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The Great 5G Race: Is China Really Beating the United States?

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Fearmongers claim the 5G sky is falling: China is way ahead, and drastic measures are needed to catch up. But these claims are often based on poorly understood comparisons of 5G deployment. China's 5G stats can paint a misleading picture if taken at face value.

KEY TAKEAWAYS

- China's reporting of 5G "package subscribers" should not be conflated to mean the number of 5G users. Not every 5G subscriber has a 5G-capable device, nor does every 5G subscriber actually have access to a 5G network.
- China's mobile operators tend to count base stations, whereas U.S. operators report physical sites. Usually there are multiple base stations for each cell site or tower, so it's important not to conflate these numbers.
- A larger 5G network does not guarantee superior network performance. All else being equal, China will need roughly 4.5 times as many cell sites as the United States to support its substantially larger population.
- Adjusted by the size of population served, the U.S. and China have a similar deployment pace. In 2019, the U.S. companies built 1 cell site for every 7,134 people; China is projected to build about 1 site for every 6,965 people by the end of 2020.
- China's 5G ambitions should not be underestimated. The country's fast-tracking of network deployment demonstrates its commitment to the industries of the future. But accurate comparisons of deployment stats show there is little reason to panic.

INTRODUCTION

5G is expected to provide the connective tissue for many emerging technologies critical to productivity, innovation, and national competitiveness. Some commentators have panicked over the so-called "race" for 5G, pointing in fear at China's hundreds of thousands of new base stations, and projections of hundreds of millions of 5G subscribers this year alone.

But if we are going to base policy decisions on this race (and it is questionable that we should), understanding how infrastructure and subscription numbers are actually counted matters. A closer look reveals that China's wireless infrastructure and subscriber numbers are not as impressive as they may first appear: By counting anyone on a 5G plan—even if they only have a 4G device connecting to 4G infrastructure—as a 5G subscriber, and measuring individual base stations instead of cell sites, China's 5G stats can paint a misleading picture. This misleading picture leads to the interpretation that the sky is falling.

THE SKY IS FALLING: CLAIMS THAT CHINA IS BEATING THE UNITED STATES AT 5G

One can barely scan a technology news site without reading that the United States is losing to China in 5G, and that this will mean economic catastrophe. Headlines such as "China's Dominance Of 5G Networks Puts U.S. Economic Future At Stake" and "China's growing 5G dominance is a disaster for US security" keep policymakers on edge when considering how the United States should move forward with the next generation of wireless.[1] The fear is that the first country to build 5G networks will have a head start in developing the emerging technologies that depend on 5G's low-latency, high-throughput wireless connectivity. As Attorney General William Barr put it, "China's success in 5G infrastructure is also translating into advantages in a range of new technologies associated with 5G."[2] He claimed, "Within the next five years, 5G global territory and application dominance will be determined," and "the stakes for the United States could not be higher."[3]

Are these Chicken Littles to be believed? Certainly, China has advantages in deploying 5G infrastructure, with state-directed companies making investments that market actors might not. But it is important we have a strong understanding of the metrics of Chinese 5G deployment, and the methodology for counting before calling the 5G race.

5G USERS VERSUS SUBSCRIBERS

Many reports likely overstate the extent of Chinese 5G deployment for several reasons. Part of this is likely due to intentional inflation of statistics reported by operators under pressure from Chinese authorities. This is a long-standing practice in China, going back at least as far as Mao and agricultural communes reporting fake crop yields so as not to displease leadership.[4] And today they are not unique to the telecom sector, as organizations of all kinds inflate numbers in order to meet Beijing's expectations. The Ministry of Industry and Information Technology (MIIT) put out a statement encouraging telecommunications providers to "accelerate user migration to 5G through measures such as package upgrade offer, and credit purchases, etc."[5] Providers then started encouraging or even forcing customers to upgrade to 5G subscriptions regardless of their actual need, use, or device.[6] Some companies reduced 5G subscription prices so much they are even cheaper than staying on a 4G plan.[7] As one reporter put it, "[W]ith all of China's big telcos

slashing 5G package prices in the past few months, it could well be that customers are being drawn in more by attractive tariffs than by a desire to get their hands on the latest hardware and its related capabilities."[8] The push for 5G subscribers was evident before 5G was even activated: Although 5G service was not turned on in China until November of 2019, Chinese telecom providers listed 9 million 5G users in October 2019, a month prior to its actual activation.[9]

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Apparently, the numbers game went too far, as the MIIT later called upon providers to "clean up" reporting and end aggressive sales practices after news of subscriber inflation spread.[10] But current numbers are still plagued with confusion. Consider that China Telecom and China Mobile (the two largest operators in China) reported 150 million "5G package customers" as of September 2020. But according to China's Academy for Information and Communications Technology, only 94 million 5G devices had been shipped for all of China during the same time frame, indicating a sizable gap between the number of "subscribers" and actual 5G users.[11]

The discrepancy may be due largely to terminology: "5G package customers" is a blanket term often used by Chinese carriers to refer to anyone on a 5G subscription, regardless of whether they actually have a 5G device or access to a 5G network.[12] China Mobile acknowledges that they count anyone "who has subscribed to 5G tariff plans" as a 5G customer.[13] The number of 5G-capable devices alone is impressive, and the competitive threat from China justifies a thoughtful policy response, but no one should be worked into a panic by goosed stats.

NETWORK DEPLOYMENT: BASE STATIONS VERSUS CELL SITES

Subscriptions are not the only potentially misunderstood stat. Chinese operators tend to count mobile infrastructure differently from how Western operators generally do. The key difference is between cell sites (how U.S. telecommunications operators typically measure deployment) and base stations (how Chinese telecommunications operators typically measure deployment). A cell site usually refers to the entire area of a given tower, which includes potentially multiple base stations and antennas using different spectrum. The term "base station" generally refers to the equipment each carrier uses to send signals over multiple antennas at the cell site. Often one cell site will have multiple base stations, sometimes it will host only one. But generally, it is not a one-to-one conversion between base stations and cell sites or towers; It is important that these numbers are not conflated to mean the same thing.

Deployment figures are often further mischaracterized because of the way Chinese operators sometimes count each spectrum band as a separate "logical" base station instead of actual pieces of equipment.[14] Just like how a Wi-Fi router can work on different spectrum (generally 2.4 GHz and 5 GHz), a mobile base station can operate on multiple spectrum bands. American carriers would generally count a multi-spectrum base station as at most one piece of equipment. But some Chinese reporting apparently treats each individual spectrum band a base station supports as a different "logical site."[15] A representative from Huawei explained that "a China Unicom base station supports GSM 900, GSM 1800, WCDMA 2100 and LTE. Most of the

equipment is deployed in the same room at one physical site, but there are four bands, so there are four logical sites."[16]

As a result, Chinese numbers could easily be misrepresented as three to four times higher compared with how Western operators tend to count equipment.[17] Policymakers and the media should take care not to conflate estimates of base stations for logical sites with actual, physical cell sites—these are two totally different measurements. For a rough comparison, it seems fair to assume two or three base stations per cell site, but the number of logical sites—meaning each spectrum band used—could be many more.

ACTUAL PERFORMANCE

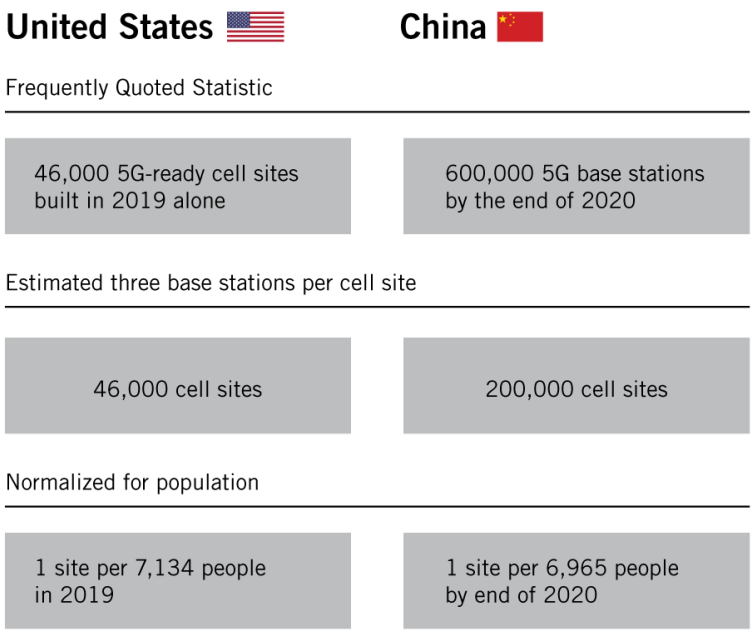
The raw number of base stations is not always a good measure of a network's performance. What we really care about is a network's performance for the population it covers. Measuring performance becomes increasingly complicated with 5G's diverse spectrum assets, some of which do not use the traditional cellular architecture.

The utilization of different spectrum resources or amounts of bandwidth results in varying levels of performance even with equal levels of infrastructure. This is relevant when comparing China, which so far uses exclusively mid-band spectrum for 5G, with the United States, which has made a large push to focus on high-band coverage. High-band 5G offers the highest performance leap over existing networks, at least where it is available.

But that being said, let's try a rough comparison, assuming the similar spectrum assets and using China's announcement that it anticipates 600,000 5G base stations by the end of 2020.[18] Assume three base stations per Chinese cell site—one for each of the major operators—and we get about 200,000 sites. This could be several times lower if we're talking logical sites, but it is hard to say—let's keep the estimate conservative and set that issue aside.

The population served also plays a big role in the performance of a given network. China's population is about 1.39 billion. This is about 4.5 times larger than that of the United States, indicating Chinese operators will need roughly 4.5 times as many base stations as their U.S. counterparts to get a similar level of performance for each user (all else being equal). So, those 200,000 sites work out to about 1 site per 7,000 people. In 2019 alone, U.S. operators invested in 5G-ready cell sites and added 46,000 new cell sites—roughly 1 site per 7,134 people.[19] To the uninformed, 600,000 base stations might sound alarming, but understanding what those numbers mean, we're about neck-and-neck. If we assume that the Chinese sites include logical sites, and the spectral efficiency of their base stations is less, then it appears the United States is clearly in the lead.

Figure 1: 5G deployment comparison of United States and China[20]



Slow and steady may win the race. Whereas the United States is pursuing a gradual, economical deployment of 5G, the problems with China's rushed 5G deployments are already starting to show. One of Huawei's own executives went so far as to call China's 5G "fake, dumb and poor," mostly due to poor integration with the 4G network.[21] Another former official warned in a recent speech that China's 5G push could become a failed investment.[22] While China is no doubt investing substantially in the expansion of its 5G network, including by pressuring its state-owned carriers to invest faster than the market demands, Chinese figures must be properly scrutinized when using them to make U.S. policy decisions.

CONCLUSION

It is important that the advocates, experts, and policymakers in the United States get these comparisons right if U.S. policy is going to be oriented toward winning the race. Even with these numbers possibly being misrepresented and overinflated, China's 5G ambitions should not be underestimated. The country's deliberate all-hands-on-deck approach to fast-track these networks demonstrates China's commitment to gaining an edge with the industries of the future. And federal, state, and local policy should also work to spur the expeditious and widespread deployment of 5G systems by wireless carriers.[23] And policymakers and the media should view Chinese operators' 5G claims with skepticism. Chinese firms count their 5G deployment and subscribers differently than U.S. operators, so these methodologies can be misleading if improperly compared.

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ENDNOTES

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