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 that involved 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 that were 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

[1] In this matter, John Asker was retained as a consultant and potential 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.

general. However, in June 2019 the attorneys general for 13 states and the District of Columbia filed suit in federal district court to block the transaction.

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

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

- *The Role of the Structural Presumption.* At trial, the plaintiffs relied on the "structural presumption" that a merger harms competition if it significantly increases concentration in an already concentrated market. The defendants challenged the theoretical and empirical bases for the numerical thresholds used in applying the presumption. However, subject to some reservations, the court found the plaintiff's application of the structural presumption was sufficient to meet their initial burden.

- *Predicting Coordinated Effects*. Critics of the merger, including the State plaintiffs, argued that the merger posed a substantial risk of facilitating coordination among New T-Mobile, AT&T, and Verizon Wireless. It generally is difficult to quantify coordinated effects, and in recent decades merger enforcement has given more weight to unilateral effects. Formal economic analysis ended up playing little role at trial, and the court rejected the prediction that New T-Mobile would settle for its current market

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[2] The closing required the 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. These delayed the closing until April 1.

share and coordinate with rivals after substantially increasing its capacity through the merger.

- *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 trial 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 to be sufficient to offset otherwise substantial competitive harms. In the present matter, however, the court found that the efficiencies were substantial, and the efficiencies appear to have played an important role in the court's 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 that are expected to cure (or fix) the potential problems that would otherwise follow from the merger. 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 trial court credited the fix with a procompetitive impact despite the plaintiffs' (the state attorneys general) 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 that

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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.

were presented in different forums. The analyses submitted to the DOJ and FCC were much more sophisticated that than those that were presented to the trial court, and the 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 that were presented to the DOJ and FCC played a role in shaping the settlements with those agencies, 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 wireless networks and instead purchased wholesale 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

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[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 electromagnetic spectrum holdings of the MNOs also varied. At a high level, there were three "flavors" of spectrum that were available to carriers at the time of the transaction: low-, mid-, and high-frequency bands. Generally, as the frequency of the spectrum increases, capacity increases but propagation degrades. That is, more data can be carried, but the signal does not carry as far and can have trouble penetrating buildings and other physical barriers.[9] At the time that 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, which contributed to congestion problems on its network. By contrast, Sprint held no low-band spectrum and a substantial amount of higher-frequency mid-band spectrum, which meant that it was poorly positioned to provide broad coverage but was well-positioned to provide 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 with the use of the Nielsen Mobile Performance (NMP) dataset, which follows the experiences of

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[8] These numbers are based on FCC (2020, Fig II.A.26).

[9] For a brief, user-friendly introduction to spectrum characteristics, see https://www.nasa.gov/directorates/heo/scan/spectrum/overview/index.html, accessed 4 August 2022.

roughly 45,000 wireless consumers.[10] For each network, two metrics of quality were calculated at a highly localized level:[11] speed, which was measured in megabits per second (Mbps); and coverage, which was measured as the percentage of time on 4G LTE coverage. Because network quality varied 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 and that: (a) absent the merger, neither Sprint nor T-Mobile had sufficient network quality to put strong competitive pressure on AT&T and Verizon; and (b) even in the absence of any detailed modeling, New T-Mobile could reasonably be expected to offer

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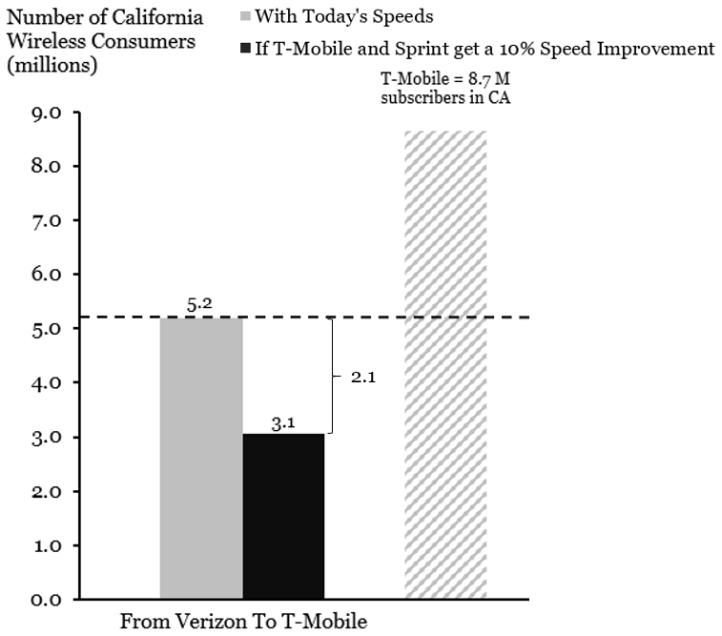
10 Nielsen, "Mobile Performance," *available at* http://www.nielsen.com/us/en/solutions/capabilities/nielsen- mobile-performance.html, accessed October 25, 2018.

11 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.

greater speed than could T-Mobile alone and greater coverage than could Sprint alone, which would allow New T-Mobile to be a more effective competitor than either standalone firm.

The merging parties offered various visualizations that pointed to the potential competitive benefit of increased network quality. For instance, Figure 1 compares the number of Verizon customers in California that would experience speeds that were more than 10 percent slower were they to switch to T-Mobile with and without a contemplated 10-percent increase in network speed due to the merger. Visualization such as 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 if 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 was 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 that were raised by state and federal antitrust agencies as well as by the FCC; the FCC reviewed the proposed merger under a "public interest" standard that has been interpreted as incorporating traditional antitrust considerations as well as broader, unspecified concerns.[12]

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[12] For example, the merging parties identified potentially substantial merger benefits that would accrue to consumers of fixed broadband services. Such out-of-market benefits are generally

Agency staff raised high-level concerns about the effects of the merger. Although they raised questions about the merging parties' analyses of those effects, agency staff did not share any analyses of their own with the merging parties. Hence, the discussion below focuses on the analyses that the parties put before the reviewing agencies, as well as comments that the FCC published in its order approving the merger subject to conditions. The FCC and DOJ reviews operated in tandem, and the agencies appeared to cooperate closely. Hence, to the extent that the discussion below tends to draw on the FCC record, which contains more public material regarding the agency's thinking, it should be read as reflecting the interaction between the parties and both Federal agencies.[13]

A. AGENCY CONCERNS REGARDING COORDINATED AND UNILATERAL EFFECTS

DOJ and FCC staff were concerned that, by eliminating Sprint as an independent competitor, the proposed merger would make it easier for the remaining three national MNOs to coordinate to reduce the intensity of competition and/or would give New T-Mobile unilateral incentives to increase its prices. Both agencies characterized the pre-merger industry structure as one in which AT&T and Verizon competed in a premium industry segment, while Sprint and T-Mobile competed for more value-conscious consumers.

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

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ignored as a matter of antitrust law but could be considered under the FCC's public-interest standard.

[13] Interaction with the state regulators, and in particular the California Public Utility Commission, also largely reflected interaction between the parties and the FCC interaction, at least in terms of economic substance.

mavericks.[14] This merger was no different. Staff raised the concern 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.

In addition, Sprint and T-Mobile 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. They also argued that, based on a checklist of factors that mirrored those of Stigler (1964), collusion was unlikely. Specifically, the parties argued that relatively low level of price transparency, substantial 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. As we discuss below, however, the academic literature at present provides little basis to quantify the degree to which a proposed merger will increase the likelihood of successful coordination under various conditions.

The DOJ remained concerned that, absent the divestitures to which the parties were committed (see below), "[t]he merger would also leave the market vulnerable to increased coordination among the remaining three carriers."[15] Although the DOJ did not provide an

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14 See Baker (2002) for a discussion of mavericks and coordinated effects.

15 DOJ (2019.c.)

explanation of its reasoning, the reduction in the number of national MNOs and the more-symmetrical market positions of the remaining firms very likely were key factors.[16] In its final order, the FCC considered all of these arguments and found "that the record does not support a conclusion that post-transaction coordination is likely."[17] The FCC also found that the divestitures would further mitigate any coordination risk.[18]

Although "coordinated effects" received considerable attention, the DOJ's and FCC's principal theory that was relevant to the assessment of 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.[19]

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* contemplates increasing its price, any sales that it would lose to firm *B* reduce *A*'s incentive to increase its price. Once the two firms have merged, however, the merged firm does not consider sales that shift from *A* to *B* to

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16 The text of the complaint is only 8.5 pages long. (Id.)

17 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.

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

19 For a general description of unilateral effects, see *Horizontal Merger Guidelines,* §§ 1 and 6.

be lost, which increases the firm's incentive to raise its price as long as those sales earn a positive margin.

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 reduce its prices. Changes in costs can also affect a firm's choice of product quality: By reducing the marginal costs of increasing quality, merger efficiencies can 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. This closeness is typically measured by "diversion ratios."[20] Both the DOJ and FCC were particularly concerned about the loss of head-to-head competition between Sprint and T-Mobile to serve value-conscious consumers, especially buyers of pre-paid services, such as those that were offered by Sprint's Boost brand and T-Mobile's Metro by T-Mobile brand. With regard to the potential for generating competitive benefits, there were two broad issues: One was the extent to which the proposed merger

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[20] 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.)

would reduce the marginal costs of additional output and/or quality. A second issue was the value to consumers of any quality improvements that the proposed merger might generate.

Sprint and T-Mobile presented extensive evidence to the agencies with regard to both merger efficiencies and the nature of consumer demand; the latter was relevant for 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

DOJ and FCC staff initially expressed skepticism with regard to the potential for the proposed merger to generate substantial efficiencies. Consequently, the parties engaged in extensive efficiency modeling. The DOJ never disclosed whether it engaged in independent modeling of the merger's potential efficiencies, although the FCC reported that it conducted various sensitivity analyses with respect to the parties' modeling.

The vast majority of the marginal cost savings that were 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' network experiences 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.

The extent of marginal costs savings was projected with the use two stages of modeling: First, the "Network Build Model" was used to generate projections of network investment and performance under various scenarios. For any given spectrum inventory, baseline network, and traffic forecast, the Network Build Model determined the incremental cell sites and equipment 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 in the second stage to calculate how total costs varied with the level of traffic that was served on each of the standalone Sprint, standalone T-Mobile, and New T-Mobile networks. The resulting changes were the respective networks' marginal costs of additional traffic.

The Network Build Model was based on T-Mobile's ordinary-course-of-business 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 AT&T unsuccessfully attempted to obtain antitrust clearance for its proposed acquisition of T-Mobile in 2011.[21] It was necessary to extend the 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 of its own: Network coverage, rather than congestion, was Sprint's primary concern.

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[21] For a discussion of flaws that FCC staff identified in the model used by the AT&T to defend its proposed acquisition of T-Mobile, see DeGraba and Rosston (2018).

There were several sources of the proposed merger's cost savings:

- *Benefits of Resource Pooling in the Presence of Load Diversity.* As standalone companies, either the Sprint or the T-Mobile network could become congested at a time and place when the other network was not congested. By pooling network resources, the "excess" capacity on one network could be used to offset the congestion on the other, which would reduce 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 that is deployed.

- *Benefits of a Diverse Spectrum Portfolio*. New T-Mobile planned to combine Sprint's and T-Mobile's spectrum portfolios, which were complementary in that they were weighted toward different bands with different propagation characteristics. When deployed by a single company, each spectrum band could be used for the type of traffic for which it was best suited, which increased the capacity that could be 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. 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 traffic-sensitive roaming fees Sprint was paying.

The DOJ offered no assessment of merger efficiencies other than the conclusion that, absent the required divestitures, the efficiencies were insufficient to fully offset the loss of Sprint as an independent competitor. For its part, the FCC found that the parties' "models yield verifiable quantifications of marginal cost benefits, but with some uncertainty as to certain modeling choices and inputs."[22] For example, the size of the projected savings was sensitive to the projected growth in traffic volume, as well as to assumptions of the deployment of new network technologies. FCC staff undertook various sensitivity analyses and predicted "substantial marginal cost savings" in all of the scenarios considered. [23]

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22 *FCC Final Order*, Appendix F, ¶ 92.

23 *FCC Final Order*, ¶ 161.

C. THE MERGING PARTIES' DEMAND ANALYSES

The merging parties also 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. This demand model adopted a discrete-choice framework and was estimated as a standard conditional logit model of brand choice. As described in the Technical Appendix, the utility specification that was used to estimate demand did not include price, and the effect of price enters through the location-specific brand fixed effects

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.[24] The quantitative findings were corroborated by testimony from executives regarding the importance of network quality as well as by the high levels of annual network investment made to maintain quality.

Second, the demand model provided diversion ratios, which measured the extent of substitution between firms in the event of a price change. Diversion ratios varied across firms. Of those consumers who would leave AT&T in the event of a price increase, 40 percent were estimated to switch to Verizon. Of those consumers who would leave T-Mobile

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[24] Specific quantifications of the value of quality are not publicly available.

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.[25]

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 who were retained by DISH, for resembling share-proportional diversion.[26] A vigorous written and oral exchange occurred among economists working for the merging parties, the FCC, and DISH, as to whether the estimated diversion ratios represented an empirical finding or an artifact of modeling choices.[27] Ultimately, the FCC cited various concerns regarding the structure of the model, the reliability of the NMP data, and the possible impact of omitted variables as reasons to dismiss the empirical finding of nearly share-proportional diversion ratios.[28]

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 the formal econometric modeling. As noted by Chen and Schwartz (2016), "It is widely recognized, of course, that churn and diversion ratios

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25 T-Mobile, in this instance, refers to T-Mobile's prepaid brands. Table 1, in the technical appendix, shows the full set of estimated diversion ratios.

26 *FCC Final Order*, ¶ 127. DISH has not shared with us its reasons for intervening, but it is notable that the agreements ultimately reached between the merging parties and the FCC and DOJ to obtain approval to merge have greatly facilitated DISH's entry as a mobile network operator.

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

28 *FCC Final Order*, ¶¶ 128-129.

can differ depending on the specific reasons for churn…".[29] 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 acknowledged the limitations of switching data but, nonetheless, concluded that "…porting data, while not perfect, is the most reliable diversion proxy available in this record."[30] As a result, the *FCC Final Order* did not rely on the demand modeling. DOJ staff also engaged with the demand modeling but never disclosed whether, or to what extent, it shaped their final thinking on the transaction.

D. THE MERGING PARTIES' MERGER SIMULATION

A variety of merger simulations were offered by the parties. These simulations combined a Bertrand-Nash pricing model with estimates of pre-merger marginal costs and several different estimates of diversion ratios, namely estimates based on: (a) the demand model; (b) two industry surveys of switching behavior; and (c) internal T-Mobile estimates of additions and deactivations. These simulations quantified the impact of the transaction on consumer surplus under various scenarios that captured different marginal cost reductions and quality improvements. The parties argued that consumers would benefit from the merger even if conditions were not imposed by the FCC or DOJ.

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29 Chen and Schwartz (2016).

30 *FCC Final Order*, ¶ 128.

The FCC staff adopted the simulation framework, and modified it in several ways. Most notably, they assumed diversion ratios based on porting data. Based on the simulations and the overall record, the FCC concluded that, in certain areas (e.g., rural) and customer segments (e.g., quality-conscious consumers), the increases in network quality and capacity would outweigh the upward pricing pressures created by the loss of competition between Sprint and T-Mobile, so that consumers would benefit from the merger even in the absence of conditions.[31] However, the FCC was concerned that price-conscious consumers in densely populated areas might suffer because the FCC concluded that the parties' prepaid brands, Boost Mobile and Metro, were particularly close competitors.[32]

E. SETTLEMENTS

The DOJ, FCC, and Attorneys General of several states reached settlements with the merging parties. The DOJ remained concerned about both coordinated and unilateral effects, and it filed a complaint in federal district court along with a proposed final judgment (consent decree) that contained remedies that the DOJ concluded were sufficient to address its concerns.[33] As noted above, the FCC recognized that the proposed merger would generate benefits for some consumers even absent settlement conditions, but the agency was concerned with potential adverse competitive effects to serve price-conscious consumers in urban

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31 *FCC Final Order*, ¶¶ 10, 11.

32 *FCC Final Order*, ¶¶ 9, 11.

33 DOJ (2019.a).

areas.[34] 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 that were suitable for providing such services -- to enter the market as a nationwide, facilities-based provider that would replace the competition that would be 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 prepaid brand and associated customer base (which was owned by Sprint); Sprint's 800 MHz spectrum licenses; wholesale capacity that would be 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 that they would 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 -- a

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

company that offered broadband access, cable television, and mobile data services -- to include access to the New T-Mobile network;

- *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.

Critics of the settlement argued that it was largely a conduct remedy rather than structural one. Further, some argued, "[t]he extreme dependency of Dish on the good graces of New T-Mobile creates abundant opportunities for the merged firm to engage in strategic pricing, slowdown of provision, alteration of terms or quality of the assets and services, and so forth" and that the settlement "has all the hallmarks of a detailed, regulatory, and interventionist remedy of the sort previously and properly criticized by the DOJ."[35] Skepticism was also expressed as to whether Dish would ever build out a competitive national network and, even

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[35] *State of New York v. Deutsche Telecom AG, Brief of Amici Curiae Nicholas Economides, John Kwoka, Thomas Philippon, Robert Seamans, Hal Singer, Marshall Steinbaum, and Lawrence J. White in Support of Plaintiffs,* 01/13/20, available as NET Institute Working Paper 20-01.

if it did, whether the delay in realizing any competitive benefits from the creation this new network would be too great to offset any competitive harms arising from the merger.

IV. THE STATE LITIGATION

The attorneys general for several states and the District of Columbia also found the settlement conditions to be insufficient and filed a complaint in federal district court that asserted that the proposed merger would violate Section 7 of the Clayton Act by harming competition in the markets -- at the national level and in many local areas -- for retail mobile wireless telecommunications services.

The court applied a standard, three-stage process to assess these claims: First, the plaintiffs were required to establish a prima facie case of harm to competition that showed that the proposed merger would lead to high concentration in one or more relevant markets. If the plaintiffs met their initial burden, then the defendants (T-Mobile and Sprint) would present evidence in the second stage to rebut the prima facie case by demonstrating that the market-share analysis was not indicative of actual competitive effects. If the defendants succeeded in the second stage, the burden would shift back to the 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 the 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 district court's three-phase framework.

A. CONCENTRATIONS MEASURES AND THEIR IMPLICATIONS

The 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; (b) how MVNOs should be treated in calculating concentration in the relevant market; and (c) the validity of standard concentration thresholds.

With regard to geographic market definition, the plaintiffs argued that there was a national relevant market as well as local relevant markets that corresponded to "Cellular Market Areas."[36] The defendants agreed that a national market existed but challenged the usefulness of the narrower geographic markets because: 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 that were 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. The plaintiffs argued

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[36] "Cellular Market Areas (CMAs) are standard geographic areas used by the FCC for administrative convenience in the licensing of Cellular systems. CMAs comprise Metropolitan Statistical Areas (MSAs) and Rural Service Areas (RSAs). CMAs and the counties they comprise are listed in "Common Carrier Public Mobile Services Information, Cellular MSA/RSA Markets and Counties," Public Notice, Rep. No. CL-92-40, 7 FCC Rcd 742 (1992)." See 47 CFR § 22.909

that an MVNO's share should be attributed to the MNO(s) that provided the wholesale services to the MVNO because wholesale fees constituted such a high percentage of an MVNO's costs (and the selling MNO had the ability to affect that price) and the MVNO had only a limited ability to differentiate itself. The defendants argued that MVNOs -- particularly those that were 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 the 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."[37] The Court further stated that the treatment of MVNOs and DISH's impending entry (in part as an MVNO) "may ultimately reduce the persuasive force of market share statistics in the final analysis."[38]

The final issue with regard to the plaintiffs' application of the structural presumption concerned the validity of the concentration thresholds that underlay the presumption. The court examined two thresholds to determine whether the proposed merger would presumptively harm competition:

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37 *Opinion*, p. 45.

38 *Opinion*, p. 46.

- 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
- 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 the use of either the 30-percent-share or the 2,500-HHI concentration thresholds, while thresholds that are based on the *change* in concentration have firmer theoretical footing.[39] As pointed out by the defendants, the 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 the plaintiffs had met their initial burden -- the merger was presumptively anticompetitive if either the market-share or the HHI threshold was applied -- 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

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[39] See Willig (1991) for an early attempt at providing a theoretical basis for having concentration thresholds that are based on both the level and change in concentration. For a more recent contribution to the debate, see Nocke and Whinston (2022). For a summary of the inconclusive state of empirical work on merger retrospectives, see Asker and Nocke (2021). Kwoka (2017) offers a different view.

'show[s] that the market-share statistics [give] an inaccurate account of the acquisition['s] probable effects on competition.'"[40]

The defendants argued that market-share statistics did indeed give an inaccurate account and that the proposed merger would strengthen -- not weaken -- competition. The plaintiffs responded by offering analyses beyond concentration figures to project competitive effects and by challenging various elements of the defendants' rebuttal case.

B. A More Sophisticated Examination of Competitive Effects

The plaintiffs emphasized unilateral effects at trial. This may have been due to the difficulty that economists have in quantifying the extent to which a merger would increase the likelihood of coordination. For example, economic theory identifies several factors as potentially affecting the ability of firms to coordinate successfully, including the number of firms that would have to coordinate for it to be successful, the degree to which pricing is observable to rivals, whether customer orders are large and infrequent, and whether a firm can gain competitive advantage by secretly investing in innovations that are difficult for rivals to match quickly after the innovation has been launched in the market. However, the academic literature at present provides little basis to conclude whether a merger that is undertaken in the presence of some combination of factors results in a (say) 20-, 50-, or 80-percent increase in the likelihood of coordination.[41]

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40 *Opinion*, p. 55, citation omitted.

41 See Asker and Nocke (2021) for a discussion of theoretical and empirical work on coordinated effects. For a different interpretation of existing studies, see Kwoka (2017).

Nevertheless, in their pre-trial reports, economic experts for the two sides engaged on several issues with regard to coordinated effects. The plaintiffs organized much of their discussion around an elegant distillation of the incentive of an individual firm to defect from coordination that arises in a simple, repeated-game model. A firm contemplating whether to deviate from coordination would compare the *gains* from deviating -- the amount by which the profit it earns deviating until caught exceeds its coordination profit -- with the *losses* it would suffer -- the amount by which its coordination profits would have exceeded the profits it will earn while being punished for deviating. The flow gains and losses have to be weighted to account for the length of time that the firm would deviate before being punished, the length of the punishment period, and the firm's rate-of-time preference. All of these considerations are captured by δ, the discount factor. If the punishment lasts *T* periods, then the firm will disrupt coordination if and only if

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

where the right-hand side of the equation is the "disruption index." The higher is the disruption index, the greater is the range of values of δ for which the firm will find it profitable to disrupt coordination by being a maverick. A finding that the merger would decrease the disruption index was interpreted to mean that the merger would make it less likely that a firm would act as a maverick. The disruption index was used to give economic structure to a discussion of factors that indicated whether the transaction would make coordination significantly more likely.

In a pre-trial expert report, the defendants used their merger simulation to quantify the disruption index and in the process argued that: (1) the plaintiffs had failed to articulate

clearly either the conduct over which the suppliers allegedly would coordinate or the degree to which they would do so, which meant that the plaintiffs had failed to provide a valid basis for calculating the coordination profit; and (2) under reasonable assumptions (such as those that are often made in the repeated game/collusion literature), the post-merger disruption index was either higher than the pre-merger index or was inconsistent with coordination given any plausible discount rate.

Perhaps because of the difficulties of quantifying coordinated effects, at trial the plaintiffs primarily relied on: (a) business documents that the plaintiffs interpreted as showing that the defendants believed post-merger coordination was likely, and (b) the testimony of lay witnesses to assert that Sprint and T-Mobile were mavericks. The court did not find the documents to be probative, and the court agreed with the 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, given its spectrum holdings, recent investment and hiring decisions, and commitments to the DOJ and FCC, DISH was more likely to be an influential maverick in the future than was Sprint,[42] which suffered from "demonstrably poor network quality and numerous financial constraints."[43] Ultimately, the court concluded that New T-Mobile would use its increased capacity to compete more aggressively rather than engage in coordination.

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42 *Opinion* pp. 108-109, and 126.

43 *Opinion*, p. 84. Indeed, the court stated that it was "not persuaded… that Sprint possesses the financial and operational means to survive in the near term as a national wireless carrier." (Id., p. 163.)

At trial, the 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 the plaintiffs' and the defendants' experts at trial with regard to 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, the defendants' economic expert demonstrated that plugging the defendants' estimates of the merger's marginal cost savings into the formula that was used by the plaintiffs' economic expert to calculate pricing pressure yielded a prediction that prices would fall substantially.

C. MERGER EFFICIENCIES

There has been disagreement among the courts with regard to 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 the consideration of efficiencies is a key component of the assessment of competitive effects.

Under the approach that is 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." The plaintiffs argued that the efficiencies that were identified by the defendants were neither merger-specific nor verifiable.

The plaintiffs challenged the merger specificity by arguing that there were several other means of achieving the projected benefits of the proposed merger, including: the acquisition of additional spectrum through federal license auctions or secondary markets; investments in additional cell sites to allow greater frequency reuse; the implementation of a technology known as "Dynamic Spectrum Sharing" (DSS), which increases the efficiency of spectrum use by allowing a network to allocate a spectrum band to LTE or 5G on a real-time basis; 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:[44]

> … 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.

The plaintiffs also attacked the verifiability of the projected efficiencies. As was discussed above, the 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.

The plaintiffs attacked the Network Build Model as something that had been created for purposes of litigation, rather than an existing model that was 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

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[44] *Opinion*, p. 71.

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."[45]

The plaintiffs also argued that T-Mobile's efficiencies modeling unreasonably restricted the standalone firms' abilities to acquire additional spectrum or adopt new technologies -- specifically DSS. One of plaintiffs' economic experts presented sensitivity analyses purporting to show that efficiencies were much smaller than shown by defendants' modeling.

Sprint and T-Mobile executives testified that the plaintiffs' alternative assumptions regarding the availability and useability of additional spectrum were unrealistic because they accounted neither for associated sharing obligations and power limits, nor the geographic scopes of the licenses, nor the time necessary to put "available" spectrum actually into use. Defendant witnesses also testified that plaintiffs failed to properly account for certain spectrum efficiency losses ("overhead") associated with DSS as well as limitations on where it can be applied. Under cross examination, the plaintiffs' engineering expert testified that he had identified possibilities but was offering no prediction of what would actually happen with regard to spectrum purchases or technology deployment.

The sensitivity analyses presented by plaintiff's economic expert witness were internally inconsistent because they relied on parameter values that violated certain financial constraints faced by T-Mobile while at the same time using other parameter values that were generated

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45 *Opinion*, p. 77.

by those constraints. Plaintiff's expert also failed to account for the costs of deploying additional spectrum, thus underestimating standalone T-Mobile's network marginal costs.

T-Mobile bolstered support for its efficiencies projections by pointing out that many of the network efficiencies that were generated by its 2013 acquisition of Metro PCS were similar in character and implementation to those that were 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.[46]

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 that could be measured in dollars. The defendants' economic expert projected benefits primarily by extrapolating the results of an existing empirical study of fixed-line broadband internet access.[47] One of the 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; the court commented on the expert's argument that "The same may have been said about airplane speeds and pilotless flying machines in 1920."[48]

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46 *Opinion*, pp. 82-83.

47 Specifically, Nevo et al. (2016).

48 *Opinion*, p. 79.

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."[49] In a nod to some of the concerns that had been raised by the 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 with regard to the proposed merger's legality.[50]

D. SPRINT AS A WEAKENED COMPETITOR

The defendants also argued that, if it remained as a standalone company, Sprint would continue to decline in competitive significance. Specifically, the defendants characterized a downward spiral in which Sprint had a lower-quality network than its rivals, which would lead to higher "churn" -- customer loss -- and a poor reputation with consumers, which would lead to poor financial performance, which in turn would undermine Sprint's ability to invest in its network.

The plaintiffs asserted that there were several means for Sprint to become a strong competitor as a standalone company, including: 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.

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49 *Opinion*, p. 83.

50 *Opinion*, p. 83.

The plaintiffs also tried to use the proposed merger's break-up provisions as an argument against the deal. The plaintiffs noted that the substantial payment and spectrum transfer that T-Mobile received from AT&T as a break-up fee for their unsuccessful merger attempt had allowed T-Mobile to become a much stronger competitor. The plaintiffs argued that the break-up fee for the proposed Sprint-T-Mobile merger -- coupled with a roaming agreement that T-Mobile had 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 trial court. If courts were to accept such arguments, then parties that propose to merge in the future would have incentives to design their break-up agreements in ways that minimize the competitive strength of the party that would receive the break-up payment.

E. LITIGATING THE FIX

The 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. The defendants argued that the conditions were unnecessary but eliminated any residual concerns that one might have.

The 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, the defendants pointed out that the behavioral remedies were intended only as temporary measures in support of the overall remedy (including asset divestitures) that were designed to facilitate a structural change to the industry by allowing DISH to become a new facilities-based carrier.

The plaintiffs argued that the settlement was unlikely to prevent harm to competition because DISH's entry would neither be sufficiently timely nor likely to replace the competition that was lost due to T-Mobile's acquisition of Sprint, and that there was a substantial risk that DISH would fail to honor its entry commitments.[51] The court, however, concluded that DISH would build its promised network and would replace the competition that was 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 the 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:[52]

> ...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."[53] In summary, the Court concluded that

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51 In arguing for a standard under which DISH would have to fully replace Sprint as a competitor, the plaintiffs effectively gave no weight to the merger's efficiencies.

52 *Opinion*, pp. 4-5.

53 *Opinion*, pp. 7-8.

executives of the merged entity intended to continue and amplify T-Mobile's "UnCarrier" strategy rather than reduce the company's aggressiveness.

Nevertheless, economics does appear to have played a role: First, there was vigorous engagement on the economic modeling in the regulatory investigations that were conducted by the FCC and DOJ. This likely contributed to -- and shaped the terms of -- the settlements with those agencies. Second, 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 was described above, there was extensive pre-trial expert exchanges on coordinated effects that led to streamlined presentations at trial. Third, the economists who were 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 that would arise 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. Last, despite dismissing much of the expert evidence, the underlying logic of the court's opinion is structured in a way that mirrors the structure that was adopted by the economic experts on both sides; we suspect that this is no accident.

VI. A PREMATURE RETROSPECTIVE

The period between the consummation of the merger and the writing of this chapter (late 2022) provides a window with which to examine post-merger outcomes. At the time of

writing, T-Mobile is widely acknowledged to have the best spectrum portfolio, and its network capacity and speed have increased dramatically as a result of the merger and subsequent investments in its network. In its opinion, the court predicted that "New T-Mobile would likely make use of [its asymmetric capacity] advantage by cutting prices to take market share from its biggest competitors."[54] Leading industry analyst Craig Moffett's July 2022 statement that "The combination of a single telecom operator [T-Mobile] having both the industry's best network and its lowest prices is unprecedented, and we believe paves the way to significant share gains…"[55] suggests that the court was correct.

Figure 2 shows two measures of prices between January 2016 and August 2022. The heavy solid line is the Bureau of Labor Statistics (BLS) Producer Price Index for Wireless Telecommunications Carriers (Wireless PPI) expressed in constant 2016 dollars (that is, adjusted for inflation based on the Consumer Price Index for all Urban Consumers). The Wireless PPI is a measure of average revenue per subscriber for the industry.[56] The lighter solid line is the Consumer Price Index for Wireless Telecommunications Services (Wireless CPI) similarly adjusted for inflation. The Wireless CPI is a measure of the prices available to consumers seeking to sign up for service with a carrier as the sampling date.[57]

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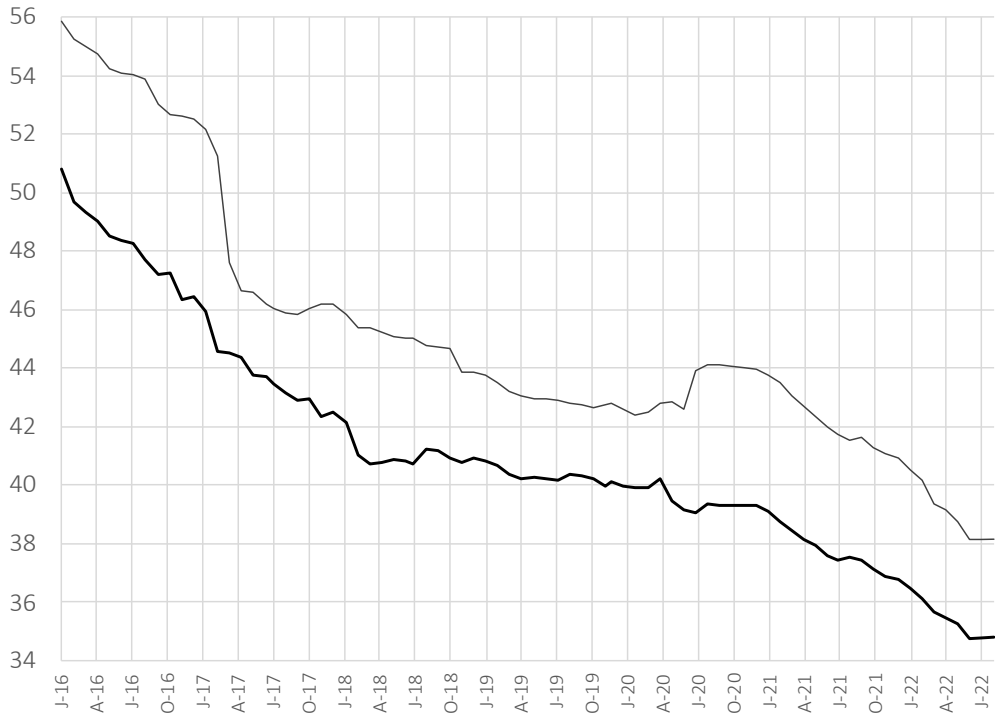
54 *Opinion*, p. 137.

55 https://www.nexttv.com/news/moffettnathanson-sees-cables-q2-broadband-growth-slipping-as-wireless-momentum-continues, accessed 3 October 2022.

56 See https://www.bls.gov/ppi/factsheets/producer-price-index-for-wireless-telecommunications-carriers-naics-517312.htm, accessed 21 September 2022. This URL also discusses sampling, quality adjustments and other measurement details.

57 See https://www.bls.gov/cpi/factsheets/telecommunications.htm, accessed 21 September 2022. This URL also discusses sampling, quality adjustments and other measurement details.

Figure 2: Pre- and Post-Merger Prices



Notes: The heavy line plots the PPI data for Wireless telecommunications carriers as constructed by the BLS (series id PCU517312517312), after adjusting for changes in the aggregate CPI level (using series id CUUR0000SA0) since January 2016. The lighter solid line plots the CPI data for Wireless telephone service as constructed by the BLS (series id CUUR0000SEED03) and similarly adjusted by the aggregate CPI.

The merger closed on April 1, 2020. Three months later, the Wireless CPI jumped up 3.6 percent (in nominal terms). The Wireless PPI exhibited a much smaller increase, which might be expected given that it reflects prices paid under existing, possibly long-term contracts. Given the abrupt price increases followed by the return to the earlier downward trends in both indexes, we conjecture that this increase is the result of removing Sprint pricing plans from the data used to calculate the price indexes, as opposed to price increases by the remaining service providers. Moreover, to the extent that Sprint had been offering lower-quality services than were the other major wireless providers, the BLS data overstate the change in

quality-adjusted prices paid by consumers. The BLS also does not adjust for the benefits of some quality changes (such as the introduction of 5G), which likely means that these indexes further understate the decrease in quality-adjusted real prices.[58] However, absent a baseline for comparison, these data to do not tell us whether prices would have fallen faster or slower if the merger had not been consummated.

The DISH remedy was controversial, with the plaintiffs in the litigation asserting that DISH was unlikely to become a serious competitor. Under the terms of its commitments to the FCC, Dish was required to have built out a 5G network that covered 20 percent of the US population by June 14, 2022.[59] Dish met this requirement and has announced that it is launching a new postpaid brand, Boost Infinite. That said, Dish's subscriber base, as at 2Q 2022 was reported at 7.87 million, which is 1.1 million less than the number of subscribers originally inherited from Boost.[60] Other MVNOs, particularly those associated with leading cable companies, have fared better. Contrary to predictions by the state plaintiffs, Comcast's and Charter's MVNOs offer lower prices than do the three national MNOs, and cable

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58 Similarly, it is unclear from BLS documentation how the CPI and PPI incorporate device subsidies. A recent increase in device subsidies corresponds to a decrease in the overall cost of mobile data services. (See https://www.counterpointresearch.com/cable-players-capture-nearly-one-third-us-postpaid-phone-net-additions-q2-2022/, accessed 4 August 2022.)

59 See https://www.rcrwireless.com/20220615/5g/dish-wireless-buildout-reaches-20-of-u-s-population, accessed 21 September 2022.

60 See https://www.fiercewireless.com/wireless/dish-drops-another-210k-wireless-subs-2q, accessed 21 September 2022.

company MVNOs accounted for almost one-third of postpaid phone net additions in the second quarter of 2022.[61]

VII. TECHNICAL APPENDIX

This appendix provides addition information with regard to the merging parties' demand model, which was estimated as a standard conditional logit model of brand choice with the use of individual-level data on carrier choice and usage (which was provided by the NMP data that were 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 she uses her phone; α_{lb} and α_{tb} capture brand preferences that depend on the individual's location of residence and whether she is a light, medium, or heavy data use type;[62] γ_b captures brand preferences that may depend on consumer demographics that are given by C_i;[63] ε_{ib} is a stochastic term that is distributed type-I extreme value that reflects the determinates of choice that are not

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61 Matthew Orf, "Cable Players Capture Nearly One-third of US Postpaid Phone Net Additions in Q2 2022," Counterpoint Research, *available at* https://www.counterpointresearch.com/cable-players-capture-nearly-one-third-us-postpaid-phone-net-additions-q2-2022/, accessed 3 October 2022.

62 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.

63 The precise configuration of consumer demographics is not publicly available.

included in the model; and β_t are the preference coefficients that govern how much individuals of data use type *t* (light, medium, or heavy) value each network quality product characteristic.[64] The parameter β_t also varies 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.[65]

In the demand model, consumers choose from one of seven brands and an outside option. The seven brands that were modeled directly -- including measuring the network quality that 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.

The utility specification that was 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 that used price -- which is proxied by the average monthly revenue per user -- by carrier, information on margins and the Bertrand-Nash equilibrium conditions (see the section on the

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64 As was noted in 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 her phone.

65 This choice model was estimated directly with the use of maximum likelihood.

merger simulation in the main text above). 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 Table 1.

Table 1: 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), 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.

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