

Pantelis Michalopoulos  
202 429 6494  
pmichalopoulos@steptoe.com



1330 Connecticut Avenue, NW  
Washington, DC 20036-1795  
202 429 3000 main  
www.steptoe.com

**REDACTED—FOR PUBLIC INSPECTION**

March 25, 2019

***By ECFS***

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

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

Dear Ms. Dortch:

DISH has shown that porting data—a factual, historical account of the carrier each porting subscriber leaves and the one to which she switches—are the most reliable estimates of diversion. It is the metric on which the highest levels of management of both Sprint and T-Mobile (together, the “Applicants”) rely on to weigh competitive pressure and decide on responses. Porting data show plainly that each of Sprint and T-Mobile is currently the other’s primary competitor.

In two additional declarations,<sup>1</sup> the Applicants’ economists continue to claim that the diversion ratios estimated by Cornerstone are superior to both diversion derived from porting ratios and from survey-based diversion (the measure that Compass Lexecon previously used). They take great pains to show that a chart comparing carrier promotions and porting changes

---

<sup>1</sup> See Letter from Nancy Victory, Counsel for T-Mobile, to Marlene Dortch, FCC, WT Docket No. 18-197 (Feb. 7, 2019), John Asker, Timothy Bresnahan, Kostis Hatzitaskos, *Response to DISH Comments Regarding Diversion Ratios* (Attachment A); Mark Israel, Michael Katz, and Bryan Keating, *Porting Data are Biased and Inferior to Both Survey Data and Structural Demand Estimation as a Means of Estimating Diversion Ratios* (Attachment B).

DISH has denoted with **{{BEGIN HCI END HCI}}** information that is deemed to be Highly Confidential Information pursuant to the *Protective Order*. A public, redacted version of this filing is being filed with the Commission. Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations, *Protective Order*, WT Docket No. 18-197, DA 18-624 (June 15, 2018).

**REDACTED—FOR PUBLIC INSPECTION**

Marlene Dortch  
March 25, 2019  
Page 2

does not show the two to be well aligned.<sup>2</sup> For perfect alignment between promotions and porting changes, of course, all promotions would have to be equally and totally successful. They are obviously not, and that is one likely reason why the two are not always perfectly aligned. But, below is another chart contained in a document recently submitted by T-Mobile. This chart (created by T-Mobile in the ordinary course of business) is in the same format as those previously cited by DISH, and correlates promotions and porting data for the period March 2016-April 2017.

**{{BEGIN HCI**

**END HCI}}<sup>3</sup>**

Notably, it depicts port-ins for *prepaid* service, the services for which the Applicants allege porting data to be particularly unsuitable. The alignment of promotions and port-in changes is often uncanny. For example, it shows that MetroPCS experienced a steep increase in port-ins, immediately after a decline, when: **{{BEGIN HCI**

**END HCI}}**

---

<sup>2</sup> T-Mobile Feb. 7 Letter at 24-25.

<sup>3</sup> TMUS-FCC-07849832 at 07849853.

## REDACTED—FOR PUBLIC INSPECTION

Marlene Dortch  
March 25, 2019  
Page 3

Moreover, as DISH's economists previously explained, Cornerstone's diversion ratio estimates are unreliable and inaccurate. Brattle has shown that the Cornerstone demand model relies on data that has no information about actual subscriber switching behavior, no information on pricing differences, and uses overly aggregated demographic data.<sup>4</sup>

In the enclosed report, Brattle has again reviewed Cornerstone and Compass Lexecon's claims regarding estimation of diversion ratios and finds that both sets of economists reach the wrong conclusion that porting data should be completely discounted in favor of their own estimates of diversion.<sup>5</sup> In addition, Brattle finds:

- The Applicants mischaracterize Brattle's findings with respect to share-based diversion ratios. Cornerstone misleadingly presents individual-level diversion ratio estimates from its model, but the relevant diversion ratios are aggregate diversion ratios across individuals because pricing decisions are made at an aggregated level. Review of Cornerstone's individual-level ratios again shows that they simply reproduce diversion in proportion to subscriber share.
- Because there is no price information in Cornerstone's demand model, its diversion ratio estimates are best understood as diversion in response to unobserved brand characteristics. That is, Cornerstone would estimate the same diversion in response to a change in T-Mobile's magenta brand logo as it does for a change in T-Mobile's subscription prices. Therefore, despite its representations to the contrary, Cornerstone does not estimate diversion ratios based on changes in price, and Cornerstone's claims that it estimates price effects using standard practices are both overstated and irrelevant.
- Brattle shows conclusively that low-income consumers and non-premium subscribers are more likely to be harmed by the proposed merger.
- Compass Lexecon quibbles with the diversion ratio Brattle uses from the Boost deactivation survey, but misses the larger point about this survey—regardless of whether the diversion ratio from Boost-to-T-Mobile/MetroPCS is **{{BEGIN HCI  
END HCI}}**, the Boost-to-T-Mobile/MetroPCS diversion ratios estimated from the Cornerstone model are significantly understated.

---

<sup>4</sup> See Coleman Bazelon, Jeremy Verlinda, and William Zarakas, *Response to Applicant Filings on Diversion Ratios*, Attachment A to letter from Pantelis Michalopoulos to Marlene Dortch, FCC, WT Docket No. 18-197 (Jan. 28, 2019).

<sup>5</sup> Coleman Bazelon, Jeremy Verlinda, and William Zarakas, *Response to Applicants' February 7 Filings on Diversion Ratios*, at 1 (March 22, 2019) (enclosed as Attachment A).

**REDACTED—FOR PUBLIC INSPECTION**

Marlene Dortch

March 25, 2019

Page 4

- Both Cornerstone and Compass Lexecon incorrectly claim that the Applicants' **{{BEGIN HCI** **END HCI}}**<sup>6</sup> is not relevant to whether porting should be used to measure diversion. Brattle confirms that understanding how the Applicants alter their pricing to reflect changes in porting prompted by rival pricing behavior is at the very heart of this merger review's assessment of the degree of competitiveness between the Applicants' brands.
- Compass Lexecon's emphasis on quality-based diversion cannot make up for a key shortcoming of Cornerstone's model—that it cannot (and does not) directly estimate price-response diversion.
- Compass Lexecon discounts the relevance of competition between Sprint and T-Mobile in urban areas. But Sprint and T-Mobile are particularly close substitutes in urban and suburban areas. When examining how the merger changes pricing incentives, the most relevant diversion information is the diversion in those areas where they compete.
- Contrary to Compass Lexecon's claims, comparisons of switching metrics across data sources fail to demonstrate bias concerns in porting data. Additionally, several of Cornerstone's critiques would apply to *any* method of estimating diversion ratios from switching data, and not to porting data specifically.

The Commission should therefore use porting data based on actual subscriber switching behavior to best measure diversion between the Applicants, consistent with Commission precedent, and as the Applicants have done in their ordinary course of business.

---

<sup>6</sup> Newly produced documents since DISH's Jan. 28 filing further buttress DISH's conclusion that the Applicants use porting data extensively in the ordinary course of business. *See e.g.*, TMUS-FCC-07940781, **{{BEGIN HCI**

**END HCI}}**

**REDACTED—FOR PUBLIC INSPECTION**

Marlene Dortch  
March 25, 2019  
Page 5

Respectfully submitted,

\_\_\_\_\_/s\_\_\_\_\_  
Pantelis Michalopoulos  
*Counsel to DISH Network Corporation*

## **Attachment A**

**Response to Applicants' February 7 Filings on Diversion Ratios**

**Coleman Bazelon**

Principal, The Brattle Group

**Jeremy Verlinda**

Principal, The Brattle Group

**and**

**William Zarakas**

Principal, The Brattle Group

**March 25, 2019**

# Table of Contents

- I. Introduction..... 3
- II. Cornerstone’s estimated diversion ratios are unreliable and should not be used in the merger simulation. .... 5
  - A. Cornerstone and Compass Lexecon mischaracterize our findings with respect to share-based diversion ratios. .... 6
  - B. Despite its representations to the contrary, Cornerstone does not estimate diversion ratios based on changes in price, and its claims of estimating price effects using standard practices are both overstated and irrelevant..... 8
  - C. Low-income consumers and non-premium subscribers are more likely to be harmed by the merger..... 9
  - D. Survey information shows that the Cornerstone model’s estimated diversion ratios among the Applicants are significantly understated. .... 13
  - E. Cornerstone reaches a false conclusion that switching information, such as porting data, should be completely discounted in favor of its own estimates of diversions. .... 14
- III. Careful examination of survey data and the Applicants’ documents indicates that porting data provide a reliable basis for understanding subscriber perceptions of brand substitutability ..... 15
  - A. Cornerstone and Compass Lexecon incorrectly claim that the Applicants’ extensive use of porting data for pricing decisions is not informative about diversion and brand substitutability..... 15
  - B. Compass Lexecon underappreciates the relevance of competition between Sprint and T-Mobile in more urban geographies..... 17
  - C. Contrary to Compass Lexecon claims, comparisons of switching metrics across data sources fail to demonstrate bias concerns in porting data. .... 18

## I. Introduction

In their February 7<sup>th</sup> declarations,<sup>1</sup> Cornerstone and Compass Lexecon continue to claim that the diversion ratios estimated from the Cornerstone demand model provide the best indicators of substitution among mobile telecommunications brands, and that other indicators of diversion (such as porting data) should not be seriously considered. They base this conclusion on the claim that the Nielsen Mobile Performance (“NMP”) data allows for estimation of “substitution patterns that reflect the characteristics of each consumer as well as the individualized network quality different brands offer to each consumer.” This leads Cornerstone and Compass Lexecon to conclude that diversion ratios from the Cornerstone model are appropriate to use in merger simulations, and that other indicators of diversion are not. We disagree.

As we have shown in our January 28 and February 18 filings, the diversion ratio estimates that come out of Cornerstone’s demand model are unreliable and inaccurate. Specifically, we have demonstrated that Cornerstone’s methodological approach has proven unable to identify market segmentation that is abundantly evident elsewhere in this proceeding. Cornerstone, in effect, funnels an information set through its demand model that has no data about actual subscriber switching behavior, no information on pricing differences, and overly aggregated demographic data. The information that Cornerstone uses is insufficient to move its model away from its baseline assumption of share-proportional diversion. To be clear, Cornerstone’s conclusion that there are trivial differences from share-proportional diversion is not a “found truth.” It is merely the result of an overall modeling strategy with share-proportional diversion as the default assumption and insufficient data. It should not be used as a basis for any inference of either diversion ratios or potential anticompetitive effects of the proposed Sprint/T-Mobile merger.

In this report, we review the claims presented by Cornerstone and Compass Lexecon regarding estimation of diversion ratios. We find that:

---

<sup>1</sup> See Response to DISH Comments Regarding Diversion Ratios by John Asker, Timothy Bresnahan, Kostis Hatzitaskos, Feb. 6, 2019 (henceforth “Cornerstone Diversion Reply Rebuttal”) and Porting Data are Biased and Inferior to Both Survey Data and Structural Demand Estimation as a Means of Estimating Diversion Ratio by Mark Israel, Michael Katz, and Bryan Keating, Feb. 7, 2019 (henceforth “Compass Lexecon Diversion Reply Rebuttal”), *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197.

- Cornerstone and Compass Lexecon mischaracterized our findings with respect to share-based diversion ratios. Cornerstone misleadingly presents a wide range of individual-level “diversion ratio” estimates from its model, but the relevant diversion ratios are aggregate price-response diversion ratios across individuals because pricing decisions are made at an aggregated level. Further, review of the average diversion ratios across individuals approximates the correct diversion calculation, and again reveals diversion ratio estimates that reproduce diversion in proportion to share.
- There is no price information in Cornerstone’s subscriber choice demand model, and its diversion ratio estimates are best understood as diversion in response to unobserved brand characteristics. That is, Cornerstone would estimate the same diversion in response to a change in T-Mobile’s magenta-colored brand logo as it estimates for a change in T-Mobile’s subscription prices. Therefore, despite its representations to the contrary, Cornerstone does not estimate diversion ratios based on changes in price, and Cornerstone’s claims that it estimates price effects using standard practices are both overstated and irrelevant.
- Cornerstone has incorrectly claimed that low-income customers are likely to benefit from the merger, and that we have not shown there are any identifiable segments of consumers that are likely to be harmed. We show the opposite: that low-income consumers and non-premium subscribers are more likely to be harmed by the transaction.
- Compass Lexecon takes issue with the diversion ratio we use from the Boost deactivation survey, but misses our primary point about this information. Regardless of whether the diversion ratio from Boost-to-T-Mobile/MetroPCS is **{{BEGIN HCI  
END HCI}}**, the Boost-to-T-Mobile/MetroPCS diversion ratios estimated from the Cornerstone model are significantly understated.
- Cornerstone reaches a false conclusion that switching information, such as porting data, should be completely discounted in favor of its own estimates of diversions.
- Cornerstone and Compass Lexecon incorrectly claim that the Applicants’ **{{BEGIN HCI  
END HCI}}** is not informative about diversion and brand substitutability. Understanding how the Applicants alter their pricing to reflect changes in porting induced by rival pricing behavior lies at the very heart of this merger review’s assessment of the degree of competitiveness between the Applicants’ brands.
- Compass Lexecon’s emphasis on quality-based diversion cannot make up for a key shortcoming of the Cornerstone model—namely that it cannot (and does not) directly estimate price-response diversion. The Cornerstone and Compass Lexecon merger simulations estimate the merger’s effects on prices, the relevant input for which is price-response diversion.

- Compass Lexecon underappreciates the relevance of competition between Sprint and T-Mobile in more urban geographies. Sprint and T-Mobile are particularly close substitutes in urban and suburban areas. When examining how the merger changes pricing incentives, specifically through sales recapture, meaning the capture by T-Mobile of customers who would otherwise have left for Sprint and vice versa, the most relevant diversion information is the diversion in those areas where they compete.
- Contrary to Compass Lexecon's claims, comparisons of switching metrics across data sources fail to demonstrate bias concerns in porting data.

Finally, several of Cornerstone's critiques apply to the merits of estimating diversion ratios from switching data generally (and not porting data specifically), including claims that:

- Switching data only summarizes the behavior of people who leave their carrier but does not describe the behavior of subscribers choosing to remain with their carrier.
- Switching data includes people who switch for reasons unrelated to changes in price of quality.
- Switching data is only used by the merging parties in order to qualitatively gauge competition, not as a proxy for diversions.

Cornerstone implies that, due to these criticisms, the only correct method of gauging diversion ratios would be through its demand model. The logical implication of this is, therefore, that the only way in which these concerns could be relevant is if the Cornerstone model is capable of providing accurate diversion information. We have shown that it is not. Given the inability of the Cornerstone demand model to provide reliable diversion information, the logical conclusion is contrary to Cornerstone's claims and implications. 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.

## II. Cornerstone's estimated diversion ratios are unreliable and should not be used in the merger simulation.

A coordinated theme across the Compass Lexecon and Cornerstone rebuttals to our January 28 filing on diversion is that information sources such as porting data, switching surveys, deactivation surveys, and the Applicants' own internal documents should all be dismissed in

favor of the diversion ratios estimated from Cornerstone’s demand model. In this section, we address these claims and explain that Cornerstone’s estimated diversion ratios do not provide a reliable basis for assessment of brand preferences or, ultimately, the merger’s likely predicted price effects.

### A. Cornerstone and Compass Lexecon mischaracterize our findings with respect to share-based diversion ratios.

Cornerstone and Compass Lexecon misrepresent our comments concerning the share-based diversion ratios. Specifically, we demonstrated that the aggregate diversion ratios estimated from the Cornerstone model were nearly identical to diversion ratios calculated based on subscriber shares. In their rebuttals, Cornerstone and Compass Lexecon distort our comments to suggest that we expected that the diversion for each individual in the NMP data set would be equal to the share-based numbers. We have made no such claim.

Moreover, individual-level diversion ratios are, as a standalone set of information, irrelevant to the tasks of determining how close a substitute each of the Applicants’ brands is perceived to be for the other or what the merger’s price effects are likely to be. For these tasks it is the aggregate diversion ratios that are relevant. Such aggregation is relevant and important because Cornerstone’s own merger simulation uses national prices as opposed to individualized prices. Compass Lexecon also acknowledges the relevance of aggregate diversion information, stating that “because Sprint and T-Mobile set prices nationally, we focus on nationwide diversion ratios, which are the ones relevant to assessing nationwide pricing incentives.”<sup>2</sup> In other words, it is clear that the profit-maximizing condition is a function of some weighted average of the individual level choice-probabilities, and the only relevant metric of substitutability is aggregate diversion.

We further elaborate on this point in Figure 1, below. The figure provides an alternative summary of the information in Exhibit 1 in Cornerstone’s February 6 filing, in which diversion ratios from Sprint to T-Mobile were presented at an individual level.

---

<sup>2</sup> Compass Lexecon Diversion Reply Rebuttal at p. 9.

**Figure 1: Comparison of Weighted Average Diversion to KPMG Share-Based Diversion**  
**{{BEGIN HCI**

**END HCI}}**

Source: Cornerstone February 6, 2019 Backup Materials for Exhibit 1. Weighted average of individual diversion ratio values by sample weights used in Cornerstone study. Each dot corresponds to a single brand-pair aggregate diversion ratio (e.g., Boost-to-MetroPCS).

The figure shows that aggregating the individual, subscriber-level diversion ratio values leads to aggregate diversion ratios that are essentially identical to those generated under an assumption of share proportionality—even when, as Cornerstone showed in its report, the individualized diversion ratios are dispersed around these averages. These aggregation results are consistent with the precise diversion ratios shown in our January 28 filing,<sup>3</sup> revealing, yet again, the

---

<sup>3</sup> See Response to Applicant Filings on Diversion ratios by Coleman Bazelon, Jeremy Verlinda, and William Zarakas, Attachment A to Letter from DISH Network Corporation, *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, January 28, 2019 at p. 25 and Figure 3 (henceforth “Brattle Diversion Response”).

observed insufficiency of Cornerstone’s methodology for accurately capturing the true diversion ratios that are relevant for assessing the competitive effects of the proposed Sprint/T-Mobile merger.

B. Despite its representations to the contrary, Cornerstone does not estimate diversion ratios based on changes in price, and its claims of estimating price effects using standard practices are both overstated and irrelevant.

Cornerstone continues to claim that its analysis directly estimates price-response diversion ratios. However, as we have previously explained, this is not the case. Prices are reflected in the Cornerstone demand model as one among many unobserved brand characteristics, which include such diverse traits as speed throttling thresholds, store locations, and even brand logo design choices. Formally, these unobserved features appear as a single brand-location fixed effect. Diversion in response to any unobserved feature that is captured by the brand-location fixed effect will be identical across those myriad features, and entirely independent of how the brand-location fixed effect might be decomposed. Cornerstone has presented no explanation to change our conclusion that its estimation of price-response diversion ratios is any way more than just a predetermined function of choice-probabilities.<sup>4</sup> *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.*

Notwithstanding the fact that price effects are irrelevant to Cornerstone’s diversion estimates, Cornerstone further overstates the extent to which its methodology is “standard” practice. While the papers cited by Cornerstone are relevant examples of modern, accepted approaches to demand estimation in the academic literature, Cornerstone’s modeling deviates from the methodologies described in these papers in important ways. In these papers, demand estimation is conducted with great care and attention to the econometric identification of subscriber preferences for prices and quality characteristics, including emphasis on variation in shares/choices and prices (over time and across markets), careful consideration of omitted information that may be correlated with prices and quality characteristics, and identification of

---

<sup>4</sup> Brattle Diversion Response at Appendix A.

variables that ought to be included to address “endogeneity” bias.<sup>5</sup> Such an approach is notably absent in Cornerstone’s estimation of price effects.

### C. Low-income consumers and non-premium subscribers are more likely to be harmed by the merger.

Cornerstone claims that we have “not shown that there are any identifiable segments of consumers that are likely to be harmed,”<sup>6</sup> because its data shows that AT&T and Verizon are critical competitors for all segments.<sup>7</sup> Cornerstone ignores the fact that the available data and merger simulation models show that prices will increase<sup>8</sup> for the merging brands and that the Applicants’ brands are strong substitutes for each other for low-income subscribers.

Instead, Cornerstone applies a superficial assessment of the competitiveness of non-Applicant brands by presenting AT&T, Verizon, and Cricket subscriber shares for subscribers residing in lower-income, lower-credit score, and more ethnically diverse zip codes. However, simply observing that AT&T, Verizon, and Cricket jointly have a significant share of subscribers in these areas is a relatively meaningless indicator of the extent to which low-income subscribers perceive these brands as close substitutes for the Applicants’ brands. First, Cornerstone uses only aggregate census data for these assessments and ignores actual subscriber information such as their reported incomes. Second, a closer examination of even the aggregate census demographic information indicates that AT&T and Verizon are far more successful in areas with higher credit

---

<sup>5</sup> For example, *See* Nevo, Aviv, “Mergers with Differentiated Products: The Case of the Ready-to-Eat Cereal Industry,” *The RAND Journal of Economics*, vol. 31, no. 3, (2000): 395-421 at p. 404. “The data required to consistently estimate the model include the following variables: market shares and prices in each city-quarter, brand characteristics, advertising, and information on the distribution of demographics.”

*See also* Nevo (2000) at p. 404. “The variation in prices is due to both exogenous and endogenous sources (i.e., variation correlated with demand shocks). Consistent estimation will have to separate these effects.”

<sup>6</sup> 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. *See* Further Reply Declaration of Coleman Bazelon, Jeremy Verlinda, and William Zarakas, *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, December 4, 2018 at p. 20 (henceforth “Brattle Further Reply”).

<sup>7</sup> Cornerstone Diversion Reply Rebuttal at ¶ 17.

<sup>8</sup> *See* Brattle Further Reply at p. 31.

scores, higher incomes, and that are less ethnically diverse. In comparison, subscribers living in lower-income, lower-credit score, and more ethnically diverse areas are much more likely to use the Applicants' brands than they are to use AT&T and Verizon. These facts are summarized in Table 1, below.

**Table 1: Subscriber Share by Census Median Income Levels and Other Census Demographics**  
**{{BEGIN HCI**

**END HCI}}**

Source: Cornerstone November 6, 2018 Report Backup Materials.

Table 1 shows the data that Cornerstone has reported<sup>9</sup> compared to the same metric for high-credit score, high-income, and less ethnically diverse areas. We see that while Verizon and AT&T do indeed compete in all segments, they have much higher subscriber shares in the high-credit score, high-income, and less ethnically diverse areas. This means that AT&T and Verizon are relatively less successful at winning subscribers in lower-income, lower-credit score and more ethnically diverse areas.

To show this relative success point more clearly, the table also includes the “odds ratio” for being a subscriber of a brand given their area’s income, credit score, and diversity quartile.<sup>10</sup> Income segments are divided into four quartiles, with the first quartile representing the lowest segment of income and the fourth quartile representing the highest income segment. Similar quartiles are calculated for credit score and the percentage of zip code residents that are African American or

---

<sup>9</sup> Cornerstone Diversion Reply Rebuttal at ¶ 17.

<sup>10</sup> In the table, the “odds ratio” is the ratio of the odds values across income quartiles for being a subscriber of a given carrier. For each income quartile, the “odds” is calculated as the share of subscribers for that carrier to one minus that share.

Hispanic. As shown in the table, wireless customers living in areas at the fourth income quartile are {{BEGIN HCI    END HCI}} times more likely to be Verizon subscribers than are wireless customers living in areas at the first income quartile, while customers in the fourth income quartile are only {{BEGIN HCI    END HCI}} times more likely to be Boost/Virgin subscribers than are customers in the first quartile.<sup>11</sup> Similar patterns can be seen in the credit score and diversity demographics. Thus, the Applicants' brands' subscribers, particularly Boost/Virgin and MetroPCS, are much more likely to reside in lower-income, lower-credit score, and more ethnically diverse areas, whereas the opposite pattern is apparent for AT&T and Verizon.<sup>12</sup>

Moreover, as we described in our February 19<sup>13</sup> and March 18<sup>14</sup> filings, aggregation present in the census demographic information appears to be masking further evidence of market segmentation across brands. The disparity in reported income across non-premium and premium brand subscribers is not captured in census data used by Cornerstone. This fact pattern is also present when we examine diversion ratios across estimated income levels based on the reported NMP income information. The NMP income data shows just how dispersed income actually is for the NMP panel participants, and indicates that non-premium brand subscribers divert to other non-premium brands at a much higher rate than Cornerstone's diversion estimates suggest.<sup>15</sup>

We have extended this analysis to calculate the diversion among carriers segmented by income to show how subscriber preferences vary across income levels in Figure 2, below.

---

<sup>11</sup> Equivalently, a consumer in the first income quartile is {{BEGIN HCI    END HCI}} times more likely to be a Boost/Virgin subscriber than a consumer in the fourth quartile.

<sup>12</sup> These points extend beyond premium and non-premium brand distinctions. For example, Table 1 also shows that subscribers in the most ethnically diverse zip codes are {{BEGIN HCI    END HCI}} times more likely to be T-Mobile subscribers than subscribers in the least ethnically diverse zip codes. In contrast, the relevant odds ratio for Verizon is just {{BEGIN HCI    END HCI}}.

<sup>13</sup> See Reply to Cornerstone "Response to Dish and CWA Comments" by Coleman Bazelon, Jeremy Verlinda, and William Zarakas, *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, February 19, 2019 at Section III (henceforth "Brattle Feb 19 Reply to Cornerstone").

<sup>14</sup> See Reply to Cornerstone "Reply to Cornerstone's 'Response to Dish's February 19 and 25 Submissions'" by Coleman Bazelon, Jeremy Verlinda, and William Zarakas, *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, March 18, 2019 (henceforth "Brattle Mar 18 Reply to Cornerstone").

<sup>15</sup> See Brattle Feb 19 Reply to Cornerstone at p. 22 for a detailed discussion about this procedure.

**Figure 2: Diversion Ratios by Estimated Income Quartiles**  
**{{BEGIN HCI**

**END HCI}}**

Source: Brattle calculations, NMP Survey Data, and Cornerstone November 6, 2018 Report Backup Materials. Quartiles calculated from estimated income values for full set of NMP panelists.

As shown in Figure 2, diversion ratios estimated by Cornerstone’s model based on income estimates from the NMP survey income data indicate the presence of market segmentation between premium and non-premium brands.<sup>16</sup> These estimates also show segmentation is exceptionally high for low income consumers for the Applicants’ brands. In the bottom estimated income quartile, the non-premium brands are relatively closer substitutes for each other, with approximately **{{BEGIN HCI      END HCI}}** of Boost subscribers diverting to MetroPCS and approximately **{{BEGIN HCI      END HCI}}** of MetroPCS subscribers diverting to Boost. In contrast, in the top estimated income quartile, the diversion ratios among the non-premium brands are significantly lower, with approximately **{{BEGIN HCI      END HCI}}** of Boost

---

<sup>16</sup> See Brattle Feb 19 Reply to Cornerstone at pp. 27-28.

subscribers diverting to MetroPCS and approximately {{BEGIN HCI      END HCI}} of MetroPCS subscribers diverting to Boost.

The fact that the Applicants' non-premium brands compete critically for the low-income segment of the market, and are more substitutable within this segment, is reinforced by the fact that we see the opposite pattern for the relationship between diversion ratios and income level among the non-Applicant brands. For example, we find that diversion ratios are greatest between AT&T and Verizon for the top estimated income quartile, with approximately {{BEGIN HCI      END HCI}} of AT&T subscribers diverting to Verizon and approximately {{BEGIN HCI      END HCI}} of Verizon subscribers diverting to AT&T. Meanwhile, the diversion ratios between AT&T and Verizon are significantly lower for the bottom estimated income quartile, with approximately {{BEGIN HCI      END HCI}} of AT&T subscribers diverting to Verizon and approximately {{BEGIN HCI      END HCI}} of Verizon subscribers diverting to AT&T.

D. Survey information shows that the Cornerstone model's estimated diversion ratios among the Applicants are significantly understated.

Compass Lexecon claims that after adjusting a calculation in the text of our filing, the implied diversions from Boost to T-Mobile/MetroPCS will lead to a procompetitive merger. This claim is demonstrably false. As we explained in our October 31 filing, Compass Lexecon has significantly overstated the marginal cost efficiencies associated with the merger, which are insufficient to offset the merger's likely anticompetitive price increases.<sup>17</sup>

Furthermore, Compass Lexecon's discussion of the deactivation survey results overlooks the fact that Cornerstone's estimated diversion ratios are less than half the values observed from the Boost deactivation survey. Cornerstone's diversion estimates imply the analogous diversion to be {{BEGIN HCI      END HCI}}.<sup>18</sup> Our point is that Cornerstone's model

---

<sup>17</sup> See Reply Declaration of Joseph Harrington, Coleman Bazelon, Jeremy Verlinda, and William Zarakas, Exhibit 1 to Reply Comments by DISH Network Corporation, *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, October 31, 2018 at pp. 52-60 (henceforth "HBVZ Reply Declaration" or "*HBVZ 2*").

<sup>18</sup> See Economic Analysis of the Proposed T-Mobile/Sprint Merger by John Asker, Timothy F. Bresnahan, and Kostis Hatzitaskos, *In the Matter of Applications of T-Mobile US, Inc. and Sprint*

significantly underestimates substitution to and from the Applicants' brands; this conclusion still stands.

E. Cornerstone reaches a false conclusion that switching information, such as porting data, should be completely discounted in favor of its own estimates of diversions.

Cornerstone claims that “now that the FCC has access to the NMP data and our careful examination of consumer demand, it is no longer necessary to rely on porting data.”<sup>19</sup> Furthermore, it claims that “to the extent that our results differ from what the porting data imply, our rigorous analysis should be given more weight than the inherently imperfect shortcut.”<sup>20</sup> There is no basis for Cornerstone to make these statements. As we have shown in our prior filings, Cornerstone's estimation of diversion ratios is flawed and flatly unreliable. Notably, we have shown that the diversions calculated do not differ across any changes in brand characteristics that are collectively lumped into the demand model's brand-location fixed effects. Equally troubling, the “individualized” consumer data used by Cornerstone incorrectly masks the likely market segmentation observed in the wireless market. For example, robustness checks using alternative data available to Cornerstone reveal substitution patterns across brands that indicate substantial market segmentation, particularly between premium and non-premium brands. Such substitution patterns are more closely aligned with additional data sources reviewed in this proceeding, including porting data, switching surveys, deactivation surveys, and the Applicants' own internal documents.<sup>21</sup> Therefore, Cornerstone's assertion that its analysis somehow trumps other indicators of diversion ratios is unsupported.

---

Continued from previous page

*Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, November 6, 2018 at Exhibit 12 (Henceforth “Cornerstone Report”).

<sup>19</sup> See Cornerstone Diversion Reply Rebuttal at ¶33.

<sup>20</sup> See *Ibid.*

<sup>21</sup> See Section III and Brattle Reply to Cornerstone.

### III. Careful examination of survey data and the Applicants' documents indicates that porting data provide a reliable basis for understanding subscriber perceptions of brand substitutability

The remainder of Cornerstone and Compass Lexecon's criticisms address the alleged greater relative reliability of Harris survey data on switching behavior in comparison to porting data. These issues are distinct from the criticisms described above insofar as, in the absence of a reliable demand model to estimate diversion ratios, the available information about price-response diversion must come from other sources, potentially including porting data and switching surveys. A closer look at Compass Lexecon's critiques reveals that the relevant diversion ratios are much closer to the switching behavior seen in porting data than the Applicants have presented so far. We address Cornerstone and Compass Lexecon's criticisms of porting data's reliability below.

#### A. Cornerstone and Compass Lexecon incorrectly claim that the Applicants' extensive use of porting data for pricing decisions is not informative about diversion and brand substitutability.

Diversion in response to price changes is a critical summary measure in merger review. It directly informs the degree of brand substitutability for the merging parties in a way that is more intuitive than its related, underlying economic concepts (own- and cross-price elasticities). And it can also be used to approximate, and understand, potential merger-related price increases. To the extent that diversion ratio estimates are valuable in this proceeding, it is under the backdrop that it is important to understand the extent to which sales recapture of acquired brands (in response to a price increase) makes a price increase more profitable following the merger.<sup>22</sup>

---

<sup>22</sup> See Declaration of Joseph Harrington, Coleman Bazelon, Jeremy Verlinda, and William Zarakas, Exhibit B to Petition to Deny of DISH Network Corporation, *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, August 27, 2018 (henceforth "HBVZ Declaration" or "HBVZ I").

Evidence 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 is therefore highly relevant information.

As we explained in our January 28 filing, Sprint and T-Mobile documents indicate that the Applicants **{{BEGIN HCI**

**END HCI}}**. For example, T-Mobile executives **{{BEGIN HCI**

**END HCI}}**.<sup>23</sup> Sprint documents indicate similar behavior with regard to T-Mobile pricing and porting activity.<sup>24</sup> This activity is at the very heart of the relevant issues for reviewing the present merger because it speaks directly to both the degree of competition observed between the Applicants' brands and also to subscriber perceptions of brand substitutability. Internal documents describe **{{BEGIN HCI**

**END HCI}}**. That is, the Applicants **{{BEGIN HCI**

**END HCI}}**. No other information in this proceeding so tightly aligns the carriers' pricing behavior with subscriber choices.<sup>25</sup>

Moreover, and relatedly, Compass Lexecon is misguided in its over-reliance on diversion in response to quality differences. We agree that merger review must consider potential loss of competition in all areas where carriers compete, including price and quality. However, Compass Lexecon's emphasis on quality-based diversion cannot make up for a key shortcoming of the Cornerstone model—namely that it cannot, and does not, *directly* estimate price-response diversion.<sup>26</sup> In addition:

---

<sup>23</sup> See Brattle Diversion Response at p. 7.

<sup>24</sup> See *Ibid.*

<sup>25</sup> This is not to say that switching or porting activity that may be influenced by perceived or real changes in quality cannot be informative about price-response diversion. The context of such information's usefulness in estimating a merger's price effects is, however, as a proxy for price-response diversion. Moreover, any challenge in isolating price-induced switching/porting from quality-induced switching/porting is insufficient cause for dismissing switching/porting activity as an estimate of diversion.

<sup>26</sup> Price-response diversion in the Cornerstone model is only inferred from diversion in response to unobserved brand characteristics. It is, in fact, independent of, and therefore invariant to, whatever

- (i) the relevant question in the models proposed by both Compass Lexecon and Cornerstone is how the merger affects wireless plan prices (i.e., they do not present or consider formal modeling of competitively strategic quality choices), and the only diversion input for price effects is diversion in response to price, not in response to quality;
- (ii) as Compass Lexecon itself shows, evidence from deactivation surveys indicates that when the Applicants' subscribers change carriers for primarily price-induced reasons, they are far more likely to switch among the carrier's brands than when they switch for quality-induced reasons; and, therefore
- (iii) relying upon (unobserved) quality-induced diversion as a proxy for price-response diversion is questionable at best, and likely to understate the extent to which subscribers perceive the Applicants' brands as close substitutes.<sup>27</sup>

## B. Compass Lexecon underappreciates the relevance of competition between Sprint and T-Mobile in more urban geographies.

As we have stated, and as Compass Lexecon agrees, wireless plans' prices are generally understood to be offered at a nationwide level. Moreover, all of the merger simulation models presented in this proceeding attempt to predict the merger's effects on nationwide prices for each brand.<sup>28</sup> We have also stated, and Compass Lexecon agrees, that aggregation of subscribers for diversion calculations more accurately reflects pricing patterns in the industry, insofar as we are unaware of any evidence to suggest widespread adoption of *individual* subscriber-level price discrimination.<sup>29</sup>

---

Continued from previous page

information may be available about demand-sensitivity to price that Compass Lexecon infers from the supply-side margin equation.

<sup>27</sup> This criticism is independent to our concerns that the Cornerstone analysis fails to capture the market segmentation that the carriers are faced with and which is on display in various sources of switching information—namely that, at minimum, prepaid subscribers are far more likely to switch to another prepaid service, in sharp contradiction to the demand models results that Cornerstone presents.

<sup>28</sup> To the extent that local variation in promotions, particularly through channels, would indicate scope for consideration of local-level decision-making on plan prices, it is our understanding that, as a practical matter, the Applicants have provided insufficient information on geographic-market pricing, ARPU, or promotions to allow for formal modeling of anything more disaggregate than nationwide-level pricing.

<sup>29</sup> As we explain above, it is for this reason that we find variation in individual subscriber-level diversion ratios, as reported by Cornerstone, to provide minimal information relevant to the question of how the merger will affect prices.

Following from this, we expect that the Applicants will consider their subscriber base when developing prices for their plans, and the unchallenged fact here is that the Applicants' subscribers are primarily urban-based. As we indicated in our January 28 filing, Sprint and T-Mobile, and in particular their prepaid brands Boost and MetroPCS, are disproportionately more successful in less rural (more urban) areas.<sup>30</sup> We have also documented that the non-rural diversion ratios between the Applicants' brands exceed the national-level diversion ratios, particularly in the urban and suburban core.<sup>31</sup> Specifically, we explained that the Applicants' higher non-rural diversion ratios imply greater scope for merger-related price increases than would be suggested by the aggregate, national-level Harris survey results alone.<sup>32</sup> In other words, Sprint and T-Mobile are particularly close substitutes in urban and suburban areas. When examining how the merger changes pricing incentives, specifically through sales recapture, the diversion information most relevant to understanding lost Sprint sales that are recaptured by T-Mobile is the diversion in those areas where they compete.

For clarity, consider a possible fact pattern in which Boost retail stores are predominately located in non-rural areas, and where pricing promotional activity is concentrated through Boost retail stores. When Boost reduces its promotional activity, the subscribers that it loses are predominantly in non-rural areas, and the subscribers that MetroPCS therefore recaptures are also predominantly only in non-rural areas. The fact that either of these carriers might have a small presence in rural areas, wherein they are less likely to lose subscribers to each other and may be more likely to lose them to carriers with greater rural dominance, obscures the fact that the recapture happens in the non-rural areas. It is the MetroPCS recapture of lost Boost subscribers, in the areas where Boost predominates, that determines the extent of merger-related Boost price increases.

### C. Contrary to Compass Lexecon claims, comparisons of switching metrics across data sources fail to demonstrate bias concerns in porting data.

In our January 28 filing, we countered Compass Lexecon's argument that switching metrics indicated that porting data would provide biased estimates of diversion ratios. In its February 7

---

<sup>30</sup> See Brattle Diversion Response at p. 8 and Tables 7-8.

<sup>31</sup> See Brattle Diversion Response at Table 8.

<sup>32</sup> See Brattle Diversion Response at p. 21.

filing, Compass Lexecon attempts to address our counter-arguments of its claims, but its response is inadequate. As we have previously indicated, contrary to Compass Lexecon's claims, switching metrics do not provide any basis for concluding that porting data would be likely to bias estimates of diversion ratios.

For background, in its initial, September 17 filing, Compass Lexecon presented as evidence of likely bias in the porting data a comparison of carrier shares of ports-in (LNP data) to carrier shares of gross additions and switches in (Harris Survey data). The ostensible purpose of these comparisons was to demonstrate that since, allegedly, the porting data oversamples the Applicants' brands and undersamples AT&T and Verizon brands, while switching data does not, the porting data is biased. The benchmark in this scenario was presented as T-Mobile estimates of the carrier shares of gross additions.

In our January 28 filing, we presented additional alternatives for benchmarking, and argued that these benchmarks indicated that concerns about the porting data oversampling the Applicants' brands and/or undersampling other carrier's brands were unsupported. For example, we noted that KPMG information about carrier shares of gross additions indicated that AT&T is, if anything, oversampled in the porting data and that, contrary to Compass Lexecon's conclusions, Sprint is undersampled in the porting data. All else equal, these comparisons would suggest that porting-based estimates of diversion associated with the Sprint brands would be too low.

We also pointed out that even if KPMG data were not employed, simply considering deactivations instead of gross additions would have opposite conclusions from those of Compass Lexecon. Again, AT&T would appear to be oversampled in the porting data (but undersampled in the Harris data) and T-Mobile would be approximately accurately represented in the porting data (but undersampled in the Harris data). All else equal, these comparisons would suggest that Harris data understate diversion associated with the T-Mobile brands, whereas porting data do not.

In its February 7 comments, Compass Lexecon appears to abandon its original proposal to assess carrier shares across the data sets as a relevant measure of potential bias, instead shifting the burden to assessment of the diversion ratios themselves. It then claims that our discussion of over- or under-sampling fails to address bias in the diversion ratios from various information sources. However, as a functional measure of potential bias, Compass Lexecon's proposal could only be operational if we had a benchmark of objectively true diversion ratios to begin with,

which is, of course, circular, since the “true diversion ratios” are the unobserved thing that we are trying to estimate.

Second, Compass Lexecon suggests that our analysis errs by including certain carrier sub-brands in our tabulations that, allegedly, we should have omitted in order to conduct an apples-to-apples analysis across the candidate data sets.<sup>33</sup> This is misleading and misguided, for the following reasons:

- In both Compass Lexecon’s initial report and in our January 28 filing, the Harris survey and LNP porting data include all brands owned by the carriers as they appear in the data.<sup>34</sup>
- In contrast, Compass Lexecon estimates carrier shares of KPMG gross adds/deactivations based on a calculation that omits certain Sprint-affiliated products on the grounds that they “are generally less likely to port their numbers”,<sup>35</sup> which purportedly would somehow makes them more comparable to the porting data. We have been unable to determine Compass Lexecon’s grounds for this brand omission except through its reference to statements made about porting incidence for prepaid carriers such as Boost and MetroPCS.<sup>36</sup>
- Even if it were appropriate to benchmark using KPMG gross adds/deactivations based on a limited set of brands, the benchmark KPMG data and both the Harris and porting data would need to be adjusted accordingly for a genuine apples-to-apples comparison. Compass Lexecon has not made these adjustments, and so its claims are invalid.

---

<sup>33</sup> Compass Lexecon incorrectly asserts that our backup materials were not provided. These materials were made available, and include our analysis of carriers shares of gross adds and deactivations. In addition, Compass Lexecon does not accurately “reverse engineer” our KPMG-based metrics. Our analysis was based on KPMG’s reported national aggregate Gross Adds and Deactivations.

<sup>34</sup> See Compass Lexecon workpapers for September 17 filing, Table 27. While Compass Lexecon appears to drop resellers from its Sprint figures when calculating its Gross Adds benchmark (T-Mobile estimates version), it allocates TracFone subscribers to AT&T, T-Mobile, and Verizon. We have been unable to identify the justification for this inconsistency of treatment for reseller subscribers.

<sup>35</sup> See Compass Lexecon Diversion Reply Rebuttal at pp. 5-6 and Compass Lexecon workpapers for February 7 filing, KPMG analysis.

<sup>36</sup> See Additional Information Regarding the Estimation of Diversion Ratios by Mark Israel, Michael Katz, and Bryan Keating, Appendix F to Joint Opposition of T-Mobile US, Inc. and Sprint Corporation, *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, December 14, 2018 at pp. 4-5 (henceforth “Compass Lexecon Diversion White Paper”). Compass Lexecon cites support which discusses lower incidence of porting for Boost and MetroPCS.

Finally, Compass has alleged that a source of bias in diversion estimates based on porting data is that MVNOs utilize porting promotions less intensively than the MNO brands,<sup>37</sup> and that, for example, non-porting Boost-to-MVNO switches may exceed Boost-to-MVNO ports. However, this claim is contradicted by the Applicants' own documents. For example, diversion estimates from the Comlink porting data indicate that {{BEGIN HCI      END HCI}} of Boost ports go to "Other" brands.<sup>38</sup> Similarly, Boost deactivation surveys indicate that {{BEGIN HCI      END HCI}} of Boost switchers go to a combination of either "TracFone" or "Others".<sup>39</sup> While some Sprint documents estimate that the share of non-porting Boost-to-MVNO switches may be higher than {{BEGIN HCI      END HCI}},<sup>40</sup> the evidence available to support this possible source of bias is, at best, mixed.

---

<sup>37</sup> See Declaration of Compass Lexecon by Mark Israel, Michael Katz, and Bryan Keating. *In the Matter of Applications of T-Mobile US, Inc. and Sprint Corporation for Consent to Transfer Control of Licenses and Authorizations*, WT Docket No. 18-197, September 17, 2018 at ¶ 177.

<sup>38</sup> See Brattle Diversion Response at Table 12. "Other" in this table captures all brands that are not one of the MNO brands.

<sup>39</sup> See Brattle Diversion Response at Table 4.

<sup>40</sup> See SPR-FCC-04301172 at SPR-FCC-04301177.