&T and Verizon is unlikely because collusion would probably be unstable. There would be too much capacity controlled by firms that are not part of the collusive arrangement.
- Collusion by AT&T, Verizon, and either Sprint or T-Mobile (but not both) is unlikely because neither Sprint nor T-Mobile would want to participate. If Sprint were to collude with AT&T and Verizon, it would lose potentially significant market share to T-Mobile and thus it would not participate. An analogous argument applies to participation by T-Mobile, which would lose market share to Sprint. Furthermore, the uncertainty surrounding participation by Sprint or T-Mobile would make coordination challenging.
- Collusion by all four network operators is unlikely because it violates the coordination and participation conditions. T-Mobile is unlikely to want to participate because it wants to grow market share, and participation would require maintaining its market share. Even if the participation condition was satisfied for all four network operators, coordination is problematic because tacit coordination is very difficult when it involves four firms, especially given the uncertainty about whether T-Mobile would participate.

## 2. Tacit Collusion Would Be Significantly More Likely in the Post-Merger Market

Distilling the key points in the preceding analysis, the primary obstacles to tacit collusion in the pre-merger market are: 1) Sprint and T-Mobile have enough excess capacity that, if they were not to collude, it would undermine collusion between AT&T and Verizon; 2) Sprint is unlikely to collude with AT&T and Verizon because it would lose market share to T-Mobile (with an analogous argument applying to T-Mobile if it were to participate in a collusive arrangement

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<sup>125</sup> Harrington, Joseph E., Kai Hüscherlath, Ulrich Laitenberger, and Florian Smuda, “The discontent cartel member and cartel collapse: The case of the German cement cartel,” *International Journal of Industrial Organization* 42 (2015): 106-119.

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with AT&T and Verizon); and 3) T-Mobile is unlikely to collude with AT&T, Verizon, and Sprint because T-Mobile would not achieve its goal of increasing its market share.

With that understanding, a merger between Sprint and T-Mobile likely would have coordinated effects because: 1) New T-Mobile is more willing to collude with AT&T and Verizon than is either Sprint or T-Mobile before a merger, which means the participation condition for collusion is more likely to be satisfied; and 2) it is less difficult for AT&T, Verizon, and New T-Mobile to coordinate than any collection of three or four firms in the pre-merger market, which means the coordination condition for tacit collusion is more likely to be satisfied. Finally, the stability condition is satisfied for the reasons given in Section IV.A and we elaborate upon these points in Section IV.C.3 below.

One of the major obstacles to collusion in the pre-merger market is that T-Mobile has been pursuing a maverick strategy to grow its market share. Participation in a collusive arrangement would require T-Mobile to adopt a less aggressive strategy and accept little growth in its market share. T-Mobile's past conduct reveals it is not willing to do that.

As noted in Section IV.B, the merger of the Applicants would result in a combined firm that is more content with its market share (than is T-Mobile currently) and that would not find a maverick strategy to be in its best interests. New T-Mobile's interests would be more aligned with those of AT&T and Verizon with an emphasis on increasing profit margins rather than capturing market share. Those interests would be best served through coordinated price increases, which tacit collusion would deliver. The claim that New T-Mobile would likely not be a maverick and would have interests aligned with those of AT&T and Verizon was discussed above in Section IV.B.2.

A merger among medium-sized firms—such as Sprint and T-Mobile in the mobile voice/broadband market—can have significant coordinated effects because it affects the incentive to participate in a collusive arrangement:

In exploring the incentives associated with joining a cartel, a firm faces a trade-off. By becoming a member of the cartel, more capacity is brought under the control of the cartel, which leads to a higher cartel price. Hence, a firm benefits from a higher price-cost margin by joining the cartel. The downside is that it is forced to reduce its sales ... A firm finds it optimal not to join the cartel when its capacity is sufficiently low because the effect of its membership on price is trivial but, at the same time, it experiences a non-trivial reduction in its output. Thus, we

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should not expect a cartel to include very small firms. [T]he merger with the biggest price effect involves a medium firm and either another medium firm or a small firm.<sup>126</sup>

As previously stated, significant unused capacity would be available outside of a collusive arrangement involving only AT&T and Verizon, and that would be a challenge to the stability of collusion. Under the current market structure, Sprint would not want to join an arrangement with AT&T and Verizon because it would forego too much in sales and market share to T-Mobile, as long as T-Mobile remained outside of the collusive arrangement. Similarly, T-Mobile would not want to join an arrangement with AT&T and Verizon.

However, the merged firm's incentives are very different, for now New T-Mobile joining a collusive arrangement with AT&T and Verizon would bring more capacity to the table—which means price will commensurately increase more—and leaves less capacity (effectively, none) outside of it—which means there will not be a loss of sales and market shares. It is the merger between the Applicants—rather than between any other two network operators—that would have the largest coordinated effects because it would create the strongest incentives for all network operators to participate in a collusive arrangement.<sup>127</sup>

In addition to participation in collusion becoming more likely as a consequence of a merger between Sprint and T-Mobile, coordination also becomes easier. Of course, it is easier for three firms to coordinate than it is for four firms.<sup>128</sup> But the merger does more than that; it eases the challenge of coordination by aligning firms' interests. In the post-merger market, AT&T, Verizon, and New T-Mobile would have a common interest in colluding and, furthermore, their

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<sup>126</sup> Bos, Iwan, and Joseph E. Harrington, Jr. "Endogenous cartel formation with heterogeneous firms." *The RAND Journal of Economics* 41, no. 1 (2010): 92-117.

<sup>127</sup> "A merger between two moderate-sized firms may significantly expand the size and profitability of a potential cartel by inducing the merged firm to be a cartel member. From the perspective of an antitrust or competition authority, concerns about coordinated effects may be most severe for these mergers involving firms which are not small, but not large either." Bos, Iwan, and Joseph E. Harrington, Jr. "Endogenous cartel formation with heterogeneous firms." *The RAND Journal of Economics* 41, no. 1 (2010): 108.

<sup>128</sup> "Other things being equal, collusion is the more likely the smaller the number of firms in the industry. ... [T]he lower the number of [firms] in the industry the easier for them to coordinate their behaviour." Motta, Massimo, *Competition policy: theory and practice*, Cambridge University Press, 2004, pp. 142-143.

pricing incentives would be more aligned and that makes it easier to coordinate on common price increases.

There is a substantive misalignment of interests in the pre-merger market between AT&T and Verizon on one hand and Sprint and T-Mobile on the other hand. Given their smaller market shares, Sprint and T-Mobile have been more aggressive in growing market share than AT&T and Verizon. Table 9 shows that, recently, ARPUs have been similar between AT&T and Verizon, and they have been well above the ARPUs for Sprint and T-Mobile. That measure reflects their different positions in the market; Sprint and T-Mobile need to expand and solidify their customer base with lower prices, while that is not a first-order concern for AT&T and Verizon. This misalignment of interests between the two larger network operators—AT&T and Verizon—and the two smaller network operators—Sprint and T-Mobile—makes tacit collusion difficult in the pre-merger market. In Section IV.B, we noted that New T-Mobile would likely not be the maverick that T-Mobile was, and that, more generally, the merger aligns the interests of AT&T, Verizon, and New T-Mobile, which is conducive to collusion.

Elaborating on this point, the merger would better align the pricing incentives of the network operators. This is because of the relationship between a firm's preferred price and its market share in a market with switching costs. For the current discussion, the relevance of switching costs is that, all else the same, it is easier for a firm to retain an existing customer than to attract new customers because existing customers must overcome switching costs to leave, while new customers either face no switching costs (if they are new to the market) or incur switching costs to come (if they are currently being supplied by another provider).

As discussed in Section IV.A, a firm's existing customers are less responsive to its price than are potential new customers. While the firm would then like to charge existing customers a higher price than new customers, that is not done in practice and is generally not feasible (though a firm might be able to offer some initial enticements to a new customer).<sup>129</sup> In deciding on its price, a firm balances a desire to price higher in order to earn more profit from existing customers, with a desire to price lower in order to attract new customers. The more existing customers that a firm

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<sup>129</sup> When multi-year term contracts were offered, they were able to price discriminate between existing and new customers, especially in a market like mobile voice/broadband with rapidly declining unit prices.

has relative to the number of potential new customers (for which market share is a good proxy), the more is its price decision driven by extraction of profit from existing customers rather than attracting new customers. Hence, a firm's preferred profit margin is increasing in its market share, which is a crucial property of a market in which customers face switching costs, such as the mobile voice/broadband market.<sup>130</sup>

By this argument, the higher market shares of AT&T and Verizon compared to Sprint and T-Mobile imply that the preferred profit margins of AT&T and Verizon are generally higher than those for Sprint and T-Mobile, which is consistent with the profit margin estimates shown in Table 12. As the merger would result in New T-Mobile having a market share similar to that of AT&T and Verizon,<sup>131</sup> the post-merger market would have firms whose pricing incentives are much better aligned compared to the pre-merger market. With more similar pricing incentives, it is easier for firms to coordinate on a collusive price increase, as there is a larger range of price increases that all firms agree are attractive. Smaller differences in network quality between carriers after the merger could further facilitate such price increases since the services offered by different providers would be more similar.

This merger-induced alignment of pricing incentives arose in a recent merger case in the Italian mobile telecommunications market.<sup>132</sup> As with the case of a merger between the Applicants in the U.S. wireless market, the Italian case involved a merger between the two smallest network operators—H3G and WIND—and would have induced a change in market structure from four to three network operators.<sup>133</sup>

First, from an economic perspective, firms with a comparatively low market share such as H3G benefit appreciably less from coordination attempts than larger incumbents, since they have a smaller customer base on which they could earn a supra-competitive margin. Such firms are therefore much less inclined to cement the existing market structure by agreeing to engage in accommodative pricing. On the contrary, they have a comparatively stronger incentive to try and win over customers from rivals through price cuts.

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<sup>130</sup> *Supra*, fn 109.

<sup>131</sup> See Table 17.

<sup>132</sup> European Commission CASE M.7758-Hutchinson 3G Italy/WIND/JV 01/09/2016.

<sup>133</sup> European Commission CASE M.7758-Hutchinson 3G Italy/WIND/JV 01/09/2016, Table 6, p. 75.

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Second, firms with smaller market shares such as H3G have to be less concerned than large incumbents that aggressive price discounts would cannibalise the profits they make with their existing mobile customer base. As a result, smaller contestants are generally more inclined to discount their price in an effort to win customers from rivals. Conversely, [mobile network operators] with a large market share are likely to be concerned that competitive discounting policies to attract new customers might later force them to offer better terms also to their large existing customer base.<sup>134</sup>

As with WIND and H3G merging in the Italian wireless market, a merger between the Applicants would alter their pricing incentives such that they desire to set higher prices, and those incentives would be more aligned with the pricing incentives of AT&T and Verizon. That means the three remaining network operators would be more likely to be able to coordinate on common price increases, and that makes tacit collusion more likely in the post-merger market.

For the reasons mentioned above, we conclude that a merger between the Applicants likely would be expected to have coordinated effects.

Additional evidence in support of the conclusion that a merger between the Applicants would have coordinated effects comes from the calculation of the pre-merger and post-merger Coordinated Price Pressure Index (“CPPI”). The CPPI is a price pressure test under the assumption of tacit collusion. Originally developed by the Applicants’ experts Professor Salop and Dr. Sarafidis (with coauthors) to analyze the proposed merger of AT&T and T-Mobile,<sup>135</sup> the CPPI was designed to assess the impact of a merger on the likelihood of coordinated effects through price leadership.<sup>136</sup> Formally, the CPPI measures the maximum common price increase that a pair of firms is willing to initiate and match, holding the prices of all the other firms constant.

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<sup>134</sup> European Commission CASE M.7758-Hutchinson 3G Italy/WIND/JV 01/09/2016, ¶ 975-6.

<sup>135</sup> Moresi, Serge, David Reitman, Steven C. Salop, and Yianis Sarafidis, “Gauging Parallel Accommodating Conduct Concerns with the CPPI,” (2011).

<sup>136</sup> The CPPI is designed to capture upward pricing pressure for only one form of coordinated effects—price leadership—within the confines of one particular oligopoly model and under particular assumptions—price competition and only two firms engaging in parallel conduct. The form of collusion considered has one firm raising its price with the expectation that the other firm will match that price increase.

**Table 27: The Coordinated Price Pressure Test**

Pre-Merger Coalition [A]	Pre-Merger CPPI [B]	Post-Merger CPPI [C]	Delta CPPI [D]
T-Mobile - Verizon	6.8%	21.9%	15.1%
T-Mobile - AT&T	8.8%	29.3%	20.5%
Sprint - Verizon	6.8%	21.9%	15.1%
Sprint - AT&T	8.8%	29.3%	20.5%

Sources: 20<sup>th</sup> Mobile Wireless Competition Report; UBS Wireless Report; 2017 Company Annual Reports.

Notes:

[A]: Two-firm coalition.

[B]: CPPI for listed firm pair before Sprint/T-Mobile merger.

[C]: CPPI for listed firm pair after Sprint/T-Mobile merger.

[D]: Change in CPPI for listed firm pair due to Sprint/T-Mobile merger.

In Table 27, we report the pre-merger and post-merger CPPIs between the merging firms—T-Mobile and Sprint—and each one of the other national carriers, AT&T and Verizon.<sup>137</sup> In the pre-merger market, a CPPI of 6.8% for T-Mobile-Verizon indicates that T-Mobile and Verizon would find it profitable to implement a 6.8% increase in their prices with one of them leading and the other following. The price increase that New T-Mobile and Verizon could profitably implement is distinctly higher at 21.9%. As the table illustrates, in all cases the post-merger CPPI is significantly higher than the pre-merger CPPI, suggesting that the merger likely would increase the incentives to engage in tacit collusion through price leadership.<sup>138</sup>

It is important to note that the CPPI only captures some of the relevant factors that determine whether tacit collusion would occur in a market. Its value resides in assessing whether a merger

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<sup>137</sup> CPPIs are calculated based on postpaid subscriber connections and margins for each firm as shown in Table 12. Own-price elasticities were calculated based on the Lerner index. Diversion ratios were calculated using gross subscriber additions for postpaid, as was done for the pricing pressure tests discussed in Section III.C.

<sup>138</sup> The approach we have taken is that used in Moresi et al. (2011), which calculates the post-merger CPPI between the two merging firms and a rival by summing the shares of the merging firms and using the pre-merger price-cost margin and elasticity of demand of one of the two merging firms along with diversion ratios based on pre-merger market shares. See Moresi, Serge, David Reitman, Steven C. Salop, and Yianis Sarafidis, “Gauging Parallel Accommodating Conduct Concerns with the CPPI,” (2011).

would substantively increase those particular factors. We find that the CPPI would be significantly higher with a merger between Sprint and T-Mobile, and that this evidence is consistent with the merger having coordinated effects.

### 3. There Is a Serious Risk of Tacit Collusion in the Post-Merger Market

To summarize the analysis thus far regarding coordinated effects, the mobile voice/broadband market is suitable for tacit collusion and a merger between Sprint and T-Mobile would result in a market structure for which tacit collusion is significantly more likely. However, the merger not only makes tacit collusion significantly more likely but we believe it creates a serious risk of tacit collusion emerging, both on pricing and on network quality. To substantiate this claim, it is necessary to go beyond describing market conditions and market structure, and describe how tacit collusion would work in the post-merger market.

As has been explained, it would be in the interests of the three remaining network operators to participate in a collusive arrangement. Such a desire to collude can only be translated into actual collusion if firms are able to coordinate on a stable collusive arrangement. This can be done as follows. Coordination could be achieved through price leadership by one of the three network operators, which initiates a “trial” price increase for acceptance by the other operators. A stable collusive arrangement requires monitoring for compliance, and an effective punishment when there is evidence of non-compliance. Monitoring would be effective because of price and plan transparency in the retail market. Punishment would be effective because any deviation would be quickly observed, and firms can retaliate by lowering their prices (and adjusting plan features) and advertising these changes. This punitive price war would be swift and severe because of the absence of long-term service contracts. If a firm that deviates can anticipate only a short period of higher sales before aggressive competition returns, it will be inclined to go along with coordinated price increases and plan changes.

If firms offered the same services and charged a single price for their services, what has just been described would be sufficient for firms to tacitly collude on price. One of the firms could raise price and, given it is publicly observed, the other firms could match that price. If any firm did not do so then other firms could lower their prices.

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However, tacit collusion on price in the mobile voice/broadband market defies that simple description for two reasons. First, network operators do not charge a single price. A firm's offerings are multi-dimensional as a plan has a monthly payment with a maximum number of minutes, overage charges (which could take the form of an additional fee or slower speeds), discounts for additional lines, and so on. To provide an example, AT&T's Unlimited Choice plan starts at less than \$40 dollars per month per line for four lines or \$70 dollars per month for one line.<sup>139</sup> This plan includes an HBO subscription for all devices, unlimited texting to 120+ countries, and roaming in Mexico and Canada.<sup>140</sup> AT&T does not charge overages ever, but data speeds on an individual line may be throttled after 22GB of usage in a given month. Thus, tacit collusion could mean coordinating on something more than a common price.

Second, network operators offer similar, but not identical, services. While all network operators offer the same type of talk, text, and data services, services differ in terms of their quality and coverage because of different network structures. For example, coverage varies across providers, with Verizon and AT&T having the most extensive coverage, T-Mobile close behind, and Sprint a distant fourth, covering roughly 17 million fewer people and 59% less land area than Verizon.<sup>141</sup> If there are differences in service quality in the post-merger market then tacit collusion—which has all three network operators coordinating on identical (or highly similar) prices and plans—would result in sales shifting from firms with lower quality to those with higher quality. This could destabilize collusion, in that the firm losing market share might depart from the common supracompetitive price to reclaim sales.

These complications would not prevent tacit collusion from emerging and persisting over time in the mobile voice/broadband market. To begin, there are several ways that tacit collusion could work even with multi-dimensional offerings. First, firms could coordinate on all of those dimensions, for they are all publicly observed. Just as a consumer can learn a plan's prices and features, so can rival firms. A workable method would be for firms to coordinate on some standard plans, thereby leaving only a few dimensions to adjust over time. For example, all

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<sup>139</sup> "Unlimited Data Plans," AT&T, available <https://www.att.com/plans/unlimited-data-plans.html/>, accessed August 18, 2018.

<sup>140</sup> "Unlimited Data Plans," AT&T, available <https://www.att.com/plans/unlimited-data-plans.html/>, accessed August 18, 2018.

<sup>141</sup> Calculations: 304 million – 287 million = 17 million.  $(2,377,385 - 976,639) / 2,377,385 = 59\%$ . See 20<sup>th</sup> Mobile Wireless Competition Report, Appendix III: Table III.D.ii.

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network operators have come to have the common feature of an unlimited number of texts and voice minutes for postpaid service. Additionally, all carriers currently offer unlimited data, with potential speed reductions for heavy data users.<sup>142</sup> All carriers also now allow customers to use their wireless devices as “mobile hotspots” and, except for Sprint, allow some form of international roaming or calling. If the three network operators standardize on plan features, it would only require them coordinating on the monthly fee. In that case, there would effectively be a single menu of prices that firms would need to coordinate on over time.<sup>143</sup>

Second, even if the other dimensions did not become standardized, collusion can be effective even when firms coordinate on only a subset of dimensions and compete on the remaining ones. It is rarely the case that collusion—even when it is explicit—involves coordination on all relevant dimensions. There are always some instruments for which firms do not coordinate, yet collusion proves successful.<sup>144</sup> While competition may intensify on those dimensions for which firms do not coordinate—as the profit margins on gained units are now higher as a result of

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<sup>142</sup> Unlimited plans of all carriers throttle heavy users, but each has a different threshold for defining heavy users, currently 22GB for AT&T and Verizon, and 50GB for Sprint and T-Mobile. See “Unlimited Data Plans,” AT&T, available <https://www.att.com/plans/unlimited-data-plans.html>, accessed August 18, 2018; “Unlimited,” Verizon, available <https://www.verizonwireless.com/plans/verizon-plan/>, accessed August 17, 2018; “Sprint Unlimited data, talk & text cell phone plans,” Sprint, available [https://www.sprint.com/en/shop/plans/unlimited-cell-phone-plan.html?ECID=vanity:unlimited\\_](https://www.sprint.com/en/shop/plans/unlimited-cell-phone-plan.html?ECID=vanity:unlimited_), accessed August 6, 2018; and “T-MobileONE,” T-Mobile, available [https://www.t-mobile.com/cell-phone-plans?icid=WMM\\_TM\\_Q117TMO1PL\\_H85BRNKTD037510](https://www.t-mobile.com/cell-phone-plans?icid=WMM_TM_Q117TMO1PL_H85BRNKTD037510), accessed August 6, 2018.

<sup>143</sup> Such was the view of the FCC in 2011 when it expressed concerns about the proposed AT&T and T-Mobile merger having coordinated effects: “Because these providers offer the same plans and charge the same prices nationwide, increased coordination would most likely take the form of raising the level of prices.” FCC Staff Report, ¶ 76.

<sup>144</sup> For example, airlines successfully colluded over 1999-2006 in the air cargo market by only coordinating on a fuel surcharge; all other components of price (as well as any non-price dimensions) were left to the discretion of the airlines. The effectiveness of collusion in raising transaction prices is evidenced by the collection of damages totaling \$1,235,907,442 from 28 airline defendants (*Air Cargo Shipping Services Antitrust Litigation*). “Air Cargo,” Hausfeld, available <https://www.hausfeld.com/what-we-do/eu/case-studies/air-cargo>, accessed August 6, 2018; “Hausfeld Announces Final Settlement in Decade-Long Air Cargo Price Fixing Litigation,” Hausfeld, May 29, 2016, available <https://globenewswire.com/news-release/2016/05/19/841819/0/en/Hausfeld-Announces-Final-Settlement-in-Decade-Long-Air-Cargo-Price-Fixing-Litigation.html>, accessed August 6, 2018.

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collusion on some dimensions—collusion will remain worthwhile as long as that intensified competition does not dissipate a large fraction of the incremental profits from collusion.<sup>145</sup>

There are at least two reasons why competition on other dimensions would not dissipate all supracompetitive profits and thus not undermine the stability of collusion. First, the intensity of competition in a dimension depends on how sensitive consumers are to that dimension. The less sensitive are consumers to a dimension, the less aggressively a firm will compete in that dimension because, for any given cost of competing, there is a smaller benefit in terms of additional sales. For example, if consumers are not very responsive to overage charges then it is not worthwhile for firms to compete aggressively on that dimension as they forego revenue without yielding much of a return in terms of attracting new customers.

What is critical for effective collusion is that firms coordinate on the variable for which consumer demand is most sensitive, and that variable is likely to be the monthly fee. That it is the most heavily advertised is consistent with firms believing it is the most crucial variable determining consumer demand. Other fees such as roaming charges and overage charges are unlikely to be influential in a consumer's choice of a carrier. Roaming historically accounted for only a small fraction of minutes,<sup>146</sup> and national network operators no longer charge for roaming services within the U.S. Also, consumers have been shown to be overconfident that they will not incur overage charges,<sup>147</sup> which would imply that their choice of a carrier and plan is not very sensitive to overage charges.

The second reason that competition on these other dimensions may not destabilize collusion has to do with monitoring. Firms observe market shares, and recognize that intensified competition leading to a shift in market shares may cause collusion to breakdown. A network operator that loses too much market share may, in response, undercut the collusive price. As network operators provide market shares, net additions, ARPU, and other relevant information in their quarterly reports, monitoring for evidence of non-collusive conduct would be quick and

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<sup>145</sup> Professor Salop and Dr. Sarafidis believe that collusion on network investment is unlikely. However their analysis of collusion on this particular dimension is incomplete. See Salop/Sarafidis Declaration, Section III.A.

<sup>146</sup> See, e.g., 15<sup>th</sup> Mobile Wireless Competition Report, p. 123.

<sup>147</sup> Grubb, Michael D., "Selling to overconfident consumers," *American Economic Review* 99, no. 5 (2009): 1770-1807.

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reasonably effective. For this reason, firms would unilaterally restrain how aggressively they compete on the dimensions for which they have not coordinated.

The second complication for tacit collusion in the mobile voice/broadband market is that firms may offer different quality services. If that is the case, then coordinating on a common higher price may not prove sustainable, as the network operator with the lowest quality will lose market share. However, coordinating on a common price is not the only way in which firms can tacitly collude. They could instead coordinate on a common price increase (either in dollars or percentage terms) from the current base in which network operators offer different prices. It is likely that a modest common increase in the monthly fee would prove profitable and sustainable, particularly to the extent that differences in quality will be lower after the merger.

Regardless of the extent of demand or cost heterogeneity among competitors, a small rise in the lowest price in the market, with the other firms optimally responding to that price increase, would likely be profitable for all firms.<sup>148</sup> Thus, the lowest-priced firm is acting like a leader. One could imagine that, after the merger, New T-Mobile leads a price increase (beyond that predicted by any unilateral effects). Doing so would signal that it is no longer a maverick and is instead interested in reducing the intensity of competition. In response, AT&T and Verizon would raise their prices to maximize their profits. These price increases would raise all firms' profits. This is just one way in which, in spite of possibly offering services of different qualities, simple price leadership could work to coordinate on a stable collusive outcome.

Though coordination in the retail market is complicated by the multi-dimensional offerings and possible heterogeneity in service quality and coverage, we do not believe these complications are substantive obstacles to tacit collusion. Tacit collusion is likely to succeed if network operators offer comparable plans and coordinate on common increases in monthly rates. That they currently offer highly similar plans gives them a useful starting point.

Earlier analysis expressed that the enterprise and wholesale markets are not particularly suitable for tacit collusion. While tacit collusion would not be easy in those markets, there are some circumstances whereby it could occur. Though enterprise and wholesale prices are not

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<sup>148</sup> Harrington, Joseph E., "Heterogeneous firms can always collude on a minimum price," *Economics Letters* 138 (2016): 46-49. For such a price increase to be profitable for all firms, it is not necessary that other firms match the increase but instead respond unilaterally to it.

transparent, customers are observable and, in particular, it could be observed that one network operator attracts a customer away from another network operator. The observability of network operator-MVNO relationships was documented further in Section III.A.2. Such competition could be avoided if network operators were to coordinate on a “no poaching” agreement whereby each network operator does not offer attractive prices to the customers of the other network operators. If there was that understanding then each network operator could charge higher prices on its enterprise and wholesale customers. While such an arrangement would not affect competition for customers new to the market, it would result in supracompetitive prices for existing customers. A “no poaching” agreement would circumvent the lack of transparent pricing though it is unclear how easily firms could coordinate on it.

A second way in which competition may be softened in the enterprise and wholesale markets is through multi-market effects. If tacit collusion emerges in the retail market, a network operator may be hesitant to compete too aggressively in the enterprise and wholesale markets because it could spill over to undermine collusion in the retail market. If competition in the enterprise and wholesale markets causes a network operator to lose market share in those markets, it may try to make up for it by cutting retail prices and picking up more market share in the retail market.

For these reasons, one cannot dismiss the possibility that tacit collusion (or, more generally, some softening of competition) would arise in the enterprise and wholesale markets, even though those markets are not particularly well-suited for tacit collusion.

## V. Spectrum Utilization and Screen

### A. The Spectrum Utilization

As shown in Table 28, whether measured by subscribers per MHz, subscribers per cell site, or subscribers per MHz per cell site, there are significant differences in the intensity of network use. Verizon is using its network resources most intensively, serving more customers per unit of spectrum than its competitors. Likewise, Sprint is using its resources least intensively. The logic of a spectrum screen, or more broadly looking at the spectrum input as a measure of market structure, requires a presumption that these measures of intensity of network use will converge over time.

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**Table 28: Major Carriers’ Wireless Networks**

Carrier [1]	Population- Weighted Average MHz Holdings [2]	Percentage of Big Four Population Weighted Average MHz Holdings [3]	Cell Sites [4]	Total Subscriber Connections (thousands) [5]	Subscribers per MHz [6]	Subscribers / Cell Site [7]	Subscribers / MHz / Cell Site [8]	
AT&T	[A]	152.0	26.9%	67,000	134,875	887,139	2,013	13.2
Sprint	[B]	186.4	33.0%	50,000	59,515	319,298	1,190	6.4
T-Mobile	[C]	109.8	19.4%	59,417	71,455	650,790	1,203	11.0
Verizon	[D]	116.4	20.6%	58,300	145,859	1,253,549	2,502	21.5
<b>With Spectrum Cap</b>								
New T-Mobile - All Cell Sites	[E]	238.5	42.2%	109,417	130,970	549,140	1,197	5.0
New T-Mobile - 11,000 Retained Cell Sites	[F]	238.5	42.2%	70,417	130,970	549,140	1,860	7.8
<b>Without Spectrum Cap</b>								
New T-Mobile - All Cell Sites	[G]	296.2	52.5%	109,417	130,970	442,182	1,197	4.0
New T-Mobile - 11,000 Retained Cell Sites	[H]	296.2	52.5%	70,417	130,970	442,182	1,860	6.3

Source: 20<sup>th</sup> Mobile Wireless Competition Report, Table II.B.1 and Table II.F.i, For 11,000 retained cell sites from Sprint, see Declaration of Neville R. Ray, ¶ 31. Spectrum holdings are Brattle estimates. Subscriber holdings are as of August 2018 and are based on data from the FCC Universal Licensing System, <http://wireless.fcc.gov/uls/index.htm?job=transaction&page=weekly>.

Notes:

[2]: Brattle estimates as of August 2018. Reported 2017 screen level for [E] and [F] since combined spectrum holdings would exceed the 238.5 MHz screen.

[3]: [2] / 570.6 MHz which is the total population weighted average MHz holdings for the big four.

[4]: As of 2016.

[5]: End of year 2016.

[6]: ([5] x 1,000) / [2].

[7]: ([5] x 1,000) / [4].

[8]: ([5] x 1,000) / [2] / [4].

[E][4] - [E][5]: [B] + [C].

[F][5]: [B] + [C].

[F][4], [H][4]: [C] + 11,000. 11,000 retained cell sites from Sprint as reported in Declaration of Neville R. Ray.

[G][2] - [G][5]: [B] + [C].

[H][2], [H][5]: [B] + [C].

In Table 28, the subscriber/MHz/Cell Site provides a measure of how “full” a carrier’s network is. A carrier can continue to add cells (up to a point), but at some point will need more spectrum to expand its capacity. As Table 28 indicates, Verizon uses its spectrum most efficiently, serving 21.5 customers per MHz after accounting for spectrum reuse as measured by the number of towers deployed. AT&T is next in intensity of spectrum use at 13.2 subscribers per MHz, followed by T-Mobile (11.0) and Sprint (6.4). In the scenario in which New T-Mobile retains 11,000 Sprint cell sites and divests their spectrum holdings that exceed the screen, its network will have 7.8 subscribers/MHz/Cell Site.

## B. The Spectrum Screen

Since commercial mobile services became available in the early 1980s, the FCC has implemented policies and tools to prevent undue concentration of spectrum licenses in particular geographic markets.<sup>149</sup> This section describes the screen currently applied by the FCC to secondary market transactions.

### 1. The Current Spectrum Screen

Generally, the FCC's spectrum screen is characterized by the following:<sup>150</sup>

1. The FCC implements its case-by-case review for secondary market transactions rather than adopting bright line limits, and it believes it is in the public interest to do so.<sup>151</sup>
2. The FCC considers the appropriate product market for the screen to be the combined “mobile telephony/broadband services market,” including mobile voice and data services. It considers the appropriate geographic market to be local, though it analyzes effects of transactions that exhibit national characteristics at the national level as well.<sup>152</sup>
3. The FCC applies the spectrum screen on a county-by-county basis to identify Cellular Market Areas (“CMAs”) in which an entity would hold approximately one-third or more of the total spectrum that is both suitable and available for the provision of mobile telephony/broadband services post-transaction. The FCC then evaluates these markets for possible competitive harm.<sup>153</sup>
4. The FCC does not limit its analysis of potential competitive harms to markets identified in the initial screen, as it may encounter other factors that bear on the public interest inquiry.<sup>154</sup>

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<sup>149</sup> Report and Order, *In the Matter of Policies Regarding Mobile Spectrum Holdings and Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions*, WT Docket No. 12-269 and Docket No. 12-268, FCC, June 2, 2014, ¶¶ 7-8, accessed September 25, 2017, [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-14-63A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-63A1_Rcd.pdf) (Mobile Spectrum Holdings Report and Order, ¶¶ 7-8).

<sup>150</sup> Mobile Spectrum Holdings Report and Order, ¶¶ 227, 234, and 241.

<sup>151</sup> Mobile Spectrum Holdings Report and Order, ¶¶ 17, 227, and 231.

<sup>152</sup> See Section V.B.1.a.

<sup>153</sup> See Section V.B.1.a ;Mobile Spectrum Holdings Report and Order, ¶ 252 and 256-258.

<sup>154</sup> See Section V.C.

*a. Application of the Spectrum Screen*

In determining which spectrum bands should be included in the spectrum screen, the FCC evaluates whether bands are “suitable” and “available” in the near future for the provision of mobile/broadband services.<sup>155</sup> “Suitable” spectrum is defined as “spectrum that is capable of supporting mobile service given its physical properties and the state of equipment technology, [that] is licensed with a mobile allocation and corresponding service rules, and [that] is committed to another use that effectively precludes its uses for mobile services.”<sup>156</sup> “Available spectrum” is spectrum for which it is “fairly certain that it will meet the criteria for suitable spectrum in the near term, an assessment that can be made at the time the spectrum is licensed or at later times after changes in technology or regulation that affect the consideration.”<sup>157</sup> In the *Mobile Spectrum Holdings R&O*, the FCC noted that within the pool of mobile spectrum considered for the screen, the different characteristics of spectrum (*e.g.*, the propagation characteristics of below-1-GHz spectrum versus the suitability of above-1-GHz spectrum for increasing network capacity) are not considered in evaluating the suitability and availability of specific spectrum bands for the provision of mobile telephony/broadband services under its definition.<sup>158</sup>

In 2004, the FCC established a spectrum screen threshold of approximately one-third of suitable and available spectrum in a given market that would be held by an acquiring entity post-transaction. The FCC has stressed that a market may contain more than three viable competitors even in cases in which one entity controls approximately one-third of suitable and available spectrum and noted that, at the time, there were some providers who were competing

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<sup>155</sup> Mobile Spectrum Holdings Report and Order, ¶ 70.

<sup>156</sup> Mobile Spectrum Holdings Report and Order, ¶ 71. See, *e.g.*, AT&T-Qualcomm Transaction Order, ¶ 38 and AT&T-Centennial Transaction Order, ¶ 43.

<sup>157</sup> Mobile Spectrum Holdings Report and Order, ¶ 71. See, *e.g.*, AT&T-Qualcomm Transaction Order, ¶ 38; Memorandum Opinion and Order, *In the Matter of Applications of AT&T Inc. and Cellco Partnership d/b/a/ Verizon Wireless For Consent To Assign or Transfer Control of Licenses and Authorizations and Modify a Spectrum Lease Agreement*, WT Docket No. 09-104, FCC, June 22, 2010, ¶¶ 30 and 39, available [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-10-116A1.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-10-116A1.pdf), accessed August 23, 2018 (AT&T-Verizon Wireless Transaction Order, ¶¶ 30 and 39); and AT&T-Centennial Transaction Order, ¶¶ 34 and 43.

<sup>158</sup> Mobile Spectrum Holdings Report and Order, ¶ 72.

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successfully with less than one-third of suitable and available spectrum.<sup>159</sup> In the *Mobile Spectrum Holdings NPRM*, the FCC sought comment on whether the one-third threshold was still appropriate and found that it was.<sup>160</sup> The screen is triggered when an entity would have, on a county-by-county basis, an attributable interest<sup>161</sup> in one-third or more of suitable and available spectrum in a given market.<sup>162</sup> Over time, the FCC has revised the type and amount of spectrum included in the screen. Table 29 shows the evolution of the screen from 2013 to the present.

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<sup>159</sup> Mobile Spectrum Holdings Report and Order, ¶ 242 and AT&T Wireless-Cingular Wireless Transaction Order, ¶ 109.

<sup>160</sup> Mobile Spectrum Holdings NPRM, ¶¶ 33-34; Mobile Spectrum Holdings Report and Order, ¶ 227.

<sup>161</sup> The *Mobile Spectrum Holdings R&O* defines an “attributable interest” for the purpose of applying the FCC’s initial spectrum screen to secondary market transaction as “all controlling interests and non-controlling interests of ten percent or more... Interests of less than ten percent would be attributable if the interest confers *de facto* control, including but not limited to partnership and other ownership interests and any stock interest in a licensee.” The FCC also attributes “long-term *de facto* transfer leasing agreements and long-term spectrum manager leasing arrangements to the lessor and the lessee, including sublessors and sublessees. Mobile Spectrum Holdings Report and Order, ¶¶ 300-301.

<sup>162</sup> In cases in which AWS-1 and/or BRS/EBS spectrum were not available in a particular market, these bands were not counted for the purposes of applying the spectrum screen trigger to that market. See Mobile Spectrum Holdings Report and Order, ¶ 251 at footnote 667.

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**Table 29: Total Spectrum Included in the FCC Spectrum Screen (MHz),  
2013-2017**

Spectrum Band	2013	2014	2015	2016	2017
[A]	[B]	[C]	[D]	[E]	[F]
600 MHz					70.0
700 MHz	80.0	70.0	70.0	70.0	70.0
Cellular	50.0	50.0	50.0	50.0	50.0
SMR	26.5	14.0	14.0	14.0	14.0
Broadband PCS	130.0	130.0	130.0	130.0	130.0
AWS-1	90.0	90.0	90.0	90.0	90.0
AWS-3				15.0	65.0
AWS-4		40.0	40.0	40.0	40.0
H Block		10.0	10.0	10.0	10.0
WCS	20.0	20.0	20.0	20.0	20.0
BRS	55.5	67.5	67.5	67.5	67.5
EBS		89.0	89.0	89.0	89.0
<b>Total</b>	<b>452.0</b>	<b>580.5</b>	<b>580.5</b>	<b>595.5</b>	<b>715.5</b>
<b>Reported Screen Level</b>	<b>151.0</b>	<b>194.0</b>	<b>194.0</b>	<b>199.0</b>	<b>238.5</b>

Sources: 16th Mobile Wireless Competition Report, p. 82 at Table 16; 17th Mobile Wireless Competition Report, p. 50 at Table IV.A.1; Eighteenth Report, In the Matter of Implementation of Section 6002(b) of the Omnibus Budget Reconciliation Act of 1993, Annual Report and Analysis of Competitive Market Conditions With Respect to Mobile Wireless, Including Commercial Mobile Services, WT Docket No. 15-125, FCC, December 23, 2015, p. 40 at Table IV.A.1, available <https://docs.fcc.gov/public/attachments/DA-15-1487A1.pdf>, accessed August 23, 2018; 19th Mobile Wireless Competition Report, p. 46 at Table IV.A.1; 20th Mobile Wireless Competition Report, p. 28 at Table II.E.1; Report and Order, In the Matter of Policies Regarding Mobile Spectrum Holdings and Expanding the Economic and Innovation Opportunities of Spectrum Through Incentive Auctions, WT Docket No. 12-269 and Docket No. 12-268, FCC, June 2, 2014, ¶ 251, available [https://apps.fcc.gov/edocs\\_public/attachmatch/FCC-14-63A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/FCC-14-63A1_Rcd.pdf), accessed August 23, 2018; and Memorandum Opinion and Order, In the Matter of Applications of AT&T Inc. and Atlantic Tele-Network, Inc. For Consent To Transfer Control of and Assign Licenses and Authorizations, WT Docket No. 13-54, FCC, September 20, 2013, ¶ 30 at footnote 79, available [https://apps.fcc.gov/edocs\\_public/attachmatch/DA-13-1940A1\\_Rcd.pdf](https://apps.fcc.gov/edocs_public/attachmatch/DA-13-1940A1_Rcd.pdf), accessed August 23, 2018.

Notes:

[B]: In 2013, the FCC Mobile Wireless Competition Report noted that the 26.5 MHz of SMR spectrum included 19 MHz of SMR spectrum and 7.5 MHz of spectrum that was available for SMR and other services. The broadband PCS spectrum included in the screen included 10 MHz of 1910-15/1990-95 MHz of spectrum held by Sprint that resulted from the 800 MHz Band Reconfiguration. The 700 MHz spectrum included 10 MHz of Upper 700 MHz D Block spectrum. AWS-1 was not attributable in markets where federal government users had not been relocated, and BRS was not attributable in markets where previous BRS licensees had not been transitioned.

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[C]-[E]: In 2014-2016, FCC Mobile Wireless Competition Reports noted that AWS-1 was not attributable in markets where federal government users had not been relocated, and BRS was not attributable in markets where previous BRS licenses had not been transitioned.

[F]: In 2017, the FCC noted that it considers AWS-1 and BRS spectrum to be available nationally. While 15 MHz of AWS-3 spectrum is available nationally (1695-1710 GHz), the FCC has noted that it will “evaluate the availability of the remaining 50 [MHz] of AWS-3 spectrum (1755-1780 GHz and 2155-2180 GHz) on a market-by-market basis.” Though 112.5 MHz of EBS spectrum is considered to be available, the FCC discounts this spectrum such that 89 MHz is included in the screen. The 70 MHz of 700 MHz spectrum included in the screen does not include the 20 MHz of 700 MHz spectrum allocated to public safety. The 2017 reported screen level is the screen applied later in this memo.

There are some limits placed on spectrum available for purposes of measuring the screen. In its recent 20<sup>th</sup> Mobile Wireless Competition Report, the FCC noted that that it considers AWS-1 and BRS spectrum as available on a nationwide basis.<sup>163</sup> It also noted that while 15 MHz of AWS-3 spectrum is now available on a nationwide basis (1695-1710 GHz), the FCC will evaluate the availability of the remaining 50 MHz of AWS-3 spectrum (1755-1780 GHz and 2155-2180 GHz) on a market-by-market basis.<sup>164</sup> While 112.5 MHz of EBS spectrum are available, the FCC discounts this spectrum such that 89 MHz is included in the screen for review of proposed transactions.<sup>165</sup> The 70 MHz of 700 MHz spectrum included in the screen does not include the 20 MHz of 700 MHz spectrum allocated to public safety.<sup>166</sup>

### C. Spectrum Holdings by Carrier

This section describes the calculation of spectrum holdings by licensee and by market based on information from the FCC’s licensing database. In particular, we calculate the spectrum holdings at the county level for Sprint, T-Mobile, AT&T, and Verizon, described henceforth as “carriers of interest.” All other licensees (including DISH and U.S. Cellular) are still below the threshold of the spectrum screen.

Individual spectrum licenses are pulled from the FCC’s Universal Licensing System (“ULS”).<sup>167</sup> Specifically, we focus on the “BRS & EBS,” “Cellular,” and “Market Based Services” files from the

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<sup>163</sup> 20<sup>th</sup> Mobile Wireless Competition Report, p. 28 at footnote 130.

<sup>164</sup> 20<sup>th</sup> Mobile Wireless Competition Report, p. 28 at footnote 130.

<sup>165</sup> 20<sup>th</sup> Mobile Wireless Competition Report, p. 28 at footnote 130.

<sup>166</sup> 20<sup>th</sup> Mobile Wireless Competition Report, p. 28 at footnote 131.

<sup>167</sup> “ULS Frequently Asked Questions,” FCC, last updated October 4, 2016, available <http://wireless.fcc.gov/uls/index.htm?job=about>, accessed August 23, 2018.

FCC’s database downloads.<sup>168</sup> Table 30 illustrates which Radio Service Codes we use to identify the spectrum licenses that are covered by the screen.

**Table 30: Radio Service Codes of Bands included in the Spectrum Screen**

Band	Radio Service Code
600 MHz	WT
700 MHz	WU
700 MHz	WY
700 MHz	WZ
Cellular	CL
SMR	YC
SMR	YH
Broadband PCS	CW
Broadband PCS	CY
AWS-1	AW
AWS-3	AT
AWS-4	AD
H Block	AH
WCS	WS
BRS	BR
EBS	ED

Note: For SMR, we only consider the 14 MHz defined by the frequencies 817-824 MHz and 862-869 MHz, consistent with the FCC’s guidance on SMR in the screen. See Section V.D.

## 1. License Ownership

To accurately map licenses to the appropriate wireless carrier, we created a map of all FCC Registration Numbers (“FRNs”) associated with each of the carriers of interest based on Ownership Disclosure Filings (Form 602) filed with the FCC. For any filer, these ownership filings identify both the entities in which the filer has an interest and the entities that have an interest in the filer. In the *Mobile Spectrum Holdings R&O*, the FCC notes that it uses a 10 percent threshold for attributing ownership. Applying that threshold, we consider entities linked

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<sup>168</sup> See “Databases,” Universal Licensing System, FCC, available <http://wireless.fcc.gov/uls/index.htm?job=transaction&page=weekly>. These files were last downloaded on August 7, 2018.

if one owns at least 10 percent of the other.<sup>169</sup> Using these relationships, we identify all FRNs in which each of the carriers of interest has an interest.<sup>170</sup>

In the *Mobile Spectrum Holdings R&O*, the FCC notes that it “attribute[s] long-term de facto transfer leasing arrangements and long-term spectrum manager leasing arrangements to the lessor and the lessee, including sublessors and sublessees.”<sup>171</sup> We thus include a particular license in the spectrum holdings of both the lessor and lessee for all long-term leases. This double counts spectrum in the holdings of the lessor and lessee, but as the major carriers do not lease spectrum to each other, this does not present an issue for the current analysis.

## 2. Cellular and Market-Based Licenses

Although spectrum licenses are typically licensed by the FCC for whole markets and for the entire channel block of a particular band, they may be sub-divided over time. Both the frequencies and the geographic coverage of a band may be divided; the former is known as “spectrum disaggregation,” and the latter is known as “geographic partitioning.” To get an accurate account of the coverage of each license, we map each geographic area covered by the license to the frequencies covering that geography.

Ultimately we create a list of counties covered by each license as well as the MHz of spectrum covered in each county. When a license covers an entire market, we map the license to all counties within the particular market. When partitioned licenses do not cover an entire market, we map the license only to the counties it covers.<sup>172</sup>

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<sup>169</sup> Mobile Spectrum Holdings Report and Order, at Appendix B.

Specifically, in creating a map of entity relationships, we drop all links between entities in which the ownership stake is less than 10 percent and keep all others. For instance, if Entity A has a 10 percent interest in Entity B, and Entity B has a 10 percent stake in Entity C, we treat Entity A, Entity B, and Entity C as all being part of the same entity. There are certain entities that link to more than one carrier of interest. For example, T-Mobile Puerto Rico LLC is linked with both T-Mobile and AT&T. In this case, the licenses of that entity are counted with the holdings of both linked carriers.

<sup>170</sup> In the case when an FRN is missing from the data, we use the name of the entity as the identifier.

<sup>171</sup> Mobile Spectrum Holdings Report and Order, ¶ 301.

<sup>172</sup> Geographic partitions are classified as either “defined” or “undefined.” A “defined” area is generally made up of one or more counties while an “undefined” area does not have a pre-defined geographic designation. Some licenses (*e.g.*, B166) have such undefined areas carved out of the coverage of certain counties, but we do not account for these areas in this analysis.

### 3. BRS/EBS Licenses

BRS and EBS spectrum licenses are particularly complicated to define, but especially important given Sprint's dominant position in this band. Licenses in the BRS and EBS bands may have one of two types of geographic footprints: a P35 service area or a Basic Trading Area ("BTA") service area. A P35 consists of a particular coordinate point and the area within 35 miles of this point. Each BTA license covers the part of the BTA that is not covered by P35 licenses.<sup>173</sup> Further complicating the analysis, P35 licenses may overlap with each other, which requires assigning the spectrum in the overlapping areas to one license or the other, creating complicated (and somewhat arbitrary) geographic definitions of licenses.<sup>174</sup> In addition, a BTA license also may have been partitioned, and in those cases, we find the counties covered by the BTA using the same methodology described above for geographic partitions.

ULS does not identify the specific counties covered by P35 areas or account for overlaps between two or more P35 licenses. To determine each licensee's spectrum holdings in a county, we identify the census tracts that are within 35 miles of the central point of each P35 license. If the population weighted centroid of the census tract is within 35 miles of the central point of the P35 license, we assign the tract to the license.<sup>175</sup> When a tract falls within two or more P35 licenses, we calculate the distance between each license's center point and the census tract population centroid and assign the census tract to the nearest P35 license, defined as having the minimum distance between P35 center point and census tract population centroid. An example of assigning populations to P35s is shown below in Figure 6.

For each frequency block, after finding the census tracts covered by each P35 license, we find the remaining portions of each county covered only by a BTA licensee, defined as census tracts covered by a BTA license and not by a P35 license. Since this results in partial coverage of

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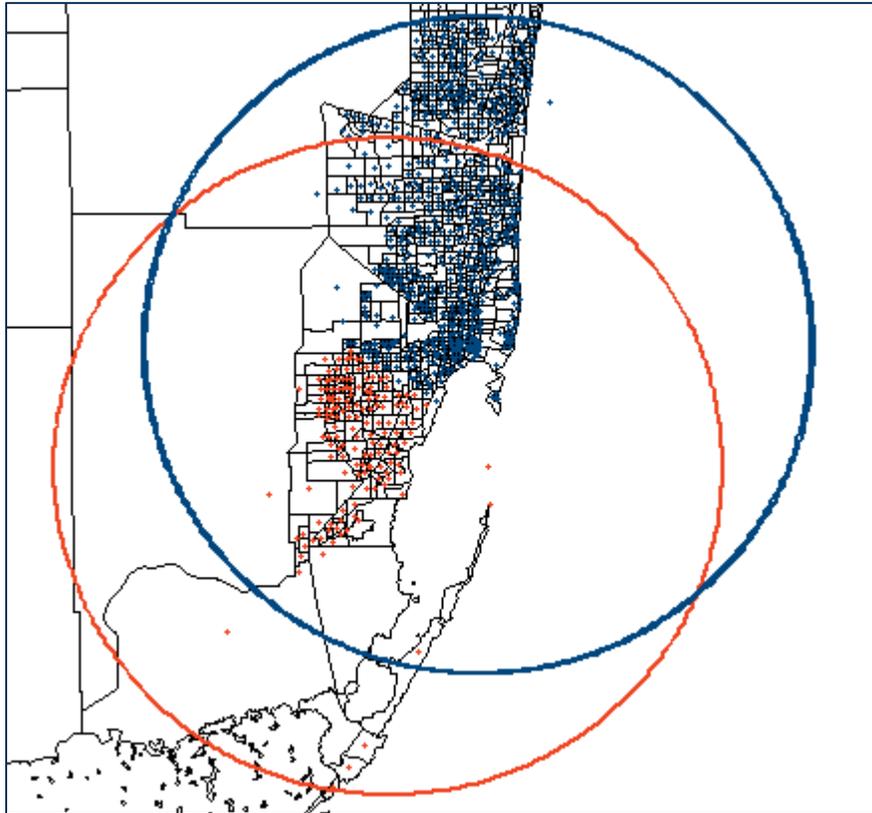
<sup>173</sup> See "Broadband Radio Service & Education Broadband Service," FCC, April 19, 2017, at tab "Licensing," available <https://www.fcc.gov/wireless/bureau-divisions/broadband-division/broadband-radio-service-education-broadband-service>, accessed August 23, 2018.

<sup>174</sup> More than one P35 can overlap each other. In fact, a few are known to overlap each other for the same frequencies.

<sup>175</sup> A small issue arises from using the population-weighted centroid of a census tract to assign population to P35 licenses. We note that a few P35 licenses do not cover any census tract population centroids and are assigned 0 population coverage. These two licenses are dropped from the analysis.

counties, we assign the spectrum in the particular county to the licensee only if the licensee covers at least 10 percent of the population in the county.<sup>176</sup>

**Figure 6: Illustration of P35 Census Tract Assignment for L000004109 (and Overlapping Licenses)**



## D. Application of the Spectrum Screen to Current FCC Holdings

### 1. Spectrum Holdings in Screen by Carrier

Table 29 illustrates the spectrum in each band included in the screen. The spectrum in most bands is considered to be available on a nationwide basis, but as noted above there are some adjustments and the FCC has noted that it will consider AWS-3 spectrum on a market-by-market basis.<sup>177</sup> Thus, we calculate the amount of AWS-3 spectrum available in each market by

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<sup>176</sup> This means that it is possible for the same frequencies to be assigned to multiple entities in a single county, if more than one entity owns frequencies covering more than 10 percent of the population in the county.

<sup>177</sup> 20<sup>th</sup> Mobile Wireless Competition Report, p. 28 at footnote 130.

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identifying which markets do not have AWS-3 licenses for certain channel blocks. This means that the MHz in the screen varies by county depending on the amount of AWS-3 licensed in that county. For a county with all spectrum available, the threshold for being above the screen is 238.5 MHz.<sup>178</sup> However, when we flag carriers as being above the spectrum screen in certain counties, we use a county-by-county threshold that may be lower, depending on how much spectrum is available in that county.

In addition, in the *Mobile Spectrum Holdings R&O*, the FCC noted that it includes all BRS spectrum except BRS Channel 1 and discounts EBS spectrum included in the screen. Specifically, it first excludes 5 percent of EBS spectrum as reserved for serving educational purposes, and then discounts an additional 16.5 percent for white space on a nationwide basis.<sup>179</sup> We discount holdings by 5 percent to account for educational purposes. Although the 5 percent reserve is actually time-based, following the FCC's guidance, we translate it into its spectrum equivalent for purposes of the screen. Since EBS white space is not licensed, we do not discount holdings to account for white space. Instead, if a licensee has more spectrum in a particular county than the spectrum counted for in the screen (89 MHz), we count only 89 MHz of the spectrum in that county for purposes of the screen.

After compiling the county-level spectrum holdings for all spectrum included in the screen, we map the spectrum holdings of each of the carriers of interest. The following maps illustrate these holdings. Of the carriers of interest, Sprint clearly holds the most spectrum in certain counties and is the only one of the carriers to hold more than 240 MHz in any county.<sup>180</sup> In particular, Sprint's current spectrum holdings are above the spectrum screen in 8 counties.<sup>181</sup>

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<sup>178</sup> Calculation:  $238.5 \text{ MHz} = 715.5 \text{ MHz} / 3$ .

<sup>179</sup> Mobile Spectrum Holdings Report and Order, ¶¶ 118-125.

<sup>180</sup> AT&T holds more than 240 MHz in certain counties in Puerto Rico. This depth of holdings in Puerto Rico is partly due to an ownership link between AT&T and T-Mobile Puerto Rico LLC. Thus, the holdings for this entity count for both AT&T and T-Mobile.

<sup>181</sup> As discussed above, being over the screen is determined on a county-by-county basis by considering the suitable and available frequencies in each county as well as the total MHz held by any entity (or proposed entity).

Figure 7: Sprint Spectrum Holdings in Screen

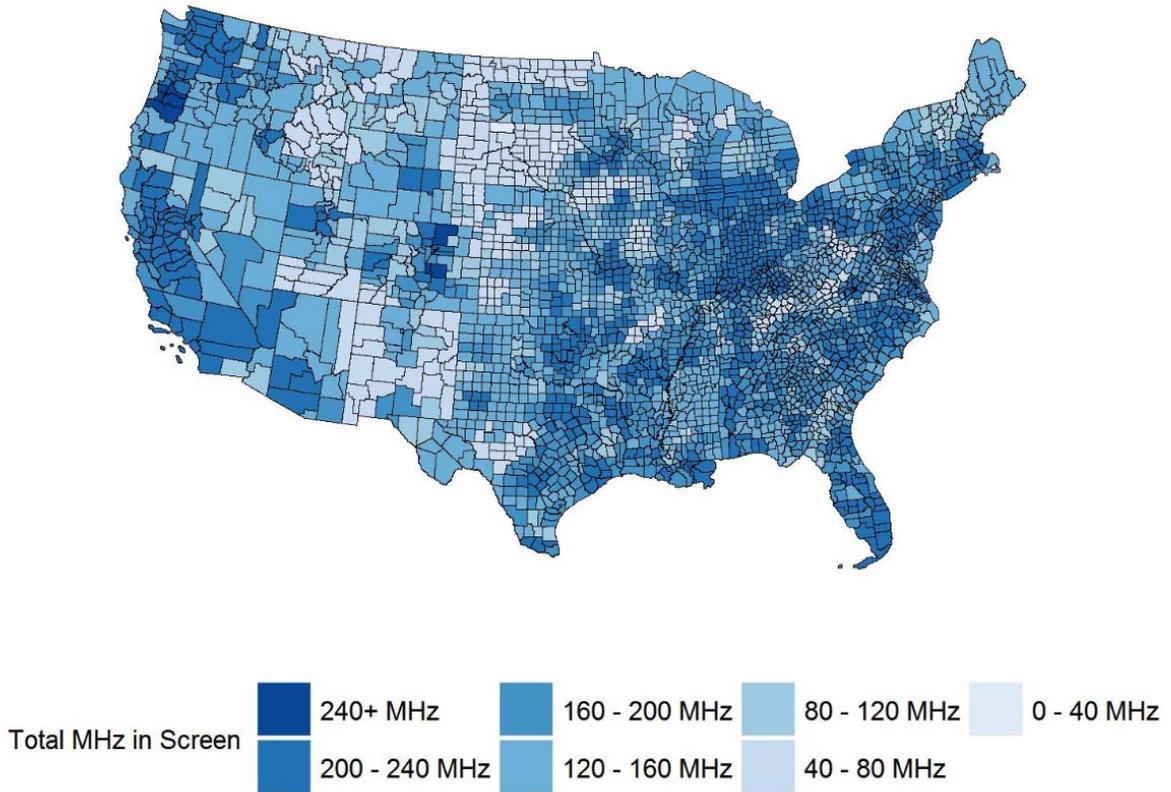


Figure 8: T-Mobile Spectrum Holdings in Screen

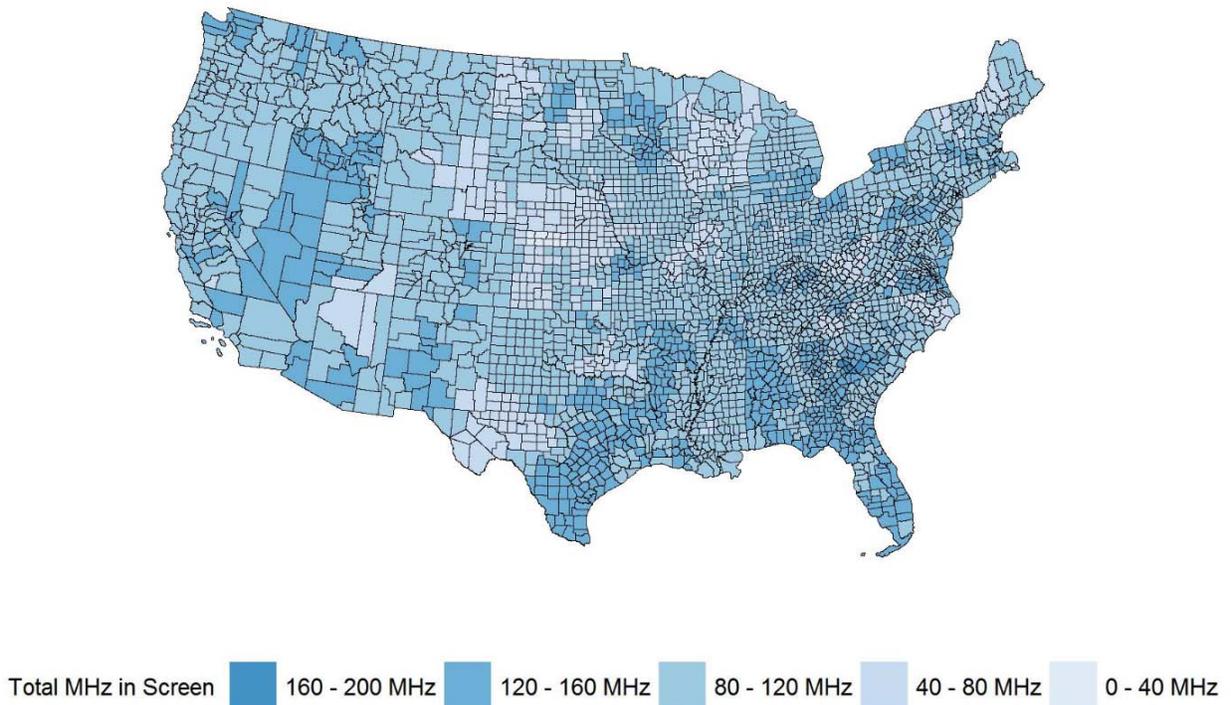
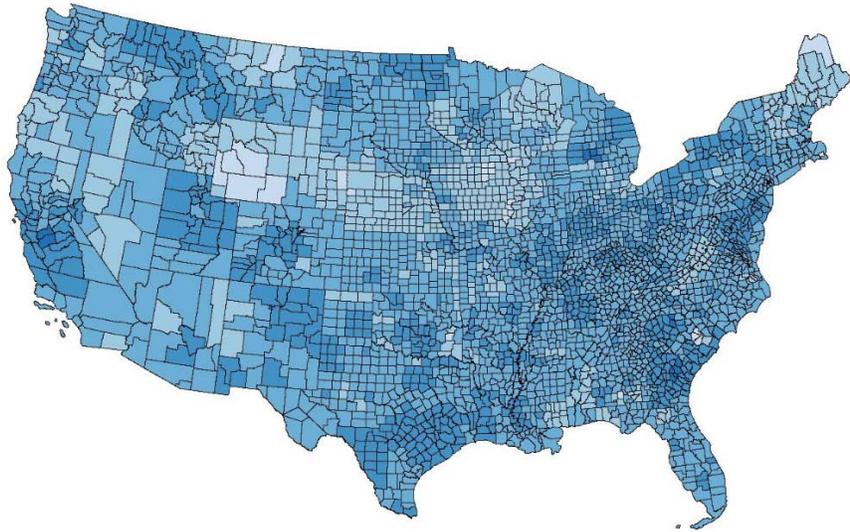
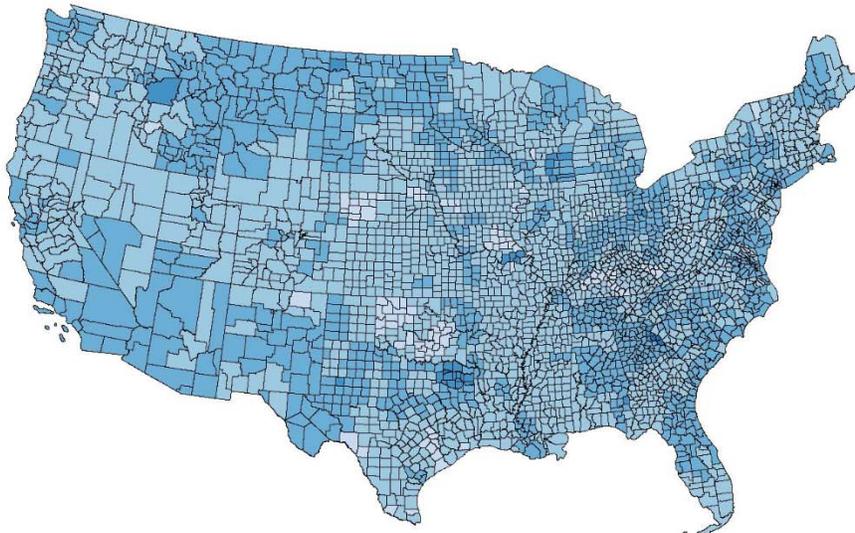


Figure 9: AT&T Spectrum Holdings in Screen



Total MHz in Screen 200 - 240 MHz 160 - 200 MHz 120 - 160 MHz 80 - 120 MHz 40 - 80 MHz

Figure 10: Verizon Spectrum Holdings in Screen

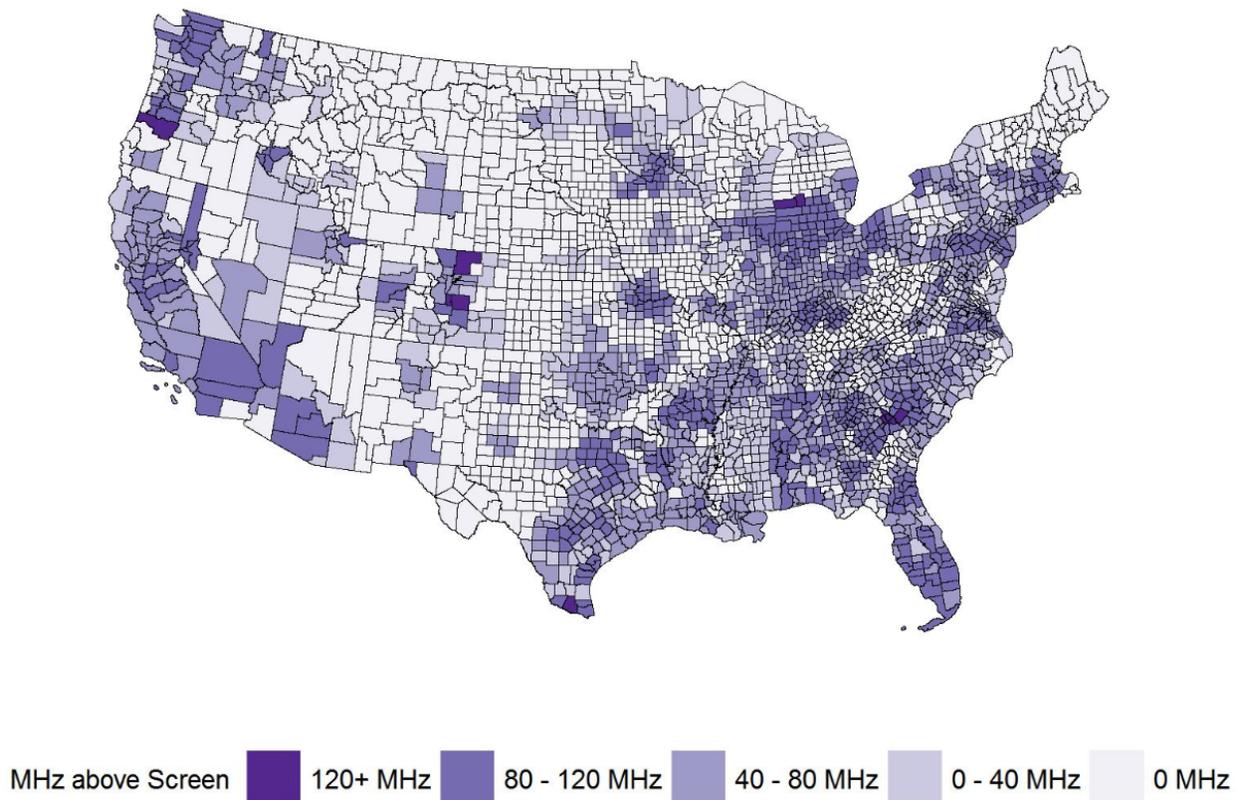


Total MHz in Screen 200 - 240 MHz 160 - 200 MHz 120 - 160 MHz 80 - 120 MHz 40 - 80 MHz

## 2. Spectrum Screen Implications of a Merger Between the Applicants

Given that both Sprint and T-Mobile have sizable spectrum holdings, a merger between the two entities would necessarily involve a review of whether their combined holdings cross the spectrum screen threshold. Although Sprint individually crosses the threshold in 8 counties, the combined holdings of Sprint and T-Mobile do so in almost 2,000 counties.<sup>182</sup> The depth of the combined holdings above the screen varies significantly, from only a few MHz in some counties to almost 140 MHz in others. Figure 11 illustrates the depth of spectrum above the screen for these combined holdings.

**Figure 11: Depth of Combined Sprint & T-Mobile Spectrum Holdings above Spectrum Screen**



<sup>182</sup> T-Mobile does not individually cross the threshold in any county.

Figure 12 illustrates the distribution of the depth of combined holdings above the screen. For the great majority of counties, the combined holdings are within 100 MHz of the spectrum screen.

**Figure 12: Distribution of the Depth of Combined Sprint & T-Mobile Spectrum Holdings above Spectrum Screen**

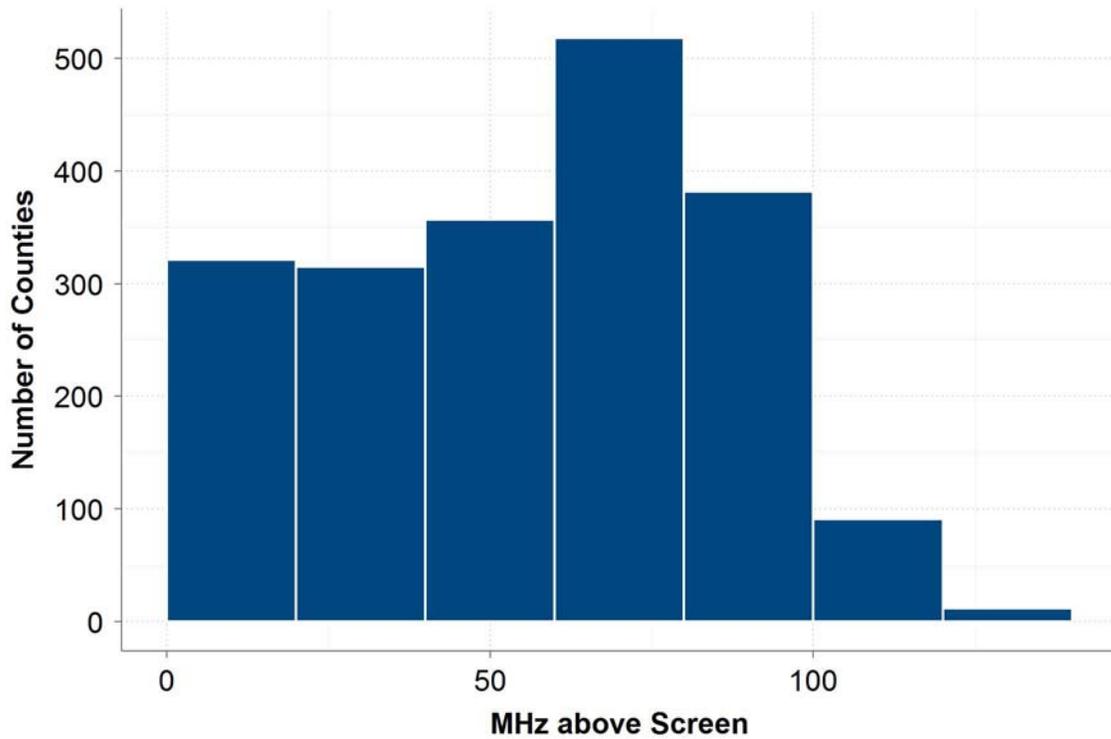


Table 31 reports the breadth of population and land area of the counties affected by the spectrum screen. Ninety percent of the U.S. population and almost half of the country’s land mass would require some level of divestiture for the merged parties to remain under the screen.

**Table 31: Summary of Counties in Screen**

	Above Screen	Not Above Screen
Count of Counties	1,996	1,225
<i>% of Total</i>	<i>62.0%</i>	<i>38.0%</i>
Population	281,927,239	30,544,088
<i>% of Total</i>	<i>90.2%</i>	<i>9.8%</i>
Land Area	1,577,558	1,957,772
<i>% of Total</i>	<i>44.6%</i>	<i>55.4%</i>

Source: FCC; 2010 Census Gazetteer File.

### 3. Spectrum Screen Below 1 GHz

Although New T-Mobile’s holdings are above the screen in the majority of counties, if the FCC does require any divestitures, either AT&T or Verizon (or both) would have the capacity to absorb all spectrum above the screen in all but a few counties.<sup>183</sup> There are 18 counties in which neither AT&T nor Verizon would be able to absorb the entire depth of combined spectrum holdings while still being under the screen. On the other hand, both DISH and U.S. Cellular would be able to absorb spectrum in all counties in which Sprint and T-Mobile go over the cap.

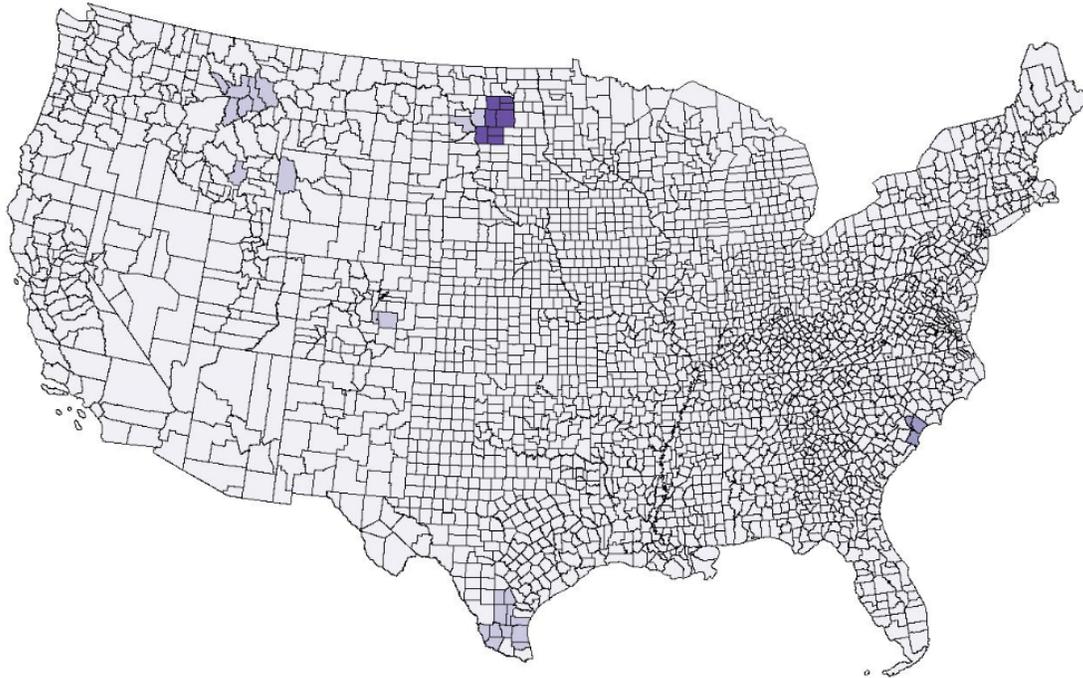
Although the FCC does not currently apply weights to spectrum in the screen, it will likely pay close attention to spectrum under 1 GHz. Restricting Sprint and T-Mobile’s combined holdings to bands below 1 GHz significantly decreases the number of counties above the screen threshold to just 35 counties.<sup>184</sup> The following map highlights the counties in which the combined holdings of licenses below 1 GHz are above the screen threshold.

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<sup>183</sup> If U.S. Cellular is included, there is an entity able to absorb all spectrum above the screen in all counties in which the combined holdings of Sprint and T-Mobile are above the screen.

<sup>184</sup> Of the 715.5 MHz in the screen, 204 MHz are for bands below 1 GHz. Therefore, since all of these bands are considered to be available on a nationwide basis, the threshold for spectrum under 1 GHz is 68 MHz, one-third of 204 MHz. The following bands in the screen are under 1 GHz: 600 MHz, 700 MHz, SMR, and Cellular.

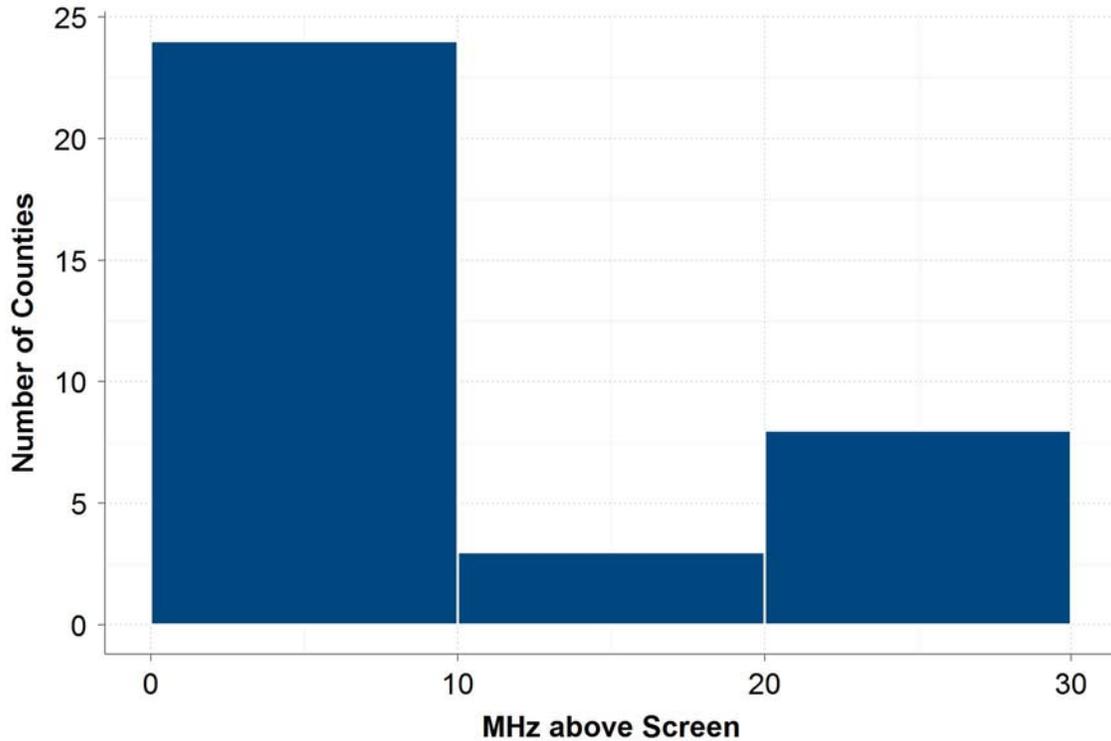
Figure 13: Depth of Combined Sprint & T-Mobile Spectrum Holdings Under 1 GHz above Spectrum Screen



MHz above Screen Below 1GHz  20+ MHz  10 - 20 MHz  0 - 10 MHz  0 MHz

In more than half of the counties in which Sprint and T-Mobile's combined holdings cross the 1 GHz-threshold, the depth of spectrum above the threshold is 10 MHz or less. Figure 14 illustrates this distribution.

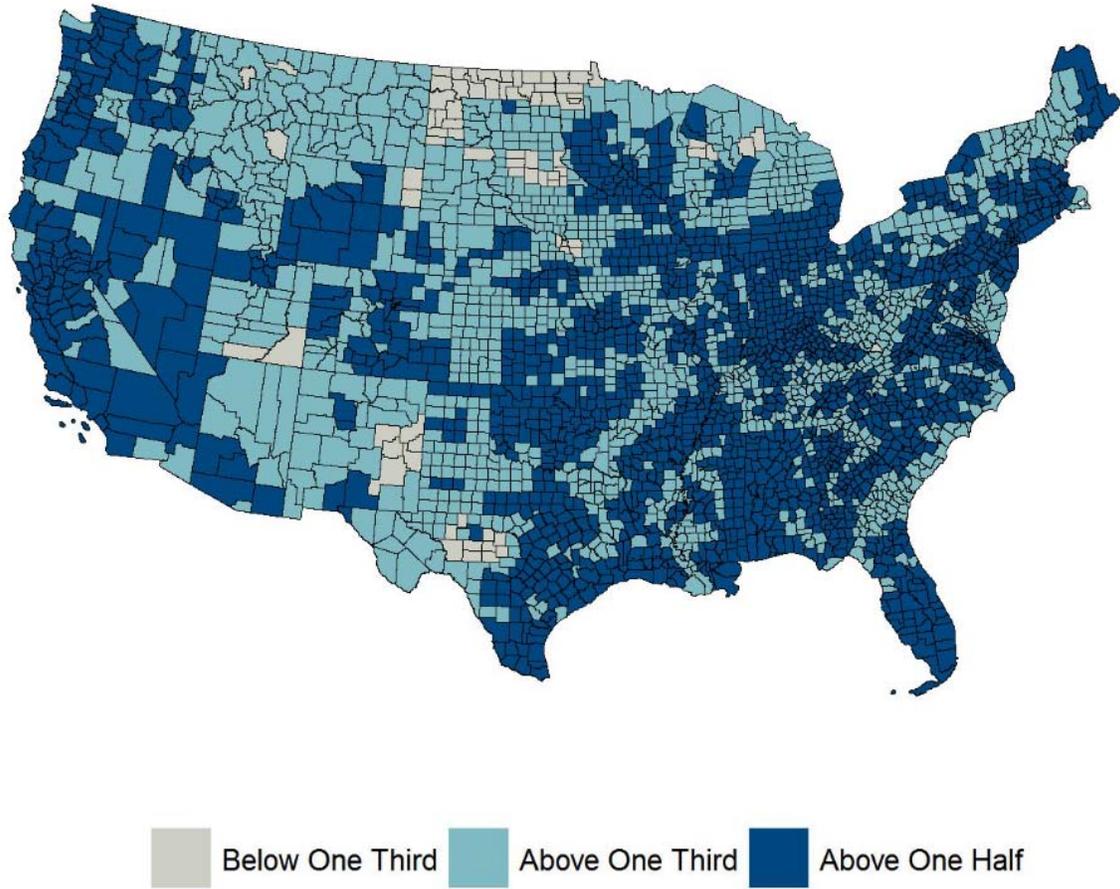
Figure 14: Distribution of the Depth of Combined Sprint & T-Mobile Spectrum Holdings below 1 GHz above Spectrum Screen



#### 4. Spectrum Holdings Shares Among the Big-4 Carriers

The spectrum screen includes all licensed frequencies from specified bands in a given geography. Of course, the impact of frequencies owned by the competitive fringe is different from the impact of frequencies owned by the major network operators. Consequently, although beyond the current spectrum screen, it can be informative to examine concentration of spectrum controlled by the big four network operators. The spectrum holdings share of New T-Mobile would be even greater when only the spectrum holdings of the Big 4 facilities-based carriers are considered. New T-Mobile would hold more than a third of that spectrum in 3,142 counties, and more than half in 1,712 counties, as shown in Figure 15.

Figure 15: New T-Mobile's Spectrum Holdings as Share of Big Four



## VI. Appendix A

### A. Marginal Cost Analysis

**Table 32: AT&T Wireless Cost Structure, 2017-2031**

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annualized Churn	[1]	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%	16.35%
Inflation Rate	[2]	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%
Connections	[3]	141,600,000														
Acquisition Cost per Connection	[4]	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259
Operating Cost per Connection	[5]	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78	\$78
Overhead Cost per Connection	[6]	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45	\$45
Gross Connections at Beginning of Period	[7]	0	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Churn	[8]	0	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481	-163,481
Gross Additions	[9]	1,000,000	163,481	163,481	163,481	163,481	163,481	163,481	163,481	163,481	163,481	163,481	163,481	163,481	163,481	163,481
Gross Connections at End of Period	[10]	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Marginal Capital Cost	[11]	\$94,251,923	\$0	\$0	\$0	\$0	\$94,251,923	\$0	\$0	\$0	\$0	\$94,251,923	\$0	\$0	\$0	\$0
Acquisition Cost	[12]	\$258,750,000	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802	\$42,300,802
Operating Cost	[13]	\$0	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946	\$78,293,946
Overhead Cost	[14]	\$0	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711	\$44,944,711
Sum of Costs	[15]	\$353,001,923	\$165,539,459	\$165,539,459	\$165,539,459	\$165,539,459	\$259,791,382	\$165,539,459	\$165,539,459	\$165,539,459	\$165,539,459	\$259,791,382	\$165,539,459	\$165,539,459	\$165,539,459	\$165,539,459
Average Costs Per Connection	[16]	\$353.00	\$165.54	\$165.54	\$165.54	\$165.54	\$259.79	\$165.54	\$165.54	\$165.54	\$165.54	\$259.79	\$165.54	\$165.54	\$165.54	\$165.54
Nominal Discount Rate	[17]	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%
Real Discount Rate	[18]	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%
Discount Factor	[19]	1.02	0.98	0.94	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.70	0.67	0.65	0.62	0.60
Present Value	[20]	\$359.78	\$162.42	\$156.36	\$150.52	\$144.90	\$218.91	\$134.28	\$129.27	\$124.44	\$119.80	\$180.99	\$111.02	\$106.87	\$102.88	\$99.04
Sum of Present Value Costs	[21]	\$2,301.48														
Annual Constant Cost Per Connection	[22]		\$216.13													
Monthly Constant Cost Per Connection	[23]		\$18.01													

Sources & Notes:

[1]: Annualized churn based on monthly churn rates. USB Wireless Report, p. 19 at Figure 35.

[2]: 10-year expected inflation rate as of October 1, 2017. "Inflation Expectations," Federal Reserve Bank of Cleveland, November 15, 2017, accessed August 23, 2018, <https://www.clevelandfed.org/our-research/indicators-and-data/inflation-expectations.aspx>.

[3]: Dennis Bournique, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.

[4]: T-Mobile's 2013 average acquisition cost per connection. John C. Hodulik, Batya Levi, Lisa L. Friedman, and Christopher Schoell, "US Wireless 411: Version 51," UBS, March 18, 2014, p. 25 at Figure 44.

[5]: Brattle calculations of AT&T Mobility cost of services / [3]. AT&T Inc., Form 10-K for the Fiscal Year Ended December 31, 2017, AT&T Inc. 2016 Annual Report at pp. 14 and 40, accessed September 26, 2017, <https://otp.tools.investis.com/clients/us/atnt/SEC/sec-show.aspx?Type=html&FilingId=11869124&CIK=0000732717&Index=10000>.

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[6]: Brattle calculations of AT&T Mobility SG&A less 2016 gross acquisition costs, per connection. AT&T Inc., Form 10-K for the Fiscal Year Ended December 31, 2017, AT&T Inc. 2016 Annual Report at pp. 14 and 40, available <https://otp.tools.investis.com/clients/us/atnt/SEC/sec-show.aspx?Type=html&FilingId=11869124&CIK=0000732717&Index=10000>, accessed August 23, 2018.

[7]: Connections maintained at beginning of the year after a one-time addition of 1 million connections.

[8]:  $(- [1]) \times [7]$ .

[9]: Gross additions necessary to maintain 1 million connections given [8].

[10]:  $[7] + [8] + [9]$ .

[11]: Brattle estimation. Expenditure recurs every five years to maintain capacity.

[12]:  $[9] \times [4]$ .

[13]:  $[5] \times [10]$ . Overhead costs for additional connections are 0 in 2017.

[14]:  $[5] \times [10]$ . Operating costs for additional connections are 0 in 2017.

[15]: Sum of [11] to [14].

[16]:  $[15] / [10]$ .

[17]: Average weighted average cost of capital for AT&T, Verizon, Sprint, and T-Mobile as of September 30, 2017. Bloomberg, accessed August 21, 2018.

[18]:  $[ ( 1 + [17] ) / ( 1 + [2] ) ] - 1$ .

[19]:  $( 1 / [18] ) ^ { ( \text{Year} - 2017 ) - .5}$ . Mid-year periods used to reflect costs incurred over the course of the year.

[20]:  $[19] \times [16]$ .

[21]: Sum of [20].

[22]:  $[ ( [18] \times [21] ) ] / [ 1 - ( 1 + [18] ) ^ { - ( 2031 - 2017 ) } ]$ .

[23]:  $[22] / 12$ .

[24]: SEC 10-K Filing.

[25]:  $( [24] - [23] ) / [24]$ .

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**Table 33: Verizon Cost Structure, 2017-2031**

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annualized Churn	[1]	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%	13.79%
Inflation Rate	[2]	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%
Connections	[3]	145,300,000														
Acquisition Cost per Connection	[4]	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259
Operating Cost per Connection	[5]	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55	\$55
Overhead Cost per Connection	[6]	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91	\$91
Gross Connections at Beginning of Period	[7]	0	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Churn	[8]	0	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880	-137,880
Gross Additions	[9]	1,000,000	137,880	137,880	137,880	137,880	137,880	137,880	137,880	137,880	137,880	137,880	137,880	137,880	137,880	137,880
Gross Connections at End of Period	[10]	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Marginal Capital Cost	[11]	\$80,975,936	\$0	\$0	\$0	\$0	\$80,975,936	\$0	\$0	\$0	\$0	\$80,975,936	\$0	\$0	\$0	\$0
Acquisition Cost	[12]	\$258,750,000	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382	\$35,676,382
Operating Cost	[13]	\$0	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912	\$54,975,912
Overhead Cost	[14]	\$0	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605	\$90,528,605
Sum of Costs	[15]	\$339,725,936	\$181,180,898	\$181,180,898	\$181,180,898	\$181,180,898	\$262,156,835	\$181,180,898	\$181,180,898	\$181,180,898	\$181,180,898	\$262,156,835	\$181,180,898	\$181,180,898	\$181,180,898	\$181,180,898
Average Costs Per Connection	[16]	\$339.73	\$181.18	\$181.18	\$181.18	\$181.18	\$262.16	\$181.18	\$181.18	\$181.18	\$181.18	\$262.16	\$181.18	\$181.18	\$181.18	\$181.18
Nominal Discount Rate	[17]	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%
Real Discount Rate	[18]	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%
Discount Factor	[19]	1.02	0.98	0.94	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.70	0.67	0.65	0.62	0.60
Present Value	[20]	\$346.25	\$177.77	\$171.13	\$164.74	\$158.59	\$220.90	\$146.97	\$141.48	\$136.20	\$131.12	\$128.63	\$121.51	\$116.97	\$112.61	\$108.40
Sum of Present Value Costs	[21]	\$2,437.27														
Annual Constant Cost Per Connection	[22]		\$228.88													
Monthly Constant Cost Per Connection	[23]		\$19.07													

**Sources & Notes:**

[1]: Annualized churn based on monthly churn rates. USB Wireless Report, p. 19 at Figure 35.

[2]: 10-year expected inflation rate as of October 1, 2017. "Inflation Expectations," Federal Reserve Bank of Cleveland, November 15, 2017, available <https://www.clevelandfed.org/our-research/indicators-and-data/inflation-expectations.aspx>, accessed August 23, 2018.

[3]: Dennis Bournique, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.

[4]: T-Mobile's 2013 average acquisition cost per connection. John C. Hodulik, Batya Levi, Lisa L. Friedman, and Christopher Schoell, "US Wireless 411: Version 51," UBS, March 18, 2014, p. 25 at Figure 44.

[5]: Cost of services / [3]. Verizon Communications Inc., Form 10-K for the Fiscal Year Ended December 31, 2016, Exhibit 13 at Note 12, available <https://www.sec.gov/Archives/edgar/data/732712/000119312517050292/d296602dex13.htm>, accessed August 23, 2018.

[6]: SG&A less 2016 gross acquisition costs, per connection. Verizon Communications Inc., Form 10-K for the Fiscal Year Ended December 31, 2016, Exhibit 13 at Note 12, available <https://www.sec.gov/Archives/edgar/data/732712/000119312517050292/d296602dex13.htm>, accessed August 23, 2018.

[7]: Connections maintained at beginning of the year after a one-time addition of 1 million connections.

[8]:  $(- [1]) \times [7]$ .

[9]: Gross additions necessary to maintain 1 million connections given [8].

[10]:  $[7] + [8] + [9]$ .

[11]: Brattle estimation. Expenditure recurs every five years to maintain capacity.

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[12]: [9] x [4].

[13]: [5] x [10]. Overhead costs for additional connections are 0 in 2017.

[14]: [5] x [10]. Operating costs for additional connections are 0 in 2017.

[15]: Sum of [11] to [14].

[16]: [15] / [10].

[17]: Average weighted cost of capital for AT&T, Verizon, Sprint, and T-Mobile as of September 30, 2017. Bloomberg, accessed August 21, 2018.

[18]:  $(1 + [17]) / (1 + [2]) - 1$ .

[19]:  $(1 / [18])^{((Year - 2017) - .5)}$ . Mid-year periods used to reflect costs incurred over the course of the year.

[20]: [19] x [16].

[21]: Sum of [20].

[22]:  $([18] \times [21]) / [1 - (1 + [18])^{- (2031 - 2017)}]$ .

[23]: [22] / 12.

[24]: SEC 10-K Filing.

[25]:  $([24] - [23]) / [24]$ .

**Table 34: Sprint Wireless Cost Structure, 2017-2031**

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annualized Churn	[1]	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%	23.20%
Inflation Rate	[2]	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%
Connections	[3]	54,600,000														
Acquisition Cost per Connection	[4]	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259
Operating Cost per Connection	[5]	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122	\$122
Overhead Cost per Connection	[6]	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57	\$57
Gross Connections at Beginning of Period	[7]	0	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Churn	[8]	0	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030	-232,030
Gross Additions	[9]	1,000,000	232,030	232,030	232,030	232,030	232,030	232,030	232,030	232,030	232,030	232,030	232,030	232,030	232,030	232,030
Gross Connections at End of Period	[10]	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Marginal Capital Cost	[11]	\$56,290,127	\$0	\$0	\$0	\$0	\$56,290,127	\$0	\$0	\$0	\$0	\$56,290,127	\$0	\$0	\$0	\$0
Acquisition Cost	[12]	\$258,750,000	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832	\$60,037,832
Operating Cost	[13]	\$0	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432	\$122,234,432
Overhead Cost	[14]	\$0	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136	\$56,678,136
Sum of Costs	[15]	\$315,040,127	\$238,950,400	\$238,950,400	\$238,950,400	\$238,950,400	\$295,240,528	\$238,950,400	\$238,950,400	\$238,950,400	\$238,950,400	\$295,240,528	\$238,950,400	\$238,950,400	\$238,950,400	\$238,950,400
Average Costs Per Connection	[16]	\$315.04	\$238.95	\$238.95	\$238.95	\$238.95	\$295.24	\$238.95	\$238.95	\$238.95	\$238.95	\$295.24	\$238.95	\$238.95	\$238.95	\$238.95
Nominal Discount Rate	[17]	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%
Real Discount Rate	[18]	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%
Discount Factor	[19]	1.02	0.98	0.94	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.70	0.67	0.65	0.62	0.60
Present Value	[20]	\$321.09	\$234.45	\$225.69	\$217.27	\$209.16	\$248.78	\$193.83	\$186.59	\$179.63	\$172.92	\$205.68	\$160.25	\$154.27	\$148.51	\$142.96
Sum of Present Value Costs	[21]	\$3,001.09														
Annual Constant Cost Per Connection	[22]	\$281.83														
Monthly Constant Cost Per Connection	[23]	\$23.49														

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### Sources & Notes:

- [1]: Annualized churn based on monthly churn rates. USB Wireless Report, p. 19 at Figure 35.
- [2]: 10-year expected inflation rate as of October 1, 2017. "Inflation Expectations," Federal Reserve Bank of Cleveland, November 15, 2017, available <https://www.clevelandfed.org/our-research/indicators-and-data/inflation-expectations.aspx>, accessed August 23, 2018.
- [3]: Dennis Bournique, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.
- [4]: T-Mobile's 2013 average acquisition cost per connection John C. Hodulik, Batya Levi, Lisa L. Friedman, and Christopher Schoell, "US Wireless 411: Version 51," UBS, March 18, 2014, p. 25 at Figure 44.
- [5]: Cost of services / [3]. Sprint Corporation, Form 10-K for the Fiscal Year Ended March 31, 2017, p. 30, available <http://d18rn0p25nwr6d.cloudfront.net/CIK-0000101830/b3706741-5644-4c1d-8e1e-80d91085fe07.pdf>, accessed August 23, 2018.
- [6]: SG&A less 2016 gross acquisition costs, per connection. Sprint Corporation, Form 10-K for the Fiscal Year Ended March 31, 2017, p. 30, available <http://d18rn0p25nwr6d.cloudfront.net/CIK-0000101830/b3706741-5644-4c1d-8e1e-80d91085fe07.pdf>, accessed August 23, 2018.
- [7]: Connections maintained at beginning of the year after a one-time addition of 1 million connections.
- [8]:  $(- [1]) \times [7]$ .
- [9]: Gross additions necessary to maintain 1 million connections given [8].
- [10]:  $[7] + [8] + [9]$ .
- [11]: Brattle estimation. Expenditure recurs every five years to maintain capacity.
- [12]:  $[9] \times [4]$ .
- [13]:  $[5] \times [10]$ . Overhead costs for additional connections are 0 in 2017.
- [14]:  $[5] \times [10]$ . Operating costs for additional connections are 0 in 2017.
- [15]: Sum of [11] to [14].
- [16]:  $[15] / [10]$ .
- [17]: Average weighted average cost of capital for AT&T, Verizon, Sprint, and T-Mobile as of September 30, 2017. Bloomberg, accessed August 21, 2018.
- [18]:  $( (1 + [17]) / (1 + [2]) ) - 1$ .
- [19]:  $( 1 / [18] ) ^ { ((Year - 2017) - .5)}$ . Mid-year periods used to reflect costs incurred over the course of the year.
- [20]:  $[19] \times [16]$ .
- [21]: Sum of [20].
- [22]:  $( ( [18] \times [21] ) ) / [ 1 - (1 + [18]) ^ - ( 2031 - 2017 ) ]$ .
- [23]:  $[22] / 12$ .
- [24]: SEC 10-K Filing.
- [25]:  $( [24] - [23] ) / [24]$ .

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**Table 35: T-Mobile Wireless Cost Structure, 2017-2031**

		2017	2018	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031
Annualized Churn	[1]	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%	18.82%
Inflation Rate	[2]	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%	1.89%
Connections	[3]	72,600,000														
Acquisition Cost per Connection	[4]	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259	\$259
Operating Cost per Connection	[5]	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79	\$79
Overhead Cost per Connection	[6]	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84	\$84
Gross Connections at Beginning of Period	[7]	0	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Churn	[8]	0	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195	-188,195
Gross Additions	[9]	1,000,000	188,195	188,195	188,195	188,195	188,195	188,195	188,195	188,195	188,195	188,195	188,195	188,195	188,195	188,195
Gross Connections at End of Period	[10]	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000	1,000,000
Marginal Capital Cost	[11]	\$58,219,159	\$0	\$0	\$0	\$0	\$58,219,159	\$0	\$0	\$0	\$0	\$58,219,159	\$0	\$0	\$0	\$0
Acquisition Cost	[12]	\$258,750,000	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419	\$48,695,419
Operating Cost	[13]	\$0	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394	\$78,939,394
Overhead Cost	[14]	\$0	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928	\$83,501,928
Sum of Costs	[15]	\$316,969,159	\$211,136,742	\$211,136,742	\$211,136,742	\$211,136,742	\$269,355,901	\$211,136,742	\$211,136,742	\$211,136,742	\$211,136,742	\$269,355,901	\$211,136,742	\$211,136,742	\$211,136,742	\$211,136,742
Average Costs Per Connection	[16]	\$316.97	\$211.14	\$211.14	\$211.14	\$211.14	\$269.36	\$211.14	\$211.14	\$211.14	\$211.14	\$269.36	\$211.14	\$211.14	\$211.14	\$211.14
Nominal Discount Rate	[17]	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%	5.84%
Real Discount Rate	[18]	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%	3.88%
Discount Factor	[19]	1.02	0.98	0.94	0.91	0.88	0.84	0.81	0.78	0.75	0.72	0.70	0.67	0.65	0.62	0.60
Present Value	[20]	\$323.06	\$207.16	\$199.42	\$191.98	\$184.81	\$226.97	\$171.27	\$164.88	\$158.72	\$152.79	\$187.65	\$141.60	\$136.31	\$131.22	\$126.32
Sum of Present Value Costs	[21]	\$2,704.16														
Annual Constant Cost Per Connection	[22]						\$253.95									
Monthly Constant Cost Per Connection	[23]						\$21.16									

**Sources & Notes:**

- [1]: Annualized churn based on monthly churn rates USB Wireless Report, p. 19 at Figure 35.
- [2]: 10-year expected inflation rate as of October 1, 2017. "Inflation Expectations," Federal Reserve Bank of Cleveland, November 15, 2017, available <https://www.clevelandfed.org/our-research/indicators-and-data/inflation-expectations.aspx>, accessed August 23, 2018.
- [3]: Dennis Bournique, "Fourth Quarter, 2017 Prepaid Mobile Subscriber Numbers by Operator," Prepaid Phone News, February 19, 2018, available <https://www.prepaidphonenews.com/2018/02/fourth-quarter-2017-prepaid-mobile.html>, accessed August 15, 2018.
- [4]: T-Mobile's 2013 average acquisition cost per connection. John C. Hodulik, Batya Levi, Lisa L. Friedman, and Christopher Schoell, "US Wireless 411: Version 51," UBS, March 18, 2014, p. 25 at Figure 44.
- [5]: Cost of services / [3]. T-Mobile US, Inc., Form 10-K for the Fiscal Year Ended December 31, 2016, p. 50, available <http://www.snl.com/Cache/c38030540.html>, accessed August 23, 2018; divided by total connections.
- [6]: SG&A less 2016 gross acquisition costs, per connection. T-Mobile US, Inc., Form 10-K for the Fiscal Year Ended December 31, 2016, p. 50, available <http://www.snl.com/Cache/c38030540.html>, accessed August 23, 2018.
- [7]: Connections maintained at beginning of the year after a one-time addition of 1 million connections.
- [8]: (- [1]) x [7].
- [9]: Gross additions necessary to maintain 1 million connections given [8].
- [10]: [7] + [8] + [9].

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[11]: Brattle estimation. Expenditure recurs every five years to maintain capacity.

[12]: [9] x [4].

[13]: [5] x [10]. Overhead costs for additional connections are 0 in 2017.

[14]: [5] x [10]. Operating costs for additional connections are 0 in 2017.

[15]: Sum of [11] to [14].

[16]: [15] / [10].

[17]: Average weighted average cost of capital for AT&T, Verizon, Sprint, and T-Mobile as of September 30, 2017. Bloomberg, accessed August 21, 2018.

[18]:  $[(1 + [17]) / (1 + [2])] - 1$ .

[19]:  $(1 / [18])^{((Year - 2017) - .5)}$ . Mid-year periods used to reflect costs incurred over the course of the year.

[20]: [19] x [16].

[21]: Sum of [20].

[22]:  $[( [18] x [21] ) / [1 - (1 + [18])^{- (2031 - 2017)} ]]$ .

[23]: [22] / 12.

[24]: SEC 10-K Filing.

[25]:  $( [24] - [23] ) / [24]$ .

## VII. Appendix B

### A. List of Wholesale MVNO-Host Network Relationships

**Table 36: U.S. MVNO Brands Excluding Facilities Based Providers**

Owner	MVNO Brand	Host Network	Supplemental Sources
[A]	[B]	[C]	[D]
Armed Forces Mobile*	Armed Forces Mobile	Verizon Wireless	
Affinity Cellular*	Affinity Cellular	Verizon Wireless	
AirVoice Wireless	AirVoice Wireless	AT&T	
Albany Mutual Telephone	Albany Mutual Telephone	Verizon Wireless	"FAQ," Albany Mutual Telephone, accessed October 25, 2017, <a href="http://www.albanytel.com/faq/">http://www.albanytel.com/faq/</a> .
Best Cellular*	Best Cellular	AT&T, Sprint, T-Mobile, Verizon Wireless	
Black Wireless*	Black Wireless	AT&T	
Boom! Mobile*	Boom! Mobile	AT&T, Sprint, T-Mobile, Verizon Wireless	
campusSIMs*	campusSIMs	AT&T, T-Mobile	
CellNUVO*	CellNUVO	Sprint	
ChitChat Mobile*	ChitChat Mobile	Sprint	
Comcast Corporation	Xfinity Mobile	Verizon Wireless	Mike Dano, "Editor's Corner - A look at how Comcast is taking its Xfinity Mobile MVNO to market," <i>Fierce Wireless</i> , September 1, 2017, accessed December 12, 2017, <a href="https://www.fiercewireless.com/wireless/editor-s-corner-a-look-at-how-comcast-taking-its-xfinity-mobile-mvno-to-market">https://www.fiercewireless.com/wireless/editor-s-corner-a-look-at-how-comcast-taking-its-xfinity-mobile-mvno-to-market</a> .
Consumer Cellular Inc.	Consumer Cellular	AT&T, T-Mobile	
KDDI America	EasyGO Wireless	AT&T	"About H2O Wireless," EasyGO, accessed December 12, 2017, <a href="https://easygo.h2owirelessnow.com/mainControl.php?page=about">https://easygo.h2owirelessnow.com/mainControl.php?page=about</a> .
EcoMobile*	EcoMobile	Sprint, T-Mobile, Verizon Wireless	
Expo Mobile*	Expo Mobile	Sprint, Verizon Wireless	
FreedomPop	FreedomPop	AT&T, Sprint	
Google	Project Fi	Sprint, T-Mobile, U.S. Cellular	
good2GO Mobile*	good2GO Mobile	AT&T, Sprint	
GreatCall, Inc.	GreatCall	Verizon Wireless	
Hayai Mobile*	Hayai Mobile	T-Mobile	
Jaguar Mobile*	Jaguar Mobile	T-Mobile	
Network Enhanced Technologies, Inc.	Jolt Mobile	AT&T, T-Mobile	
Karma Mobility*	Karma Mobility	Sprint	
KDDI America	H2O Wireless	AT&T	"About H2O Wireless," EasyGO, accessed December 12, 2017, <a href="https://easygo.h2owirelessnow.com/mainControl.php?page=about">https://easygo.h2owirelessnow.com/mainControl.php?page=about</a> .
KidsConnect*	KidsConnect	T-Mobile	
Liberty Wireless*	Liberty Wireless	T-Mobile	
Lycamobile	Lycamobile	T-Mobile	
United Online, Inc.	NetZERO	Sprint	
Pix Wireless*	Pix Wireless	AT&T, Sprint	"Check our Coverage," Pix Wireless, accessed December 12, 2017, <a href="https://www.pixwireless.com/coverage">https://www.pixwireless.com/coverage</a> .
Puppy Wireless*	Puppy Wireless	Verizon Wireless	
Telrite Corporation	Pure TalkUSA	AT&T	"Pure TalkUSA Everything You Should Know Before Subscribing," Best MVNO, accessed December 12, 2017, <a href="https://bestmvno.com/mvnos/pure-talkusa/">https://bestmvno.com/mvnos/pure-talkusa/</a> .
Red Pocket Mobile*	Red Pocket Mobile	AT&T, Sprint, T-Mobile, Verizon Wireless	
Bandwith.com, Inc.	Republic Wireless	Sprint, T-Mobile	
ROK Mobile*	ROK Mobile	AT&T, Sprint, Verizon Wireless	
Scratch Wireless*	Scratch Wireless	Sprint	
Selectel Wireless*	Selectel Wireless	Verizon Wireless	
SpeedTalk Mobile*	SpeedTalk Mobile	T-Mobile, Sprint, Verizon Wireless	
KeepCalling	Tello	Sprint	Colin Gibbs, "UK's Tello launches in a cutthroat MVNO segment via Sprint's network," <i>Fierce Wireless</i> , May 5, 2016, accessed December 12, 2017, <a href="https://www.fiercewireless.com/wireless/uk-s-tello-launches-a-cutthroat-mvno-segment-via-sprint-s-network">https://www.fiercewireless.com/wireless/uk-s-tello-launches-a-cutthroat-mvno-segment-via-sprint-s-network</a> .
Tempo Telecom*	Tempo Telecom	Sprint	
TextNow*	TextNow	Sprint, T-Mobile	
The People's Operator USA (TPO)*	The People's Operator USA (TPO)	Sprint, T-Mobile	
TracFone Wireless	GoSmart Mobile	T-Mobile	
TracFone Wireless	Net10 Wireless	AT&T, Sprint, T-Mobile, Verizon Wireless	
Page Plus Cellular	Page Plus Cellular	Verizon Wireless	
TracFone Wireless	Simple Mobile	T-Mobile	
TracFone Wireless	Straight Talk Wireless	AT&T, Sprint, T-Mobile, Verizon Wireless	
TracFone Wireless	Telcel America	Sprint, T-Mobile	
TracFone Wireless	Total Wireless	Verizon Wireless	
TracFone Wireless	TracFone Wireless	AT&T, T-Mobile, Verizon Wireless	
TracFone Wireless	Walmart Family Mobile	T-Mobile	
Tucows	Ting	Sprint, T-Mobile	
Twigby*	Twigby	Sprint, Verizon Wireless	"Twigby Everything You Should Know Before Subscribing," Best MVNO, accessed December 12, 2017, <a href="https://bestmvno.com/mvnos/twigby/">https://bestmvno.com/mvnos/twigby/</a> .
Ultra Mobile	Mint SIM	T-Mobile	
Ultra Mobile	Ultra Mobile	T-Mobile	
US Mobile*	US Mobile	T-Mobile, Verizon Wireless	
Working Assets	Credo Mobile	Verizon Wireless	
ZingPCS*	ZingPCS	Sprint, T-Mobile, Verizon Wireless	
ZIP SIM*	ZIP SIM	T-Mobile	

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Sources: For list of MVNOs and owners, "List of United States Mobile Virtual Network Operators," Best MVNO, available <https://bestmvno.com/mvnos/> and "Online database of MVNOs," accessed August 23, 2018; "MVNO Directory, available <http://www.blog.mvnodirectory.com>, accessed August 23, 2018. For MVNOs on Sprint's network, Marc Lagace, "Complete List of Sprint MVNOs," *Android Central*, April 14, 2017, available <https://www.androidcentral.com/complete-list-sprint-mvnos>, accessed August 23, 2018. For MVNOs on Verizon Wireless's network, Mike Tanasychuk, "Complete List of Verizon Wireless MVNOs," *Android Central*, April 12, 2017, available <https://www.androidcentral.com/complete-list-verizon-mvnos>, accessed August 23, 2018. For MVNOs on AT&T's network, Mike Tanasychuk, "Complete List of AT&T MVNOs," *Android Central*, May 8, 2017, available <https://www.androidcentral.com/complete-list-att-mvnos>, accessed August 23, 2018. For MVNOs on T-Mobile's network, Marc Lagace, "Complete List of T-Mobile MVNOs," *Android Central*, May 3, 2017, available <https://www.androidcentral.com/complete-list-t-mobile-mvnos>, accessed August 23, 2018.

Note: This is not an exhaustive list of active MVNOs in the U.S.

[A]: Asterisks indicate MVNOs for which no ownership information could be found. In these cases, we assume that the MVNO is not owned by another firm.

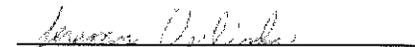
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\* \* \* \*

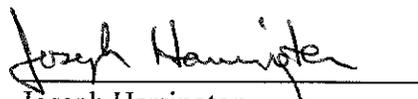
The foregoing declaration has been prepared using facts of which we have personal knowledge or based upon information provided to us. We declare under penalty of perjury that the foregoing is true and correct to the best of our current information, knowledge, and belief.

Executed on August 27, 2018

  
\_\_\_\_\_  
William P. Zarakas  
Principal  
The Brattle Group

  
\_\_\_\_\_  
Jeremy A. Verlinda, Ph.D.  
Principal  
The Brattle Group

  
\_\_\_\_\_  
Coleman Bazelon  
Principal  
The Brattle Group

  
\_\_\_\_\_  
Joseph Harrington  
Business Economics and Public Policy  
Department Chair  
Wharton School  
University of Pennsylvania

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## **Exhibit C**

### **Declaration of Stephen Wilkus**

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**DECLARATION OF STEPHEN WILKUS**

I, Stephen Wilkus, being over 18 years of age, swear and affirm as follows:

1. I make this declaration in support of the Petition to Deny of DISH Network Corporation (“DISH”) regarding the transfer of control of Sprint Corporation to T-Mobile US, Inc. (together, the “Applicants”) (WT Docket No. 18-197). This declaration will focus on statements made by representatives of the Applicants concerning their post-merger plans for 5G, spectrum usage, and integration. In addition to the Application, I have reviewed the declarations of Neville R. Ray, Executive Vice President and Chief Technology Officer (“CTO”) of T-Mobile; Michael Sievert, President and Chief Operating Officer (“COO”) of T-Mobile; John Saw, Chief Technology Officer (“CTO”), Sprint; and Brandon “Dow” Draper, Chief Commercial Officer (“CCO”).

2. My review of the Application and related materials indicates that the Applicants’ presentation of their post-merger network plans suffers from a number of technical gaps and inconsistencies. These gaps and inconsistencies render the technical analysis in the Application incomplete and unreliable, requiring substantial additional information before a full assessment of the Applicants’ post-merger plans can be performed and the claimed benefits verified.

3. I hold a B.S. degree in Physics and a MSEE degree from the University of Illinois and have extensively studied and worked on RF SAW filter design and wireless system design, architecture, system engineering, regulatory, standards issues. I was employed by Bell Labs for 28 years as a Distinguished Member of the Technical Staff and Member of the Alcatel-Lucent Technical Academy, and served most recently as a director in the Wireless Chief Technology Office, where I advised North American operators on technical aspects of spectrum issues, wireless equipment, and strategies. Over the years I have led teams in developing cellular

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filters, early Wireless LAN products, a wireless shelf label (RFID) system, and a fixed wireless terminal. I have been awarded over 13 patents and have published more than 12 peer reviewed articles and book chapters, edited several whitepapers for 4GAmericas and the IWPC on MIMO and Smart antennas, and have been an invited subject matter expert at several FCC workshops,<sup>1</sup> as well as Mexico's CoFeTel and Rutgers University Summits. I am a senior member of the IEEE and on the advisory boards of Rutgers University's WINLAB and Electrical and Computer Engineering School. Since leaving Bell Labs in 2014, I have consulted on spectrum valuation and wireless system proposals and have been a managing partner and CTO of Spectrum Financial Partners, LLC.

**Declaration of Neville Ray, T-Mobile CTO**

4. Mr. Ray attempts to show how New T-Mobile will take the two distinct T-Mobile and Sprint networks and combine them into a nationwide 5G superpower. He also tries to set forth the benefits consumers will receive from the resulting 5G deployment. He delves into issues regarding infrastructure, spectral efficiency and capacity, and integration. On each of these issues, Mr. Ray raises new questions as to whether the merger can achieve the benefits that he claims.

*Infrastructure*

5. It is not clear from the Application how the infrastructure from the stand-alone companies will be combined to create the dynamic 5G network that the Applicants claim they

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<sup>1</sup> See Alcatel Lucent presentation at FCC forum on the future of wireless band plans of July 16, 2012, last accessed June 25, 2018 and available at: <http://transition.fcc.gov/bureaus/oet/tac/tacdocs/meeting71612/PANEL2.2-Wilkus-Alcatel-Lucent.pdf>; FCC Receiver Workshop of March 12, 2012 last accessed June 25, 2018 and available on-line at <https://transition.fcc.gov/bureaus/oet/receiver-workshop1/Session3/SESSION-3-4-Wilkus-ALU.pdf>; FCC Learn Workshop on Incentive Auctions of May 3, 2013, agenda available on-line, last accessed June 26, 2018 <https://ecfsapi.fcc.gov/file/7022421551.pdf>.

cannot achieve on their own. For example, T-Mobile currently has 61,000 sites and 18,000 small cells and distributed antennas systems (“DAS”).<sup>2</sup> The majority of these locations are leased and not owned; this implies that renegotiated lease agreements and upgrades might be required to install Sprint’s 2.5 GHz spectrum equipment on all the sites for 5G deployment. The Applicants should explain how they will deal with this integration challenge.

*Spectral Efficiency and Capacity*

6. The Applicants have touted the benefits of the 5G network that the combined companies will be able to deploy. But they appear to have wrapped into their story certain benefits that are not at all tied to 5G, or at least not 5G alone. Mr. Ray quotes the capability requirements accepted by the ITU standards bodies,<sup>3</sup> but not all of these capabilities will be delivered by all 5G networks, and not all capabilities will be simultaneously available by virtue of a 5G implementation. In particular, the “tenfold improvement in the typical user experienced data rate from 10 Mbps to 100 Mbps or more” assumes that additional spectrum is used in the implementation, and the “three times greater spectral efficiency” depends upon the spectrum band and details of implementation as seen in Table 3, ¶ 50 of Mr. Ray’s Declaration.

7. Nor is the Applicants’ story clear as to why the merger would be such a boon for throughput rates. The 25 Mbps average throughput rate appear to be based on 10+10 MHz for 600 MHz with a spectral efficiency of 2.5 bps/Hz.<sup>4</sup> However, it is unclear how the Applicants arrived at the peak rate of 900 Mbps. Does it include other spectrum? If so, why is that spectrum not considered in the average capacity number? Similarly, in paragraph 53 of Mr.

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<sup>2</sup> Ray Declaration ¶ 5.

<sup>3</sup> *Id.* ¶¶ 11-15.

<sup>4</sup> *See id.* ¶ 17. The notation, 10+10 MHz is to indicate 10 MHz of uplink plus 10 MHz of downlink spectrum blocks. Downlink data rates of 25 Mbps are available with 10 MHz of downlink spectrum at an efficiency of 2.5 bps/Hz; 2.5\*10.

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Ray's Declaration, Tables 4 and 5 present unexplained numbers; considering 60 MHz of 2.5 GHz spectrum and a 4:1 TDD ratio, and using the average spectral efficiency number expected for mid-band 5G of 3.8 bps/Hz, Sprint should be able to support an average capacity of 182.4 Mbps. However, in paragraph 53 (Table 4), Sprint's stand-alone 5G average rate is shown to be only 55 Mbps. In addition, given that Sprint has already demonstrated peak speeds of up to 1 Gbps using 60 MHz for LTE,<sup>5</sup> it is unclear why the peak speeds for 5G on a standalone basis for the same amount of spectrum will result in peak speeds of only 300 Mbps.

8. Figures 3 and 4 of Mr. Ray's Declaration are difficult to credit.<sup>6</sup> They show that Sprint and T-Mobile will have zero subscribers with speeds greater than 200 Mbps or 250 Mbps without the merger in years 2021 through 2024. It appears that T-Mobile is excluding the 28 GHz spectrum that it owns and plans to deploy, as well as the 28/39 GHz spectrum and the CBRS spectrum that it may acquire and deploy in the upcoming auctions from these projections. T-Mobile also does not mention the use of unlicensed spectrum and related technologies like LAA that it has been trialing and deploying, nor the fact that both T-Mobile and Sprint have already announced trials of 1 Gbps with existing spectrum.<sup>7</sup> Additional data, including breakdown for covered rural, suburban and urban POPs are required to evaluate the claims of improved throughput for the population given the propagation characteristics of 2.5 GHz spectrum.

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<sup>5</sup> "Sprint Debuts Gigabit Class LTE in New Orleans," press release of March 9, 2017 accessed on line on Aug 19, 2018 available on line at: <http://newsroom.sprint.com/sprint-debuts-gigabit-class-lte-in-new-orleans.htm>; Press Release, "T-Mobile, Ericsson exceed 1 Gbps with LAA demo," December 05, 2017, last accessed Aug. 19, 2018 and available on-line at <https://www.t-mobile.com/news/tmobile-ericsson..>

<sup>6</sup> See Ray Declaration ¶¶ 18-20.

<sup>7</sup> Press Release, "T-Mobile, Ericsson exceed 1 Gbps with LAA demo," December 05, 2017, last accessed Aug. 19, 2018 and available on-line at <https://www.t-mobile.com/news/tmobile-ericsson>.

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9. The Applicants also appear to be underplaying Sprint's peak speed in a 5G world as a stand-alone company. Mr. Ray seems to imply that this speed will peak at 300 Mbps.<sup>8</sup> However, Sprint has publicly stated that its 5G deployments in 2019 will result in significantly higher speeds.<sup>9</sup> Additionally, Ericsson and Qualcomm have demonstrated Gbps speeds using technologies like LAA, 256 QAM, and 4x4 MIMO.<sup>10</sup> T-Mobile has indicated an average 5G capacity of 25 Mbps for the lower bands.<sup>11</sup> This is reasonable assuming 10+10 MHz of 600 MHz at 2.5 bps/hz. However, under the same approach using 3.8 bps/Hz and 4:1 TDD ratio, 60 MHz of 2.5 GHz should result in an *average* capacity of 182.4 Mbps in areas where 2.5 GHz spectrum is deployed for 5G by Sprint on a stand-alone basis. Peak speed should be much higher.

10. Mr. Ray indicates that New T-Mobile will perform cell splitting of anchor T-Mobile sites by retaining up to 11,000 of Sprint sites. However, gains resulting from the cell splitting will depend on the existing layouts of Sprint and T-Mobile sites. Mr. Ray seems to imply that cell splitting will result in a doubling of capacity for the split sites. However, it is unclear if the full benefit will be realizable. It is also unclear if anchoring on the T-Mobile sites and selectively retaining Sprint sites is a better strategy than selecting and retaining optimum site locations from the combined pool of both T-Mobile and Sprint's sites. Additional data are

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<sup>8</sup> Ray Declaration ¶ 53.

<sup>9</sup> Sprint Press Release of Sept. 12, 2017, "Sprint and Ericsson Conduct First U.S. Field Tests for 2.5 GHz Massive MIMO," <http://investors.sprint.com/news-and-events/press-releases/press-release-details/2017/Sprint-and-Ericsson-Conduct-First-US-Field-Tests-for-25-GHz-Massive-MIMO/default.aspx>

<sup>10</sup> <https://www.ericsson.com/en/press-releases/2017/8/gigabit-speeds-blast-1.07-gbps-in-north-america>

<sup>11</sup> Ray Declaration ¶ 53.

required to evaluate the amount of gain that is being attributed to the retention of 11,000 Sprint sites.

*Integration*

11. Integration will likely be a significant challenge post-merger. Mr. Ray's Declaration cannot help drawing attention to some of these issues. For example, Mr. Ray states that New T-Mobile intends to only retain 11,000 cell sites from Sprint,<sup>12</sup> a small fraction of Sprint's total sites.<sup>13</sup>

12. One would expect that there would be comparable numbers of optimal "anchor" sites coming from each company's site database. That only Sprint's sites would be decommissioned ought to worry Sprint customers who receive only CDMA voice service—a service that will not be available from T-Mobile sites. This suggests that Sprint assets would not be optimally used, to the potential detriment of current Sprint customers.

13. Mr. Ray also appears to misstate the importance of signal strength. Signal to interference ratio, or SINR, also needs to be considered.<sup>14</sup> Mr. Ray does not show that SINR will be improved as a result of this transaction. It is simple to say that doubling the number of base stations can double the overall network capacity, but if the user density also doubles, the average user experience may not necessarily change, assuming the spectrum and SINR are unchanged.

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<sup>12</sup> *Id.* ¶ 31.

<sup>13</sup> "A merged Sprint/T-Mobile will shutter 25,000 towers, and Crown Castle will suffer most," Fierce Wireless April 30, 2018 by Mike Dano. Available on-line as of Aug. 20, 2018 at: <https://www.fiercewireless.com/wireless/a-merged-sprint-t-mobile-will-shutter-25-000-towers-and-crown-castle-will-suffer-most>.

<sup>14</sup> *See* Ray Declaration ¶¶ 38, 39.

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14. Mr. Ray declares that “I expect that Sprint customers are likely to be completely migrated within three years.”<sup>15</sup> But this is belied by the historical record of how long it takes to migrate customer bases, particularly now that smart phone lifespans have grown, with 42% of users waiting three or more years between replacements—longer than the time period during the MetroPCS merger and subsequent integration.<sup>16</sup> This can be seen in the long transition time for subscribers in Dr. Evans’ Declaration. Dr. Evans notes that there are still 9% of U.S. mobiles using 2G. This speaks to the need to plan much longer transitions for convincing customers to give up their immensely personal mobile devices for a transition to 5G. Tower negotiations, modifications, and installation of 2.5 GHz MIMO antennas and associated Remote Radio Heads (“RRHs”) may also take longer than three years in many cases.

15. Mr. Ray provides a macro cell site count of 84,000.<sup>17</sup> But 61,000 (T-Mobile) + 11,000 (retained Sprint) totals 72,000 sites. Are the Applicants planning to build an additional 13,000 sites? If so, are these going to be predominantly in rural areas?

16. The Applicants’ story on rural coverage is also incomplete. Mr. Ray claims that outdoor rural coverage will be 59.4 million POPs, and indoor rural coverage will be 31 million POPs.<sup>18</sup> This appears to be solely from T-Mobile’s 600 MHz holdings and not a synergy provided by the two companies’ spectrum holdings, since the outdoor and indoor coverage of Sprint’s 1.9 GHz and 2.5 GHz holdings are significantly lower. Incremental rural POPs coverage, then, has not yet been shown to be a benefit of the merger. In spite of the claims about

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<sup>15</sup> *Id.* ¶ 65.

<sup>16</sup> “Americans Keep Their Cellphones Longer,” Thoma Gryta, Wall Street Journal, April 18, 2016, last accessed Aug 20, 2018, available at <https://www.wsj.com/articles/americans-keep-their-cellphones-longer-1461007321>

<sup>17</sup> Ray Declaration ¶ 73.

<sup>18</sup> *Id.* ¶ 74.

rural coverage, most of the rural population will be covered by anchor T-Mobile sites that have likely been planned for deployment with T-Mobile's 600 MHz spectrum. Sprint has minimal rural coverage using 2.5 GHz.<sup>19</sup> Therefore, it is unlikely that the 11,000 Sprint sites that are to be retained post-merger will be able to supplement the rural coverage being provided by T-Mobile's 600 MHz rural sites.

**Declaration of Mike Sievert, T-Mobile President and COO**

17. Mr. Sievert speaks to T-Mobile's position as a market disruptor, the merger's synergies, and the post-merger plans for New T-Mobile. Specifically, he addresses issues of integration, capacity, new services, and job creation. But there are missing pieces and inconsistencies throughout Mr. Sievert's testimony that need to be addressed.

*Integration with Respect to Capital Expenditures*

18. The projected \$40 billion capital spend in first three years does not break out the costs of integration. The costs of integrating 2.5 GHz equipment on existing T-Mobile sites may be higher than expected, given the weight and wind loading that some tower sites may need to be reinforced against. The time to migrate the Sprint customer base may also take longer than envisioned. The Applicants should provide more detailed accounting of the transition plans and contingencies for expanded timeframes that do not overstress the customers or the site upgrade costs and difficulties.

*Capacity*

19. Mr. Sievert also appears undecided on the improvement to capacity that the merger will bring. He asserts that capacity will be "four times" in paragraph 17, but then states that "capacity will double" in paragraph 21.

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<sup>19</sup> Saw Declaration ¶ 32.

*New Services*

20. Mr. Sievert declares that “[b]y 2024, New T-Mobile is expected to provide in-home broadband service to 9.5 million households nationwide...”<sup>20</sup> In Mr. Ray’s Declaration, however, the estimate seems far more ambitious: “By 2024, New T-Mobile will deliver fixed broadband service meeting the FCC’s speed definition for broadband of 25/3 Mbps to a total of 52.2 million rural POPs over 2.4 million square miles...”<sup>21</sup>

*Jobs*

21. The Applicants promise job gains, but this appears far from certain.<sup>22</sup> As 35,000 cell sites are decommissioned, there will surely be field maintenance personnel who will become redundant, as well as accounting, marketing, advertising and similar general and administrative personnel. It is unclear whether the Applicants have accounted for those that will be “let go” as a result of the proposed consolidation.

**Declaration of John Saw, Sprint CTO**

22. Mr. Saw’s Declaration details the challenges Sprint has faced deploying its networks and competing in the marketplace. But these are obstacles that likely can be overcome without a merger.

23. Much of the difficulty that Mr. Saw cites with Sprint’s 2.5 GHz spectrum is the nature of TDD, where reduced transmit times reduce the energy that can be transmitted from power limited amplifiers. This has been mitigated somewhat by the development of the High Power User Equipment standard (“HPUE”), though only by increasing the peak transmit power from 23 dBm to 26 dBm, 3 dB or a simple factor of 2 for band 41 operations (2.5 GHz band).

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<sup>20</sup> *Id.*

<sup>21</sup> Ray Declaration ¶ 76.

<sup>22</sup> Sievert Declaration ¶ 19.

The Applicants have not addressed the prospects that this technology portends for a standalone Sprint.

24. Mr. Saw also appears to take the position that low latency benefits of 5G are possible only by dedicating the entire 2.5 GHz band to the endeavor on a standalone basis. However, Sprint has not demonstrated why 5G deployed in split mode within a spectrum band cannot be rolled out on a standalone basis.

**Declaration of Dow Draper, CCO, Sprint Corporation**

25. Mr. Draper addresses the challenges Sprint faces in the marketplace “just trying to catch up with the competition.” Specifically, Mr. Draper discusses Sprint’s planned 5G capital expenditures, its reliance on CDMA technology, its coverage, and its competitiveness with AT&T and Verizon. But some of his statements provide evidence that Sprint can be successful without the merger.

26. Sprint’s plans to spend \$5-6 billion per year on 5G over each of the next three years make the Applicants’ argument that \$40 billion will be used to build out a 5G network seem less than impressive.<sup>23</sup> Indeed, when Sprint’s stand-alone figures are combined with T-Mobile’s, they add up to a total of \$10-12 billion per year, which is roughly consistent with what New T-Mobile purportedly would be spending.

27. Sprint claims continued reliance on CDMA technology, which it says, among other things, keeps it from having a presence in the IoT market.<sup>24</sup> But, given the support for IoT in LTE, it is unclear why Sprint needs to continue to rely on CDMA.

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<sup>23</sup> See Draper Declaration ¶ 5.

<sup>24</sup> *Id.* ¶ 38.

**Conclusion**

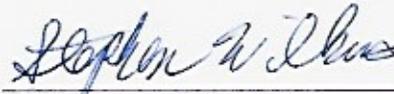
28. The Applicants have not yet shown that the benefits they claim will come from their merger are real, verifiable, and transaction specific.

**REDACTED—FOR PUBLIC INSPECTION**

\* \* \* \*

The foregoing declaration has been prepared using facts of which I have personal knowledge or based upon information provided to me. I declare under penalty of perjury that the foregoing is true and correct to the best of my current information, knowledge, and belief.

Executed on August 27, 2018



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Stephen Wilkus  
Managing Partner and Chief Technology  
Officer  
Spectrum Financial Planners, LLC

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**CERTIFICATE OF SERVICE**

I, Andrew Golodny, hereby certify that on August 27, 2018, I caused true and correct copies of the foregoing public, redacted version to be served by electronic mail upon the following:

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