The Sprint/T-Mobile Merger

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I. INTRODUCTION[1]

On April 29, 2018, the then third-largest mobile wireless service provider in the United States, T-Mobile, proposed acquiring the fourth-largest provider, Sprint. T-Mobile and Sprint offered mobile wireless voice and data services to residential and business customers in the United States, Puerto Rico, and the U.S. Virgin Islands. The proposed transaction would combine the firms' customer bases and assets (notably spectrum licenses and cell site leases) in a single entity, New T-Mobile.

Because it was a telecommunications merger involving the transfer of spectrum licenses, the transaction was subject to review by antitrust agencies and public utilities regulators at both the state and federal levels. Subject to various conditions reached through negotiation and settlement, the proposed merger received approval from the U.S. Department of Justice (DOJ), the Federal Communications Commission (FCC), and several state attorneys general. However, in June 2019, the attorneys general for ten other states, three commonwealths, and the District of Columbia filed suit in federal district court seeking to block the transaction.

The District Court held a two-week trial in December 2019, with a day of closing arguments the following January, and ruled in favor of the defendants in February 2020. The transaction closed on April 1, 2020.[2]

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[1] In this matter, John Asker was retained as a consultant and testifying expert by Sprint and Softbank (Sprint's majority shareholder) and Michael Katz was retained as a consultant and testifying expert by T-Mobile. No confidential information is disclosed in this chapter.

[2] The closing was delayed, pending approval of the transaction by the California Public Utilities Commission and a Tunney Act review of the settlement with the DOJ by another federal district court.

The settlements, trial, and subsequent court opinion touched on issues regarding the appropriate approach and standards for merger review by courts:

- *Treatment of Efficiencies.* Sprint and T-Mobile argued that their proposed merger would generate substantial efficiencies that would benefit consumers. The role of efficiencies in merger analysis has been subject to ongoing debate.[3] Some courts treat efficiencies as a "defense" against a finding that a merger harms competition. By contrast, under a consumer welfare standard, as the District Court recognized, consideration of merger efficiencies is central to the determination of whether the merger is pro- or anticompetitive. Regardless of the view taken, efficiencies are rarely, if ever, considered by the courts sufficient to offset otherwise substantial competitive harms. In the present matter, however, the Court found the efficiencies to be substantial, and they appear to have played an important role in its conclusion that the proposed merger would benefit consumers.

- *Weakened Competitor Defense.* The merging parties argued that Sprint was in decline and hence its acquisition by T-Mobile would not eliminate a vigorous, independent, competitor. Although some courts have been receptive to weakened competitor or "flailing firm" defenses, others have treated them with considerable skepticism.[4] In

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[3] For a brief but insightful review, see Baker (2009). See also, United States District Court Southern District of New York, *State of New York et al. v. Deutsche Telekom AG, et al.*, Decision and Order, filed February 11, 2020 (hereinafter *Opinion*), pp. 57-59.

[4] See Kazmerzak and Widnell (2020).

the present case, the parties succeeded in convincing the court that Sprint's current market share overstated the firm's future competitive strength.

- *Litigating the Fix.* Mergers that might be anticompetitive as proposed are frequently approved by the federal antitrust agencies subject to divestitures or other remedies. However, even if an agency rejects a potential remedy, the merging parties may be able to commit to it unilaterally and force the agency to challenge the modified transaction. This is known as "litigating the fix."[5] There is ongoing debate about whether allowing parties to litigate the fix is sound antitrust policy. Salop (2013) has shown that allowing parties to litigate the fix gives the agencies less pre-trial bargaining power to negotiate what they consider to be appropriate fixes. Questions have also been raised about whether proposing fixes after announcing the initial transaction wastes agency resources or undermines the agencies' abilities to develop sound trial strategies.[6] In the present case, the merging parties committed to the fix through settlements with the DOJ and FCC. The District Court credited the fix with a procompetitive impact despite Plaintiffs' claims that it was inadequate.

- *Role of Sophisticated Economics.* The role of economics in merger review was highlighted by the differences in the sophistication and complexity of analyses presented in different forums. The analyses submitted to the DOJ and FCC were much more sophisticated that than those presented to the District Court at trial, and the

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5 See Gelfand and Brannon (2016) for a discussion.

6 See, for example, U.S. Department of Justice and U.S. Federal Trade Commission, Request for Information on Merger Enforcement, January 18, 2022, Question 8.a.

Court's opinion seemed to dismiss expert analysis. However, the core of the opinion was consistent with the application of standard and well-accepted economic frameworks. Moreover, the more sophisticated analyses presented to the DOJ and FCC played a role in shaping the settlements with them, which in turn influenced the Court.

II. INDUSTRY BACKGROUND AND MERGER RATIONALE

Prior to the merger, the U.S. wireless industry comprised four nationwide, facilities-based providers: Verizon, AT&T, T-Mobile, and Sprint. These Mobile Network Operators ("MNOs") collectively provided service to the vast majority of mobile wireless users. AT&T and Verizon each had nearly 100 million wireless subscribers, while T-Mobile had 70-80 million, and Sprint had approximately 40 million.[7] In addition to the four largest providers, there were several, much smaller, regional network operators. Mobile wireless services were also offered by Mobile Virtual Network Operators ("MVNOs")—firms that did not own their own radio access networks and instead purchased wholesales wireless services from facilities-based providers and resold these services to end users under the MVNOs' brand names.

Maintaining a cellular network requires investment, particularly as new technologies are introduced. The four national MNOs had persistent differences in their levels of network investment. From 2015 to 2019, Verizon averaged $10.5 billion per year in wireless capital

[7] *Opinion*, pp. 21 and 23.

expenditures, and AT&T $10.2 billion. By contrast, T-Mobile averaged $5.1 billion, and Sprint averaged $3.3 billion.[8]

The spectrum holdings of MNOs also varied. At a high level, there were three "flavors" of spectrum available to carriers at the time of the transaction, low-, mid-, and high-frequency bands. Generally, as the frequency of the spectrum increases, propagation erodes and capacity increases. At the time the merger was proposed, AT&T, T-Mobile, and Verizon all had substantial low-band spectrum holdings, which allowed them to offer broad coverage. T-Mobile's spectrum holdings were relatively concentrated in low-band spectrum, contributing to congestion problems in their network. By contrast, Sprint held no low-band spectrum and a lot of higher-frequency mid-band spectrum, which meant it was poorly positioned to provide broad coverage but well-positioned to providing high capacity where it did offer coverage.

The differences in investment histories and spectrum holdings were reflected in network quality levels. The merging parties demonstrated the differences in network quality using the Nielsen Mobile Performance ("NMP") dataset, which follows the experiences of roughly 45,000 wireless consumers.[9] For each network, two metrics of quality were calculated at a highly localized level: speed (measured in megabits per second, "Mbps") and coverage (measured as the percentage of time on 4G LTE coverage).[10] Because network quality varied

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8 Federal Communication Commission (2020), drawn from Fig II.A.26.

9 Nielsen, "Mobile Performance," *available at* http://www.nielsen.com/us/en/solutions/capabilities/nielsen- mobile-performance.html, accessed October 25, 2018.

10 A local area was defined by layering a grid of hexagons over the US. The basic hexagonal unit was approximately 2/3 of a mile across. In less densely populated areas these basic hexagonal units were combined.

across locations and different consumers used their phones in different locations, it was useful to examine individual-specific network quality metrics. For each consumer and network pair in the sample, average speed, worst speed, average coverage, and worst coverage were calculated. The worst speed (or coverage) measure corresponded to the speed (or coverage) that was the network's worst of any of the local areas that the consumer visited.

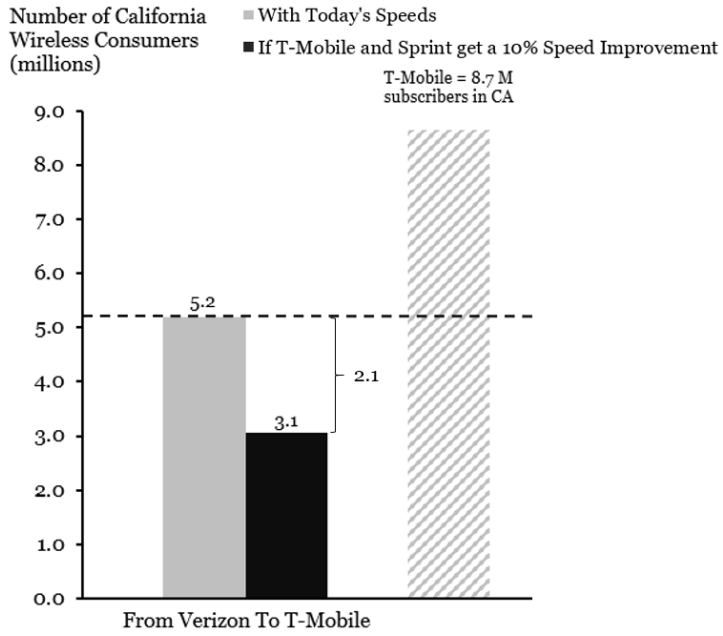
The NMP data confirmed industry views of network quality: For most consumers, Sprint's network offered poor coverage but good speeds, while T-Mobile's offered good coverage but poor speeds. The data also showed that AT&T and Verizon both tended to offer higher-quality services than either Sprint or T-Mobile. These findings also aligned with consumer perceptions.

The merging parties argued that these data were critical to understanding the effects of the proposed merger. Specifically, they argued that: (a) absent the merger, neither Sprint nor T-Mobile had sufficient network quality to put strong competitive pressure on the industry leaders, AT&T and Verizon, and (b) even in the absence of any detailed modeling, New T-Mobile could reasonably be expected to offer greater speed than T-Mobile and greater coverage than Sprint, which would allow New T-Mobile to be a more effective competitor than either standalone firm.

The merging parties offered various model-free visualizations pointing to the potential competitive benefit of increased network quality. For instance, Figure 1 shows the number of Verizon customers in California that would experience speeds more than 10 percent slower were they to switch to T-Mobile, both in in raw data, and after a contemplated network improvement such that T-Mobile could increase its speeds by 10 percent network wide.

Visualization like Figure 1, together with statements from the parties' engineers that New T-Mobile would surpass AT&T and Verizon in delivered speed, were used to explain that the contemplated network improvements would make New T-Mobile a competitive option for a much larger set of consumers than would be the case for either of T-Mobile or Sprint on a standalone basis.

Figure 1: Californian Verizon consumers that would experience a 10% speed drop in they were to switch to T-Mobile.



Source: Rebuttal Testimony of Timothy F. Bresnahan (Public Version), January 29, 2019 C.P.U.C. Docket Number A.18-07-011 and A.18-07-012. *Available at* https://www.tellusventure.com/downloads/cpuc/tmobile_sprint/joint_applicants_bresnahan_rebuttal_testimony_tmobile_sprint_29jan2019.pdf accessed 5 May 2022.

III. AGENCY REVIEW

As noted above, the transaction was subject to review by antitrust agencies and public utilities regulators at both the state and federal levels. In what follows, we focus on the competition issues raised by state and federal antitrust agencies as well as the FCC, the latter of which

reviewed the proposed merger under a "public interest" standard that has been interpreted as incorporating traditional antitrust considerations as well as broader, unspecified concerns.[11]

A. THE FEDERAL AGENCIES' COMPETITION CONCERNS

The agencies raised the concern that, by eliminating Sprint as an independent competitor, the proposed merger would increase the risk that the remaining firms would coordinate to reduce the intensity of competition and/or New T-Mobile would unilaterally have incentives to raise its prices once it no longer faced the threat of losing customers to Sprint.

Because of the difficulties in quantifying coordinated effects, arguments about the likely effects of mergers on coordination often center of how the merger affects industry mavericks.[12] This merger was no different. Both merger skeptics and T-Mobile executives often asserted that AT&T and Verizon were duopolists that sought to avoid vigorously competing. Merger skeptics further asserted that, absent the merger, Sprint and/or T-Mobile would continue to be industry mavericks but, post merger, the combined firm would be part of a cozy triopoly. By contrast, T-Mobile argued that, as the result of substantial merger efficiencies, New T-Mobile would be a super maverick—one willing and able to place competitive pressure on AT&T and Verizon to an extent that neither standalone T-Mobile nor Sprint ever could.

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[11] For example, the merging parties identified potentially substantial merger benefits accruing to consumers of fixed broadband services. Such out-of-market benefits are generally ignored as matter of antitrust law but could be considered under the FCC's public-interest standard.

[12] See Baker (2002) for a discussion of mavericks and coordinated effects.

The merging parties submitted a three-part economic analysis to the FCC on the issue of coordinated effects with respect to pricing and investment. First, it made the case that efficiencies generated by the merger would "supercharge" T-Mobile's existing maverick behavior. Second, it argued that, because consumers tend to stick with their wireless service providers and it is costly to acquire new customers rapidly, New T-Mobile would have incentives to engage in penetration pricing in order to build up its customer base in anticipation of having lower costs in the future. Third, it argued that collusion was unlikely based on a checklist of factors, mirroring those of Stigler (1964). Specifically, it argued that relatively low price transparency, high product differentiation, the existence of market asymmetries, and the relatively low frequency with which consumers make purchasing decision all contributed to a conclusion that coordination was unlikely.

Opponents to the merger countered that reducing the number of firms in the market from four to three raised the risk of coordination. Some opponents also claimed that coordination was already occurring in the market. In its final order, the FCC considered all these arguments but found "that the record does not support a conclusion that post-transaction coordination is likely."[13] The FCC also found that the divestitures to which the parties were committed would further mitigate any coordination risk.[14]

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13 Federal Communications Commission (2019), *Memorandum opinion and order, declaratory ruling, and order of proposed modification*, FCC-19-103A1. Adopted October 16, 2019, (hereinafter *FCC Final Order*), ¶ 188.

14 *Id*. The DOJ, in its competitive impact statement, also pointed to the divestitures as mitigating coordination risk. (DOJ, 2019.c.)

Although coordinated effects received considerable attention, the principal theory relevant to assessing the proposed merger's potential competitive harms (or benefits) was that of unilateral effects, which arise when a merger lessens competition even if the non-merging suppliers in the industry continue to act in their unchanged self-interests.[15]

Whether it is profitable for a firm to raise the price of one of its products depends, in part, on how much it will lose sales to its rivals as the price rises—the incentive to raise price is smaller when the volume of lost sales is larger. To see how a merger can affect the profitability of raising price, consider two firms, *A* and *B*, that are contemplating merging. When the firms are independent of one another and firm *A* raises its price, any sales that it loses to firm *B* reduce *A*'s incentive to raise its price. Once the two firms have merged, however, the merged firm does not consider sales that shift from *A* to *B* to be lost, which increases the firm's incentive to raise its price as long as those sales earn a positive margin. The agencies were concerned that Sprint and T-Mobile were particularly close competitors of one another, especially for low-income consumers. The proposed merger's critics claimed that it was especially problematical for prepaid services, such as those offered by Sprint's Boost brand and T-Mobile's Metro by T-Mobile brand.

A merger's effects on unilateral pricing incentives also depends on how the merger affects marginal costs. To the extent that merger efficiencies result in a firm that has lower marginal costs of output than would either firm on a standalone basis, the transaction creates incentives for the merged firm to lower its prices. Changes in costs can also affect a firm's choice of

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15 *Horizontal Merger Guidelines,* §§ 1 and 6.

product quality. Specifically, by lowering the marginal costs of increasing quality, merger efficiencies could generate incentives for the post-merger firm to provide higher quality services than would either firm as an independent entity.

In theory, the unilateral effects of a merger can be positive or negative. A factual inquiry is required to determine the net effect of a merger. With regard to the potential for generating competitive harms, a key empirical question was the degree to which Sprint and T-Mobile were close competitors of one another, typically measured by diversion ratios.[16] With regard for the potential for generating competitive benefits, there were two broad issues. One was the extent to which the proposed merger would reduce the marginal costs of additional output and/or quality. The other was to assess the value to consumers of any quality improvements that the proposed merger might generate.

Sprint and T-Mobile presented extensive evidence to the agencies regarding both merger efficiencies and the nature of consumer demand, the latter of which was relevant to assessing both how close Sprint and T-Mobile were as competitors and for assessing the value of increased quality.

B. THE MERGING PARTIES' EFFICIENCIES MODELING

The vast majority of the marginal cost savings projected to be realized due to the merger were from the integration of the Sprint and T-Mobile radio access networks. When an MNO's traffic significantly increases, the firm must increase capacity in order to prevent users'

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[16] The diversion ratio between two products measures 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." (*Horizontal Merger Guidelines*, § 6.1.)

network experience from degrading below acceptable levels. MNOs have a range of options to increase capacity, and an MNO will generally try to implement the most cost-effective solutions first. As the MNO exhausts its most attractive capacity solutions, it must turn to options that generally are more expensive means of solving congestion. The proposed merger was projected to reduce network marginal costs by increasing the network capacity that can be provided using lower-cost capacity-expansion options—thus avoiding the need to use higher-cost options.

Agency staff were initially skeptical of the potential for the proposed merger to generate substantial efficiencies. Consequently, the parties engaged in extensive efficiency modeling. The extent of marginal costs savings was projected using two stages of modeling. First, the "Network Build Model" was used to generate projections of network investment and performance under various scenarios. Second, economic analysis was used to convert the results of the Network Build Model into predictions of the marginal costs of standalone Sprint, standalone T-Mobile, and New T-Mobile.

The Network Build Model was based on T-Mobile's ordinary course network model and was developed by T-Mobile in consultation with Sprint to evaluate the merger. One reason for adhering as closely to existing models as possible was to avoid claims that the modeling as rigged to favor the merger—a claim that had strongly undermined AT&T's arguments before the DOJ and FCC when unsuccessfully attempting to obtain antitrust clearance for its proposed acquisition of T-Mobile in 2011. It was necessary to extend existing T-Mobile network modeling to incorporate the deployment of emerging 5G technology, as well as to cover the networks of Sprint and the proposed merged firm. Sprint did not have a comparable model its own—network coverage, rather than congestion, was Sprint's primary concern.

The Network Build Model had the following inputs: (i) an inventory of spectrum licenses; (ii) a baseline network plan consisting of spectrum deployed on specific sites (there was a separate baseline network for each of the standalone and New T-Mobile networks in each year modeled); and (iii) a traffic forecast, which consisted of a projection of the overall traffic level, a forecast of the split of traffic between 5G-capable devices and LTE-only devices, and a forecast of the distribution of traffic across time-of-day and geography. For any given baseline network and traffic forecast, the Network Build Model determined the type and number of incremental builds beyond the baseline network that were necessary to accommodate the traffic while satisfying the relevant network performance planning criteria. Once the outputs of the Network Build Model were in hand, it was conceptually straightforward to use those results to calculate how total costs varied with the level of traffic served on each of standalone Sprint, standalone T-Mobile, and New T-Mobile. The resulting changes were the respective networks' marginal costs.

There were several sources of the proposed merger's cost savings. They can be intuitively understood as follows:

- *Benefits of Resource Pooling in the Presence of Load Diversity.* As standalone companies, either the Sprint or T-Mobile network could become congested at a time and place when the other network was not congested. By pooling the two companies' network resources, the "excess" capacity on one network could be used to offset the congestion on the other, reducing the need to make costly incremental network investments to handle increases in network traffic.

- *Cell-Site Level Economies of Scale Deploying Spectrum.* The merged firm would be able to deploy Sprint and T-Mobile's combined spectrum holdings at every New T-Mobile site. Critically, the costs of deploying spectrum at a site typically rise less than proportionately with the amount of spectrum deployed (i.e., costs less than double when the amount of spectrum deployed doubles).

- *Benefits of a Diverse Spectrum Portfolio*. New T-Mobile planned to combine Sprint's and T-Mobile's spectrum portfolios, which were weighted toward different bands with different propagation characteristics. The combination of complementary spectrum bands would allow New T-Mobile to use spectrum more efficiently than could Sprint or T-Mobile acting as separate companies: when deployed by a single company, each spectrum band could be used for the type of traffic for which it was best suited, thus increasing the capacity realized from a given spectrum portfolio.

- *Enhanced Spectral Efficiency due to More Rapid 5G Deployment*. The proposed transaction would accelerate the migration of customers to 5G, which had a higher degree of spectral efficiency than do the radio technologies that were currently widely deployed. Two factors promoted the acceleration. First, because of various engineering complementarities, New T-Mobile would be able to maintain the necessary transitional LTE capability using less than the sum of the spectrum that Sprint and T-Mobile would have had to use as standalone companies. Second, New T-Mobile would have additional scale that would make it more attractive for manufacturers to accelerate the roll out of access devices (e.g., smartphones) that functioned on New T-Mobile's 5G network.

- *Roaming Efficiencies*. Because of its substantial network-coverage limitations, Sprint had roaming agreements with other carriers to provide coverage outside of Sprint's network's footprint. Sprint typically paid a per-unit fee for the data its customers consumed while roaming on a partner network. From Sprint's perspective, these fees were a marginal cost of providing mobile wireless service. Post-merger, New T-Mobile would provide most of the network services that, had Sprint remained a separate company, would have been provided under roaming agreements. New T-Mobile's marginal costs were projected to be far below the roaming fees Sprint was paying.

C. THE MERGING PARTIES' DEMAND ANALYSES

The merging parties presented a detailed econometric demand model that estimated substitution patterns and supported a merger simulation. Specifically, the merging parties used the Nielsen NMP data, described above, to estimate a model of how consumers select a wireless brand given where, when, and how they use their phone ("the demand model"). The demand model adopted a discrete-choice framework and was estimated as a standard conditional logit model of brand choice.[17]

The demand model supplied two things. First, it provided a quantitative measure of consumers' response to quality changes. Consumers were found to put a high value on network quality. Unsurprisingly, if you can't get coverage on a network, or adequate speed,

[17] Details of the demand model are contained in the technical appendix.

you do not choose it. The quantitative findings mirrored testimony from executives and were consistent with the high levels of annual network investment observed in the industry.[18]

Second, the demand model provided diversion ratios, measuring the extent of substitution between firms in the event of a price change. Diversion ratios varied across firms. Of those consumers that would leave AT&T in the event of a price increase, 40 percent were estimated to switch to Verizon. Of those consumers that would leave T-Mobile in the event of a price increase, 35 percent would go to Verizon, while 28 percent would go to AT&T, 12 percent to Sprint, and 12 percent to regional carriers and MVNOs.[19]

The primary challenge to the demand model related to the accuracy of the diversion ratios. The estimates were critiqued by FCC staff, as well as economists retained by DISH, for resembling share-proportional diversion.[20] A vigorous written and oral exchange occurred between economists for the merging parties, agency staff, and economists retained by DISH, as to whether the diversions represented an empirical finding or an artifact of modeling choices.[21] Ultimately, the FCC did not identify specific problems with the model, instead noting only that:[22]

> …if the model estimation returns diversion that is proportional to market share, then either the diversion ratios are in reality nearly share-proportional, or other

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18 Specific quantifications of the value of quality are unavailable in public documents.

19 T-Mobile, in this instance, refers to T-Mobile's prepaid brands. Figure 3, in the technical appendix, shows the full set of estimated diversion ratios.

20 *FCC Final Order*, ¶ 127.

21 The back-and-forth addressed questions relating to whether, as a theoretical matter, the model could generate diversion ratios substantially different from share ratios, whether in the data at hand differences from share-based diversion was substantial, and whether alternative data rebutted the results, among other issues.

22 *FCC Final Order*, ¶ 128.

> factors are preventing the demographics or quality data from reliably informing the estimation.

This exchange occurred against a broader discussion as to whether porting data, which tracks switching (churn) from one firm to another on a weekly or monthly basis was more indicative of substitution patterns than that arising from discrete choice demand modeling. As noted by Chen and Schwartz (2016), "It is widely recognized, of course, that churn and diversion ratios can differ depending on the specific reasons for churn…".[23] The difficulty in mapping porting data (which reflect changes in any factors that influence consumer purchase decisions) to diversion (which reflects the impact of a single firm's price change) was readily apparent in this matter given that extensive switching between any two firms was present in both directions within the same time period.

The FCC recognized the limitations of switching data but, nonetheless, concluded that "…porting data, while not perfect, is the most reliable diversion proxy available in this record."[24] As a result, the *FCC Final Order* did not rely on the demand modeling. The DOJ also engaged with the demand modeling, although, due to the nature of the DOJ process, it is unclear to what extent it shaped DOJ's final thinking on the transaction.

D. THE MERGING PARTIES' MERGER SIMULATION

Amerger simulation was conducted in which the demand model was combined with a Bertrand-Nash pricing assumption and estimates of marginal costs pre-merger (derived from information on margins). This simulation quantified the impact of the transaction on

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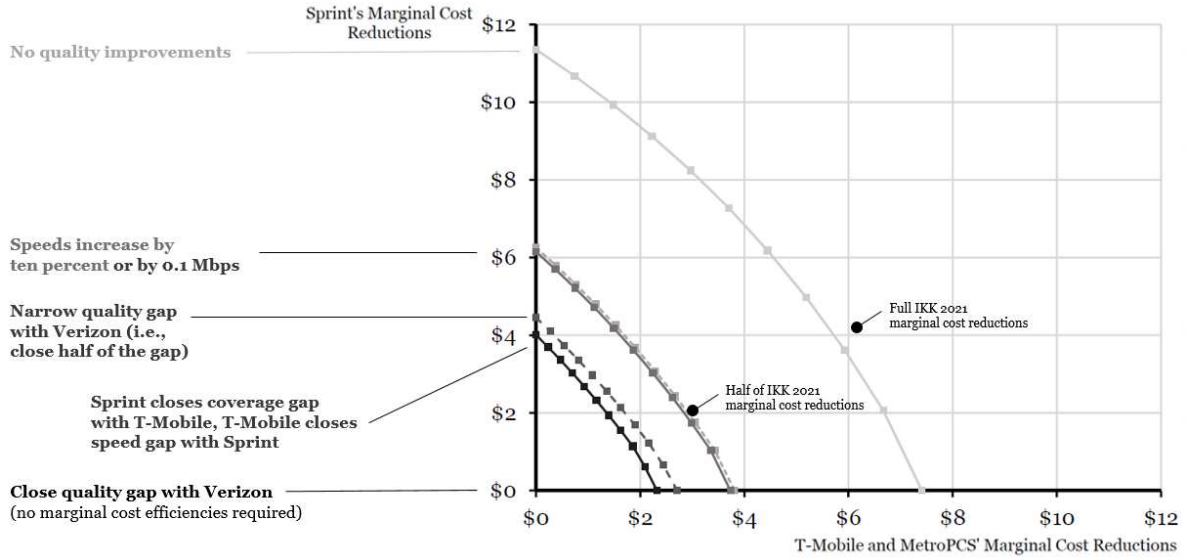
23 Chen and Schwartz (2016).

24 *FCC Final Order*, ¶ 128.

consumer surplus under various scenarios capturing different marginal cost reductions and quality improvements.

Figure 2 summarizes the results. It shows a series of frontiers, each corresponding to a different set of assumptions. To the right of each frontier, consumer surplus increases, on the frontier consumer surplus is unchanged, and to the left, consumer surplus decreases as a result of the merger. The far-right frontier portrays the marginal cost reductions that would be required to make the merger consumer-surplus neutral in the absence of any quality improvements. By contrast, if the merger enabled a quality increase that enabled the new network to close any quality gaps with Verizon, then no marginal cost reductions are required to keep consumers at least as well off with the merger. The figure also shows "IKK 2021 marginal cost reductions," which are marginal cost reductions generated from the efficiencies modeling assuming no quality increases.

Figure 2: Critical marginal cost reductions required to make consumer surplus positive, under different scenarios.



Source: Rebuttal Testimony of Timothy F. Bresnahan (Public Version), Janaury 29, 2019 C.P.U.C. Docket Number A.18-07-011 and A.18-07-012. Available at https://www.tellusventure.com/downloads/cpuc/tmobile_sprint/joint_applicants_bresnahan_rebuttal_testimony_tmobile_sprint_29jan2019.pdf accesed 5 May 2022.

E. SETTLEMENTS

The DOJ, FCC, and Attorneys General of five states reached settlements with the merging parties. The DOJ recognized that the proposed merger could strengthen competition and benefit consumers but had concerns that it felt needed to be addressed. The DOJ filed a complaint in federal district court along with a proposed final judgment containing remedies that the DOJ concluded were sufficient to address its concerns.[25] The FCC also recognized that the proposed merger could generate efficiencies that would benefit consumers but was concerned with potential adverse competitive effects to serve price-conscious consumers in

[25] U.S. Department of Justice (2019.a and .b).

urban areas.[26] The FCC concluded that, with the settlement conditions and commitments in place, the merger did not threaten harm to competition and was in the public interest.

Most fundamentally, the DOJ and FCC settlements were intended to allow DISH—which was not a mobile wireless services provider but had amassed a considerable portfolio of spectrum licenses suitable for providing such services—to enter the market as a nationwide, facilities-based provider that would replace the competition lost from the elimination of Sprint. The merging parties agreed to make a range of resources available to DISH to support its entry efforts, including: the Boost Mobile, Virgin, and Sprint's prepaid brands and associated customer bases; Sprint's 800 MHz spectrum licenses; wholesale capacity supplied to DISH while DISH built out its own radio access network; and the option to obtain the merging parties' decommissioned cell sites and retail locations. The merging parties also agreed not interfere with DISH's efforts to deploy a nationwide 5G network.

The settlements also included commitments by the merging parties with respect to their post-merger competitive conduct. Specifically:

- *Wholesale Commitments*: New T-Mobile would abide by the terms of all of the merging parties' existing wholesale supply agreements with MVNOs and extend those terms for the seven-year duration of the Proposed Final Judgment and would engage in good-faith negotiations to amend the terms of its MVNO agreement with Altice to include access to the New T-Mobile network;

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[26] *FCC Final Order*, ¶¶ 8-11 and 20.

- *Retail Price Commitments*: New T-Mobile would not raise retail prices above the levels that prevailed in February 2019 for a period of three years from that date, and Sprint customers would be able to keep their current Sprint rate plan or switch to a better New T-Mobile plan; and
- *Network Build Commitments*: New T-Mobile would meet a series of specific performance targets for the deployment of a 5G network.

In addition, DISH made network build commitments to the FCC, including a commitment to build a nationwide 5G broadband network by June 2023, as well as interim coverage commitments.

IV. THE STATE LITIGATION

Attorneys general for several states, commonwealths, and the District of Columbia found the settlement conditions to be insufficient and filed a complaint asserting that the proposed merger would violate Section 7 of the Clayton Act by harming competition in the market for retail mobile wireless telecommunications services.

The court applied a standard, three-stage process to assess these claims. First, Plaintiffs were required to establish a prima facie case of harm to competition based showing that the proposed merger would lead to high concentration in one or more relevant markets. If Plaintiffs met their initial burden, Defendants would present evidence in the second stage to rebut the prima facie case by demonstrating the market-share analysis was not indicative of actual competitive effects. If Defendants succeeded in the second stage, the burden would shift back to Plaintiffs in a final stage in which to provide additional evidence that the merger

would harm competition. Although the burden of production shifted between the parties, the ultimate burden of persuasion was always with Plaintiffs.

In order to focus on the economic logic, the summary of the parties' arguments and the court's decision below are organized by economic issue, rather than the court's three-phase framework.

A. CONCENTRATIONS MEASURES AND THEIR IMPLICATIONS

Plaintiffs relied on the "structural presumption" that a merger harms competition if it significantly increases concentration in an already concentrated market. The three most significant points of contention between the parties were: (a) whether local markets were an appropriate frame for analysis, and (b) the treatment of MVNOs in calculating concentration in the relevant market, and (c) the validity of standard concentration thresholds.

With regard to geographic market definition, Plaintiffs argued that there was a national relevant market as well as local relevant markets corresponding to Cellular Market Areas. Defendants agreed that a national market existed but challenged the usefulness of the narrower geographic markets, observing that prices were largely determined at the national level, most advertising was nationwide, and network investment policies (e.g., network performance targets) were set at the national level. The Court concluded that there were sufficiently important decisions taken at the local level that both national and local relevant markets were appropriate. The Court also relied on the FCC's and DOJ's having reached a similar conclusion in analyzing MNO mergers.

The parties also disagreed on how MVNOs should be treated when calculating market shares and concentration metrics. Although the court framed the issue as one of market delineation,

it really was one of attribution and the appropriate calculation of shares. Plaintiffs argued that an MVNO's share should be attributed to the MNO(s) providing the wholesale services to the MVNO because wholesale fees constituted such a high percentage of an MVNO's costs and the MVNO had limited ability to differentiate itself. Defendants argued that MVNOs—particularly those operated by cable television/broadband providers—had the ability to differentiate themselves through bundling with other services, and these companies were often willing to sell service at very low incremental prices as additions to service bundles. The Court sided with Plaintiffs and ruled that MVNOs were not independent competitors and that their revenues should be allocated to the underlying wholesale providers when calculating market shares. However, the Court also stated that "MVNOs do undoubtedly compete with MNOs in some ways and should not be altogether excluded from broader consideration."[27] The Court further stated that the treatment of MVNOs and DISH's impending entry (in part as an MVNO) "ultimately reduc[ed] the persuasive force of market share statistics in the final analysis."[28]

The final issue regarding Plaintiffs' application of the structural presumption concerned the validity of the concentration thresholds underlying the presumption. The Court examined two thresholds to determine whether the proposed merger would presumptively harm competition:

- whether the resulting firm would have a market share greater than 30 percent, which was the approach of *Philadelphia National Bank*, 374 U.S. 321 (1963), and

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27 *Opinion*, p. 45.

28 *Opinion*, p. 46.

- whether the merger would increase the Hefindahl-Hirschman Index (HHI) by more than 200 points and result in an HHI of greater than 2,500, which followed the U.S. Department of Justice and Federal Trade Commission 2010 *Horizontal Merger Guidelines*.

There is little or no theoretical or empirical basis for use of either the 30-percent-share or 2,500-HHI concentration thresholds, while thresholds based on the *change* in concentration have firmer theoretical footing.[29] As pointed out by Defendants, Plaintiffs made no attempt at trial to use economic theory or data to show that the generic thresholds were appropriate given the specifics of the markets at issue in the case. The Court noted that this fact further reduced its confidence in the informativeness of the concentration analysis.

The Court concluded that Plaintiffs had met their initial burden (the merger was presumptively anticompetitive applying either the market-share or HHI thresholds), but also indicated that it had limited confidence in the presumption as applied to the present case. This conclusion set up the next step under the three-stage process applied by the Court, "Defendants may … rebut evidence of high market concentration by producing evidence that 'show[s] that the market-share statistics [give] an inaccurate account of the acquisition['s] probable effects on competition.'"[30] Defendants argued that market-share statistics did indeed give an inaccurate account and that the proposed merger would strengthen—not weaken—

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[29] See Willig (1991) for an early attempt at providing a theoretical basis for having concentration thresholds based on both the level and change in concentration. For a more recent contribution to the debate, see Nocke and Whinston (2022).

[30] *Opinion*, p. 55, citation omitted.

competition. Plaintiffs responded by offering analyses beyond concentration figures to project competitive effects and by challenging various elements of defendants' rebuttal case.

B. A MORE SOPHISTICATED LOOK AT COMPETITIVE EFFECTS

Plaintiffs emphasized unilateral effects at trial. Nevertheless, in their pre-trial reports, economic experts for the two sides engaged on several issues regarding coordinated effects. Plaintiffs organized much of their discussion around an elegant distillation of the incentive of an individual firm to defect from coordination arising in the incentive compatibility (IC) constraint in standard repeated-game models. If punishment from deviation (deciding to act as a maverick) lasts *T* periods, and δ is the relevant discount rate, then the IC constraint can be written as

$$\frac{\delta(1-\delta^T)}{(1-\delta)} \geq \frac{deviation\ profit - coordination\ profit}{coordination\ profit - punnishment\ profit},$$

where the right-hand side of the equation is the "disruption index." An increase in the disruption index was interpreted as an increase in the risk of coordinated effects. The disruption index was used to give economic structure to a discussion of factors indicating that the influence of T-Mobile and Sprint as mavericks would be diminished by the transaction.

In a pre-trial expert report, Defendants used their merger simulation to quantify the disruption index and in the process argued that: (1) Plaintiffs had failed to provide the level of analysis required to support quantification (e.g., calculating the coordination profit requires clear articulation of form of coordination at issue, which Plaintiffs did not offer); and (2) under reasonable assumptions (such as those often made in the repeated game/collusion literature), the post-merger disruption index either decreased or was inconsistent with coordination given any credible discount rate.

An underlying theme in much of the exchange on coordinated effects was the difficulty economists have in quantifying the extent to which factors suggestive of coordination might increase the likelihood of actual coordination (absent a history of collusion, or evidence of specific attempts at, or plans of, coordination). That is, the academic literature at present provides little basis to conclude whether a merger undertaken in the presence of some combination of plus factors results in a (say) 20-, 50-, or 80-percent increase in the chance of coordination.

Perhaps because of the difficulties of quantifying coordinated effects, at trial Plaintiffs primarily relied on lay witnesses to claim that Sprint and T-Mobile were mavericks. However, the Court agreed with Defendants that the fact that two out of the four industry leaders were allegedly mavericks suggested that collusion was hard to sustain in this industry. Moreover, the Court determined that DISH was more likely to be an influential maverick in the future than was Sprint.

At trial, Plaintiffs' lead economic expert focused on unilateral effects. The arguments at trial were based on upward pricing pressure analyses. Neither party introduced a full-blown merger simulation model at trial. Although there were disagreements between Plaintiffs' and Defendants' experts at trial regarding the projected magnitude of unilateral effects in the absence of efficiencies, these disagreements were of relatively little significance with respect to assessing the merger. The big issue was the magnitude of the efficiencies. At trial, Defendants' economic expert demonstrated that plugging Defendants' estimates of the merger's marginal cost savings into the formula used by the Plaintiffs' economic expert to calculate pricing pressure yielded a prediction that prices would substantially fall.

C. MERGER EFFICIENCIES

There has been disagreement among the courts regarding the role of efficiencies in merger analysis. Some courts have treated efficiencies as a "defense" against a finding that a merger harms competition. From an economic perspective, this approach makes little sense: an efficiencies analysis helps to determine whether a transaction makes competition stronger or weaker. The Court in the present matter recognized that consideration of efficiencies is a key component of the assessment of competitive effects.

Under the approach summarized in the *Horizontal Merger Guidelines* (§10) and widely adopted by courts, "[c]ognizable efficiencies are merger-specific efficiencies that have been verified and do not arise from anticompetitive reductions in output or service." Plaintiffs argued that the efficiencies identified by Defendants were neither merger-specific nor verifiable.

Plaintiffs challenged merger specificity by arguing that there were several other means of achieving the projected benefits of the proposed merger, including: acquisition of additional spectrum through federal license auctions or secondary markets; investments in additional cell sites to allow greater frequency reuse; implementation of a technology known as Dynamic Spectrum Sharing; or having either Sprint or T-Mobile instead merge with DISH. Sprint and T-Mobile executives testified that all of these alternatives were inadequate and had highly uncertain benefits. The Court found that the claimed efficiencies were merger specific on the grounds that:[31]

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[31] *Opinion*, p. 71.

> … it may be that Defendants are not entirely incapable of improving their networks and services through means other [than] the Proposed Merger. But none of those alternatives appear reasonably practical, especially in the short term, and neither company as a standalone can achieve the level of efficiencies promised by the Proposed Merger.

Plaintiffs also attacked the verifiability of the projected efficiencies. As disussed above, Defendants addressed verifiability in large part by relying on detailed efficiency modeling (the Network Build Model) that utilized ordinary-course-of-business principles and techniques.

Plaintiffs attacked the Network Build Model as something that had been created for purposes of litigation, rather than an existing model used in the ordinary course of business. Specifically, the Network Build Model differed from T-Mobile's ordinary course models in that it also modeled Sprint and was more forward-looking, including the modeling of 5G. The Court observed that these extensions covered factors that someone conducting an efficiencies-modeling exercise would naturally want to take into account, and the Court found that the litigation model "hewed as closely to ordinary business principles as could be reasonably expected under the circumstances."[32]

Plaintiffs also argued that T-Mobile's efficiencies modeling unreasonably restricted the standalone firms' abilities to acquire additional spectrum or adopt new technologies, specifically Dynamic Spectrum Sharing. Defendants' economic expert witness challenged the methodological soundness of the sensitivity analyses presented by one of Plaintiffs economic

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[32] *Opinion*, p. 77.

expert witnesses, and Sprint and T-Mobile executives testified that Plaintiffs' alternative assumptions were unrealistic.

T-Mobile also bolstered support for its efficiencies projections by pointing out that many of the network efficiencies generated by its 2013 acquisition of Metro PCS were similar in character and implementation to those anticipated from the proposed merger with Sprint, and many of the MetroPCS efficiencies were achieved ahead of schedule and exceeded the pre-merger projected total value. These facts gave the Court much greater confidence in T-Mobile's efficiency projections for its proposed acquisition of Sprint.[33]

Engineering modeling predicted that New T-Mobile would have higher speeds than either standalone company, but economic modeling was necessary to translate higher speeds into consumer benefits measured in dollars. Defendants' economic expert projected benefits primarily by extrapolating the results of an existing empirical study of fixed-line broadband internet access.[34] One of Plaintiffs' economic experts testified that any estimates of the consumer benefits of the greater network speeds the proposed merger would generate were unreliable because, at present, consumers had no uses for services with those speeds. The Court rejected this argument for neglecting the likely innovation in applications, commenting on the expert's argument that "The same may have been said about airplane speeds and pilotless flying machines in 1920."[35]

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33 *Opinion*, pp. 82-83.

34 Specifically, Nevo et al. (2016).

35 *Opinion*, p. 60.

Ultimately, the Court found "that Defendants' proposed efficiencies are cognizable and increase the likelihood that the Proposed Merger would enhance competition in the relevant markets to the benefit of all consumers."[36] In a nod to some of the concerns raised by Plaintiffs, as well as the unsettled legal treatment of efficiencies in merger review, the Court was careful to note that efficiencies were just one of several factors on which its overall finding regarding the proposed merger's legality.[37]

D. SPRINT AS A WEAKENED COMPETITOR

Defendants argued that, if it remained a standalone company, Sprint would continue to decline in competitive significance. Specifically, Defendants characterized a downward spiral in which Sprint had a lower quality network than its rivals, which led to higher churn (i.e., customer loss) and a poor reputation with consumers, which led to poor financial performance, which in turn undermined Sprint's ability to invest in its network.

Plaintiffs asserted that there were several means for Sprint to become a strong competitor as a standalone company. These included greater network investment, improvements in deployed technology, future low-band spectrum acquisitions, entering commercial partnerships to address coverage gaps, or merging with DISH or an MVNO. The Court rejected these arguments as either speculative or unrealistic.

Plaintiffs also tried to use the proposed merger's break-up provisions as an argument against the deal. Plaintiffs noted that the substantial payment and spectrum transfer that T-Mobile

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36 *Opinion*, p. 83.

37 *Opinion*, p. 83.

received from AT&T as a break-up fee for their unsuccessful merger attempt had allowed T-Mobile to become a much stronger competitor. Plaintiffs argued that the break-up fee for the proposed Sprint-T-Mobile merger, coupled with a roaming agreement that T-Mobile entered into with Sprint as an inducement to pursue the deal, could have a similar effect on Sprint if the proposed merger were enjoined. This argument did not appear to sway the Court. If courts were to accept such arguments, then parties proposing to merge in the future would have incentives to design their break-up agreements in ways that minimize the competitive strength of the party receiving payment.

E. LITIGATING THE FIX

Plaintiffs argued that the conditions of the settlements with the DOJ and FCC were inadequate to ensure that the proposed merger would not harm competition. Defendants argued that the conditions were unnecessary but eliminated any residual concerns that one might have.

Plaintiffs criticized several of the settlement conditions as being behavioral rather than structural. Although there are valid concerns with respect to the long-term effectiveness of behavioral remedies, Defendants pointed out that the behavioral remedies were intended only as temporary measures in support of the overall remedy (including asset divestitures) designed to facilitate a structural change to the industry by allowing DISH to become a new facilities-based carrier.

Plaintiff argued that the settlement was unlikely to prevent harm to competition because DISH's entry would not be sufficiently timely or likely to replace competition lost due to T-Mobile's acquisition of Sprint and, indeed, that there was a substantial risk that DISH would fail to honor its entry commitments. The Court, however, concluded that DISH would build

its promised network and replace competition lost by Sprint's acquisition—especially given the Court's finding that Sprint was very likely to continue to decline in competitive significance. The Court also took comfort in the fact that the DOJ and FCC both had approved the proposed merger conditional on the terms of DISH's entry.

V. IS THERE A ROLE FOR SOPHISTICATED ECONOMICS IN MERGER REVIEW?

As a final matter, the Court's opinion drew attention for apparently downplaying the role of expert witnesses and analytical modeling. Specifically, the Court described the parties as offering "competing crystal balls" and stated that:[38]

> ...the parties' costly and conflicting engineering, economic, and scholarly business models, along with the incompatible visions of the competitive future their experts' shades-of-gray forecasts portray, essentially cancel each other out as helpful evidence the Court could comfortably endorse as decidedly affirming one side rather than the other.

The Court emphasized that it found "especially relevant and compelling… the plausibility and persuasiveness of particular witnesses' trial presentations" based in part on its assessment of "their credibility and demeanor on the witness stand."[39] In summary, the Court concluded that executives of the merged entity intended to continue and amplify T-Mobile's UnCarrier strategy rather than reduce the company's aggressiveness.

This is not to say that economics played no role. First, there was vigorous engagement on the economic modeling in the regulatory investigations conducted by the FCC and DOJ. This likely contributed to—and shaped the terms of—the settlements with those agencies. Second,

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[38] *Opinion*, pp. 4-5.

[39] *Opinion*, pp. 7-8.

the sequence of reports and rebuttal reports between experts in pre-trial expert discovery contained a wealth of detailed economics. This exchange likely shaped the evidence that was presented to the court. For example, as described above, there was extensive pre-trial expert exchanges on coordinated effects that led to streamlined presentations at trial. Third, the economists retained by both sides worked closely with counsel in shaping the overall narratives that were presented to the Court.

Our assessment is that each of these elements likely shaped the Court's final opinion. The Court recognized the impacts of the FCC and DOJ settlements on the likelihood of a pro-competitive outcome arising from the merger. In the absence of the rigorous economic debate between the two sides during expert discovery, one side might have attempted to present at trial economic evidence that appeared to be dispositive but actually was subject to sound rebuttal. Lastly, despite dismissing much of the expert evidence, the underlying logic of the opinion is structured in a way that mirrors the structure adopted by economic experts on both sides. We suspect that this is no accident.

VI. TECHNICAL APPENDIX

This appendix provides addition information regarding the merging parties' demand model, which was estimated as a standard conditional logit model of brand choice using individual-level data on carrier choice and usage (provided by the NMP data discussed in the main text). Formally, each person was indexed by *I,* of data use intensity type *t,* living in location *l,* assigned a utility level u_{itlb} to brand *b*. The utility level was specified as:

$$u_{itlb} = \alpha_{lb} + \alpha_{tb} + \beta_t x_{ib} + \gamma_b C_i + \epsilon_{ib},$$

where x_{ib} is a list of the network quality metrics, subscripted by *i* and *b* to reflect that an individual *i*'s experienced quality for brand *b* depends on where and when they use their phone; α_{lb} and α_{tb} capture brand preferences that depend on the individual's location of residence and whether they are a light, medium, or heavy data use type;[40] γ_b capture brand preferences that may depend on consumer demographics given by C_i;[41] ε_{ib} is a stochastic term distributed type-I extreme value reflecting determinates of choice not included in the model; and β_t are preference coefficients that govern how much individuals of data use type *t* (light, medium, or heavy) value each network quality product characteristic.[42] The parameter β_t also varied by whether individual *i* was a light, medium, or heavy data user. The estimated parameters are α_{lb}, α_{tb}, β_t, and γ_b. The NMP data were used to measure x_{ib}, and both census and NMP data were used to measure C_i.[43]

In the demand model, consumers chose from one of seven brands and an outside option. The seven brands that were modeled directly, including measuring the network quality they offer, were AT&T, Sprint, T-Mobile, Verizon, Cricket, Boost/Virgin, and MetroPCS. The outside option in the model, whose network quality was not measured, represents options such as US Cellular, Tracfone, Xfinity, Google, and other MVNOs.

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40 Light data users were users that on average utilized less than 30 megabytes of data per day. Medium data users utilized on average between 30 and 100 megabytes of data per day. Heavy data users utilized on average more than 100 megabytes per day. Across the four national carriers, 15-23% of users were light and 30-38% were medium.

41 The precise configuration of consumer demographics are not disclosed in public materials.

42 As noted in the Section II, these individual-specific network quality product characteristics were average speed and worst speed, and average coverage and worst coverage, and depended on how and where each consumer in the sample used their phone.

43 This choice model was estimated directly using maximum likelihood.

The utility specification used to estimate demand did not include price. Instead, the effect of price enters through the location-specific brand fixed effects, α_{lb}. Note that because there was only one national price for each carrier (no plan-specific information was available in the data), the price coefficient could not be separately identified from location-brand fixed effects in the conditional logit regression. The price coefficient was recovered via calibration using price (proxied by average monthly revenue per user) by carrier, information on margins and the Bertrand-Nash equilibrium conditions (see the section on the merger simulation, below). When calibrating the price coefficient the location-specific brand fixed effects were separated into a price effect, δp_b, and the remaining location-brand fixed effect, ξ_{lb}: $u_{itlb} = \xi_{lb} + \delta p_b + \alpha_{tb} + \beta_t x_{ib} + \gamma_b C_i + \varepsilon_{ib}$.

The diversion ratios that were generated by the demand model are reported in Figure 3.

Figure 3: Diversion Ratios

	Diversion To:							
Diversion From:	**AT&T**	**Verizon**	**Sprint**	**T-Mobile**	**Boost/Virgin**	**MetroPCS**	**Cricket**	**Regional Carriers and MVNOs**
AT&T	-	40.0%	11.0%	19.1%	3.8%	5.4%	3.6%	17.1%
Verizon	33.8%	-	12.4%	20.4%	4.2%	5.5%	3.5%	20.3%
Sprint	24.6%	32.6%	-	19.2%	4.0%	5.2%	2.5%	12.1%
T-Mobile	27.5%	34.8%	12.4%	-	4.0%	6.9%	2.7%	11.7%
Boost/Virgin	22.0%	28.4%	10.3%	16.0%	-	5.9%	2.8%	14.5%
MetroPCS	22.7%	27.6%	9.9%	20.4%	4.4%	-	2.8%	12.3%
Cricket	25.9%	29.5%	8.2%	13.5%	3.5%	4.7%	-	14.6%
Regional Carriers and MVNOs	27.5%	38.7%	8.7%	13.0%	4.1%	4.7%	3.3%	-

Source: Rebuttal Testimony of Timothy F. Bresnahan (Public Version), Janaury 29, 2019 C.P.U.C. Docket Number A.18-07-011 and A.18-07-012. Available at https://www.tellusventure.com/downloads/cpuc/tmobile_sprint/joint_applicants_bresnahan_rebuttal_testimony_tmobile_sprint_29jan2019.pdf accesed 5 May 2022.

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