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Testimony of

Doug Brake

Director of Broadband and Spectrum Policy

Information Technology and Innovation Foundation

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An Examination of the T-Mobile and Sprint Merger"

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Chairman Doyle, Ranking Member Latta, and members of the Subcommittee, thank you for inviting me to share the views of the Information Technology and Innovation Foundation ("ITIF") on the pending merger of T-Mobile US, Inc. ("T-Mobile") and Sprint Corporation ("Sprint").

My name is Doug Brake, and I am the Director of Broadband and Spectrum Policy at ITIF, a non-profit, non-partisan research and educational institute—a think tank—whose mission is to formulate and promote public policies to advance technological innovation and productivity internationally, in Washington, and in the states. Recognizing the vital role of technology in ensuring prosperity, ITIF focuses on innovation, productivity, and digital economy issues.

INTRODUCTION AND SUMMARY

ITIF has openly supported the proposed transaction since its announcement with the belief that the merger advances innovative wireless broadband services, offers significant benefits that will ultimately flow to consumers, and presents few concerns in terms of competition.[1] The merger offers significant scale and operational efficiencies that will help accelerate the transition to next generation networks, intensify competition, and bring numerous benefits that flow throughout the economy. A future in which T-Mobile and Sprint are combined is far better future than one in which the two attempt to continue on separate paths.

We are not alone in favoring the proposed combination. Thirteen members of Congress recently wrote to FCC Chairman Pai and Assistant Attorney General Delrahim to say that "this merger will foster greater competition and consumer choice… and help ensure the U.S. remains a world leader in next-generation wireless broadband technology."[2] The members writing in support are correct in recognizing the reality of intermodal competition "as companies in the cable, satellite, wireline, and wireless industries now compete fiercely for broadband consumers."[3] We can expect that competition to likely intensify rather than abate after the combination, offering significant benefits to U.S. consumers and businesses alike. These benefits were also recognized by the New York Public Service Commission, which recently approved the transfer with modest conditions.[4]

Some critics of the merger argue that the government must preserve four operators. We believe this view is mistaken for several reasons. This four-to-three lens also ignores the rapidly differentiating business models in and adjacent to wireless services. Raw connectivity is increasingly commodified and wireless companies are looking to new revenue streams—most notably home wireless broadband; Internet of things (IoT) applications, including connected vehicles and drones; over-the-top video, and advertising—to recoup large ongoing investments. These new business models

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[1] Lindsay Bednar, "ITIF Supports T-Mobile-Sprint merger," ITIF Press Release, (May 1, 2018), https://itif.org/publications/2018/05/01/itif-supports-t-mobile-sprint-merger.
[2] Anna G. Eshoo, et al., "Letter to Chairman Pai and Assistant Attorney General Delrahim," (January 25, 2019), *available at* https://assets.documentcloud.org/documents/5699740/Sprobile.pdf.
[3] Ibid.
[4] State of New York Public Service Commission, "Order Approving Transfer of Indirect Control Subject to Conditions," (Feb. 2019), http://documents.dps.ny.gov/public/Common/ViewDoc.aspx?DocRefId={83427611-4F04-4D0C-AEB0-429D85689C5A}.

built on top of basic Internet protocol (IP) connectivity are likely to keep downward pressure on price for voice, text, and data whether there are three or more facilities operators.

The fixation on four operators also under-appreciates companies on the cusp of wireless entry, such as cable firms, satellite companies, and other potential new entrants. Internet access provision continues to be a highly innovative area. Technologies and business models will likely change as much or more in the next ten years as they have in the past ten.

Even setting aside the dynamism of the market, changing business models, and shifting grounds for competition, we still believe this consolidation to three operators is in the public interest. As a general matter, competition is a means, not an end; if we can achieve an overall wireless system that is more productive and innovative that can be a good thing, even if that requires fewer competitors. Because of the tremendous fixed-cost investments involved in mobile communications, a smaller number of providers can more efficiently provide the needed infrastructure for a given customer base given adequate spectrum resources.

Critics also under-appreciate the specific spectrum synergies teed up for a 5G deployment. T-Mobile's recently acquired 600 MHz spectrum and Sprint's 2.5 GHz spectrum offer complimentary coverage and capacity, respectively. The performance capabilities enabled by the new 5G specification still depend on the type and amount of spectrum it is used with. A mix of low-, mid-, and high- band spectrum will offer the highest performing network. T-Mobile is looking to deploy 5G with their broad-coverage, but limited capacity 600 MHz spectrum. Sprint, on the other hand, has a respectable amount of potential capacity with its mid-band spectrum, but would lack the ability to offer wide-area 5G coverage. This means the combined firm will have the spectrum assets and financial strength to offer a much more robust next-generation network than either one alone.

Despite the FCC's efforts to streamline the deployment of small cells for 5G networks, we are unlikely to see wide-scale deployment of very high-frequency "mmWave" spectrum for mobile services soon. This high-frequency spectrum has relatively limited propagation, which drives up infrastructure cost to cover a given geographic area. There are also remaining engineering challenges in applying massive multiple-input, multiple output (MIMO) and beamforming technologies in a mobile environment (as opposed to fixed wireless). The merger is a unique opportunity to combine synergistic spectrum assets at the beginning of a nationwide deployment of next generation technology that resists comparison to other markets.

Lastly, we have to consider the alternative to this transaction. Sprint, in particular, has been challenged financially, and bankruptcy is a potential possibility. The company was forced to take a significant write down on the Nextel acquisition, and bets on technology, such as WiMAX, have turned out poorly for the company.

A market of three relatively equal-sized companies in terms of subscribers that continue to invest and expand service, capacity, and offerings is a far, far better future than a lopsided market that competes only on price. A combination of T-Mobile, with about 80 million subscribers, and Sprint with about 54 million subscribers would result in a company that would be slightly smaller than its

competitors AT&T and Verizon in terms of total connections.[5] This market structure, with three roughly equal facilities-based firms competing at scale should be preferred to one with two strong providers and two smaller ones, especially as we enter what is expected to be a capital intensive phase of 5G deployment. Combining Sprint and T-Mobile allows the needed scale for the new company to more effectively compete with AT&T and Verizon and expand into adjacent markets.

A COMBINATION WOULD YIELD SIGNIFICANT EFFICIENCIES

Economies of scale are incredibly important for high-performance telecommunications markets focused facilities-based competition, like that of the United States. The duplicative infrastructure of two companies serving the same geographic area can be less efficient than having one provider, and a larger company could also purchase equipment and services and negotiate tower siting at lower prices and pass those savings on to customers.

We should not overlook the significant technological and economic benefits that would come from a larger company and balanced market structure. Increased economies of scale will allow the company to better the recoup large fixed costs that come with operating a wireless network. Not only do these costs include the important capital expenditures required to expand, maintain, and upgrade its network, but also the expenses of developing new offerings and marketing them to consumers.

A combined company would also be able to do more with fewer resources. The companies estimate that the combination will save "approximately $43.6 billion total net present value cost synergies by 2024."[6] Combining and rationalizing network infrastructure, marketing, back-office billing, customer support, storefronts, and other factors of production will allow the companies to drive greater value throughout the business, ultimately passing a significant share of this on to consumers either in the form of lower prices, a higher quality network, innovative new offerings, or likely some combination of the three.

As respected MIT economist Bill Lehr put it, "the proposed merger…would create a third national [mobile network operator (MNO)] with the scale to sustain the maximal extent of facilities-based competition among MNOs that is likely to be economically feasible in the medium to longer-term."[7] Lehr explores the economics of the transition to 5G networks and the potential upside to a broad integration of smart infrastructure with 5G networks. The economics of facilities-based competition (as opposed to having one government-owned or regulated monopoly provider), with high fixed costs, have seen a relatively small number of providers "competing aggressively against one another" which has "sustained a record of performance that includes expanding capacity and falling

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[5] Anna-Maria Kovacs, "Competition in the U.S. Wireless Services Market," Georgetown Center for Business and Public Policy (August 2018), https://cbpp.georgetown.edu/sites/default/files/Policy%20Paper%20-%20Kovacs%20-%20Wireless%20Competition%202018-08.pdf.

[6] Public interest statement at 15.

[7] William Lehr, "Future of Broadband Competition in a 5G World," (T-Mobile Commissioned White Paper, August 2018), https://newtmobile.com/content/uploads/2018/10/William-Lehr-Future-of-Broadband-Competition-in-a-5G-World.pdf.

quality-adjusted prices."[8] Indeed, increased concentration in network industries to some optimal point usually works in the direction of innovation and consumer welfare.

The combined spectrum assets of the two companies are particularly important, with T-Mobile's low-band spectrum acquired in the FCC's recent incentive auction nicely complimenting Sprint's cache of 2.5 GHz licenses. This combination of spectrum is the foundation for a next-generation deployment that combines coverage with considerable capacity, without the capital-intensive deployment of mmWave small cells. Combining the companies makes logical sense to help advance an efficient, high-performance 5G network.

Any analysis that ignores this unique opportunity to rapidly deploy a standalone 5G network misses a core component of the logic driving this combination. The combination of low- and mid-band frequencies available to be deployed without costly repurposing of spectrum already used for 4G can quickly bring the benefits of 5G more rapidly to a wider area, demanding a response from competitors, both other mobile operators and those in adjacent markets. This competition should significantly increase output and accelerate a dynamic marketplace.

ACCELERATED DEPLOYMENT OF NEXT GENERATION WIRELESS WILL HELP ADVANCE U.S. LEADERSHIP IN EMERGING TECHNOLOGIES

Next generation connectivity, 5G in particular, represents a tremendous economic opportunity. A CTIA commissioned report by Accenture estimates 5G will require infrastructure investments by U.S. telecom operators of about $275 billion, and ultimately contribute 3 million jobs and $500 billion in GDP growth to the U.S. economy.[9]

With a deeply integrated global economy, high-tech, high-value-added industries, such as broadband networks and the services that use them, play a crucial role in national competitiveness. While global economic growth is not always zero-sum, one nation losing competitiveness compared to others does indeed mean slower economic growth in that nation. The United States is in a global race to deploy 5G and develop new offerings that take advantage of 5Gs capabilities. Many nations have made 5G deployment a national policy priority, most notably China.[10] Obviously carriers like Sprint and T-Mobile do not compete directly with other carriers abroad, such as China Mobile, likewise, there are not domestic competitors for much of the radio equipment deployed for 5G. However, when it comes to China, it is not a direct competition for 5G networks, but the national competitiveness gains that come with the capabilities others can make use of with advanced wireless technology platforms.

What makes the biggest difference is how well 5G technologies are integrated with the broader IT ecosystem and how the platform enables innovation and productivity gains throughout a nation's

[8] Ibid at 33.
[9] Sanjay Dhar, et al., "Smart Cities: How 5G Can Help Municipalities Become Vibrant Smart Cities," (Jan. 2017), Accenture Strategy, https://newsroom.accenture.com/content/1101/files/Accenture_5G-Municipalities-Become-Smart-Cities.pdf.
[10] David Abecassis et al., "Global Race to 5G – Spectrum and Infrastructure Plans and Priorities," *Analysys Mason* (April 2018), https://api.ctia.org/wp-content/uploads/2018/04/Analysys-Mason-Global-Race-To-5G_2018.pdf.

economy. Consider the leadership of the United States in the initial development of the Internet and widescale broadband adoption. In turn, this head-start enabled tremendous economic growth—for example, through the innovations emanating from Silicon Valley—growth that is an envy the world over.

It is likely the United States will win the "race" for 5G, at least in the sense that it will be first to deploy some version of 5G technologies. However, China has a long-term strategy to deploy 5G at tremendous scale, in part by having Chinese governments provide significant subsidies for network deployment. For a variety of reasons, not the least being federal budget limitations, the United States will rely almost exclusively on the private sector for 5G deployment. And that enterprise will be more successful if the major companies have the scale and resources needed to make the massive investments needed.

It is the later, advanced phase of 5G—where technological components are integrated throughout the entire network, and not just an update to the air interface—that will have the largest spillover effects for the rest of the economy, boosting national competitiveness. Again, it is difficult to justify the investment for wide-scale deployment of mmWave small cells for mobile services soon given its propagation characteristics, related infrastructure cost, and challenges in applying massive MIMO and beamforming in a mobile environment (as opposed to fixed). At the same time, initial deployments of 5G are underway, with industry actively experimenting with business models and new technology. This evolution from 4G to 5G helps explain the discrepancy in projections between various parties commenting on the merger, with some pulling select quotations claiming 5G is far-off or insignificant, and others claiming U.S. is aggressively in the lead on 5G, regardless of the merger synergies.[11] In fact, neither view is true.

The benefits from initial deployments of 5G technologies should not be understated, especially the potential for breakthroughs enabling mmWave fixed wireless to dramatically improve the economics for high-performance wireless home broadband connections. However, the benefits to the economy from incremental improvements will be eclipsed by a full 5G conversion combined with other emerging technologies. For example, the unique performance characteristics of the 5G radio specification enable far denser IoT networks of sensors and actuators with far better battery life. Next generation networking techniques incorporate greater levels of programmability and software-based control, allowing for more agile control of smart city or industrial automation networks and will enable artificial intelligence combining with IoT deployments through software-defined 5G networks.

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[11] For example, some commenters pull quotations from a Huawei executive looking selectively at consumer experience of enhanced download speeds, stating "consumers would find no 'material difference between 5G & LTE.'" Yosef Getachew et al., "Petition to Deny of Common Cause, Consumers Union, New America's Open Technology Institute, Public Knowledge & Writers Guild of America, West, Inc.," WT Docket No. 18-197, at 45 (Common Cause et al. petition) https://ecfsapi.fcc.gov/file/10827862305575/T-Mobile%20Sprint%20Petition%20to%20Deny%20CC%20CU%20OTI%20PK%20WGA.pdf; At the same time, AT&T states "the U.S. is already the world leader in 5G." Comments of AT&T Services, WT Docket No. 18-197, https://ecfsapi.fcc.gov/file/1082768442509/AT%26T%20Comments%20in%20TMUS%20Sprint%208-27-18.pdf.

The end-state of 5G networks clearly will provide important capabilities for new applications to take advantage of. The more legitimate skeptics of 5G are generally concerned that the business models aren't there to justify the investment required, not that the capabilities aren't there. In other words, where will the carriers get the revenue needed to invest in the networks? Public policy should support actions that help bring the vision of next generation network integration to reality, through smart infrastructure modernization, effective spectrum policy, and, in the case of this merger, permitting a sensible market structure rationalization. The FCC has made significant efforts on the first two fronts, and this merger presents the opportunity to strengthen the U.S. market for a competitive transition to next generation networks.

The combination of Sprint and T-Mobile will help accelerate that next phase of 5G deployments through advanced scale and spectrum synergies. The importance of economies of scale should not be underestimated. The efficiencies of providing a service to a larger customer base using the same infrastructure, marketing, billing, support, storefronts, etc. allows for much lower cost for the same or better service. Scale is especially important when transitioning to a new generation of technology that requires considerable infrastructure investment—such as that facing the industry today. This fact is not lost on Chinese actors, who continue to consider a merger of the number two and three carriers: China Unicom and China Telecom.[12] This would bring China's market—with more than triple the population—down to two operators, with each operator having on average half a billion subscribers. Developing scale for 5G deployment to rival or even exceed U.S. deployments is thought to be a core consideration motivating the potential Chinese combination.[13]

Some commenters wrongly claim the difficulties of integrating the two networks outweigh any potential benefits for transitioning to 5G.[14] This is flatly incorrect. These are not like the days of Sprint-Nextel when they struggled technologically to integrate two disparate networks. Today, integration is easier than ever. All vendors make interoperability and interworking a point of pride. The GSM and CDMA split is no longer a serious issue, with voice going to 4G (voice over LTE or VoLTE) or running over the 5G interface, and any integration undoubtedly doing away with 3G infrastructure. T-Mobile has experience integrating a CDMA customer base with MetroPCS, and with advances in technology, this integration will be even easier. Assertions like those from the American Antitrust Institute that the merger would "create costs or inefficiencies for consumers… since the company must transition from two different network technologies" reveal a very poor understanding of the contemporary wireless equipment ecosystem.[15]

The merging parties maintain the transaction will result in an increase in jobs on day one, which could very well be the case. Regardless of the net number of jobs after the merger there will

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[12] Ismail Shakil et al., "China explores merger of carriers China Unicom, China Telecom: Bloomberg," *Reuters* (September, 2018), https://www.reuters.com/article/us-china-telecoms-merger/china-explores-merger-of-carriers-china-unicom-china-telecom-bloomberg-idUSKCN1LK0VQ.
[13] *See* e.g., Shuli Ren and Nisha Gopalan, "A Giant Chinese Telecom Merger, Made in America?" *Bloomberg Opinion* (Sept. 2018), https://www.bloomberg.com/opinion/articles/2018-09-04/a-china-unicom-telecom-merger-would-be-made-in-america.
[14] Petition to Deny of the American Antitrust Institute, WT Docket No. 18-197, https://ecfsapi.fcc.gov/file/1082877863636/AAI_Sprint-T-Mobile_FCC%20Petition%20to%20Deny.pdf.
[15] Ibid.

necessarily be some rationalization, with some duplicate jobs likely being eliminated and others created. However, a focus on the merger's impact on jobs, particularly attacks on the merger for eliminating jobs, is misplaced. The purpose of any particular economic activity is not to be a make-work jobs program (that's how many poor nations, such as India, tend to look at economic activity). Rather, it is to produce the most and best value for society with the least amount of inputs. The fact that productivity has grown in the U.S. economy over the last century means that U.S. standards of living for all workers is higher, not stagnant. Viewing merger policy through the lens of jobs risks turning anti-trust into a jobs program, rather than an economic growth and innovation program. If the combined company can provide competitive wireless services to a larger customer base with fewer employees, this would benefit society by being able to produce the same or more wireless services with fewer societal resources devoted to it, while expanding output in other sectors.

A COMBINED COMPANY COULD ENHANCE COMPETITION IN THE COMMUNICATIONS, TECHNOLOGY, AND MEDIA LANDSCAPE

The combined company could very well advance competition in new areas, most notably broadband access in the home, as well as likely increase competition in the transition to nation-wide 5G wireless networks. The increased capacity of a larger initial 5G deployment will also likely maintain or enhance competition under even more narrow market definitions, such as prepaid wireless.

Critics of the merger do not fully appreciate the synergies of the transaction and take too myopic a view of competition in today's media and communications landscape. Some, such as the 4Competition Coalition, focus narrowly on the number of competitors, decrying this merger as a four to three reduction. We believe this view is mistaken for several reasons.

The Merger Will Likely Accelerate New Modes of Competition

The communications sector is in the midst of dynamic shifts, with consumer preferences changing and new fronts of competition opening up. Historically, the focus of competition in wireless was relatively narrow. Static efficiency ruled the day, with competition between major wireless carriers focused on largely on price of buckets of voice or data, the coverage map of operations, and to some extent the quality of the network. This is quickly changing. With the accelerating convergence on IP networks, what used to be separate services are all provided over broadband, forcing carriers to explore new avenues for revenue, like video, IoT services, advertising, etc. The competitive horizons of wireless companies are expanding, greatly diminishing any potential for anticompetitive coordination.

Wireless is increasingly competing with wired connections for home broadband. The Pew Research Center has for years tracked smartphone dependency, noting "a growing share of Americans now use smartphones as their primary means of online access at home."[16] As of early 2018, about 20 percent of American adults rely on mobile broadband and do not have a traditional wired broadband service at home.[17]

[16] Pew Research Center, "Mobile Fact Sheet" (Feb. 2018), http://www.pewinternet.org/fact-sheet/mobile/.
[17] Ibid.

Some advocates opposing the merger, like Free Press or Public Knowledge, will continue to resist admitting to the increasingly direct competition between wired and wireless broadband service, as this evolving, competitive market contravenes their vision of broadband as a static, natural monopoly utility. Some of these critics wrongly assert mobile broadband is "in no respect adequate as a competitive substitute" to fixed service.[18] This assertion might seem odd to the roughly one in five Americans who have chosen to forego a fixed broadband connection to the home, opting instead for a wireless connection alone. The inability for fixed broadband providers to bring on board twenty percent of the population is clearly a significant disciplining effect, and a shows broadband to the home to be contestable market by wireless even with today's LTE technology. Some complain that smartphones cannot replace computers for tasks like business or homework, but form factor has nothing to do with the way in which connectivity is delivered; a wireless hotspot can easily connect a laptop, desktop, or streaming device. Moreover, it is without doubt that the deployment of 5G wireless connectivity, both fixed and mobile, will be an even stronger competitor to fixed wireline broadband, as the additional capacity drives down the cost of data, increases speeds, and reduces latency.

T-Mobile President Mike Sievert announced in September that the company would launch a fixed wireless offering to 52 percent of U.S. zip codes if allowed to merge with Sprint.[19] Last week, the company discussed the initiation of a pilot program to experiment with LTE fixed wireless to lay the groundwork and develop the business parameters for a future 5G-based deployment.[20] The merging parties assert they will be able "to offer 100 Mbps service to two-thirds of the country."[21] This level of service is much more than adequate for home access replacement. With this level of capacity in the network available to meet demand, the economics will almost certainly see the price of data continue its dramatic decline, to a point where streaming video or other virtual video products can replace a wired connection. The market for wired and wireless broadband are continuing to converge—the merger will accelerate this beneficial process.

This heated competition is not restricted to home broadband but includes video services as well. Video is increasingly provided over-the-top, with many choosing to subscribe to streaming services such as Netflix or Hulu in lieu of traditional cable or satellite packages. T-Mobile appears to be exploring a virtual cable strategy with its acquisition of Layer3 TV. The competition for home broadband and video by wireless providers is not going unnoticed by cable companies, who are now experimenting with entry into wireless service—experiments that are expected to accelerate.

Cable's entry into wireless service is not theoretical or speculative. In fact, some believe cable to be best positioned for providing 5G wireless service, considering the existing extensive cable plant can

[18] Common Cause et al. petition at 44.
[19] Joan Engebretson, "T-Mobile: Sprint Merger Will Unleash New Cable Broadband Competitor Featuring Fixed Wireless," *Telecompetitor* (Sept. 13, 2018) https://www.telecompetitor.com/t-mobile-sprint-merger-will-unleash-new-cable-broadband-competitor-featuring-fixed-wireless/.
[20] Mike Dano, "T-Mobile to Test Fixed Wireless Broadband Using LTE by This Summer" *LightReading* (Feb 2019), https://www.lightreading.com/mobile/5g/t-mobile-to-test-fixed-wireless-broadband-using-lte-by-this-summer/d/d-id/749340.
[21] Public Interest Statement at 13.

be used for backhaul.[22] Again, this is not theoretical but under active development. CableLabs, a global consortium conducting research and development for the cable industry—has been actively developing methods of leveraging cable technology for 5G networks. It has actively studied the economics supporting the use of cable broadband for outdoor small cell deployment, and has established a "Mobile Backhaul R&D Lab" to work on supporting 5G mobile technologies.[23] Both Charter and Comcast already have wireless offerings, relying on extensive WiFi deployments and an agreement with Verizon for capacity as well. Considering Comcast's winnings in the low-band incentive auction, the coming availability of 3.5 GHz shared spectrum, and additional 5 GHz spectrum potentially cleared on an unlicensed basis, the spectrum for a much more robust wireless offering from cable operators is in the pipeline.

Many analysts consider direct competition between wireless and wired broadband providers all but inevitable considering the converging offerings.[24] An aggressive fixed-wireless deployment and video product, like that anticipated by the combined company, would make this head-to-head competition inevitable, with benefits flowing to consumers and businesses.

Wireless is a dynamic, competitive success story in the United States, and exactly what direction it will take next is difficult to predict. The long-term trends are clear, however: more and more services converging over Internet-based platforms, with different access technologies—wired or wireless—providing a similar basic bundle of services and competing on added value. In this world, wireless networks need more backhaul, functioning like wired networks except for last few hundred feet, while cable networks continue to deploy WiFi access points and explore wireless business models. A combination would likely accelerate this trend, likely intensifying competition.

The Merger is Unlikely to Harm Existing Markets

Some opposing the merger seem to think that fewer competitors is necessarily and always bad, despite this flying in the face of accepted economics of the operation of high-fixed cost network industries. Some commenters simply count the number of wireless providers, seeming to assume that more providers is necessarily better. Others try to define the market in even more narrow terms, examining only wholesale or prepaid markets.

Mobile Connectivity Output Will Likely Expand

In comments to the FCC, the American Antitrust Institute characterized the reduction from seven to four mobile carriers as a "troubling history."[25] This view is misplaced. Competition in high-fixed

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[22] Mike Farrell, "Analyst: In Wireless 'Clash of the Titans,' Cable Wins" *Multichannel News* (February 2018), https://www.multichannel.com/news/analyst-wireless-clash-titans-cable-wins-418124.
[23] Joey Padden et al., "DOCSIS Network vs. Fiber BackHaul for Outdoor Small Cells" *CableLabs* (Jan 2019), https://www.cablelabs.com/docsis-vs-fiber-backhaul-outdoor-small-cells; Jennifer Andreoli-Fang, "DOCSIS Technologies for Mobile Backhaul" *CableLabs* (May 2018).
[24] E.g., Zacks Equity Research, "Is Telecom-Cable TV-Media Convergence Inevitable?" (Nov. 2017), https://www.zacks.com/stock/news/282861/is-telecomcable-tvmedia-convergence-inevitable.
[25] Petition to Deny of the American Antitrust Institute, WT Docket No. 18-197, https://ecfsapi.fcc.gov/file/1082877863636/AAI_Sprint-T-Mobile_FCC%20Petition%20to%20Deny.pdf.

cost industries like telecommunications is not an unalloyed good.[26] A market can of course have too few competitors, resulting in monopoly prices or reduced output. But it can also have too many, resulting in fragmentation and wasteful duplication of resources. There is a reason there are fewer network operators than, say, drycleaners in the United States. Increasing the number of facilities-based competitors beyond a certain point results in redundant infrastructure costs to serve the same population, ultimately meaning higher costs for society and often higher prices for consumers.

At the same time, that doesn't mean fewer competitors is always better either. Too few competitors undermines the dynamic, competitive process that drives investment and development of new technology. It is important to strike the right balance when it comes to competition in high-fixed cost industries like communications. The optimal number of competitors for wireless services is hard to say, but four is not necessarily better than three.

The unlikely prospects of a vigorous return of Sprint to competitive even footing, and the fact that this merger will produce three firms of roughly equal size in terms of subscribers, strongly suggest that a reduction to three firms is in the public interest. Reducing the fragmentation of four uneven providers to three healthy competitors will result in a more efficient use of resources, expand output compared to the status quo, and demand a response from competitors and potential competitors alike.

The Merger Should Enhance the Wholesale and Prepaid Market Segments

Two narrow segments of the wireless market warrant special discussion: wholesale and prepaid customers. Wholesale buyers of capacity do business as so-called mobile virtual network operators (MVNOs). The unregulated wholesale market is a sign of health in the existing wireless system. MVNO access plays an important role in the wireless market, and carriers should continue to offer robust wholesale service after the merger. MVNO providers allow room for innovations in business model or pricing plans without adding costly, duplicative infrastructure.

Those skeptical of the merger often seek to analyze this market as even narrower than national mobile carriers, examining at the wholesale or prepaid segments of the market, mostly because T-Mobile and Sprint have historically been leaders in these segments. Critics assert that the "merger would negatively impact the wholesale market" and point simply to an increased Herfindahl-Hirschmann Index (HHI) in the wholesale market, for example.[27] However, this view misunderstands the role of MVNOs in the wireless market. There is nothing magical about the number four that ensures a flourishing wholesale market. Rather, MVNOs allow for efficient price discrimination that brings lower-margin customers onto the network with relatively little marginal costs to operators.

Selling wholesale capacity to MVNOs allow operators to see a return on their infrastructure investment without taking on the cost of developing alternative pricing plans, advertising, branding, customer support, etc. With the additional capacity unlocked by combining the

[26] *See* Robert D. Atkinson, "Economic Doctrines and Network Policy" Information Technology and Innovation Foundation (Oct. 2010), https://itif.org/publications/2010/10/04/network-policy-and-economic-doctrines.
[27] Common Cause et al. petition at 33.

infrastructure and spectrum assets of the two companies, it is unlikely the new firm would have any interest in restricting this mutually beneficial arrangement. Indeed, Tucows, owner of the MVNO Ting Mobile, is "generally in favor of this merger and believe it provides more benefit than detriment," stating "we think the T-Mobile/Sprint merger makes strong business sense and will generally benefit most stakeholders."[28]

There is also good reason competition in the prepaid market will continue to be vigorous after a merger. First, it is important to note the distinction between prepaid and postpaid segments has gotten less significant in recent years given changes in market offerings. As a popular consumer guide to purchasing wireless services explains, "The line between postpaid and prepaid service has gotten blurrier as carriers have done away with mandatory contracts, subsidized phones and extra charges for going over your monthly data allotment (if you even have one, now that carriers are pushing unlimited data plans)."[29]

Although historically T-Mobile has been the leader in prepaid services, since the second half of 2017, AT&T has been the fastest growing prepaid carrier, now serving nearly 30 percent of the prepaid market.[30] This market segment is dynamic and subject to market competition as much as postpaid offerings. While prepaid customers tend to provide lower margins to providers, the economics of these networks will support continued downward pressure on price for prepaid services. Communications network economics are typified by high up-front fixed costs in deploying the infrastructure. After the network is deployed, the marginal cost of providing service to additional users in the served footprint is relatively low. Even if prepaid or wholesale customers provide relatively low margins compared to wealthier consumers who buy more data, there is little reason to forgo these customers entirely when there is little marginal cost to bring them on board, especially if through an MVNO.

As long as there is capacity available on the network, every additional customer—even low-margin wholesale or prepaid customers—help pay down the up-front cost of the infrastructure. The only reason to not pursue every last additional customer would be if a carrier's capacity was so constrained (likely due to limited spectrum availability) that it choose to only pursue higher-margin customers The additional capacity available with a broad deployment of 2.5 GHz means that T-Mobile would still be well incented to bring each available customer on board to fill the available capacity, even those that are less willing or able to pay.

Technological advancements continue to make it easier to change wireless providers. Lower switching costs and easy number portability allow customers to follow the best deal, but also allows MVNOs to maintain negotiating power. One tool that will continue to ensure a healthy, unregulated MVNO market through lower switching costs is the electronic subscriber identification module or

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[28] Letter from Elliot Noss, CEO Tucows, WT Docket No. 18-197 (August, 2018), https://ecfsapi.fcc.gov/file/108271466430750/FCC%20Letter%20re%20Sprint-TMO%20Merger.pdf. Tucows also supported eSIM adoption and other requirements that allow MVNOs to use multiple networks.
[29] Philip Michaels, "Prepaid vs Postpaid Phone Service: What's Better for You?" *Tom's Guide* (Mar. 2018), https://www.tomsguide.com/us/prepaid-vs-postpaid-phone-service,review-5269.html.
[30] Mike Dano, "The U.S. Wireless Industry in 14 Quick Charts," *FierceWireless* (Nov. 2018), https://www.fiercewireless.com/wireless/u-s-wireless-industry-14-quick-charts.

"eSIM." This new specification allows for remote provisioning of SIM data, so users do not have to physically insert SIM cards to change operators.

CONCLUSION

There is little reason to think the new combined company would deviate from its maverick reputation. With market share always to be tussled over, and avenues for new revenue streams and increased differentiation among providers, there is no reason to fear a dystopian, sclerotic, price fixing future. In fact, just the opposite: The added scale of a combined Sprint and T-Mobile, especially with the complimentary spectrum assets, would mean an accelerated transition to next-generation networks, expanding output and likely provoking a competitive response. Considering the pace of innovation and change in this sector, regulators should be cautious of chasing narrow, static efficiencies over allowing a dynamic market to innovate at an appropriate scale. This merger is in the public interest and should be approved.

Doug Brake
Director, Broadband and Spectrum Policy
Information Technology and Innovation Foundation
1101 K Street NW, Suite 610
Washington, DC 20005