DLA Piper LLP (US)
500 Eighth Street, NW
Washington, DC 20004
www.dlapiper.com

Nancy Victory
nancy.victory@dlapiper.com
T 202.799.4216
F 202.799.5616

December 18, 2018

VIA ECFS

Marlene H. Dortch
Secretary
Federal Communications Commission
445 Twelfth Street, S.W.
Washington, DC 20554

REDACTED – FOR PUBLIC INSPECTION

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:

Pursuant to Section 1.1206(b) of the Commission's Rules, 47 C.F.R. § 1.1206(b), notice is hereby provided of a written *ex parte* presentation in the above-referenced docket. On December 4, 2018, DISH Network Corporation and the Communications Workers of America submitted comments[1] regarding a study prepared by John Asker, Timothy Bresnahan, and Kostis Hatzitaskos of Cornerstone Research that was submitted by the Applicants in this proceeding (the "Cornerstone Analysis").[2] In the attached response, Drs. Asker, Bresnahan and Hatzitaskos address the arguments raised by DISH and CWA as well as those commenters' misunderstandings or misrepresentations about how the Cornerstone Analysis relates to and is complementary of the analysis submitted by Mark Israel, Michael Katz and Bryan Keating.[3] Also being submitted are certain back-up support for the response as well as data referenced in footnote 121 of the Cornerstone Analysis.

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[1] DISH Network Corporation, Comments in Response to Public Notice Regarding Cornerstone Report, WT Docket No. 18-197 (Dec. 4, 2018); Comments of Comments of Communications Workers of America on Applicants' New Econometric Study, WT Docket No. 18-197 (Dec. 4, 2018).

[2] Economic Analysis of the Proposed T-Mobile/Sprint Merger, attached to Letter from Nancy J. Victory, Counsel for T-Mobile US, Inc., to Marlene H. Dortch, Secretary, FCC, WT Docket No. 18-197 (Nov. 6, 2018).

[3] Declaration of Mark Israel, Michael Katz and Bryan Keating, App. F to Joint Opposition of T-Mobile US, Inc. and Sprint Corporation, WT Docket No. 18-197 (Sept. 17, 2018).

This filing contains information that is "Highly Confidential" pursuant to the Protective Order filed in WT Docket No. 18-197.[4] Accordingly, pursuant to the procedures set forth in the Protective Order, a copy of the filing, including the attached disk, is being provided to the Secretary's Office. In addition, two copies of the Highly Confidential Filing, including the attached disk, are being delivered to Kathy Harris, Wireless Telecommunications Bureau. A copy of the Redacted Highly Confidential Filing is being filed electronically through the Commission's Electronic Comment Filing System.

Please direct any questions regarding the foregoing to the undersigned.

Respectfully submitted,

DLA Piper LLP (US)

/s/ Nancy Victory

Nancy Victory
Partner

cc: David Lawrence
Kathy Harris
Linda Ray
Kate Matraves
Jim Bird
David Krech

[4] Applications of T-Mobile US, Inc., and Sprint Corporation for Consent to Assign Licenses, Protective Order, WT Docket No. 18-197 (June 15, 2018). Pursuant to discussions with Staff, custodial documents and data and materials being provided with this response, unless specifically reviewed and downgraded, have been classified as "Highly Confidential." Notwithstanding that default classification, Applicants are not asserting Highly Confidential status for any documents that have been publicly released (which would be Public) or for third party materials that are copyrighted (which would be considered Confidential).

ATTACHMENT A

CORNERSTONE RESEARCH
ECONOMIC AND FINANCIAL CONSULTING AND EXPERT TESTIMONY

RESPONSE TO DISH AND CWA COMMENTS

By John Asker,[*] Timothy F. Bresnahan,[†] and Kostis Hatzitaskos [‡]

December 18, 2018

[*] John Asker is a Professor of Economics at the University of California at Los Angeles, where he holds the Armen A. Alchian Chair in Economic Theory.

[†] Timothy Bresnahan is a Professor of Economics at Stanford University, where he holds the Landau Professorship in Technology and the Economy.

[‡] Kostis Hatzitaskos is a Vice President in the Chicago office of Cornerstone Research.

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1. Introduction

1. We previously submitted an economic analysis of the proposed merger that empirically assessed its likely competitive effects using rich, present-day data.[1] We later discussed our analysis with Commission staff.[2]

2. As we described in our initial white paper, our analysis employed the Nielsen Mobile Performance ("NMP") data. These data provide extremely granular information on consumer behavior: where, when, and how more than [redacted] consumers use their mobile phones, [redacted].

3. We used this rich variation to estimate a flexible model of consumer demand. Controlling for price and a multitude of product and consumer characteristics, our demand estimation demonstrates that different consumer types all value network quality and are more likely to choose a brand if it offers good network quality given their individualized usage patterns. We focused our analysis on two dimensions of network quality: speed and coverage. In addition to average speed and coverage, we also evaluated how the worst speed and coverage experienced by each consumer affected their brand choice, which speaks to consumer preferences for consistency.[3]

4. Building on these estimates, we conducted a series of merger simulation analyses to quantify the likely effect of the proposed merger on pricing incentives for the merged firm and its competitors. We found that the proposed merger is likely to increase competition among wireless carriers. In particular, under a range of assumptions about marginal cost efficiencies and network quality improvements, we found that New T-Mobile will gain subscriber share, consistent with an expansion of output and welfare gains for consumers.[4]

5. We have already described our analysis in great detail in our initial white paper, including its extensive and detailed technical appendix.

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[1] John Asker, Tim Bresnahan, and Kostis Hatzitaskos, "Economic Analysis of the Proposed T-Mobile/Sprint Merger," November 6, 2018 ("Initial White Paper").

[2] John Asker, Tim Bresnahan, and Kostis Hatzitaskos "Economic Analysis of the Proposed T-Mobile/Sprint Merger: Presentation to Federal Communications Commission," December 3, 2018 ("Presentation to FCC Staff").

[3] Initial White Paper, § 3.1.

[4] Initial White Paper, ¶ 4.

6. DISH Network Corporation ("DISH") and Communications Workers of America ("CWA") recently submitted economist declarations by Coleman Bazelon, Jeremy Verlinda, and William Zarakas of the Brattle Group,[5] and Heski Bar-Isaac of the University of Toronto's Rotman School of Management,[6] respectively. We have been asked by counsel for the merging parties to respond to the DISH and CWA comments. We do so in the rest of this document.

7. Bazelon, Verlinda, Zarakas, and Bar-Isaac make certain theoretical arguments, claiming that some of our assumptions and results are faulty. We begin with a high level review of certain aspects of our analysis and reiterate why they are appropriate, in line with the academic literature, and have strong foundation in detailed consumer behavior data (§ 2).

8. We then clarify some of the misunderstandings or misrepresentations by DISH and CWA about how our analysis relates to and is complementary of the analysis submitted by Mark Israel, Michael Katz, and Bryan Keating (§ 34).[7] In particular, we discuss the relationship between the measures of speed each analysis uses, as well as the network quality improvements and marginal cost reductions the merging parties expect to result from the network integration.

9. Finally, we review the analytical critiques conducted by Bazelon, Verlinda, and Zarakas and explain that they are incomplete, rejected by the data, and inconsistent with the academic literature (§ 4). We then conclude (§ 5).

[5] Coleman Bazelon, Jeremy Verlinda, William Zarakas, "Further Reply Declaration," December 4, 2018 ("Bazelon, Verlinda, and Zarakas Declaration").

[6] Heski Bar-Isaac, "Comments on T-Mobile/Sprint Cornerstone Study," December 4, 2018 ("Bar-Isaac Declaration").

[7] Reply Declaration of Mark Israel, Michael Katz, and Bryan Keating, September 17, 2018 ("Israel, Katz, and Keating Declaration").

2. Our merger simulation offers a robust, economically coherent framework, grounded in detailed industry data, for understanding the competitive significance of the proposed merger

10. In this section, we review certain elements of our analysis and reiterate why they are appropriate, in line with the academic literature, and have strong foundation in detailed consumer behavior data.

2.1. The diversion ratios between the merging parties that our analysis estimates are more appropriate to the analysis of competitive effects than the historical porting between the two carriers

11. Both Commission staff and the academic literature recognize that the question that is relevant to evaluating a proposed merger's competitive effects is how many consumers would switch away from a product and what other products they would substitute to *in the event of a price increase or quality decrease*.[8] This last qualifier is important, as any evaluation of the merged firm's incentives must focus on substitution that arises from changes in supplier behavior. This is not just about the quality of a data source that measures switching; it is something fundamentally different from generalized switching data.

12. The NMP data enable the estimation of a detailed and flexible demand model that, consistent with the academic literature, estimates the diversion ratios that are actually relevant to assessing the competitive effects of the proposed merger. These diversion ratios reflect the closeness of competition between any two brands, taking into account product and consumer characteristics, including the individualized quality each brand offers to particular consumers given their unique usage patterns.[9]

13. Such estimates have not been available to the Commission when it has assessed prior wireless mergers. The Commission has previously relied on porting data to proxy for diversion ratios while recognizing its potential shortcomings, including the fact that switchers may do so in response to factors other than changes in price or quality and the fact that porting data capture a

[8] Federal Communications Commission Staff Analysis and Findings, Appendix C, ¶ 8 and fns. 9 and 10; Horizontal Merger Guidelines § 6.1.

[9] Initial White Paper, § 2.2.3.

non-random sample of switchers.[10] The availability of our estimates of diversion ratios allows the Commission to avoid determining which sources of switching data (e.g., porting data versus survey data) are a more accurate proxy here and to use a more appropriate estimate.

14. Data on consumer switching from one product to another, whether derived from porting data or other sources, mix changes in demand and supply, making them generally inappropriate measures for the purpose at hand. To understand why, consider automobiles. If we evaluate switching data, we might observe many men in their thirties switching from sports cars to minivans. This does not mean that sports cars and minivans are close substitutes, or that raising the price of one would lead many to switch to the other. Instead, it suggests that these individuals are experiencing a life event that is causing them to switch.

15. Similarly in the case of wireless phone service, consumers may switch from one brand to another for a variety of demand-driven reasons, e.g., because they or a family plan member moved, because their old phone broke down, or because they missed a monthly payment.

16. Although the availability of appropriate estimates of diversion ratios makes it unnecessary to determine the best source of switching data, it is important to understand that porting data suffer from additional shortcomings relative to other forms of switching data. Specifically, porting data catalogue switching only by those consumers who choose to "port" or transfer their number from one brand or network to another. We understand from discussions with executives that porting data do not reflect all switching in the wireless industry and that the non-random sample of switches that they reflect tends to overstate switches between Sprint and T-Mobile.[11]

17. Even though we understand business people use porting data to consider directional changes, porting data is clearly inferior to our estimates of diversion ratios for purposes of a competitive effects analysis. If porting data were driven by supplier behavior, i.e., changes in quality-adjusted prices, then we would

[10] Federal Communications Commission Staff Analysis and Findings, Appendix C, ¶¶ 9–10. For other examples of porting data being used to review wireless telecom mergers, see Israel, Katz, and Keating Declaration, fn. 172 on p. 126.

[11] For example, we understand that MVNOs rarely tie promotions and pricing to porting and so are underrepresented in porting data. For a further discussion of the potential problems with using porting data as a proxy for diversion ratios, see Israel, Katz, and Keating Declaration, Appendix I.C.3; and Mark Israel, Michael Katz, and Bryan Keating, "Additional Information Regarding the Estimation of Diversion Ratios," December 14, 2018.

expect switchers to only move in one direction at any given point in time, away from the brand that raised quality-adjusted prices or towards the brand that lowered them. Instead, we routinely see sets of consumers porting in both directions at the same time,[12] which is inconsistent with switching behavior driven exclusively by supply shocks, such as a price change. Our analysis avoids this and other concerns raised by the Commission in prior transactions about relying on porting data.

2.2. We are not aware of any promotions that can reliably be used to study diversion ratios

18. Given the high frequency of pricing promotions in this industry, we are not aware of isolated pricing or promotional events that could be used to cleanly estimate diversion ratios, or to study the relationship between diversion ratios and historical porting data.[13] Nor are we aware of ordinary course analysis that attempts this task.

19. Moreover, any study of promotions or other price changes as a driver of brand switching needs to focus purely on supply-driven promotions or pricing events. We are not aware of any evidence that establishes that the frequent promotions we observe are driven only by cost or other shocks to supply, as opposed to being at least partly based on business peoples' assessment of changing demand.

20. The simple facts remain that porting data capture a biased sample of switches and that it routinely mixes demand- and supply-driven switches, as evidenced by the movement of consumers in both directions. These facts mean that using porting data, even when focusing on a promotional period, is likely to lead to estimates of diversion ratios that are inferior to those that can be obtained by a rigorous econometric estimation of consumer choice. This is the approach followed by the academic literature, as well as the approach that we have followed in our initial white paper, using the granular NMP data.

[12] See our workpapers.

[13] For examples demonstrating the complex overlapping promotions in this industry, consider SPR-FCC-02396530–31 and SPR-FCC-02665524–25.

2.3. One cannot predict the competitive effects of the proposed merger simply by comparing different countries with three or four wireless competitors

21. DISH argues that a report from Rewheel Research commenting on mergers in Europe suggests that 4-to-3 mergers in the wireless industry increase prices.[14] Many factors vary between any two countries, including differences in landmass, population density, spectrum allocation, and regulatory conditions. Rewheel Research does not make any attempt to control for any of these factors. It is inappropriate to suggest that a cursory analysis that cannot control for any such factors and is focused on conditions in Europe and other parts of the world has any bearing on the likely competitive effects of the proposed merger which is a merger between US wireless providers.

2.4. Our analysis appropriately estimates consumers' sensitivity to price, while controlling for many other product and consumer characteristics

22. Our analysis directly incorporates consumers' sensitivity to price. DISH argues that our model ignores the role income plays in consumer willingness to pay for wireless services.[15] This argument is false. Our rich model of consumer choice estimates how consumers trade off price, network quality, and several other product characteristics, all the while controlling for various consumer characteristics, including income.[16] Our results show that, *everything else equal*, a consumer is more likely to choose a brand if it offers better individualized network quality given that particular consumer's unique usage patterns.[17] The data confirm that many consumers do not always choose the highest-quality brand.[18]

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[14] DISH Network Corporation, "Comments in Response to Public Notice Regarding Cornerstone Report," December 4th 2018, fn. 41 on p. 21, citing http://research.rewheel.fi/downloads/The_state_of_4G_pricing_DFMonitor_10th_release_2H2018_PUBLIC.pdf ("Rewheel Report").

[15] DISH Network Corporation, "Comments in Response to Public Notice Regarding Cornerstone Report," December 4th 2018, pp. 3, 7. See § 4 for additional detail addressing the critiques of DISH and Bazelon, Verlinda, and Zarakas.

[16] We described our demand estimation framework in detail in our initial white paper, §§ 3.1, 5.3.1.

[17] For detailed results and discussion, see our initial white paper, § 3.2.

[18] For example, consider initial white paper fn. 44, on p. 19 [redacted]

23. In particular, our demand model allows for the data to speak to the extent that lower-priced, non-premium brands may be closer substitutes for certain consumers, e.g., consumers with lower income, lower credit scores, and consumers who tend to travel to fewer locations.[19] Our demand model also directly incorporates price and reflects that consumers differ in how much they are willing to pay for a brand that improves its quality.[20] This also means that when a brand lowers its price, some consumers will be willing to choose that brand even if it means a reduction in network quality, while other consumers will not.

2.5. Our model already controls for other differences across brands, such as advertising and retail stores

24. The Bazelon, Verlinda, and Zarakas and Bar-Isaac declarations present theories that our model omits important factors that are correlated with network quality, such as advertising intensity and retail store locations.[21] They claim these omissions may lead our results to overstate the value consumers place on network quality. Neither declaration provides any empirical evidence to support this speculation, which is incorrect and at odds with standard practice in demand estimation.

25. As described in our white paper, we use rich data at the individual consumer level to estimate our demand model using methods that are standard in the academic literature. To identify the effect that network quality has on consumer choice, our model holds constant everything that may be the same across two consumers within a geographic area and asks whether and by how much a consumer is more likely to choose a brand if the brand offers greater individualized network quality.

26. Consider two consumers that live in the same city and who are considering whether or not to choose T-Mobile. These consumers face the same national price and the same level of national or local perception of overall network quality, advertising, reputation, service, and retail stores. However, the network quality that T-Mobile offers each consumer is ultimately *individualized* based on exactly where, when, and how each of them uses their phone. It is this variation in quality that our model focuses on when estimating whether and

[19] Initial White Paper, ¶ 61 and Exhibit 5.

[20] Initial White Paper, ¶ 63 and Exhibit 6.

[21] See Bazelon, Verlinda, and Zarakas Declaration, p. 7 and Bar-Isaac Declaration, p. 4.

how incremental network quality can make a given individual more likely to choose a brand.[22]

27. Controlling for such differences across brands is standard practice. The criticisms of Bazelon, Verlinda, and Zarakas and Bar-Isaac are not only unfounded, they also reflect a misunderstanding of our model.

2.6. Nielsen's consumer recruitment and selection process for the NMP dataset

28. Based on conversations with Nielsen, we understand the following.

29. [redacted]

30. [redacted]

31. [redacted]

[22] Our model includes variables that account for factors that commonly affect the brand valuation of consumers of a specific data usage type. The model accounts for differences in perception of each brand between heavy, medium, and light data users. For example, if heavy data users are especially sensitive to marketing claims made by Verizon about the quality of its network, the model will reflect and account for this difference that specifically affects heavy data users' preference for Verizon. Similarly, the model will also account for the extent to which a brand offers unlimited plans that particularly appeal to heavy usage types. Our model also includes fixed effects that account for differences in consumers' valuation of each brand in each Sprint/KPMG "market area." For example, it will account for a brand that advertises more in a particular area, or if a brand invests in more retail stores in the area. For a detailed discussion of our demand specification, see initial white paper, § 5.3.1.

[23] [redacted]

32.

33.

34. In our initial white paper we also conducted a series of checks and found the NMP data to be .[25] .[26]

[24]

[25] Initial White Paper, § 5.1.8.

[26] Initial White Paper, Exhibit 49.

[redacted].[27]

[27] Initial White Paper, Exhibit 46.

3. The analysis in our initial white paper is complementary to the results and approach Israel, Katz, and Keating took in their analysis

35. As explained in our initial white paper, our analysis is complementary to the analysis submitted by Israel, Katz, and Keating. Their analysis has strong foundations in the network engineering work done by the merging parties, while our work is based on detailed present-day micro data. Their work also focuses on the effects of 5G speed improvements, while our work focuses on the impact of network quality improvements within the range observed in present-day, LTE-era data.[28]

36. The analyses rely on different data. Israel, Katz, and Keating calibrate a model of demand and supply to aggregated data based on the best available projections about 2021 and beyond. Our analysis uses extremely granular and newly available data on consumer choice, usage behavior, and individualized network quality at the level of individual consumers. We then use that data to estimate a model of demand and supply based on competition today.

37. The analyses also differ in the analytical tasks they address. Israel, Katz, and Keating use the diversion ratio between Sprint and T-Mobile brands as an *input* and test the sensitivity of their results for a range of values. In contrast, diversion ratios are an *output* of our analysis, namely our detailed model of consumer choice. In that sense, our analysis reinforces the findings of Israel, Katz, and Keating, in that we find that the appropriate diversion ratios to use for purposes of merger analysis are among the lower end of the range that Israel, Katz, and Keating considered. Thus the merger is more likely to be procompetitive than would be indicated by their original baseline.[29]

38. In the rest of this section, we clarify other elements of how the two analyses relate to and reinforce one another.

[28] Initial White Paper, fn. 11 on p. 4.

[29] Initial White Paper, ¶ 79.

3.1. The standardized speeds in the initial white paper are lower than but consistent with the speeds in the merging party network model and the Israel, Katz, and Keating analysis

39. In our initial white paper, we explained that the measure of speed we rely on in our model is different from but related to the measure of speed that underlies the Israel, Katz, and Keating analysis and the network engineering work of the merging parties.[30] This is not surprising. The wireless industry uses multiple measures of quality, including multiple measures of speed. This is no different than other industries with complex products. For example, automobile manufacturers describe the performance of their vehicles by reporting measures such as horsepower, torque, acceleration, and top speed.

40. The speeds that underlie the Israel, Katz, and Keating analysis are outputs from a particular type of speed test, the Ookla speed test. The Ookla speed test first identifies the nearest available server and then initiates a download event for multiple large files.[31] In this sense, Ookla is optimized to measure the maximum speed that a network can bear at a certain time and location.

41. By contrast, the speeds recorded in the NMP data measure the actual speed experienced by phone users while they are using regular applications. In other words, the NMP application passively monitors the data that a phone exchanges with the network as users normally go about their day. There are several reasons why these delivered speeds would be lower than Ookla speeds, on average.

42. First, the difference in average speeds between the NMP and the Ookla data is partly due to the TCP/IP protocol that mediates communication over the internet. This protocol has the effect that smaller files tend to experience slower

[30] Initial White Paper, fn. 14 on p. 8.

[31] Ookla, "How does the Begin Test button select a server?," January 11, 2012, available at https://support.speedtest.net/hc/en-us/articles/203845410-How-does-the-Begin-Test-button-select-a-server- ("Once you press Begin Test, we take your location and determine up to five nearby servers (using spherical geometry). We then ping those nearby servers, and choose the server with the lowest result, meaning it took the shortest time for a response. This is the server that's 'closest' on the network, and usually provides the most accurate results. We can then begin the full test process: measuring your ping, download speed, and upload speed."); and Ookla, "How does the test itself work? How is the result calculated?," January 13, 2012, available at https://support.speedtest.net/hc/en-us/articles/203845400-How-does-the-test-itself-work-How-is-the-result-calculated- ("1. The client establishes multiple connections with the server over port: 8080. The client requests the server to send an initial chunk of data. 2. The client calculates the real-time speed of the transfers, then adjusts the chunk size and buffer size based on this calculation to maximize usage of the network connection. 3. As the chunks are received by the client, the client will request more chunks throughout the duration of the test. 4. During the first half of the test, the client will establish extra connections to the server if it determines additional threads are required to more accurately measure the download speed. 5. The test ends once the configured amount of time has been reached.").

speeds (lower Mbps) than larger files. Since they reflect average usage behavior, NMP data [redacted].[32] Second, NMP data may measure [redacted] Third, NMP measures the [redacted].

43. Finally, as we explained in our white paper, Sprint uses [redacted].[33] This guidance demonstrates that the network quality improvement scenarios that we considered in our initial white paper are well within the range of what the merging parties expect will result from the planned network integration.

44. For example, the merging parties' network engineering model predicts a [redacted] of Ookla speeds. [redacted].[34]

45. Thus, the fact that NMP speeds we use in our analysis are different in magnitude than Ookla speeds that are used by Israel, Katz, Keating is to be expected, and is immaterial for assessing the reliability of our analysis, or of those previously submitted by the merging parties.

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[32] Initial White Paper, ¶ 175. [redacted].

[33] Initial White Paper, fn. 78.

[34] For example, [redacted].

3.2. The network quality improvements and marginal cost reductions that we considered in our initial white paper are conservative for New T-Mobile but unattainable by the standalone firms

46. We understand that the reason that the merging parties expect to achieve such network quality improvements with their planned network integration is because of the complementarity of their assets, and in particular their spectrum assets. Our demand estimation analysis reinforces the Israel, Katz, and Keating analysis by confirming that consumers today would place substantial value on such network quality improvements.

47. Moreover, we understand that these improvements are not attainable by the standalone firms, in that they are not simply a matter of monetary investment but also hinge on access to spectrum and scale. In particular, we understand that Sprint would have difficulties with its coverage gap and so, while it might attain high speeds in areas with good coverage, consumers would get frustrated and average speeds would fall due to poor in-building coverage and coverage gaps. Conversely, we understand that T-Mobile would have good coverage but have difficulty adding capacity cost-effectively, leading to lower speeds and likely lower usage limits than New T-Mobile expects to achieve.

3.3. The merging parties would not move consumers currently on Sprint onto the New T-Mobile network before they could guarantee that consumers would not experience degraded network quality

48. We understand from discussions with the T-Mobile engineering team that their plan is that consumers will not experience network quality degradation when they are switched over to the New T-Mobile network. They have also repeatedly indicated that the network integration plan follows the template T-Mobile used in the successful integration of MetroPCS, which avoided such degradation.[35]

49. Our demand estimation results demonstrate that consumers value network quality and, consistent with the statements of the executives and Sprint's

[35] Description of Transaction, Public Interest Statement, and Related Demonstrations filed 06/18/18, pp 39-41; Joint Opposition of T-Mobile US, Inc. and Sprint Corporation filed 09/17/18, p 47.

experience during its Network Vision network modernization,[36] the merged firm risks losing consumers if it degrades their experience.

[36] For example, see Phil Goldstein, "Sprint's LTE rollout hampered by lack of backhaul and Network Vision issues," July 24, 2013, Fierce Wireless, available at https://www.fiercewireless.com/wireless/sprint-s-lte-rollout-hampered-by-lack-backhaul-and-network-vision-issues. See also SBG-000084933 showing poor network quality as a result of Sprint's Network Vision revitalization plan lead to increased churn.

4. The DISH analytical critiques are incomplete, rejected by the data, and portray a fundamental misunderstanding of demand estimation and merger simulation

50. In our initial white paper, we explained that the proposed merger is procompetitive under a wide range of marginal cost reductions and network quality improvements the merging parties expect to result from their planned network integration.[37]

51. Rather than examining the range of scenarios we consider in our initial white paper, Bazelon, Verlinda, and Zarakas only present analyses where the proposed merger either (a) leads to no marginal cost reduction whatsoever, or (b) leads to no network quality improvement whatsoever. They make these strong assumptions in the context of their other critiques, presumably to give the impression that these critiques have meaningful implications for the bottom line conclusions. They do not.

52. Our analysis has multiple steps. When we say that our merger simulation offers an economically coherent framework, we mean that it models demand, supply, and the interactions of the two in a way that is robust and internally consistent. This allows us to consider scenarios where Sprint and T-Mobile merge and ask how the merger and any resulting merger-specific marginal cost reductions and network quality improvements affect demand, supply, and the equilibrium of the two.

53. A common theme of the analytical willingness to pay arguments by Bazelon, Verlinda, and Zarakas is that they are internally inconsistent and incomplete. In particular, they tend to adjust the demand model of consumer choice in some way, without going through the rest of the analysis to investigate the effects that has on supply and critical marginal cost reductions, as we have done.

54. This effectively neglects to account for consumer choice. In particular, Bazelon, Verlinda, and Zarakas try to argue that pockets of consumers may not agree with the majority who are better off from network quality improvements. But individualized quality and fiercer competition from New T-Mobile means that consumers are frequently just as well off or better off switching to their previously second-best option, as evidenced from the merger simulation.

[37] Initial White Paper, § 4.

55. In addition, the Bazelon, Verlinda, and Zarakas analytical work is riddled with implementation errors that undercut their results and the reliability of their adjustments to our analysis.[38]

56. In the rest of this section we explain why the adjustments they have made are inappropriate, faulty, and rejected by the data. We also explain how, even if they are adopted, carrying their adjustments through the rest of the analysis shows that our bottom line results do not change and, indeed, are frequently strengthened.

4.1. The claim by Bazelon, Verlinda, and Zarakas that consumers with lower income have lower willingness to pay for network quality is an untested theoretical argument that they implement in ways inconsistent with the academic literature and rejected by the data

57. Bazelon, Verlinda, and Zarakas conjecture that consumers with lower income may be less willing to pay for network quality, and undertake a series of calculations they claim show that some consumers have lower willingness to pay for network quality than we have reported.[39] Theirs is ultimately a theoretical argument. It involves a series of extremely strong assumptions they have made no effort to empirically validate. In fact, the calculations they undertake are inconsistent with the academic literature and testing their conjecture reveals that it is rejected by the data.

58. First, the specification Bazelon, Verlinda, and Zarakas use is rejected by the data. The demand model where they have asserted their assumption about the relationship between price sensitivity and income does not fit the data as well as our demand model.[40]

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[38] For example, Bazelon, Verlinda, and Zarakas attempt to calculate the T-Mobile share of Verizon's port outs in various geographic areas and compare it to the speed differential between Verizon and T-Mobile (see their Table 15). Yet they make elementary spreadsheet errors in aggregating the underlying data and, without justification or explanation, selectively exclude certain counties from their calculations. As a result, their porting statistics do not correspond to the listed geographies, nor are they compared to the appropriate speed differential. Setting aside the fact that this analysis ignores the individualized nature of network quality and the need to control for other factors when estimating demand, correcting their methodological errors shows that porting from Verizon to T-Mobile tends to be [redacted] in areas where Verizon speeds are higher compared to T-Mobile's. See our workpapers. As another example, Bazelon, Verlinda, and Zarakas re-estimate our demand model imposing an unsupported assumption that income affects consumer choice in a specific and non-standard way. Setting aside the conceptual and empirical issues with their argument (see § 4.1 for a detailed explanation of why it is incorrect), they have implemented it incorrectly. In their prediction of post-merger prices, they adjust the estimation of demand but neglect to adjust the merger simulation, thus comparing inconsistent demand and supply responses.

[39] Bazelon, Verlinda, and Zarakas Declaration, § IV.A.

[40] In particular, the log likelihood of their model is lower. See our workpapers.

59. Second, they assume that, aside from income, consumers with lower and higher incomes have the same preferences over wireless service. This is highly unlikely to be the case. Consumers with lower incomes may be more likely to be cord-cutters and to more heavily rely on their smartphone for their communications and media consumption. Conversely, consumers with higher incomes may be more likely to offload to wi-fi or to consume media over cable or on additional electronic devices that are connected to the internet through a broadband connection. In that sense, whether willingness to pay for wireless service in general and for network quality improvements in particular is higher, lower, or roughly the same is an empirical question rather than something that can simply be assumed.

60. Third, not only do they assume that consumers with lower income have lower willingness to pay for quality, they assert a very rigid and specific relationship between income and price sensitivity. Not only is this relationship entirely assumed rather than estimated with data, but it is also entirely non-standard. While Bazelon, Verlinda, and Zarakas claim to cite to the academic literature,[41] their backup reveals that they use a different way for income to enter consumer utility than the papers to which they cite.

61. Fourth, while the literature does recognize that willingness to pay may change with income in certain circumstances (albeit in a different way from that employed by Bazelon, Verlinda, and Zarakas), the circumstances the literature identifies are very different. The papers Bazelon, Verlinda, and Zarakas cite talk about the choice of whether or not to purchase a brand new automobile within any given year, a purchase that many households choose not to make, that constitutes a very large proportion of their disposable income in any given year, and indeed that many households only make on credit. This is very different from wireless service, where most adults have at least one wireless device, they do not buy their monthly service on long-term credit, and where the choice consumers tend to make is whether to pay an incremental price to get a plan with better network quality and more relaxed usage limits.

62. Fifth, replacing the non-standard formulation Bazelon, Verlinda, and Zarakas use with the formulation that the academic literature uses in situations where income may directly affect willingness to pay demonstrates that this is not one of those situations. In particular, for large purchases like automobiles,

[41] Bazelon, Verlinda, and Zarakas Declaration, fn. 14 on p. 12.

the literature sometimes considers whether consumers care not about the price of what they are buying but about their residual income after paying the price. When we adjust our demand estimation to test whether consumer choice in the wireless industry responds in this way, we find that it does not.[42]

63. Sixth, even when we take the Bazelon, Verlinda, and Zarakas modeling critique at face value, we find that it has no impact on the conclusions of our analysis. Bazelon, Verlinda, and Zarakas' analysis of income effects is incomplete. They do not apply the estimates from their modified demand model to our merger simulation analysis. When we do so, we find that bottom-line metrics that inform whether the proposed merger is procompetitive, such as average compensating variation and change in merging party share, do not qualitatively change.[43]

64. In sum, our model already accounts for consumer price sensitivity. Bazelon, Verlinda, and Zarakas' critique of how our model accounts for consumer income and price sensitivity is unfounded, inconsistent with the academic literature, rejected by the data, and irrelevant to the conclusions of our analysis.

4.2. Our results are robust to how data usage types are categorized

65. The results we presented in our initial white paper indicate that a consumer's willingness to pay for network quality is related to the amount of data they use each month. In particular, we categorized each consumer in the NMP data into light, medium, and heavy data users. This allowed the data to demonstrate an important feature of consumers preferences, namely that consumers who use more data tend to value network quality more. Our results and overall conclusions are not sensitive to the particular method of categorizing data usage types.

[42] See our workpapers.

[43] See our workpapers.

66. Bazelon, Verlinda, and Zarakas argue that our data usage categorization leads us to overstate the willingness to pay for network quality for many consumers and suggest adding an additional data usage category, "very heavy" data users. They find that this decomposition leads to willingness to pay estimates that are different for "heavy" and "very heavy" data users. Their suggestion that this finding reveals a flaw in our analysis and conclusions is unfounded and misleading. Rather, their alternative specification confirms that our results are robust to alternative data usage categorizations.

67. First, their results reinforce our findings that all consumer types positively value network quality and that consumers who use more data tend to value network quality more.[44] Second, they adjust demand by adding very heavy data users but do not complete the merger simulation to ask what effect this has on supply and the calculation of critical marginal cost reductions. Taking these next steps shows that, when evaluated within the coherent framework of the merger simulation, their adjustment is trivial. Critical marginal cost reductions are qualitatively unchanged from those we presented in our initial white paper.[45]

4.3. The Bazelon, Verlinda, and Zarakas suggestion to estimate consumer sensitivity to price using Sprint rather than T-Mobile margins leads to more procompetitive outcomes

68. An elementary and well-understood result in economics is that firms that face more price sensitive demand have lower margins.[46] The reason we use T-Mobile margins to estimate consumer sensitivity to price is that doing so is *conservative*, in the sense that a merged firm that faces demand that is less sensitive to price is more likely, everything else equal, to raise prices.[47]

69. Bazelon, Verlinda, and Zarakas are correct to argue that using Sprint's margins instead would lead to demand being more price sensitive.[48] Yet they get the conclusion exactly backwards. They focus on what this price sensitivity may mean for consumers' willingness to pay for any given increment of network quality. They fail to take into account that higher price sensitivity will also

[44] See Bazelon, Verlinda, and Zarakas Declaration, Table 3.

[45] See our workpapers.

[46] Robert S. Pindyck and Daniel L. Rubinfeld, *Microeconomics*, Seventh Edition, p. 355.

[47] Initial White Paper, ¶ 239.

[48] Bazelon, Verlinda, and Zarakas Declaration, pp. 15–16.

fundamentally change the equilibrium between demand and supply. This in turn means that the proposed merger will lead to significantly lower upward pricing pressure.

70. Tellingly, they do not run a merger simulation to test the bottom-line outcome of this sensitivity. Conducting a complete merger simulation analysis shows that using Sprint margins makes the proposed merger significantly *more* procompetitive, with critical marginal cost reductions falling by approximately [redacted].[49]

4.4. Bazelon, Verlinda, and Zarakas fail to allow for consumer choice

71. Another failing of the Bazelon, Verlinda, and Zarakas analyses is that they employ a non-standard approach to consumer welfare analysis. They focus on willingness to pay for network quality improvements based on the brand that consumers currently choose. This focus denies consumers the option to switch products when faced with a price increase, even if they have good alternatives that are becoming even more attractive as a result of increased competition.

72. This methodological choice biases their results towards an anticompetitive finding even where there is no consumer harm. In particular, our analysis demonstrates that New T-Mobile becomes a more effective competitor to AT&T and Verizon under a wide range of assumptions regarding marginal cost reductions and network quality improvements. In those scenarios, the two leading firms reduce prices in an attempt to retain share, making them even better alternatives for consumers who value network quality improvements but by less than the average consumer.

73. The standard approach in the academic literature to calculating consumer welfare when both prices and qualities are changing does not suffer from this issue and is the one we follow in our initial white paper.[50]

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[49] See our workpapers. [redacted]

[50] For a detailed discussion of this approach, see our initial white paper, § 5.3.3, "Compensating variation" and, for example, for example, see Formula 7 in Nevo, Aviv, "Mergers with differentiated products: the case of the ready-to-eat cereal industry," *RAND Journal of Economics*, Vol. 31, No. 3, 2000, p. 404.

5. Conclusion

74. The merger simulation analysis we presented in our initial white paper offers a robust, economically coherent framework for understanding the competitive significance of the proposed merger. As we explained in our detailed white paper and its extensive technical appendix, our analysis is grounded in rich data on network quality and consumer behavior. It finds that the proposed merger is likely to increase competition among wireless carriers. It is also complementary to the analysis submitted by Israel, Katz, and Keating, which has strong foundations in the network engineering work done by the merging parties.

75. Bazelon, Verlinda, and Zarakas and Bar-Isaac have offered several conceptual and analytical critiques of our analysis. These critiques are incomplete, rejected by the data, inconsistent with the academic literature, and, where they are not entirely theoretical, are riddled with errors in their implementation. They do not test the bottom line outcome of their critiques. When we do so, we find they do not qualitatively change our results or conclusions.

76. Moreover, the Bazelon, Verlinda, and Zarakas analysis always assumes that the proposed merger will lead to no marginal cost reductions whatsoever, or no network quality improvement whatsoever. This selective focus on scenarios that do not reflect the merging parties' plans or the record about the likely effects of those plans is misleading. It thus does nothing to rebut our original conclusion that under a range of assumptions about marginal cost efficiencies and network quality improvements, the proposed merger is likely to increase competition among wireless carriers.