April 3, 2019

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:

In this letter, T-Mobile US, Inc. and Sprint Corporation (collectively, "Applicants")
respond to a letter by DISH Network Corporation dated March 25, 2019 (the "March 25 DISH
letter) and an accompanying paper by economists affiliated with the Brattle Group (the "Brattle
Economists") (collectively, the "March 25 DISH/Brattle Economists").[1] This letter is supported
by a submission from Drs. John Asker, Timothy Bresnahan, and Kostis Hatzitaskos (collectively,
"ABH")(the "ABH April 3 Submission").

Over the past month, the Applicants have uncovered and highlighted serious deficiencies
in DISH's advocacy to the Commission and in the Brattle Economists' purported analysis,
including DISH's misrepresentation to the Commission that the Brattle Economists used "actual
subscriber incomes" from the NMP survey data. That representation by DISH and the Brattle
Economists is false, and only a labor-intensive review of their supporting materials revealed that
they had instead relied on fabricated data that bears no relation to any real-world dataset. The
March 25 DISH/Brattle Submission is conspicuous in its continued failure to offer any meaningful
defense of the prior DISH/Brattle work or any explanation for their still uncorrected
misrepresentations to the Commission.

Instead, in an apparent effort to change the subject, the March 25 DISH/Brattle Submission
merely recycles their earlier criticisms of the ABH analysis. Applicants have already shown why
these criticisms are without merit, and DISH's arguments have grown no more convincing with

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[1] Letter from Pantelis Michalopoulos, Counsel to DISH Network Corp., to Marlene Dortch, Secretary, FCC, WT
Docket No. 18-197 (Mar. 25, 2019); Coleman Bazelon, Jeremy Verlinda, and William Zarakas, "Response to
Applicants' February 7 Filings on Diversion Ratios," Attachment A to March 25 DISH Letter.

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time or repetition. For example, the March 25 DISH/Brattle Submission asserts that the "methodological approach [used by ABH] has proven unable to identify market segmentation that is abundantly evident elsewhere in this proceeding."[2] The Applicants previously explained why this claim is false[3] – the only "abundant evidence" in the data contradicts DISH's assertions – and it is telling that DISH and Brattle recycle their argument without even addressing the Applicants' prior refutation or the consistent data disproving DISH's characterization.

Brattle Again Fails to Address ABH's Nested Logit Specifications and Results

As discussed in the attached submission from ABH, and as was previously explained to the Commission in a filing on February 6, 2019,[4] the Applicants have already tested DISH's claim about further segmentation and found it to be meritless. ABH did this by using a well-recognized econometrics approach involving an extension to their baseline demand specification that uses a nested logit model.

Nested logit models, at a basic level, allow one to test whether individual consumers have particular preferences for certain groupings of brands (i.e., a preference for brands within the same "nest"). This provides flexibility to a demand model, allowing the data to speak to whether there exists potential segmentation that may not otherwise be captured in the model. Nested logit models have been relied on in prior matters decided by the Commission. Here, when this additional flexibility is added to the ABH baseline model, the data either reject the existence of a hypothesized nest (i.e., reject the idea that there is a preference for switching among the nested brands) or shows that the potential existence of a nest confirms the modelling and diversion ratios previously calculated by ABH. For example, in one potential nesting structure, ABH tested whether consumers view the Sprint and T-Mobile premium brands as close substitutes relative to Verizon and AT&T.[5] The data reject this proposition.[6] ABH also tested whether consumers have distinct preferences for (1) AT&T and Verizon as a group; (2) all four merging party brands and Cricket as another group; and (3) MVNOs and regional carriers as a third group.[7] ABH found that there is no nesting and "thus no additional segmentation beyond that already captured in the baseline model."[8]

The DISH/Brattle March 25 Submission does not even acknowledge that ABH used nesting as a robustness check, much less address the results of that analysis discrediting the Brattle Economists' claims. Instead, DISH merely repeats its same debunked assertions.

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[2] March 25 Brattle Submission at 3.

[3] *See e.g.*, Letter from Regina M. Keeney, Counsel to Sprint Corporation, and Nancy J. Victory, counsel to T-Mobile US, Inc., *et al.*, to Marlene Dortch, Secretary, FCC, WT Docket No. 18-197 (March 14, 2019) at 5.

[4] Letter from Nancy J. Victory, Counsel to T-Mobile US, Inc., to Marlene Dortch, Secretary, FCC, WT Docket No. 18-197 (Feb. 7, 2019); John Asker, Timothy Bresnahan, and Kostis Hatzitaskos, *Response to Dish Comments Regarding Diversion Ratios* (Feb. 6, 2019).

[5] ABH April 3 Submission at 3.

[6] ABH April 3 Submission at 4.

[7] ABH April 3 Submission at 4.

[8] ABH April 3 Submission at 4.

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Brattle Recycles Other Criticisms of the ABH Work Previously Debunked

The other criticisms leveled by the DISH/Brattle March 25 submission fare no better. For example, the Brattle Economists attempt to cast doubt on the ABH work by noting that "identical price- response diversion ratios flow from [the ABH] model, regardless of any specific value that is calibrated for the price sensitivity parameter from their supply-side assumptions."[9] This is a red herring. DISH seeks to mislead the Commission by suggesting that a standard feature of every economic model using a diversion ratio – including published research that the Brattle Economists cite approvingly – is somehow problematic.

Equally spurious is the argument of the Brattle Economists that AT&T and Verizon should not be viewed as relevant competitive options in low income areas because "AT&T and Verizon are far more successful in areas with higher credit scores, higher incomes, and that are less ethnically diverse."[10] But this argument fails to acknowledge that AT&T and Verizon are very successful in all neighborhoods. That they may be somewhat more successful in some neighborhoods does not in any way undercut their competitive significance in all other neighborhoods. The Brattle Economists' argument incorrectly conflates a competitor's relative performance in different neighborhoods with its competitive significance in each neighborhood. Because of their immense scale, AT&T and Verizon are important competitors in *all* neighborhoods, including those that have lower income, lower credit scores, and more African Americans and Hispanic consumers, even though it is also true that they serve large numbers of high income customers as well. These rehashed criticisms remain without basis and in no way lessen the serious deficiencies with Brattle's own work.

Conclusion

In sum, the DISH/Brattle advocacy in this matter continues to rely on fabricated data and mischaracterizations and should be given no weight by the Commission.

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[9] March 25 Brattle Submission at 8.
[10] March 25 Brattle Submission at 9–10.

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Please direct any questions regarding the foregoing to the undersigned.

<div style="text-align:center">Respectfully submitted,</div>

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CORNERSTONE RESEARCH
ECONOMIC AND FINANCIAL CONSULTING AND EXPERT TESTIMONY

RESPONSE TO DISH'S MARCH 25 SUBMISSION

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

April 3, 2019

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1. Introduction and summary

1. In their March 25 submission on behalf of DISH,[1] Bazelon, Verlinda, and Zarakas of The Brattle Group ("BVZ") recycle a series of arguments they have already submitted to the FCC. We have already rebutted their arguments related to our work in prior submissions.[2]

2. We reiterate in Section 2 of this submission two results we presented in our February 6 submission that directly address BVZ's recycled arguments, but which BVZ have completely failed to acknowledge or address. In particular, this is the analysis where we introduced "nesting" to our base demand specification. Nesting allows the data to test whether certain brands are closer substitutes than the model would otherwise predict. These tests reinforce our initial conclusions. In particular, the data reject nesting that would allow merging party brands to be materially closer substitutes than indicated in our initial results, undercutting BVZ's segmentation claims.[3]

3. Section 3 summarizes economic challenges in using porting or switching data, as BVZ propose, to draw conclusions about diversion. We and Israel, Katz, and Keating have previously laid out these challenges, but BVZ have failed to substantively engage with these issues.[4]

4. Section 4 provides specific sources of rebuttal evidence for other arguments that BVZ recycle in their March 25 submission.

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[1] Coleman Bazelon, Jeremy Verlinda, and William Zarakas, "Response to Applicants' February 7 Filings on Diversion Ratios," March 25, 2019, WT Docket No. 18-197, ("Bazelon, Verlinda, and Zarakas March 25 Submission").

[2] John Asker, Tim Bresnahan, and Kostis Hatzitaskos, "Response to DISH and CWA Comments," December 18, 2018, WT Docket No. 18-197, ("Asker, Bresnahan, and Hatzitaskos December 18 White Paper"); John Asker, Tim Bresnahan, and Kostis Hatzitaskos, "Response to DISH Comments Regarding Diversion Ratios," February 6, 2019, WT Docket No. 18-197, ("Asker, Bresnahan, and Hatzitaskos February 6 White Paper"); John Asker, Tim Bresnahan, and Kostis Hatzitaskos, "Response to DISH's February 19 and 25 Submissions," March 13, 2019, WT Docket No. 18-197, ("Asker, Bresnahan, and Hatzitaskos March 13 White Paper").

[3] BVZ's segmentation claims in DISH's February Submissions were based upon their use of manufactured "data," not actual data. As we discussed in the Asker, Bresnahan, and Hatzitaskos March 13 White Paper, when the actual data that BVZ purported to (but did not) use was in fact used in our demand model, there was no meaningful change in our results. See Asker, Bresnahan, and Hatzitaskos March 13 White Paper, Exhibits 7 and 8.

[4] Asker, Bresnahan, and Hatzitaskos February 6 White Paper; and Mark Israel, Michael Katz, and Bryan Keating, "Additional Information Regarding the Estimation of Diversion Ratios," December 14, 2018, WT Docket No. 18-197, ("Israel, Katz, and Keating December 14 Submission").

2. Nested logit specifications and results[5]

5. Nested logit models allow an econometrician to group brands into "nests," so that the data can identify whether certain consumers have stronger or weaker preferences for all brands within a nest (or group) of brands.[6] In other words, this technique allows one to test whether certain brands are closer substitutes than the model would otherwise predict based on the numerous variables already included in the model.[7] Our baseline model already allows for segmentation based on income, credit scores, age, race/ethnicity, and extent of data usage; a nested logit model would indicate whether any segmentation exists beyond what these variables in our model already capture.[8]

6. In our February 6 submission we used this methodology to test whether the merging party brands are particularly close competitors or whether certain consumers have distinct preferences for premium and non-premium brands, beyond that identified in our baseline model. The data reject the notion that merging party brands in particular compete more closely with one another. That is, the merging parties do not form a distinct nest. Furthermore, the data indicate that our baseline model already captures most of consumers' distinct preferences for non-premium brands; allowing the data to identify that non-premium brands compete more closely with one another shows the proposed merger to be more procompetitive, not less.[9]

7. This finding is particularly meaningful given the detailed consumer behavior and network quality information in the NMP data. Consider a consumer in our data whose usage patterns would lead him or her to experience below-average network quality for Sprint relative to other consumers in their geographic area. Every such consumer offers an experiment: do we observe these consumers disproportionately choosing T-Mobile, indicating that the two compete more closely with one another than we would expect? The rich variation in our data is particularly well suited to allowing the nested logit model to identify

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[5] This section collects results found in § 6.2 of the Asker, Bresnahan, and Hatzitaskos February 6 White Paper. It provides additional commentary and presents results from the workpapers and backup to the February 6 White Paper.

[6] Stata, "Nested logit regression," available at https://www.stata.com/manuals13/rnlogit.pdf, accessed February 5, 2019.

[7] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 2.3.

[8] John Asker, Tim Bresnahan, and Kostis Hatzitaskos, "Economic Analysis of the Proposed T-Mobile/Sprint Merger," November 6, 2018, WT Docket No. 18-197, § 3.1 ("Asker, Bresnahan, and Hatzitaskos November 6 White Paper").

[9] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 6.2.

incremental closeness of competition between the merging party brands, but the data reject that conjecture.

8. This finding from our February 6 submission has been ignored by all three subsequent BVZ submissions.[10] In their March 25 submission, BVZ assert that "Cornerstone's methodological approach has proven unable to identify market segmentation that is abundantly evident elsewhere in this proceeding."[11] The nested logit provides an appropriate and widely used econometric test that is directly responsive to BVZ's assertion. The Commission has previously relied on nested logit models in prior matters.[12] The test shows in a rigorous way that the data reject BVZ's assertion. BVZ never acknowledge, in any submission, our use of the nested logit model to test for such segmentation. They merely repeat their assertion without responding to the evidence against it.

9. In the nested logit model, the econometrician first considers a particular nesting structure (i.e., a particular grouping of products). Each nest is assigned a "nesting parameter," whose estimated value indicates whether the data support or reject the segmentation considered. We tested four potential nesting structures in our February 6 submission:

- {AT&T, Sprint, T-Mobile, Verizon} as one nest and {Boost/Virgin, MetroPCS, Cricket, Other} as another nest – this nesting structure places the non-premium brands, including the MVNOs and regional carriers, in a separate nest from premium brands, in order to test the proposition that consumers have particular preferences for non-premium brands or for premium brands, as BVZ claim.[13]
- {AT&T, Verizon} as one nest, {Sprint, T-Mobile} as a second nest, and {Boost/Virgin, MetroPCS, Cricket, Other} as a third nest – this structure differs from the first by also placing the merging party premium brands in a separate nest, allowing for an additional test of whether consumers view the Sprint and T-Mobile brands as particularly close substitutes relative to the AT&T and Verizon brands.

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[10] BVZ filed further submissions on February 19, March 18, and March 25. They also presented to the FCC on February 27.

[11] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 3.

[12] Federal Communications Commission, "In the Matter of Applications of AT&T Inc. and DIRECTV for Consent to Assign or Transfer Control of Licenses and Authorizations, Memorandum Opinion and Order, MB Docket No. 14–90," July 28, 2015, pp. 39, 43–44. The data used for the nested logit model in this case were a combination of DMA-level aggregates, including aggregates based on survey data (see ¶ 13 on p. 176).

[13] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 4 ("We show the opposite: that low-income consumers and non-premium subscribers are more likely to be harmed by the transaction.").

- {AT&T, Verizon} as one nest, {Sprint, T-Mobile, Boost/Virgin, MetroPCS, Cricket} as a second nest, and {Other} as a third nest – this structure tests whether consumers have distinct preferences for the AT&T and Verizon brands as a group. It also allows for the possibility that consumers have distinct preferences over all four merging party brands and Cricket as another group, separate from MVNOs and regional carriers.
- {AT&T, Verizon, Cricket, Other} as one nest, {Sprint, T-Mobile} as a second nest, and {Boost/Virgin, MetroPCS} as a third nest – this structure places the Sprint and T-Mobile brands in a nest and Boost/Virgin and MetroPCS in another nest, which tests the proposition that consumers view the merging party premium brands as particularly close substitutes and the merging party non-premium brands as particularly close substitutes.

10. For each of these specifications, we again report the nesting parameter estimates from our February 6 submission in Exhibit 1. The values of the "nesting parameter" are interpreted as follows:

- Values of the nesting parameter that are statistically indistinguishable from one, as is the case with one of our proposed nested logit specifications (specifically, the one that tests whether all merging party brands compete particularly close with one another and Cricket), indicate that there is no nesting and thus no additional segmentation beyond that already captured in the baseline model. See rows 6–8 in Exhibit 1.
- Values that are statistically greater than one, as is the case with two of our proposed nested logit specifications (specifically, the ones that test whether the Sprint and T-Mobile brands compete particularly close with each other), indicate that the nesting structure is unreasonable and inconsistent with the random utility model. This means the data reject the proposed nesting structure.[14] See rows 3–5 and 9–11 in Exhibit 1.
- Values statistically below one indicate there is nesting, as is the case in one of our tested nested logit specifications (the one that considers distinct preferences for premium and non-premium brands). In particular, the data indicate that the second choice of a consumer choosing a non-premium brand is more likely to be another non-premium brand, but finds no evidence that the same is true for premium brands (i.e., the nesting

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[14] David A. Hensher, John M. Rose, and William H. Greene, *Applied Choice Analysis*, *Second Edition*, (New York, NY: Cambridge University Press, 2015), § 14.3.

parameter on premium brands is statistically indistinguishable from one).
See rows 1–2 in Exhibit 1.

EXHIBIT 1
*Nesting parameters from nested logit demand model*
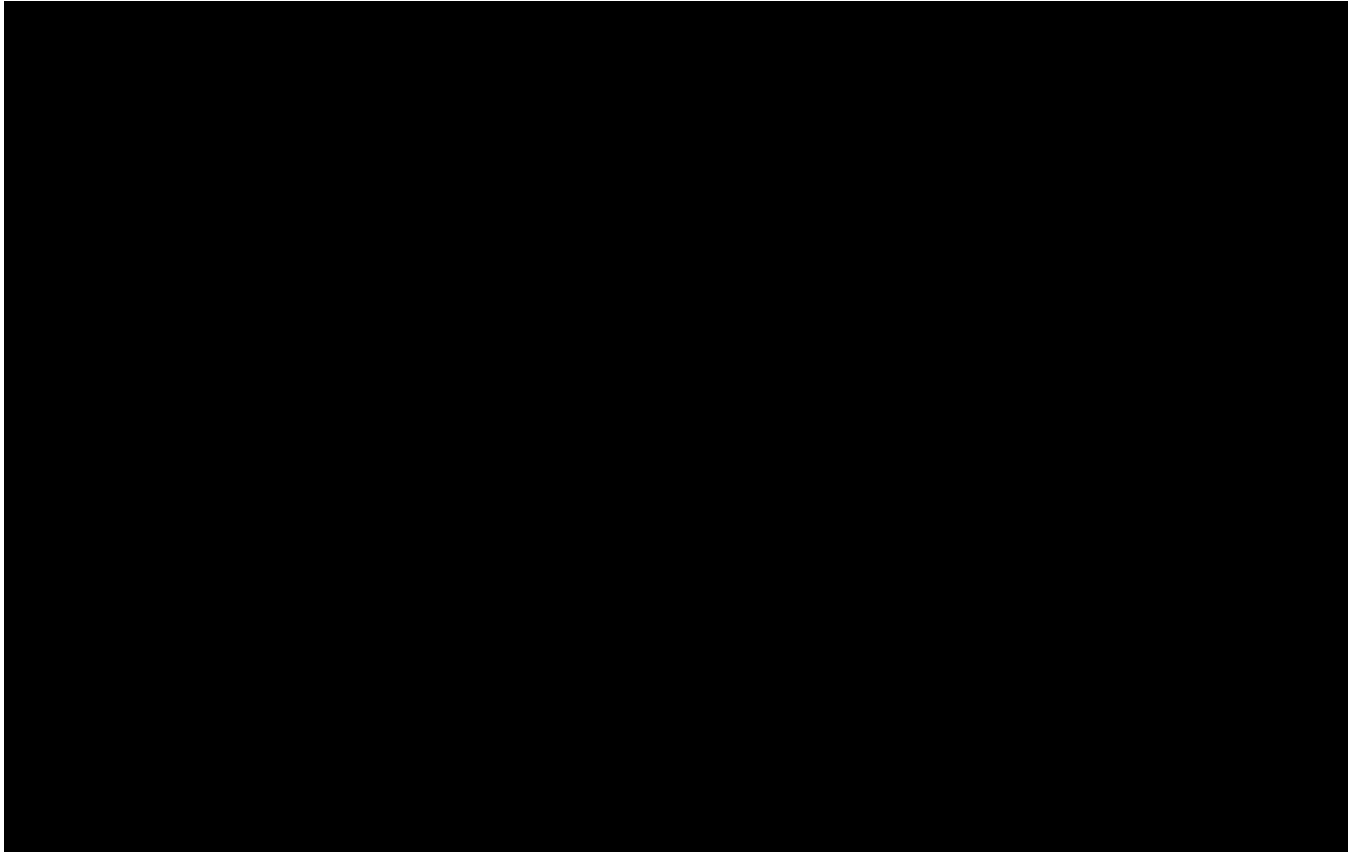
11. For the two specifications that are not outright rejected by the data, we
present in Exhibit 2 the diversion ratios we initially reported in our February 6
submission for the baseline model and these two nested logit models. The
nested logit does not lead to meaningful differences to diversion ratios for
purposes of the competitive effects analysis.

- In particular, consider how diversion ratios change from the baseline (the
  top panel) to the specification where certain consumers have distinct
  preferences for non-premium brands (the middle panel). Diversion from
  Boost/Virgin to MetroPCS and vice versa is substantially higher, almost
  double the diversion estimated in the baseline model.
- However, diversion from a merging party non-premium brand to the
  merging partner's premium brand has a corresponding decrease.

- In other words, consistent with the merger simulation results, this particular type of incremental segmentation does not lead the merging parties to be closer competitors at the *firm* level.[15]

EXHIBIT 2
Estimated pre-merger diversion ratios between brands, with baseline conditional logit and nested logit demand models
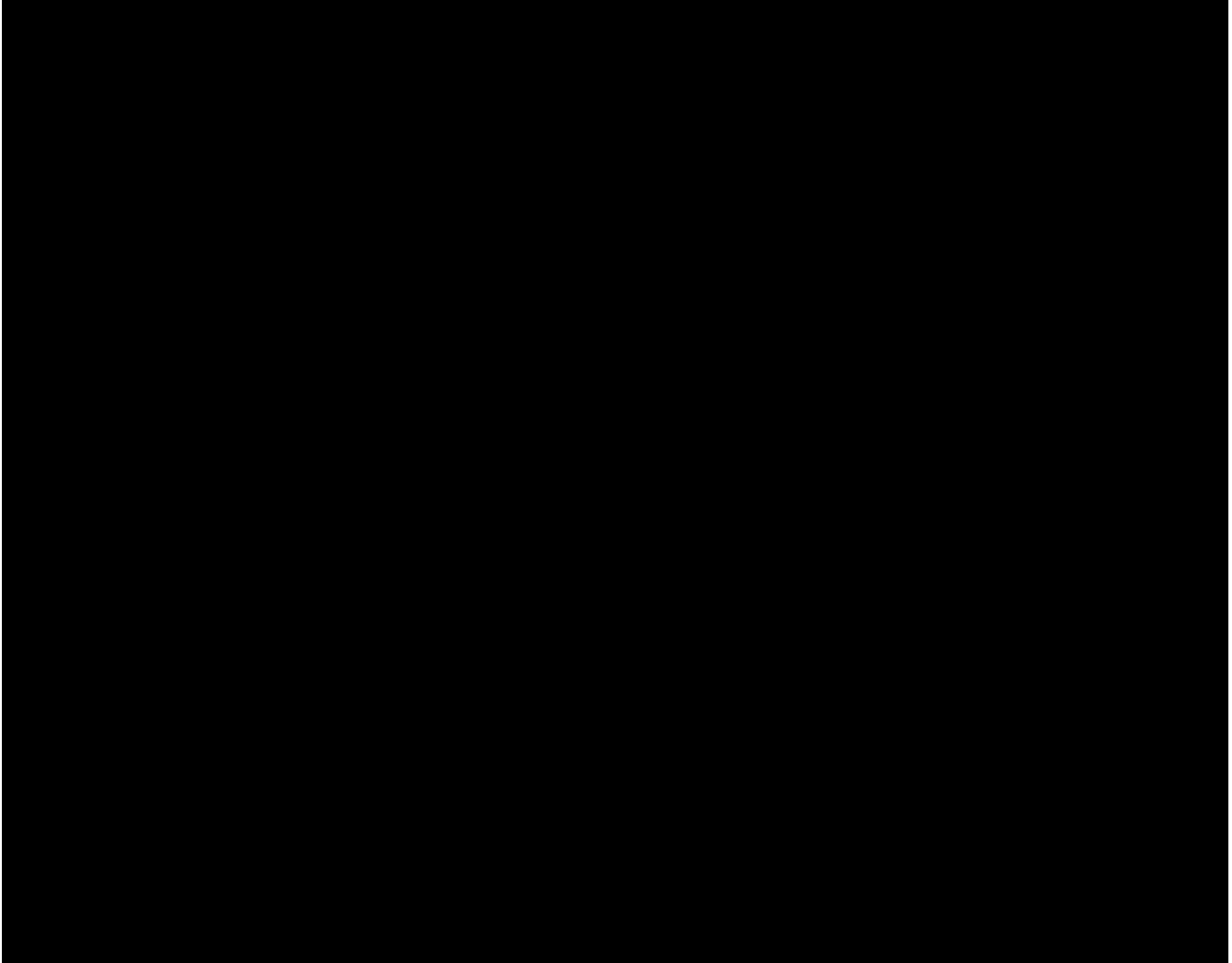
12. To further understand the impact of this finding, we report merger simulation results from our February 6 submission for these two specifications. Namely, from the scenario where Sprint closes the gap with T-Mobile on

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[15] In the baseline, total diversion from Sprint, Boost/Virgin, T-Mobile, and MetroPCS to both merger partner brands is ███. In the nested logit {A,V,S,T},{B,M,C,O} specification, the same figures are ██████████████████████████ ████████████████████████████.

coverage and T-Mobile closes the gap with Sprint on speeds, while assuming the full Israel, Katz, and Keating marginal cost reductions.[16]

13. We show the results in Exhibit 3. The first column shows the results from our baseline model. The second column shows the results from the specification that tests the proposition that some consumers have distinct preferences for non-premium brands. The third column shows the results from the specification that tests the proposition that some consumers have distinct preferences for the merging party brands and Cricket, relative to the AT&T and Verizon brands, and relative to the MVNOs and regional carriers. For both specifications the bottom-line conclusions of this analysis do not change, indicating that the proposed merger is procompetitive. Consumer welfare increases, as indicated by consumer choices, namely that the merging party brands gain share at the expense of their competitors.[17]

EXHIBIT 3
Merger simulation detail, scenario conservatively capturing some of the speed and coverage benefits that Sprint and T-Mobile expect to realize from combining their complementary spectrum assets, and the marginal cost reductions estimated by Israel, Katz, and Keating with baseline conditional logit and nested logit demand models

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[16] Mark Israel, Michael Katz, and Bryan Keating, "Declaration of Compass Lexecon," September 17, 2018, WT Docket No. 18-197, ("Israel, Katz, and Keating Declaration").

[17] Exhibit 3 provides the weighted average compensating variation that incorporates the corrections described in the errata on April 2, 2019.

3. Porting data and the estimation of diversion ratios[18]

14. BVZ continue to insist that an analysis of competitive effects should rely on diversion ratios estimated from porting data.[19] Both Commission staff and the academic literature recognize that the relevant question to evaluating a proposed merger's competitive effects is how many consumers would substitute away from one product and to what other products *in response to a price increase or quality decrease by the **first** product*.[20] 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. The substitution relevant to measuring diversion ratios and evaluating competitive effects is fundamentally different from generalized switching; it must capture substitution that occurs specifically due to changes in prices or quality by a particular product and only by that product.

15. BVZ argue that our data are unreliable for the purpose of estimating diversion ratios because they do not capture actual subscriber switching.[21] This argument is nonsensical; it would disqualify the large academic literature and agency practice on evaluating mergers.[22] Consistent with that literature and practice, the NMP data enable the estimation of a detailed and flexible demand model that estimates the diversion ratios that are actually relevant to assessing the competitive effects of the proposed merger.[23] These diversion ratios reflect the closeness of competition between any two brands, taking into account product and consumer characteristics, including the individualized quality each

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[18] This section reiterates summary points made in the Asker, Bresnahan, and Hatzitaskos December 18 White Paper. It provides additional information to many of the summary points made in that submission, indicating where in other material on the record more detail can be found.

[19] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 5 ("To understand the competitive effects of this merger, it is important to analyze information based on subscriber switching behavior, as the Applicants have done in their ordinary course of business.").

[20] Federal Communications Commission Staff Analysis and Findings in AT&T/T-Mobile, November 29, 2011, Appendix C, ¶¶ 8–10 and fns. 9 and 10; U.S. Department of Justice and Federal Trade Commission, Horizontal Merger Guidelines, August 19, 2010, § 6.1. Frequently there are no natural experiments that can be analyzed to directly evaluate competitive effects, because multiple products might be changing their price or price changes may be driven by demand rather than supply. Economists use demand models to analyze competitive effects precisely because they allow us to rigorously analyze the substitution that would occur in the event of a hypothetical price increase by a single firm or product.

[21] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 3 ("Cornerstone, in effect, funnels an information set through its demand model that has no data about actual subscriber switching behavior….").

[22] For example, see Aviv Nevo, "Mergers with differentiated products: the case of the ready-to-eat cereal industry," *RAND Journal of Economics*, 2000, pp. 395–421; Federal Communications Commission, "In the Matter of Applications of AT&T Inc. and DIRECTV for Consent to Assign or Transfer Control of Licenses and Authorizations, Memorandum Opinion and Order, MB Docket No. 14–90," July 28, 2015, pp. 176–177 ("Generating Shares") and 178–179 ("Modeling Demand").

[23] Asker, Bresnahan, and Hatzitaskos White Paper, § 3.

brand offers to particular consumers given their unique usage patterns, as discussed in our initial white paper.[24]

16. Such demand-based 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 their shortcomings, including the fact that switchers may switch in response to factors other than changes in the price or quality of the brand of interest and the fact that porting data capture a non-random sample of switchers.[25] 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 of diversion ratios.

17. BVZ also argue that some of our criticisms of estimating diversion ratios using porting data also apply to switching data more generally.[26] That is correct, and it is the reason why we have previously explained that it is more appropriate to use demand-based estimates such as ours.[27] 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 less reliable measures for the purpose at hand.[28]

18. To understand why estimating diversion ratios using porting data is inappropriate, note that as BVZ and DISH themselves have demonstrated in erroneously defending their use of porting data, the wireless service industry tends to feature multiple different types of offers from different brands at the same time.[29] This makes it particularly challenging to link observed switching to the change in price or quality of a single brand. Rather, switches likely reflect a combination of prices or quality movements by multiple brands. Moreover, consumers may switch from one brand to another for a variety of demand-driven reasons that have nothing to do with price or quality changes, e.g.,

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[24] Asker, Bresnahan, and Hatzitaskos White Paper, § 2.2.3.

[25] Federal Communications Commission Staff Analysis and Findings, in AT&T/T-Mobile, November 29, 2011, 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.

[26] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 5 ("Finally, several of Cornerstone's critiques apply to the merits of estimating diversion rations [sic] from switching data generally (and not porting data specifically)....").

[27] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 3.

[28] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 3.4.

[29] For example, see the internal T-Mobile document cited by Pantelis Michalopoulos, DISH Cover Letter to Bazelon, Verlinda, and Zarakas March 25 Submission, p. 2 (TMUS-FCC-07849832 at TMUS-FCC-07849853).

because they or a family plan member moved, because their old phone broke, or because they missed a monthly payment.

19. Despite multiple submissions in this record, BVZ have not offered a demand model that would support the diversion ratios they use the biased porting data to proxy. BVZ continue to assert that this one data source should be used instead of other estimates of diversion ratios (whether based on our demand model or the switching data that Israel, Katz, and Keating have used to evaluate competitive effects). BVZ do so even though their porting data proxy is an outlier and they have conducted no analysis to support their proxy's veracity over estimates based on other sources (all of which indicate that the proposed merger is procompetitive). Furthermore, even if one were to accept using the porting data, BVZ have not even explained why one should focus on port-outs or some other metric.

20. 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, industry data sources, and ordinary course documents that porting data capture only a minority of all switching in the wireless industry and that the non-random sample of switches they represent tends to overstate switches between Sprint and T-Mobile, especially for certain types of consumers.[30]

21. Even though we understand business people use porting data to consider directional changes within short time frames (i.e., hourly, daily),[31] porting data are 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 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,

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[30] We understand that MVNOs rarely tie promotions and pricing to porting and so are underrepresented in porting data (see, for, example, SPR-FCC-02425213 at SPR-FCC-02425217 and SPR-FCC-04301172 at SPR-FCC-04301177). Moreover, porting data tends to over-represent high value consumers (see, for example, TMUS-FCC-00206649 at TMUS-FCC-00206651). 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.

[31] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 4.2.

we routinely see sets of consumers porting in both directions at the same time, which is inconsistent with switching behavior driven exclusively by supply shocks, such as a price change.[32] Moreover, Applicants in the ordinary course of business typically review net ports and porting ratios, and BVZ have not examined the patterns in these metrics to establish whether their approach to using porting data align with these patterns.

22. Our analysis overcomes these and other concerns about relying on porting data raised by the Commission in prior transactions.

4. Rebuttal of specific assertions in BVZ's March 25 submission relating to our work

23. This section addresses other claims in BVZ's March 25 submission, pointing to existing material in the record that already rebuts these claims.[33] Where appropriate, it also points out materials in BVZ's own submissions that contradict BVZ's own positions. This section is intentionally brief, as the arguments in BVZ's latest submission are not new and we have already addressed them.

24. **BVZ's section II(A).** Here, BVZ claim that because our demand model produces diversions that are close to diversion according to aggregate shares, our estimates must be unreliable.[34] BVZ's claim is problematic for at least two reasons. First, their Figure 1 does not show the diversions from our actual baseline model, but rather, it shows a manufactured aggregation that is different from the diversion ratios we present in our initial white paper (see Exhibit 12 in our initial white paper).[35] Second, their argument is based on an assumption that diversion can never be close to that produced by aggregate shares. They do not provide any foundation for this assumption.

- As we have explained previously, our findings are driven by actual data rather than assumption, and these findings are robust to using all real-world data of which we are aware.[36]

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[32] See Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 3.

[33] Bazelon, Verlinda, and Zarakas March 25 Submission.

[34] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 7.

[35] Asker, Bresnahan, and Hatzitaskos White Paper, p. 35.

[36] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 2; Asker, Bresnahan, and Hatzitaskos March 13 White Paper, § 4.

- BVZ's own estimation results, where they use an inappropriate econometric model to impute income "data" (even data that are actually already available and require no imputation), refute their repeated assertions that our model produces diversion proportional to shares, regardless of the data inputs.[37] In particular, BVZ show that using these "data," which are unlike real-world data, the model yields diversion ratios that are very different from diversion proportional to shares. Thus their own work establishes that our methodology is flexible.

- The nested logit specifications we previously submitted and summarize above further refute BVZ's claims that more segmentation exists than is already captured by our analysis.[38]

- As we explained in a previous submission, BVZ are also wrong to discount the competitive information that shares convey.[39] As we have noted, shares overall and within granular consumer segments demonstrate that AT&T and Verizon are important competitive constraints for the merging firms not just on average but across all observable consumer segments, including lower-income consumers.[40]

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[37] Asker, Bresnahan, and Hatzitaskos March 13 White Paper, ¶¶ 32–33.

[38] § 2 of the current submission; Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 6.2.

[39] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 2.5.

[40] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, ¶ 17 on p. 8.

25. **BVZ's section II(B).** BVZ begin by stating that "It is telling that the same, identical price-response diversion ratios flow from Cornerstone's model, regardless of any specific value that is calibrated for the price sensitivity parameter from their supply-side assumptions."[41] This statement is a red herring.[42] It portrays a key feature of diversion in standard economic models as if it were problematic. The apparent purpose of this paragraph is to instill fear in the reader regarding any model-based approach to measuring diversion.[43] By way of illustration, the same features exist in the Nevo (2000) paper that BVZ cite so approvingly in their subsequent paragraph.[44] Far from being problematic, demand models allow us to rigorously conduct the thought experiment of the merging firm increasing prices in a way that is simply not typically possible using switching data.

26. BVZ take issue with our estimation of the price coefficient.[45] In a previous submission, we described the precise way that our approach is standard.[46] For instance, our approach uses exactly the same economic structure as that used in Nevo (2000) to recover marginal costs.[47]

27. **BVZ's section II(C).** BVZ begin by claiming that AT&T and Verizon are not relevant competitive options in low income areas as "AT&T and Verizon are far more successful in areas with higher credit scores, higher incomes, and that are less ethnically diverse."[48]

- BVZ's claim is contradicted by their own results.[49] AT&T's share of consumers in the bottom and top quartiles of income, credit score, and

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[41] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 8.

[42] BVZ confuse demand cross-elasticities (the amount of consumers who will switch from one product to another as a result of a supply-side change in the characteristics of the first product) with diversion ratios (the ratio of a demand cross-elasticity with the demand own-elasticity corresponding to the same change). While demand cross-elasticities do vary based on the strategic variable being changed, diversion ratios are normalized by the own-elasticity and so do not. Moreover, whether a characteristic is observed or not is irrelevant.

[43] Diversions based on porting data, being free of any model-based foundation, are immune to this critique, in much the same way that corpses are immune to disease.

[44] In particular, diversion is invariant to the price coefficient. This is because the thought experiment that diversion captures holds prices of all other products constant. Hence, all that matters are relative utilities or, equivalently, relative choice probabilities. See Aviv Nevo, "Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry," *The RAND Journal of Economics*, 31(3), 2000, cited in Bazelon, Verlinda, and Zarakas March 25 Submission, p. 9.

[45] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 8.

[46] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, ¶ 25 and fns. 29–31 on p. 10.

[47] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, fn. 30 on p. 10.

[48] Bazelon, Verlinda, and Zarakas March 25 Submission, pp. 9–10.

[49] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 10.

diversity is within one or two percentage points. This cannot be characterized as "far more successful."[50]

- Setting the internal inconsistency aside, our conclusion is that AT&T and Verizon are important competitors in *all* neighborhoods, including those that have lower income, lower credit scores, and more African Americans and Hispanic people.[51] Whether AT&T and Verizon are even stronger competitors in some other segments is beside the point.

- In making this segmentation argument, BVZ ignore that shares convey useful competitive information. The fact that so many lower income and lower credit score consumers choose the AT&T and Verizon premium brands as their *first* choice demonstrates that they may well be the second choice for many other consumers within these segments.[52]

- We have also explained that BVZ are wrong to argue that lower income consumers have lower willingness to pay for quality improvements.[53]

28. BVZ then go on to state that "Moreover, as we described in our February 19 and March 18 filings, aggregation present in the census demographic information appears to be masking further evidence of market segmentation across brands."[54]

- The analysis that begins at this point and continues to the end of the section relies on the fundamentally flawed methodology that we discussed at length in a previous submission.[55] Nevertheless, BVZ continue to use the "data" they have "estimated," which is unlike any of the available real-world data on consumer incomes, including the NMP survey data that they claim their "data" represents.[56] When the NMP survey data is used in our

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[50] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 9.

[51] See also Asker, Bresnahan, and Hatzitaskos February 6 White Paper, ¶ 17 on p. 8. The results presented by BVZ provide additional support for our conclusion, showing that the AT&T and Verizon brands have shares among consumers in low income, low credit score, and more diverse neighborhoods that are 42 to 49 percent. See Bazelon, Verlinda, and Zarakas March 25 Submission, p. 10.

[52] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, ¶ 17 on p. 8 and § 2.5.

[53] In footnote 6 of the March 25 submission BVZ state that "In our prior filings we have shown that low income consumers have a lower willingness to pay for quality improvements given their data usage type." We already rebutted this claim (Asker, Bresnahan, and Hatzitaskos December 18 White Paper, § 4.1). In particular we showed that, even if you accept their approach, our conclusions as to competitive effects were unchanged.

[54] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 11.

[55] Asker, Bresnahan, and Hatzitaskos March 13 White Paper.

[56] See, in particular, Asker, Bresnahan, and Hatzitaskos March 13 White Paper, Exhibit 1 on p. 2 and Exhibit 5 on p. 10.

demand model directly, conclusions as to diversion and competitive effects are qualitatively unchanged.[57]

29. **BVZ's section II(D).** BVZ claim that the switching patterns discussed in § 2 of the February 7 submission of Israel, Katz, and Keating undermines the diversion ratios implied by our model.[58] We have already rebutted BVZ's claim that switching or porting data provide the most reliable information on diversion earlier in this submission and, in more detail, in a previous submission.[59]

30. **BVZ's section II(E).** This section of BVZ's submission provides a condensed summary of arguments made in sections II(A)-II(D).[60] Please refer to the relevant sections in this submission.

31. **BVZ's section III(A).** BVZ claim that the Applicants use porting data extensively to assess competitive performance and evaluate pricing, and incorrectly concludes that porting data is therefore informative about diversion and brand substitutability. They state that "Sprint and T-Mobile compete aggressively on price and measure the success (or lack thereof) based on the number of subscribers they lose or gain to rivals."[61]

- As we have explained previously, even when the Applicants use porting data "extensively," they do so directionally.[62] Moreover, while Applicants use the high-frequency porting data in the ordinary course, they do not necessarily use it in less high-frequency analyses. For instance, many Sprint quarterly competitive benchmarking and financial reporting documents show no reliance on porting data at all.[63]
- As the Commission itself recognizes and we have explained previously, porting captures only a fraction of overall switching and includes switches

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[57] See, in particular, Asker, Bresnahan, and Hatzitaskos March 13 White Paper, Exhibit 7 on p. 14.

[58] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 13.

[59] See § 3 of this submission and Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 3 (in particular) and § 2 (more generally).

[60] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 14.

[61] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 16.

[62] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 4.2.

[63] See the following quarterly Competitive Results Summary presentations from 2017 and 2018, which mention several sources of data, but not porting, when assessing competition: SPR-FCC-01955622, SPR-FCC-08607185, SPR-FCC-10937812, SPR-FCC-07832133, and SPR-FCC-08045781.

due to multiple factors, not just changes in prices.[64] Thus, the porting data
do not accurately reflect the number of subscribers the Applicants "lose or
gain to rivals,"[65] and BVZ have never provided a way to isolate that portion
of the porting data that "tightly aligns the carriers' pricing behavior with
subscriber choices."[66]

- Further, porting data contain a range of metrics: port-ins, port-outs and
net ports. BVZ never clearly engage with the differences between these
metrics and how the Applicants use them, despite the fact that the choice
of metric can support materially divergent conclusions as to the closeness
of competition (ignoring the many issues with using any porting data).[67]

- We have already discussed the many reasons why porting data are not
informative about diversion and brand substitutability, especially given
that better alternatives, such as NMP data, enable the estimation of a
detailed and flexible demand model to estimate diversion ratios that are
actually relevant to assessing the competitive effects of the proposed
merger.[68]

32. **BVZ's sections III(B) and III(C).** These sections do not engage
substantively with our work.[69]

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[64] Federal Communications Commission Staff Analysis and Findings, Appendix C, ¶¶ 9–10, § 3 of this submission, and Asker, Bresnahan, and Hatzitaskos February 6 White Paper, §§ 3.2 and 3.3.

[65] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 16. For our explanation of this issue, see § 3 of this submission and Asker, Bresnahan, and Hatzitaskos February 6 White Paper, §§ 3.2 and 3.3.

[66] Bazelon, Verlinda, and Zarakas March 25 Submission, p. 16.

[67] See § 3 of this submission.

[68] Asker, Bresnahan, and Hatzitaskos February 6 White Paper, § 3.

[69] Bazelon, Verlinda, and Zarakas March 25 Submission, pp. 17–21.