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December 6, 2018

VIA ECFS

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

REDACTED – FOR PUBLIC INSPECTION

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

Dear Ms. Dortch:

Pursuant to Section 1.1206(b) of the Commission's Rules, 47 C.F.R. § 1.1206(b), notice is hereby provided of an oral *ex parte* presentation in the above-referenced docket. On December 3, 2018, 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 the Declaration of John Asker, Professor of Economics, University of California, Los Angeles and Visiting Professor of Economics at Columbia University, Timothy F. Bresnahan, Professor of Economics at Stanford University, and Kostis Hatzitaskos of Cornerstone Research.[2] Their work complements the previously

[1] Those representatives included David Miller, Kathleen Ham and Melissa Scanlan of T-Mobile; Vonya McCann and Charles McKee of Sprint; Reinhard Wieck of Deutsche Telekom AG; Michael Senkowski and Eric DeSilva of DLA Piper LLP; Mark Nelson and George Cary of Cleary Gottlieb Steen & Hamilton LLP; 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 of Skadden, Arps, Slate, Meagher & Flom LLP; John Asker, Timothy F. Bresnahan and Kostis Hatzitaskos of Cornerstone Research.

[2] Dr. Asker is a recognized expert in empirical industrial organization, is the co-editor of American Economic Journal: Microeconomics, and has served as an expert consultant to the Department of Justice, Federal Communications Commission, and Federal Trade Commission. Dr. Bresnahan was recognized earlier this year as one of three individuals that founded and shaped the field of empirical industrial organization, the modern branch of economics that analyzes competition and market power. https://www.frontiersofknowledgeawards-fbbva.es/noticias/bbva-foundation-recognizes-bresnahan-pakes-porter-opening-up-field-empirical-industrial-organization/. Dr. Hatzitaskos has led teams in numerous merger cases, including prominent roles for government agencies in *US v. Aetna and Humana* and *FTC v. Wilhelmsen and Drew*.

submitted economic model of Drs. Mark Israel, Michael Katz and Bryan Keating. During the meeting, Drs. Asker, Bresnahan, and Hatzitaskos presented the document submitted herewith as Attachment B.

Drs. Asker, Bresnahan, and Hatzitaskos explained that their detailed merger simulation model demonstrates that the merger will benefit consumers, in part through improved network quality. Their study analyzes the merger's effects by employing, among other things, Nielsen Mobile Performance ("NMP") data. The NMP data provides extremely granular information on consumer behavior: where, when, and how thousands of consumers use their mobile phones. The data inputs for their analysis include the real-world experiences of over 50,000 consumers involving over 300 million download events and over 70 million coverage changes. Drs. Asker, Bresnahan, and Hatzitaskos noted that data of such richness are rarely available in other industries, but allow here for a sophisticated, careful examination of how consumers experience mobile wireless services and how they choose wireless carriers.

Drs. Asker, Bresnahan, and Hatzitaskos explained that these data demonstrate that each consumer experiences different quality from each network given his or her individualized usage pattern. The better service a carrier can provide at an individual's typical places of use—such as his/her home, work, commute, and main travel and shopping locations—the greater the competitive advantage that carrier has in winning that individual's business. This fact has important implications for assessing the competitive landscape of the industry.

These patterns have important implications for assessing the competitive landscape of the industry. Each consumer experiences different quality from each network given his or her individualized usage pattern. The better service a carrier can provide at an individual's typical places of use—like his/her home, work, commute, and main travel and shopping locations—the greater the competitive advantage that carrier has in winning that individual's business.

The Applicants' networks today offer good quality to millions of consumers in their respective customer bases. However, Drs. Asker, Bresnahan, and Hatzitaskos explained that the data demonstrate that many millions of consumers choose AT&T or Verizon in part because those networks better serve such consumers' needs today. Given the documented network improvements that will result from combining T-Mobile and Sprint's complementary spectrum and sites, the proposed merger stands to dramatically increase competition for these consumers' business.

Drs. Asker, Bresnahan, and Hatzitaskos also explained that the data make clear that different categories of consumers all value network quality. Even controlling for factors that are common across consumers in a geography, such as store density and advertising, as well as factors

specific to individual consumers, such as the amount of data they use or whether they live in a high or low income area, the data demonstrate that consumers are more likely to choose a network that offers better network quality for their individualized usage patterns. In particular, heavier data users value quality improvements even more. Consumers located in areas that have significant low income, credit challenged, and Hispanic/African American populations are more likely to be heavy data users and so are likely to be the biggest beneficiaries of network improvements enabled by the merger.

Drs. Asker, Bresnahan, and Hatzitaskos next showed that the rich NMP data, which were not available to the Commission in prior merger reviews, allowed them to provide a sophisticated demand model that directly estimates diversion ratios and thus avoid concerns that the Commission has expressed in the past about potential shortcomings in the use of porting data.[3] The Asker, Bresnahan, and Hatzitaskos model finds that the appropriate diversion ratios in the wireless industry are in fact closer to the lower end of the range of the diversion ratios considered in the previously submitted Israel, Katz and Keating ("IKK") merger simulation analysis, thus making that IKK analysis conservative.

Drs. Asker, Bresnahan, and Hatzitaskos ended their presentation by stating that their study complements the previously filed IKK merger simulation. Although each set of economists used a different data set and demand model, they both reached the same result—that the merger significantly enhances consumer welfare.

This filing contains information that is "Highly Confidential" pursuant to the Protective Order filed in WT Docket No. 18-197.[4] Accordingly, pursuant to the procedures set forth in the Protective Order, a copy of the filing 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.

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[3] The Commission previously relied on porting data as proxies for diversion ratios, while recognizing the potential shortcomings of such an approach (including the fact that switchers may do so in response to factors other than changes in price or quality and the fact that porting data capture a non-random sample of switchers). *See* Staff Analysis and Findings, *Applications of AT&T Inc. and Deutsche Telekom AG*, WT Docket No. 11-65, Appendix C, ¶ 10 (Nov. 29, 2011).

[4] Applications of T-Mobile US, Inc., and Sprint Corporation for Consent to Assign Licenses, Protective Order, WT Docket No. 18-197 (June 15, 2018).

Please direct any questions regarding the foregoing to the undersigned.

Respectfully submitted,

DLA Piper LLP (US)

/s/ Nancy Victory

Nancy Victory
Partner

cc: David Lawrence
Kathy Harris
Linda Ray
Kate Matraves
Jim Bird
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FCC participants listed in Attachment A

ATTACHMENT A

David Lawrence
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ATTACHMENT B

CORNERSTONE RESEARCH
ECONOMIC AND FINANCIAL CONSULTING AND EXPERT TESTIMONY

Economic analysis of the proposed T-Mobile/Sprint merger

Presentation to Federal Communications Commission

John Asker, Tim Bresnahan, and Kostis Hatzitaskos

This presentation deck is solely intended as a foundation for a discussion of the November 6th "Economic Analysis of the Proposed T-Mobile/Sprint Merger" white paper – it does not replace, change, or amend that paper or the analysis therein

Agenda

1: Summary

Summary – our approach

- We use **detailed, present-day data** to empirically assess the likely competitive effects of the proposed merger
  - » Network quality is **individualized** and depends on where, when, and how each consumer chooses to use their phone
- This rich variation allows us to estimate a flexible model of consumer demand that informs how consumers value network quality today
  - » Our analysis estimates demand for consumers with **different characteristics**, including different data usage
- We build on these estimates to quantify the competitive effects of the proposed merger under a variety of scenarios

Summary – our analytical framework

- Demand estimation
  - » Characterize consumer choice, including different consumers' response to network quality offerings
    - Brand quality measured by average and worst (a) speed, and (b) time on LTE
    - Account for consumer characteristics
  - » Calibrate price coefficient using equilibrium assumption

- Merger simulation
  - » Combine demand model and pricing model
  - » Calculate post-merger equilibrium for range of assumptions about
    - Network quality improvements
    - Marginal cost reductions
  - » Compare with pre-merger (observed) equilibrium today

Summary – demand estimation findings

- Our analysis captures key facts that:
  - » Network quality is individualized
  - » Consumers rely on network quality
  - » Consumers tend to choose brands that offer good quality
- Rich demand model finds that different consumer types all value network quality
- Heavy data users value quality increases more; they are more likely to be found in locations with:
  - » Lower credit scores
  - » Lower income
  - » A higher proportion of African American and Hispanic residents

Summary – merger simulation findings

- Detailed present-day data demonstrate that merging parties offer substantially lower network quality to many today
- Overall, we find that the proposed merger is likely to **increase competition among wireless carriers**
  - » Under a range of conservative assumptions about marginal cost efficiencies and network quality improvements, **New T-Mobile will gain subscriber share at the expense of Verizon and AT&T**
  - » This result is consistent with an expansion of output and **welfare gains for consumers**

Summary – our conclusions

- Demand estimation
  - » Estimates of diversion based on extensive data lie on the more procompetitive end of the range considered in the Israel, Katz, and Keating Declaration
  - » Consumers place substantial value on the quality of their network experience
- Merger simulation: **the proposed merger is procompetitive** under a **wide range of assumptions** regarding marginal cost efficiencies and network quality improvements
  - » Consumer welfare increases because of better network quality and lower quality adjusted prices
  - » New T-Mobile gains subscriber share
  - » Greater competitive pressure on AT&T and Verizon

2: Micro data and direct empirical evidence

Rich LTE-world network quality data
Nielsen Mobile Performance

Source: https://www.nielsen.com/us/en/sclutions/capabilities/nielsen-mobile-performance.html

The NMP micro data
Measure on-device experience of consumers

- NMP data provide individualized consumer usage patterns

[redacted]

- Not used

[redacted]

- NMP tracks sample of consumers over the course of their day

[redacted]

Source: ABH §§ 2.2.1, 5.1.1, 5.1.10

NMP data allow us to capture individualized network quality

Source: ABH Exhibits 38, 44.

Operationalizing the measurement of individualized network quality

- To summarize the individualized network quality offered to each consumer by each brand:
  - » Summarize actual brand experience from a **geographic perspective**
  - » Calculate counterfactual experience from an **individual perspective**

Aggregate rich quality measures by location
Geogrids Sprint uses in ordinary course

Source: ABH Exhibit 47

Measuring network speed
Standardized speeds

- Want a single measure of network speed that reflects the quality of each carrier's network

- Average standardized speed in each geogrid for each brand
  - » Raw download speeds can be affected by factors only partially related to the quality of the network, such as time of day and size of the file
  - » Standardized speeds can be used for apples-to-apples comparisons of different experiences

Demand estimation network quality variables
Average standardized speeds

- First, **for each geogrid** calculate average standardized speed
  - » Average the standardized speed of all download events for all consumers on the brand that occur in the geogrid
- Next, **for each consumer** calculate average standardized speed
  - » Take an average using [redacted]
  - » Weight the speed from each geogrid by [redacted]
- Do this for each brand

Counterfactual quality
Geographic perspective: Des Moines, IA

Source: ABH Exhibit 3

Counterfactual quality
Individual perspective: Winchester to Baltimore

Source: ABH Exhibit 4

Direct empirical evidence
Consumers losing 10% speed if they switch

Source: ABH Exhibit 1

Direct empirical evidence
Consumers losing 10% speed if they switch

Source: ABH Exhibit 1

Direct empirical evidence
Consumers losing 10% speed if they switch

Source: ABH Exhibit 1

Direct empirical evidence
Consumers losing 10% speed if they switch

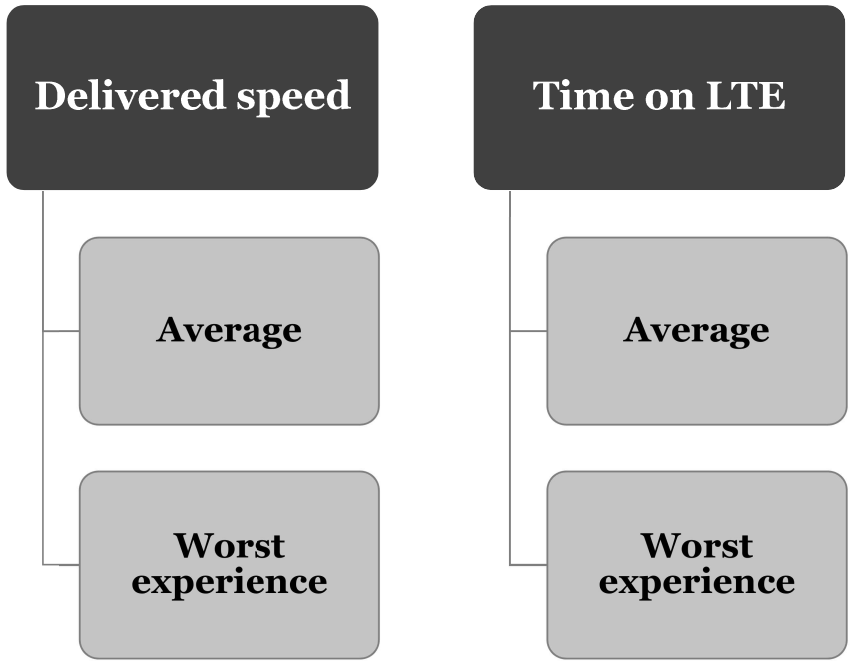
Direct empirical evidence
Consumers losing 10% speed if they switch

Source: ABH Exhibit 1

Demand model
Network quality for individual consumers

From a **geographic perspective**, we calculate two measures of network quality for each geogrid: average speed (measured in megabits per second, "Mbps") and coverage (measured as the percentage of time on LTE or 4G).

From an **individualized perspective**, we construct an average and worst average experience measure for speed and coverage, for a total of four network quality measures that vary across individuals.



Consumers choose brands that offer good quality

Average speed for subscribers vs. others

Source: ABH Exhibit 60
Note: In our data build, we exclude areas where we do not observe brands being present. For details on this and other features of the data build, please see the appendix of our white paper.

Consumers choose brands that offer good quality
Average time on LTE for subscribers vs. others

Source: ABH Exhibit 81
Note: In our data build, we exclude areas where we do not observe brands being present. For details on this and other features of the data build, please see the appendix of our white paper.

3: Data usage and consumer characteristics

Supplement rich data on network quality and consumer behavior with zip code demographics

- Heavy data usage is, if anything, **more** common in our data in zip codes with:
  - » Lower credit scores
  - » Lower income
  - » A higher proportion of African American and Hispanic residents

- Our analysis indicates that heavy data users **value** network quality increases more
- The greater proportion of heavy data users in these zip codes means that these consumers are likely be those that **most benefit** from the proposed merger

See ABH § 5.1.8

Data usage types
By brand

Data usage types
By quartile of credit score

Data usage types
By quartile of income

Data usage types
By quartile of race composition

4: Demand estimation

Demand estimation framework
Summary of approach

- Econometric model of relationship between brand choice and network quality

Summary of demand estimation framework	
Data	Rich present-day data on network quality and consumer behavior (NMP micro-data)
Modeling framework	Standard conditional logit model of brand choice
Brands modeled	[redacted]
Outside option	
Measures of network quality	Individualized – depends on when, where, and how each individual uses their phone
Heterogeneity in preferences	Based on data usage patterns and consumer characteristics

Demand model
How consumers choose a wireless brand

Individualized network quality	Responsiveness to network quality	Consumer characteristics
• Every consumer has same set of choices, but different qualities • Quality depends on when, where, and how each consumer uses their phone	• Light, medium, and heavy data usage "types" • Average and worst measures of speed and time on LTE	• Median income • Percent Hispanic or African American • Median age • Mobility • Average credit score

Demand estimation results
Consumers value network quality

Demand estimation results
Willingness to pay for quality

- We apply a hypothetical improvement in network quality to help interpret the coefficients from the demand model
- Hypothetical network improvements are roughly [redacted] percent of median quality observed in the NMP data

[redacted]

Source: ABH Exhibit 6

Demand estimation results
Model fits data well

Source: ABH Exhibit 8

Demand model
Measuring responsiveness to price

- Prices are set nationally by carriers
  - » We only have one price for each brand
  - » Consumer responsiveness to price cannot be estimated directly from the demand model

- Instead, calibrate price sensitivity using the supply side model
  - » Infer price sensitivity using assumption of Bertrand price competition, T-Mobile margin of [redacted] prices (ARPU), and shares
  - » Use FOC to back out price coefficient
  - » See ABH § 5.3.2 for solution for multiproduct firms

Porting-based vs. demand-based diversion

- The Commission has previously relied on porting data to proxy for diversion ratios while recognizing its potential shortcomings, including the fact that switchers may do so in response to factors other than changes in price or quality and the fact that porting data capture a non-random sample of switchers (AT&T/T-Mobile, Staff Report, Appendix C, ¶ 10)
- The NMP data, which were not previously available to the Commission, enable the estimation of a detailed and flexible demand model that directly estimates diversion ratios and thus avoids the concerns that the Commission has expressed about relying on porting data

Diversion ratios

Estimated pre-merger diversion ratios

- Diversion from brand *j* to brand *k* is calculated for each individual consumer as the change in the probability of choosing brand *k* divided by the change in the probability of choosing brand *j* due to a $1 increase in the price of brand *j*
- This table then reports overall diversion by taking a weighted average sum across all individuals

Source: ABH Exhibit 12
Note: See ABH § 5 for details on the data, processing, and variable definitions.

5: Merger simulation

Merger simulation framework
Summary of approach

- Simulate the potential effects of the merger on competition
  - » The world without the merger is the present-day world
  - » The supply model is standard Bertrand price competition

- Evaluate competitive effects for wide range of
  - » Marginal cost reductions
  - » Network speed improvements
  - » Network coverage improvements

Supply model
Standard multiproduct firm Bertrand pricing

AT&T	Sprint	T-Mobile	Verizon	Outside option
• AT&T • Cricket	• Sprint • Boost and Virgin	• T-Mobile • MetroPCS	• Verizon	• US Cellular • Tracfone • Xfinity Mobile • All others

"House" brands, e.g., T-Mobile, include **both** postpaid and prepaid subscribers

Merger simulation results
Procompetitive for range of assumptions

- Internalize competition between merging parties and calculate
  - » Critical **marginal cost** reductions given different assumptions about network quality improvements well within those merging parties expect
  - » Critical **speed** improvements given different assumptions about marginal cost reductions within those estimated by IKK

- Overall, the proposed merger is procompetitive under a wide range of assumptions

Critical marginal cost efficiencies (ABH § 4.2)

- When calculating critical marginal cost reductions, we consider several scenarios of network quality improvements:
  - **No network quality improvements** (ABH § 4.2.1)
  - **Ten percent speed increase** (ABH § 4.2.2)
  - **0.1 Mbps speed increase** (ABH § 4.2.3)
  - **Merging party complementarities** (ABH § 4.2.4)
    - Sprint closes coverage gap with T-Mobile, T-Mobile closes speed gap with Sprint
  - **Close or narrow quality gap with Verizon** (ABH § 4.2.5)
    - Where a gap exists at the geogrid-level, close it entirely or narrow by half

Summary of critical marginal cost efficiencies

Critical speed improvements (ABH § 4.3)

- We calculate critical network quality improvements for two types of merger-specific quality improvements, both *solely related to speed*
  - » **Percentage speed increases** (ABH § 4.3.1)
  - » **Constant speed increases** (ABH § 4.3.2)

- We consider several scenarios of marginal cost efficiencies for each type of speed increase:
  - » *Full* IKK 2021 marginal cost reductions
  - » *Half* of IKK 2021 marginal cost reductions
  - » *No* marginal cost reductions

Summary of critical percentage speed improvements

Conclusion

- Demand estimation
  - » Estimates of diversion based on extensive data lie on the more procompetitive end of the range considered in the Israel, Katz, and Keating Declaration
  - » Consumers place substantial value on the quality of their network experience
- Merger simulation: **the proposed merger is procompetitive** under a **wide range of assumptions** regarding marginal cost efficiencies and network quality improvements
  - » Consumer welfare increases because of better network quality and lower quality adjusted prices
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