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February 25, 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:

Pursuant to Section 1.1206(b) of the Commission's Rules, 47 C.F.R. § 1.1206(b), notice is hereby provided of an oral *ex parte* presentation in the above-referenced docket. On February 21, 2019, representatives of T-Mobile US, Inc. ("T-Mobile") and Sprint Corporation ("Sprint" and, collectively, "Applicants")[1] met with members of the FCC Transaction Team (a list of FCC participants is provided in Attachment A) to discuss how porting data are inferior to other methods of estimating diversion ratios that are available in this matter.

First, the representatives explained that, were the FCC to use any data on "switching" (as distinct from diversions), it should make use of available survey evidence in light of biases in the porting data. They explained that porting data reflect a non-random minority of switches – cases in which a switcher chooses to port his or her phone number. That minority of switches in which a phone number is ported exhibit starkly different patterns from the majority of switches not

[1] Those representatives included Kathleen Ham and Melissa Scanlan of T-Mobile; Vonya McCann of Sprint; Michael Senkowski and the undersigned of DLA Piper LLP; Mark Nelson and George Cary of Cleary Gottlieb Steen & Hamilton LLP; Josh Soven of Wilson Sonsini Goodrich & Rosati; Richard Metzger and Regina Keeney of Lawler, Metzger, Keeney & Logan LLC; David Meyer, Bradley Lui and Kerry Jones of Morrison & Foerster LLP; Sam Feder of Jenner & Block LLP; Steve Sunshine and Matt Hendrickson of Skadden, Arps, Slate, Meagher & Flom LLP; John Asker of the University of California, Los Angeles, Timothy F. Bresnahan of Stanford University, Kostis Hatzitaskos of Cornerstone Research; Mark Israel and Bryan Keating of Compass Lexecon; and Michael Katz, Emeritus Professor at the University of California, Berkeley.



involving a port. Moreover, many of the switches that are captured in porting data are not of the type relevant to determining diversion ratios.

Second, the FCC should make use of the much more reliable estimates of diversion ratios developed in this matter by Asker, Bresnahan, and Hatzitaskos using the extremely granular information in the Nielsen Mobile Performance data and standard econometric methods to ensure that the data were used to measure diversion ratios accurately.

The representatives' presentation tracked the attached decks (Attachments B and C), which were distributed at the meeting.

This filing contains NRUF/LNP Confidential Information and information that is "Highly Confidential" pursuant to the Protective Order filed in WT Docket No. 18-197.[2] Accordingly, pursuant to the procedures set forth in the Protective Order, a copy of the filing is being provided to the Secretary's Office. In addition, two copies of the Highly Confidential Filing are being delivered to Kathy Harris, Wireless Telecommunications Bureau. A copy of the Redacted Highly Confidential Filing is being filed electronically through the Commission's Electronic Comment Filing System.

Please direct any questions regarding the foregoing to the undersigned.

Respectfully submitted,

**DLA Piper LLP (US)**

*/s/ Nancy Victory*

Nancy Victory
Partner

cc: David Lawrence
Kathy Harris
Linda Ray
Kate Matraves

[2] In the attached decks, NRUF/LNP Confidential Information is highlighted in red; Highly Confidential Information is highlighted in yellow.




Jim Bird
David Krech
FCC participants listed in Attachment A

# ATTACHMENT A

David Lawrence
Catherine Matraves
Charles Mathias
Monica DeLong
Matthew Collins
Pramesh Jobanputra
Aleks Yankelevich
Nicolas Copeland
Patrick Sun
Paul LaFontaine
Donald Stockdale
Dana Shaffer
Katherine LoPiccalo
Babette Boliek
Giulia McHenry
Ben Freeman
Weiren Wang

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# ATTACHMENTS B & C

# Porting Data are Biased and Inferior to Survey Data as a Means of Estimating Diversion Ratios

Mark Israel, Michael Katz, and Bryan Keating

February 21, 2019

# Diversion Ratios Concern Specific Types of Switching

- Diversion ratios measure how consumers substitute to new firms in response to a price/quality change at their current firm ("Firm A").
- Diversion ratios can be measured from either direction (or a combination of the two):
  - If Firm A raises its quality-adjusted price, some consumers will depart. What fraction go to each other alternative?
  - If Firm A lowers its quality-adjusted price, some consumers will arrive. What fraction come from each other alternative?
- Diversion ratios can be useful for assessing how a merger changes price- and quality-setting incentives, but *only* if diversion is properly estimated.

# The Shortcomings of Porting Data for Purpose of Estimating Diversion Ratios are Well Understood

1. Because porting is a choice, people who port are a non-random subset of the total set of customers who switch in response to the change.
   - The switching behavior of consumers who port their numbers may be unrepresentative of the switching behavior of consumers overall.
2. In many cases, observed switching/porting is done in response to price or quality changes at other firms, not Firm A.
   - "Diversion" will misleadingly appear to be mostly to/from the firm changing its quality-adjusted price.
   - See Yongmin Chen and Marius Schwartz (2016), "Churn vs. Diversion: An Illustrative Model," *Economica,* 83(332): 564-583.
3. Switching/porting is often driven by changes in an individual's information or circumstances, not due to a price or quality change.
   - Such porting/switching cannot be used to measure diversion ratios properly.

# Commission Staff Has Recognized that Porting Data Could be Unsuitable for Purposes of Estimating Diversion Ratios

- "… those that port their mobile wireless telephone number may be a non-random sample of subscribers."
- "Since customers who port their numbers are not necessarily responding to a price or quality change, diversion ratio calculations from porting data implicitly assume that customers would switch providers in response to a price or quality change with the same substitution patterns as have been observed for all customers who port for any reason."

(Staff Analysis and Findings, WT Docket 11-65, November 29, 2011, Appendix C, ¶ 10.)

## Unlike Past Proceedings, There is Record Evidence that Porting Data are Unsuitable in Practice for Purposes of Estimating Diversion Ratios

- Commission Staff relied on porting data in *AT&T/T-Mobile* because the record lacked evidence "that those who port would react differently to a price increase than those who do not." (Staff Analysis and Findings, WT Docket 11-65, November 29, 2011, Appendix C, ¶ 10.)

- However, evidence of each of these failings of porting data is available in the present proceeding:
  - Both survey data and the Parties' documents indicate that non-port switchers behave substantially differently from porters.
  - The ABH demand model indicates that customers who are reacting to own-carrier price and quality changes have different switching patterns than do customers who are switching for other reasons.

# Dr. Israel's Prior Use of Porting Data Recognized Benefits of Superior Data

- In previous matter, the merging parties identified reasons why porting data yielded conservatively high diversion ratios and showed that their proposed merger was pro-competitive even under that standard.
  - Absent such a showing, there is no basis to use demonstrably biased data.
- As Dr. Israel previously testified, other data should be considered:

  > Although porting (or other switching) data are one useful indicator of the degree of substitution between providers, *they are imperfect and need to be evaluated in the context of other qualitative evidence… and other empirical work*. (Israel Declaration, WT Docket No. 13-193, August 1, 2013, ¶ 26 [emphasis added].)

- In the present proceeding, there are two sources of estimates that are superior to porting data:
  - Survey data (discussed below)
  - Demand model (ABH will discuss)

# Porters are a Non-Random Minority of Switchers

*IKK Declaration,* ¶ 176 (calculating the ratio of total port-ins/outs to total gross additions and deactivations).

- Only [redacted] of switchers port their numbers.
- Porting is a choice that reveals something about the porter.
- Because the sample is non-random, it is critical to check whether it is representative on the relevant dimension.

# Switchers Who Port Their Numbers Exhibit Starkly Different Switching Patterns From Those Who Do Not

| | Boost to T-Mobile/MetroPCS | Virgin to T-Mobile/MetroPCS |
|---|---|---|
| Switch-out Rate to T-Mobile Among Porters [1] | [redacted] | [redacted] |
| Switch-out Rate to T-Mobile Among Non-Porters [2] | [redacted] | [redacted] |

*Sources:*
[1] Sprint internal porting data.
[2] Sprint survey data (SPR-FCC-04301172).

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," February 7, 2019, Table 1.

- Switch-out rates to T-Mobile substantially higher among porters than among non-porters.
- Therefore, porting data yield biased estimates of overall switching.

# Survey Data Generate Switching Rates that Properly Combine the Different Behavior of Porters and Non-Porters

| | Boost to T-Mobile/MetroPCS | Virgin to T-Mobile/MetroPCS |
|---|---|---|
| Switch-out Rate to T-Mobile Among Porters [1] | [redacted] | [redacted] |
| Switch-out Rate to T-Mobile Among Non-Porters [2] | [redacted] | [redacted] |
| *Switch-out Rate to T-Mobile (Weighted Average)* | [redacted] | [redacted] |
| Harris Survey Switch-Out Rates | [redacted] | [redacted] |

*Notes:*

The port-out to deactivation ratios are [redacted] for Boost and Virgin, respectively; Harris survey switch-out rates are computed using data from Jan to Apr 2018, but the survey refer to switching behavior within the previous 12 months; Sprint's switch-out rates among porters are computed using the data for the full year of 2017; Sprint's switch-out rates among non-porters are computed using survey data for 1Q and 3Q 2017; All switch-out rates exclude within-firm switching.

*Sources:*

[1] Sprint internal porting data.
[2] Sprint survey data (SPR-FCC-04301172).
[3] Sprint's Response to FCC Attachment B Request.
[4] Harris Mobile Insights Survey Data (TMUS-FCC-07769740).

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," February 7, 2019, Table 1.

- HarrisX survey-based switching rates are similar to a weighted average of porting and non-porting switchers in Sprint data.

# A Major Source of the Bias is Well-Recognized by Industry Participants

- Porting promotions have a significant influence on the degree to which consumers port their numbers.
- MVNOs make much less use of porting incentives and thus appear much less frequently in porting data.
  - MNO brands such as Boost, Cricket, and MetroPCS offer incentives for customers to port their numbers when switching carriers—doing so creates greater stickiness.
  - MVNOs rarely offer porting promotions (difficult to implement through third-party retail channels; lower MVNO lifetime value limits incentives for porting promotions).
- Hence, porting promotions are an important source of the observed bias in porting data.

# The Parties Recognize the Flaws in Porting Data

Examples of statements in ordinary course documents:

- "No visibility into non-porting population" (TMUS-FCC-01909049.)
- "Much more accurate for Postpaid than for Prepaid" (TMUS-FCC-01909049.)
- "the ability to use porting as an indicator of performance declines sharply as you move down the food chain: prime > subprime > prepay > MVNO > (MINT = IOT = M2M = useless)." (TMUS-FCC-01914010.)

# Brattle's arguments on porting data are wrong and/or irrelevant

- **Brattle Claim:** "T-Mobile reviews porting data (that it procures from Comlink) to understand subscriber switching behavior."
- **Response:** The fact that Comlink porting data accurately measures porting rates provides no information on whether porting activity is representative of overall switching activity or a valid measure of diversion ratios.

Coleman Bazelon, Jeremy Verlinda, and William Zarakas, "Response to Applicant Filings on Diversion Ratios," January 28, 2019, p. 7 (citing TMUS-FCC-01909049 at TMUS-FCC-01909051).

# Brattle's arguments on porting data are wrong and/or irrelevant

Coleman Bazelon, Jeremy Verlinda, and William Zarakas, "Response to Applicant Filings on Diversion Ratios," January 28, 2019, p. 7 (citing TMUS-FCC-01914010).

- **Brattle Claim:** "Company documents also indicate that porting data is particularly accurate with respect to {{BEGIN HCI [redacted] END HCI}}."
- **Response:** Document indicates that porting data are inaccurate overall *and* the solution is "get survey data to help us triangulate."

# Brattle's arguments on porting data are wrong and/or irrelevant

Coleman Bazelon, Jeremy Verlinda, and William Zarakas, "Response to Applicant Filings on Diversion Ratios," January 28, 2019, p. 7 (citing TMUS-FCC-02376783).

- **Brattle Claim:** "T-Mobile's reliance on porting data extends to the top executive level."
- **Response:** Focus on net porting illustrates the fact that porting data do not accurately measure diversion—there are flows in both directions simultaneously.

# Brattle's arguments on porting data are wrong and/or irrelevant

- **Brattle Claim** "…T-Mobile tracks porting performance with pricing promotions for all carriers…"
- **Response:** This document actually demonstrates that porting data do not measure diversion.

Coleman Bazelon, Jeremy Verlinda, and William Zarakas, "Response to Applicant Filings on Diversion Ratios," January 28, 2019, p. 7 (citing TMUS-FCC-01648593).

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# Diversion ratios and porting data

## Presentation to Federal Communications Commission

John Asker, Tim Bresnahan, and Kostis Hatzitaskos

This presentation deck is intended as a foundation for a discussion of the February 7th *ex parte* submission on diversion ratios and porting data



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# Economists agree that evidence from demand modeling is superior to switching data as a means to estimate diversion ratios

# Economists agree that switching data can mislead in estimating diversion ratios

"It is widely recognized, of course, that [switching rates] and diversion ratios can differ depending on the specific reasons for [switching] . . ."

Marius Schwartz, former FCC chief economist

- Two types of switching, both likely relevant drivers of wireless service switching, that may "lead to substantial switching between relatively distant substitutes" are
  - » Changes in one's personal circumstances
  - » Learning more about product quality while using the product

Source: Yongmin Chen and Marius Schwartz, "Churn Versus Diversion in Antitrust: An Illustrative Model," *Economica*, 2016, pp. 564–583, at p. 565
See also Asker, Bresnahan, and Hatzitaskos February 6 White Paper, ¶¶ 43–53

# Economists have developed demand models that identify rich closeness of substitution patterns

"To answer the *Guidelines'* question, we must first estimate the demand function for these products… there has been a great deal of progress in the econometric estimation of demand systems for differentiated products…. It is common for two products with similar market shares to have distinct sets of close substitutes. … A good deal of the work in this literature has focused (successfully) on how to estimate versions of this model that have richer substitution patterns than the logit model."

Michael D. Whinston, "Lectures on Antitrust Economics," Cambridge, MA: MIT Press, 2006, pp. 85–95.

# Economists recognize that switching data at best offer a proxy for diversion ratios

"The econometric tools to estimate demands and costs, particularly in an industry with extensive product differentiation, are fairly recent. Moreover, time is often short in these investigations. As a result, a number of simpler techniques often have been applied.... The simplest of these involve a review of company documents and industry marketing studies, and informally asking customers about their likelihood of switching products in response to price changes. These methods, of course, are likely to produce at best a rough sense of the degree of substitution between products."

Michael D. Whinston, "Lectures on Antitrust Economics," Cambridge, MA: MIT Press, 2006, pp. 85–95

# Most of porting is inconsistent with price or quality changes by a single firm

- Would be **one-sided** if all driven by a change to price/quality by a single brand

Source: Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 3; see also discussion in ¶¶ 36–39

# Our demand estimates solve the problems inherent in switching or porting data

- Switching behavior relevant to assessing competitive effects is switching *that would result from a single price or quality change*
  - » See *Horizontal Merger Guidelines*, p. 21
- Porting data are problematic in assessing competitive effects: (a) *biased*, (b) capture switching that is *unrelated* to supply-driven changes in price or quality, and (c) capture simultaneous actions by *multiple* brands
- Now that the FCC has access to the NMP data and our examination of consumer demand, it is no longer necessary nor appropriate to rely on switching data as a proxy for diversion
  - » There is *no economic justification* for relying on porting data to estimate diversion ratios if the porting data disagree with evidence from a properly estimated demand model

See Asker, Bresnahan, and Hatzitaskos February 6 White Paper; Israel, Katz, and Keating, February 7 White Paper; and Bazelon, Verlinda, and Zarakas, January 28 Declaration, pp. 22–23; Horizontal Merger Guidelines, p. 21 ("The diversion ratio is the fraction of unit sales lost by the first product due to an increase in its price that would be diverted to the second product.")

# The data demonstrate that network quality is individualized and the merging parties are distant substitutes for many consumers

# The NMP data allow us to measure variation in network quality across localized areas

- Allows us to answer the question: what network quality can a consumer expect from each brand if they plan to use their phone in a given geographic location?

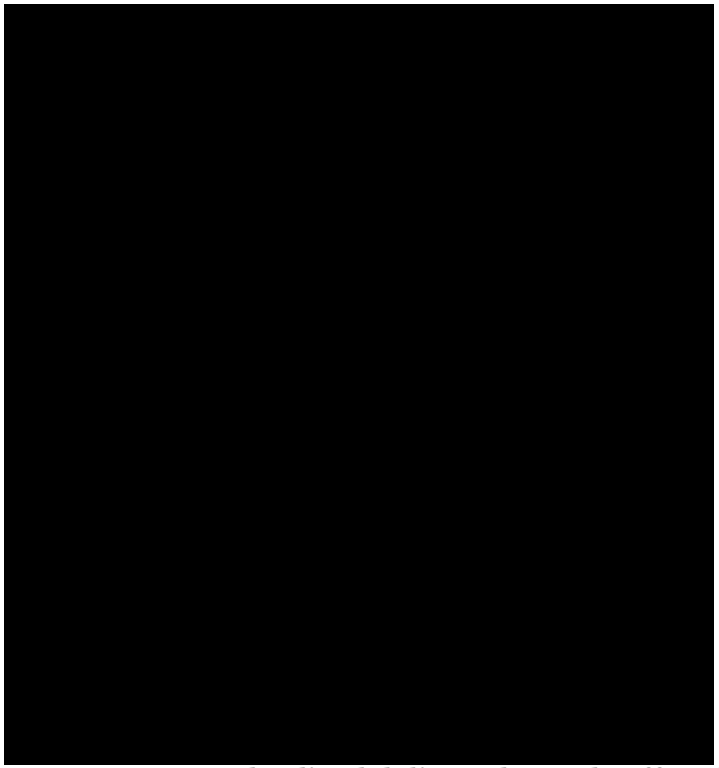
**Network quality across different networks: standardized speeds in Des Moines, Iowa**

[redacted]

Source: Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 4

# We use each individual's usage patterns to focus on the network quality relevant to that person

- Because (a) each brand's network quality varies across localized areas and because (b) individuals differ in where, when, and how they use their phones, each brand offers individualized network quality to each consumer
- For example: these maps present the average speeds Sprint, T-Mobile, AT&T, and Verizon offer in each geogrid visited by a particular consumer who lives in Reading, PA
- Allows us to answer the question: what geographic areas are relevant to the network quality experience of a given consumer?

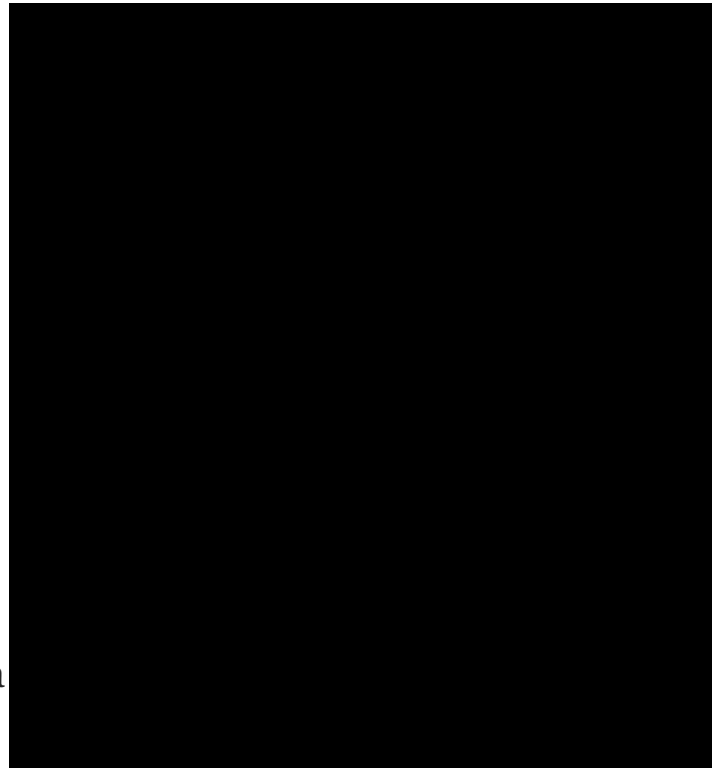


**Average standardized delivered speeds offered to a particular T-Mobile consumer in Reading, Pennsylvania**

Source: Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 5

# Individualized network quality makes merging parties distant substitutes for many consumers

- This particular consumer has chosen T-Mobile
- Given their personal usage patterns, the individualized average speeds this consumer receives would be
  - [redacted] Mbps from T-Mobile
  - [redacted] Mbps from AT&T
  - [redacted] Mbps from Verizon
  - [redacted] Mbps from Sprint
- The raw data therefore demonstrate that individualized network quality makes Sprint a particularly distant substitute to T-Mobile *for this consumer*

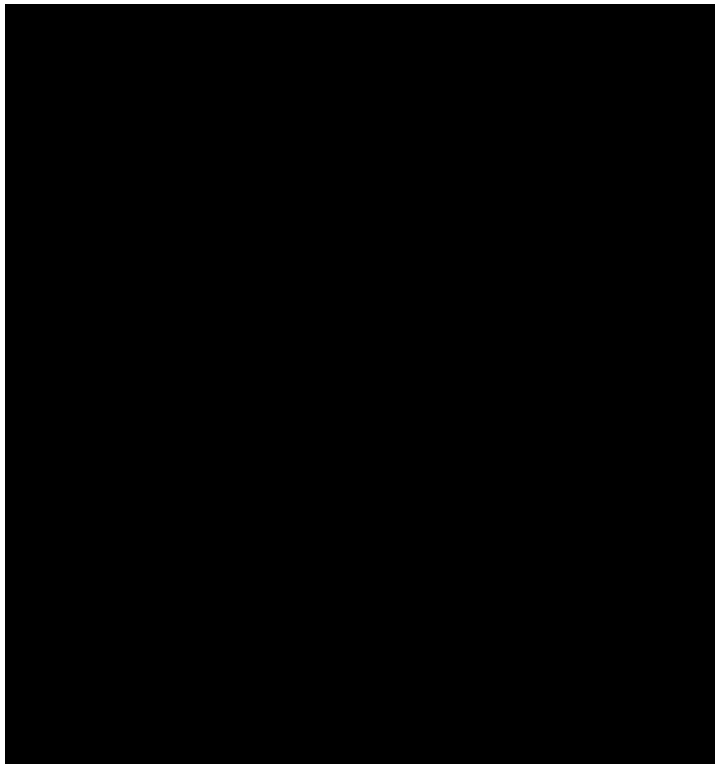


**Average standardized delivered speeds offered to a particular T-Mobile consumer in Reading, Pennsylvania**

Source: Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 5

# How we identify diversion

- The variation we use is that generated by variation in the network quality across locations, and the differing consumer choices this induces given each individual's usage patterns
- Fundamentally, variation in consumer choice, driven by variation in individualized network quality, is how we identify diversion



**Average standardized delivered speeds offered to a particular T-Mobile consumer in Reading, Pennsylvania**

Source: Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 5

# Network quality for the two merging parties differs greatly across many locations

- There are many parts of the country where one merging party offers speeds that are *twice* as fast as the other's (zip codes labeled in yellow or magenta)
- The merging parties are particularly distant substitutes in speed for consumers who use their phones in such areas

Source: Nielsen Mobile Performance Data
Note: Analysis includes download and upload events, by zip code, from March 1, 2018 to May 31, 2018. Events with missing or unreliable location and events with missing speed are excluded. Standardized speed is calculated as the average standardized speed in a zip code area. NMP IP Throughput data contains events for 81,013 panelists.

# Our analysis estimates diversion based on individual choice, taking into account brand and consumer characteristics

# We calculate diversion at the individual level using rich, granular data

- Our model estimates the probability that a consumer picks a given brand, taking into account product and consumer characteristics, including individualized network quality given the consumer's individual usage patterns
- To calculate diversion, we raise the price of a single brand by $1 and ask how that individual is likely to change their choice

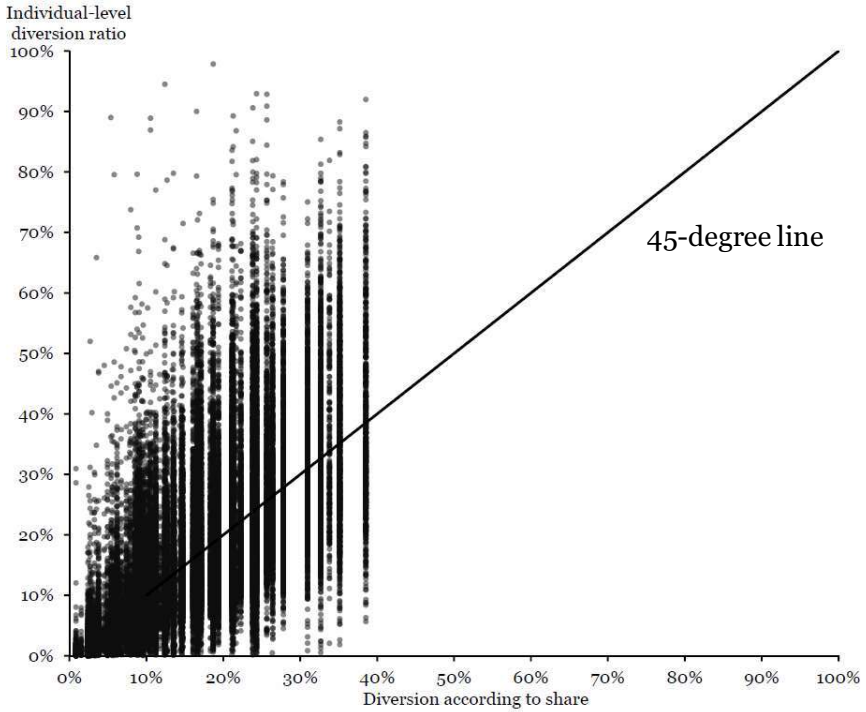
Asker, Bresnahan, and Hatzitaskos November 6 White Paper , ¶¶ 75–79

# The attractiveness of each merging party in our analysis differs greatly across many locations

- Our model reflects discrepancies in network quality, with consumers who use their phones where one merging party is particularly weak being especially unlikely to choose that brand
- Many areas where one merging party brand is more likely to be chosen than the national average, while other is less than *half* as likely to be chosen than the national average (yellow and magenta)

Source: Nielsen Mobile Performance Data
Note: Analysis includes download and upload events, by zip code, from March 1, 2018 to May 31, 2018. Events with missing or unreliable location and events with missing speed are excluded. Standardized speed is calculated as the average standardized speed in a zip code area. NMP IP Throughput data contains events for 81,013 panelists.

# Our analysis estimates diversion ratios for individuals that deviate sharply from shares



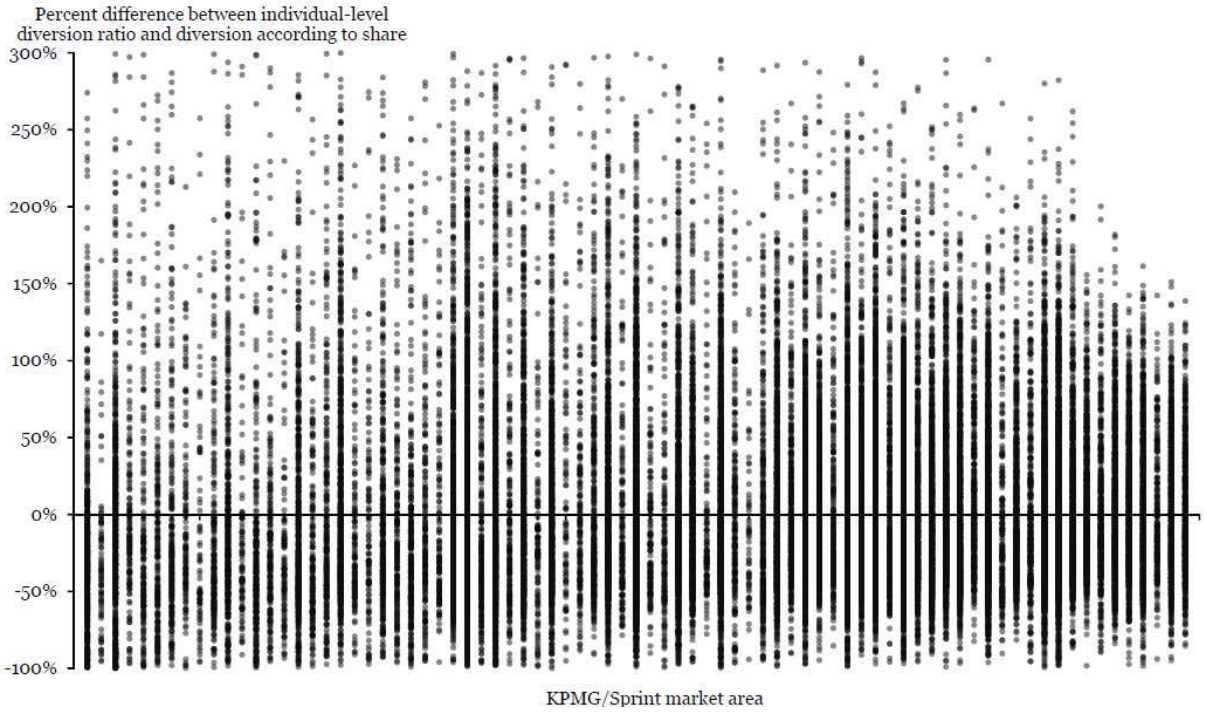

The **y-axis** for each point represents the diversion ratio from Sprint to T-Mobile **our model estimates** for each of the 51,353 individuals in our analysis, accounting for granular information about their usage patterns, the individualized network quality each brand offers to the consumer, as well as consumer characteristics such as zip code income, credit score, race and ethnicity

The **x-axis** represents diversion one would expect **based on subscriber shares** in each KPMG/Sprint market area

If the two were the same, all points would have been on the 45-degree line

Source: Nielsen Mobile Performance Data; KPMG StreamShare Data
Note: Each point is an individual in the NMP data. The y-axis describes diversion ratios from Sprint to T-Mobile estimated by our analysis at the individual level, while the x-axis describes the diversion ratio from Sprint to T-Mobile we would expect based on the Sprint and T-Mobile shares at the individual's KPMG/Sprint market area. The y- and x-axis are equal on the 45 degree line.

# Individual diversion ratios deviate from share-based estimates for every market area




Source: Nielsen Mobile Performance Data; KPMG StreamShare Data
Note: Each point is an individual in the NMP data. The y-axis reflects the diversion ratios from Sprint to T-Mobile estimated by our analysis at the individual level minus the diversion ratio from Sprint to T-Mobile we would expect based on the T-Mobile and Sprint shares at the individual's KPMG/Sprint market area ("diversion according to share") divided by the diversion according to share. Along the x-axis, each column of dots represents one KPMG/Sprint market area, ordered from lowest to highest share-based diversion.



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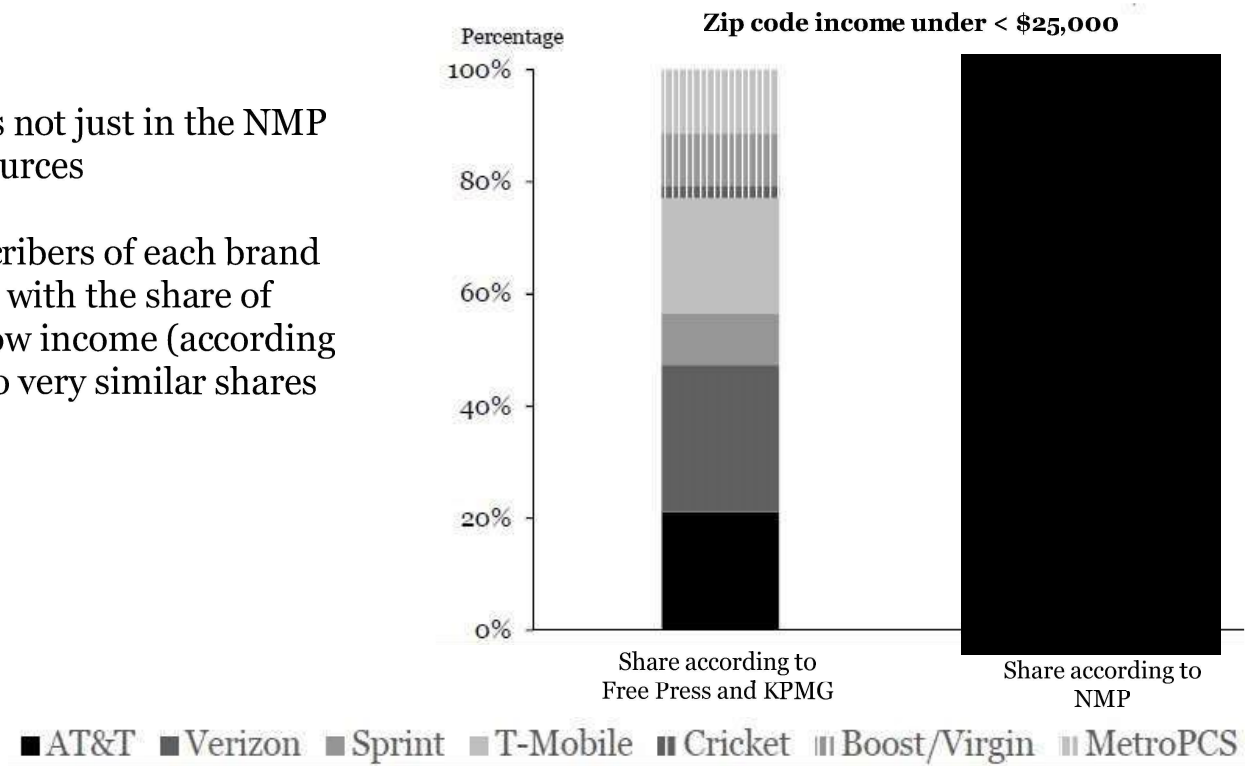
# Our diversion results are informed by data showing AT&T and Verizon are important suppliers to all consumer segments

# AT&T and Verizon have substantial shares within low income zip codes

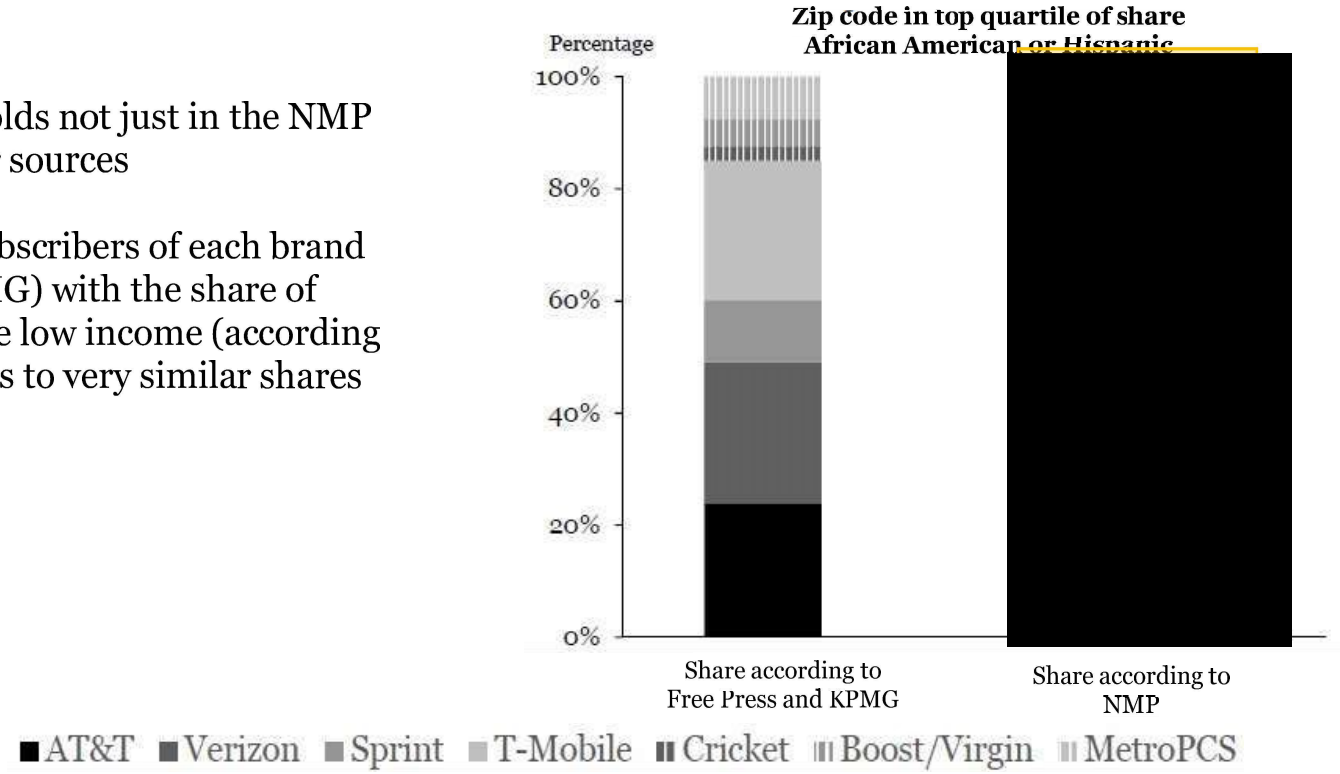
- This conclusion holds not just in the NMP data but also other sources
- Multiplying the subscribers of each brand (according to KPMG) with the share of each brand that are low income (according to Free Press) leads to very similar shares as the NMP data




Source: Nielsen Mobile Performance Data; KPMG StreamShare Data; Free Press Petition to Deny, August 28, 2018, Figure 10 and Figure 11

# AT&T and Verizon have substantial shares within communities of color

- This conclusion holds not just in the NMP data but also other sources
- Multiplying the subscribers of each brand (according to KPMG) with the share of each brand that are low income (according to Free Press) leads to very similar shares as the NMP data




Source: Nielsen Mobile Performance Data; KPMG StreamShare Data; Free Press Petition to Deny, August 28, 2018, Figure 10 and Figure 11

**We test whether groups of brands are closer substitutes, beyond what is captured in our base specification**

**Nothing changes…**

# Nested logit specifications of our demand model do not change our conclusions

- The standard statistical package we used to estimate our model allows for the estimation of nested logit models
- These models allow grouping brands into "nests" (or groups) and let the data speak to whether individual consumers appear to have stronger or weaker preferences for all brands within a nest (or group) of brands
- Each nest has a "nesting parameter" that varies between 0 and 1
  - » 1 indicates that there is no nesting and consumers behave the same way as the model in our original white paper
  - » Nesting parameters above 1 indicates that the data reject the nesting structure being tested

Asker, Bresnahan, and Hatzitaskos February 6 White Paper, ¶¶ 74–75

# The data reject the proposition that the merging party brands are closest substitutes

- Only the first specification (rows 1–2) has nesting parameters that are all below 1
- The data reject the second and fourth specifications (rows 3–5 and 9–11)
- The third specification (rows 6–8) is not meaningfully different from our original model

Source: Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 9; see also ¶¶ 20–22 and 74–80

# Conclusions are robust to nested logit specifications

- Given the richness of our data on network quality and consumer behavior, our analysis already captures much of the relationship between brands
- Any additional correlation introduced from implementing a nested logit specification has only immaterial impacts on results
  - Collectively, consumers are better off with the merger by at least $1 per month per subscriber
  - The merging party brands gain more than 2 percent share at the expense of AT&T and Verizon

[redacted]

Source: Asker, Bresnahan, and Hatzitaskos February 6 White Paper, Exhibit 10; see also ¶¶ 20–22 and 74–80

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