

An Analysis of the Proposed Merger of T-Mobile and Sprint: T-Mobile and Sprint Cannot Keep Their Promises to Maintain Their Prices and People's Employment

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I. Introduction

In April 2018, T-Mobile US, Inc. ("T-Mobile") and Sprint Corporation ("Sprint") requested approval from the Federal Communications Commission ("FCC" or "Commission") to join together to form "New T-Mobile.". This proposed merger would bring together the US's third and fourth largest wireless services providers. The proposed merger is fairly promising, as it promises to enhance the US' citizens' welfare. T-Mobile and Sprint claim that the New T-Mobile would develop 5G technology in three years after the merger and would provide 5G service coverage for about 97% of the US population. This also would incite rival companies to invest in mobile wireless capacity, thus the prices for data per gigabyte would decrease. T-Mobile and Sprint promise to establish a world-class nationwide 5G network that could surpass AT&T and Verizon networks, helping the US to continue to lead and influence the world. They also declared that the merger would bring about thousands of additional American jobs because of new networks and developed segments, as well as customer care services, after the merger.

We are skeptical about T-Mobile and Sprint's affirmation because their promises are doubtful and packed with of loopholes. We will analyze the proposed merger between T-Mobile and Sprint with respect to their vows to maintain the prices and keep jobs. The paper is organized as follows. Section II demonstrates a model calibration from the data of

the wireless industry to examine how much the marginal cost has to decrease if T-Mobile and Sprint fulfill their promises to maintain the price. Section III discusses how lowering the marginal cost is hard for New T-Mobile to implement. Finally, our conclusions are presented, with a brief discussion on our opposition against the merger.

II. Model

Based on the data on 2018 Q2, T-Mobile and Sprint have 30 million prepaid subscribers, which take 55% in total prepaid subscribers of AT&T, T-Mobile, Sprint and Verizon. Also, in the low-income population, whose annual income is less \$50,000, 46% of them choose whether T-Mobile, Sprint, or their subsidiaries.¹ Therefore, if the merger will raise the price, it will badly harm those people. To have a clear assessment of how the sensitivity of price to the merge, we apply the Bertrand model to calculate the change in price after the merge.

1. Data and Calibration.

In our model, we mainly considered the four major companies and their subsidiaries. Our data are from the Mobile-wireless competition (20th Annual). Due to the lack of data in the report, we only consider four major companies, AT&T, T-Mobile, Sprint and Verizon, and we include their subsidiaries in each company.²

With the data, we first calibrate the coefficients of the model. The general form for the demand function for firm i is

¹ Cited from page 6, 7 in An Economic Analysis of the T-Mobile - Sprint Merger, March 12, 2019, <https://docs.house.gov/meetings/JU/JU05/20190312/109053/HHRG-116-JU05-Wstate-WallstenS-20190312.pdf>

² Margin are found from Chart II.D.1, page 24; quantity are found from Table II.B.1, and we used data for 2016; and price are found Chart III.A.1, page 40 in Mobile-wireless competition (20th Annual), September 27, 2019, <https://www.fcc.gov/document/fcc-releases-20th-wireless-competition-report-0>

$$q_i = \alpha_i + \sum_{j=1}^n \beta_{ij} \cdot P_j$$

With price and price-cost margin knowing, we can calculate the cost per subscriber c_i for each firm, and the formula for calculating cost is

$$c_i = (1 - m_i) \cdot P_i$$

Then, we are able to calculate β_{ii} for firm i , which is change in quantity responding to price P_i , and the formula for calculating it is

$$\beta_{ii} = - \frac{Q_i}{P_i - c_i}$$

After we get β_{ii} , we next calculate the coefficient $\beta_{ij, j \neq i}$, which is the change in quantity responding to price $P_{i, j \neq i}$, and the formula for calculating it is

$$\beta_{ij} = - \beta_{ii} \cdot \frac{Q_j}{\sum Q - Q_i}$$

With all coefficients β known and quantity known, we can calibrate α_i for firm i , and the formula for calculating it is

$$\alpha_i = q_i - \sum_{j=1}^n \beta_{ij} \cdot P_j$$

Therefore, we can get the demand functions for each firm. With the demand functions, we can simulate the change in price after merger.

$$q_{AT\&T} = 148405.108 - 3077.2302P_1 + 1021.08062P_2 + 1219.06357P_3 + 1460.26654P_4$$

$$q_{T-Mobile} = 63297.3876 + 688.902766P_1 - 2583.1163P_2 + 537.92451P_3 + 644.357837P_4$$

$$q_{Sprint} = 110990.867 + 827.111604P_1 + 540.955076P_2 - 2976.0516P_3 + 773.629996P_4$$

$$q_{AT\&T} = 78026.6376 + 1561.21584P_1 + 1021.08062P_2 + 1219.06357P_3 - 2878.2544P_4$$

2. Change in Price After Merge.

Because this is a horizontal merger, the profit functions for the T-Mobile and Sprint after merge are the sum of the profit of original T-Mobile and Sprint, while the profit functions of AT&T and Verizon remain the same. The profit functions are

$$\pi_{AT\&T} = (P_1 - c_1)q_1$$

$$\pi_{T-Mobile} = (P_2 - c_2)q_2 + (P_3 - c_3)q_3$$

$$\pi_{Sprint} = (P_2 - c_2)q_2 + (P_3 - c_3)q_3$$

$$\pi_{Verizon} = (P_4 - c_4)q_4$$

To calculate the optimal prices for each firm after the merger, we take the partial derivative with respect to the price of each firm. With the chain rule, we can get the derivatives of profit, and we can set them equal to zero to receive the price that optimizes the profit.

$$\frac{\partial \pi_{AT\&T}}{\partial P_1} = q_1 + \beta_{11}(P_1 - c_1) = 0$$

$$\frac{\partial \pi_{T-Mobile}}{\partial P_2} = q_2 + \beta_{22}(P_2 - c_2) + \beta_{32}(P_3 - c_3) = 0$$

$$\frac{\partial \pi_{Sprint}}{\partial P_3} = q_3 + \beta_{33}(P_3 - c_3) + \beta_{23}(P_2 - c_2) = 0$$

$$\frac{\partial \pi_{Verizon}}{\partial P_4} = q_4 + \beta_{44}(P_4 - c_4) = 0$$

Based on the results from simulation, we notice that the price will increase by 6%. However, T-Mobile and Sprint claim that the merger will help decrease the cost, which will decrease the price. Thus, we ran another simulation to test how much the margin cost has to be reduced for the new T-Mobile. The methodology we apply is a simple for-loop. We start from 0% reduce in margin cost to 100% reduce in margin cost (impractical) with 0.1% increase in each step. The for-loop will stop if the new optimal price is equal to the original cost. The psedo code for it is

for i = 0% to 100%

$$c_{t-mobile} = (1 - i)c_{t-mobile}$$

$$c_{t-mobile} = (1 - i)c_{t-mobile}$$

Solve for optimal price for each firm $p_{AT\&T}, p_{T-Mobile}, p_{Sprint}, p_{Verizon},$

if $p_{T-Mobile} = P_{Original T-Mobile},$

Exit the for-loop and return the new prices.

By applying this methodology in Excel Macro, we find that the T-Mobile and Sprint have to reduce the marginal cost by 18% so they can remain the price unchanged.

3. Result and Problems

Based on the results from simulation, we find that the merger will raise the price by 6%, and to remain the price the same with before merger, T-Mobile and Sprint have to reduce their marginal cost per subscriber by 18%. In their proposal for the merger, we noticed that they also promised to promote infrastructure in rural areas to increase the wireless connection speed and promote 5G. Based on the data provided, it is suspicious if they can keep their promise. Considering the raise in price will harm the low-income population badly, we hold a negative attitude toward the merge.

However, there are some problems are not included in our model and they may provide positive support to the merger. Firstly, we did not consider the effect of increasing number of spectrum in reducing cost. The merger will integrate the spectrums of T-Mobile and Sprint, and it will help the new T-Mobile to offer service with same or better quality with lower cost. But this information is confidential in the transaction proposal and we do not have enough time to create a model for it, we do not know how much it will help reduce the cost. Secondly, due to lack of data, we did not separate the prepaid service from postpaid, so we could not have a clearer information about the effect of merger on the prepaid, which are the most common choice for low-income population. Thirdly, according to the latest update, Sprint may sell its prepaid service, Boost. We could not find enough data to make the simulation for this condition. Finally, our data are from 2016, which is quite out of date. The progress in Technology during these years have reduced the marginal cost, so T-Mobile and Sprint may not reduce that much cost. But the latest information is confidential in the transaction proposal, so we could not update our model.

III. Other Pressure on Lowering Marginal Cost

5G technology infrastructure

New T-Mobile shows a strong interest and an attempt to offer 5G services to its customers, as other mobile operators do. However, it is not plausible for New T-Mobile to be able to maintain the prices for their services while investing in the implementation of 5G technology. This is because a) 5G requires a big amount of initial investment in infrastructures and b) continuous installation of new facilities is necessary to maintain the demand and quality of services in areas with high networking traffic density. A report from McKinsey & Company³ states that it will be required for the operators to introduce Radio access network(RAN) infrastructure and increased fiberization. They show that initial installation of 5G technology can be accomplished by upgrading the the current infrastructures for 4G. Furthermore, this upgrade does not seem to satisfy customers for a long time. The report projects that this in 2020, the operators would not be capable of meeting users' demands for 5G in more than 50 of the cities. The initial technical upgrade is already a big investment, yet it does not end there. On top of that, they would need additional brand new facilities such as an advanced indoor antenna system for meeting increasing demand in 5G and for offering a better quality of services in 5G in areas with high network traffic density such as New York City. Given these facilities being new installments, it is possible that they would require a larger amount of investment at the time of 2020 when they start running out of their 5G capacity enabled by the initial investment. Taken this time frame into consideration, their promise of not raising prices for three years after

³ Reference from
<https://www.mckinsey.com/industries/telecommunications/our-insights/the-road-to-5g-the-inevitable-growth-of-infrastructure-cost>

the merger is not_credible because of the need for initial and continuous investments in 5G technology.

Rural Area Investment - In-home Broadband Service

In T-Mobile and Sprint's proposal, they promise to generate a brand new low-priced and high-quality option for in-home broadband service. They claimed that New T-Mobile would provide fixed in-home broadband service of at least 25/3 Mbps to 52.2 million rural residents over two million square miles, which is approximately 84.2 percent of rural residents.⁴ They also assert that New T-Mobile's in-home broadband service offering would lead to substantial competition to broadband incumbents.

However, we assume that these are just empty promises. First of all, it is difficult for New T-Mobile to maintain the prices or offer cheap-priced services to the US and particularly the rural area. They need to invest in a lot more infrastructures to develop in-home broadband service since T-Mobile currently has not owned any broadband services yet. At present, Sprint does provide broadband service, but it is merely considered a "residential" broadband provider in the US since it now has fewer than 1 million subscribers, which is a really low number compared to 329 million population in the US (2019).

Secondly, it is also crucial to mention that it is hard for New T-Mobile to compete with existing conventional in-home broadband products in the US. T-Mobile and Sprint insist that the in-home broadband segment today is not competitive. They claim that almost half of US' households lack competitive choices of in-home broadband service exceeding 25 Mbps. The New T-Mobile would deliver high-speed broadband with speed exceeding 100 Mbps to alter the dynamic. Nevertheless, there are about fifteen large broadband providers

⁴ Description of Transaction, Public Interest Statement, and Related Demonstrations, June 18, 2018
<https://newtmobile.com/wp-content/uploads/2018/06/T-Mobile-Sprint-Public-Interest-Statement.pdf>

in the US with a huge number of subscribers such as AT&T Internet Services, Cable One, CenturyLink, Comcast High Speed Internet (Xfinity), Frontier Communications, Verizon High Speed Internet and so on. The average download speed over fixed broadband in the US was about 96.25 Mbps (2018), with the fastest fixed broadband provider Xfinity with the downloading speed of 104.67 Mbps and the second fastest Verizon with the downloading speed of 102.57.⁵ The in-home broadband market is not as un-competitive as T-Mobile and Sprint claim, and we doubt that the emergence of New T-Mobile in-home broadband services would be able to change any dynamic. Even a large provider like Xfinity only provide internet coverage for 39 states, so it is unlikely that New T-Mobile could deliver high-speed broadband services to two-thirds of the US population by 2021 and 90 percent of the US population by 2024 as T-Mobile and Sprint claim.

IV. Employment

According to a study that Klaus Gugler and Burcin Yurtoglu published in 2004 in the International Journal of Industrial Organization, M&A diminished labor demand by 7.9% in continental Europe and a 12.4% reduction in labor demand in the United Kingdom. Even though there was no systematic evidence of employment losses in M&A in the United States, we still not guarantee if there will not be a negative effect on employment because of the merger.⁶ In this specific T-mobile and Sprint case, the welfare of retail store workers will be strongly influenced.

Sprint and T-mobile claim that the merger will create more job opportunities by building new stores for the new company, building 5G consumer service centers. They also

⁵ Speed Test Results, United States, 2018 <https://www.speedtest.net/reports/united-states/2018/fixed/>

⁶ Cited from <https://www.forbes.com/2010/02/07/mergers-acquisitions-layoffs-jobs-business-oxford.html#77674d511506>

need to hire more 5G engineers to help develop the 5G technologies. John Legere, CEO of T-mobile, noted the company will add 3,000 more jobs in the first year after the merger and 11,000 more by 2024. He said those positions will help the combined operator grow as it builds new retail stores, expands its network and enters new business segments.⁷ Sprint and T-Mobile have said their combined business would create jobs from the first day of a merger, though they have acknowledged there would be duplication among jobs. Thus, it is very possible that the promise they made about employment could be a fake promise. The Communications Workers of America has argued that the merger would eliminate more than 28,000 jobs, mostly from closing retail stores.⁸ Furthermore, comparing to normal workers, who are relatively not highly educated, the new company after the merger needs more highly educated workers since the company needs to work on the 5G technology more efficiency.

Moreover, even though there is no job loss, rather, an increase in job opportunities, as T-mobile and Sprint claimed, retail store workers' welfare is also influenced negatively because of a wage decrease. A report published by Adil Abdela and Marshall Steinbaum indicated that not only retail store workers in T-mobile and Sprint will receive a decrease in payment after the merger, but also retail store workers in AT&T and Verizon.⁹

Adil Abdela indicates that employment has become more concentrated and the wages for retail store workers in electronics and wireless industries have been stagnant given the low unemployment rate. They brought up "monopsony power" as the explanation of this situation. The monopsony power goes along with market concentration, and the

⁷ Cited from

<https://www.mobileworldlive.com/featured-content/top-three/sprint-t-mobile-execs-tackle-merger-job-concerns/>

⁸ Cited from <https://www.kansascity.com/news/business/workplace/article223105155.html>

⁹ Reference <https://www.epi.org/publication/labor-market-impact-of-the-proposed-sprint-t-mobile-merger/>

stronger the monopsony power a company has, the stronger it can control its employment pay. That is, the more concentrated a market is, the less welfare is guaranteed for the workers. In this case, they expect that the labor markets for the retail workers who would be affected by the Sprint-T-mobile merger are monopolized. They construct an estimate earnings-concentration regression equation to observe how earnings would change given a change in concentration due to the merger, holding everything else constant and find a union wage decrease for retail workers. The top 10 commuting zones that would be influenced the most are shown below

10 commuting zones with the largest predicted decline in retail wireless worker weekly earnings from a Sprint–T-Mobile merger

Rank	Commuting zone	Azar et al. (OLS)	Azar et al. (IV)	Benmelech et al.	Rinz
1	<i>Wenatchee, WA</i>	-\$46.03	-\$151.95	-\$24.33	-\$39.49
2	<i>Atlanta, GA</i>	-\$29.38	-\$96.63	-\$15.13	-\$25.22
3	<i>Newark, NJ</i>	-\$26.11	-\$86.05	-\$12.32	-\$22.40
4	<i>Philadelphia, PA</i>	-\$24.01	-\$79.14	-\$11.74	-\$20.61
5	<i>Dallas, TX</i>	-\$23.64	-\$77.65	-\$13.31	-\$20.29
6	<i>Chicago, IL</i>	-\$22.77	-\$74.71	-\$11.89	-\$19.54
7	<i>Wichita Falls, TX</i>	-\$22.14	-\$72.56	-\$11.58	-\$19.01
8	<i>St. Louis, MO</i>	-\$21.50	-\$70.61	-\$10.64	-\$18.45
9	<i>Washington, DC</i>	-\$19.73	-\$64.90	-\$9.63	-\$16.93
10	<i>Kansas City, KS</i>	-\$19.55	-\$64.14	-\$9.76	-\$16.78

Source: Authors' calculations based on data from Change to Win 2018 and earnings data from the Quarterly Census of Employment and Wages. Data columns show change in labor market concentration and worker earnings using estimated effects of labor market concentration from Azar, Marinescu, and Steinbaum 2017 ("Azar et al."); Benmelech, Bergman, and Kim 2018 ("Benmelech et al."); and Rinz 2018. See text for details.

Besides, both of T-mobile and Sprint had records violating the U.S. labor law before. T-Mobile has been guilty of violating U.S. labor law six times since 2015 and has been

subject to approximately 40 unfair labor practice charges since 2011. Sprint's violation of workers' rights dates back to the landmark La Conexion Familiar case in which Sprint fired 226 employees and closed its Spanish-language telemarketing center in San Francisco to avoid a union election.¹⁰ Therefore, there is enough reason to doubt the promise of not causing unemployment made by T-mobile and Sprint.

V. Conclusion

Based on the data provided and the simulation model generated by the data, the price will increase 6% after the merger, or they need to reduce their marginal cost by 18% to maintain the price unchanged. However, we do not see the possibility of the 18% marginal cost decrease feasible because of their need for investment in rural areas in terms of the 5G infrastructure and broadband service development. Moreover, the merger will further influence the welfare of retail store workers in the wireless industry by cutting jobs or lowering wages. We do not believe that T-mobile and Sprint can keep their promises and therefore against the merger.

¹⁰ Cited from <https://www.tmobilesprintfacts.org/jobs>