

WHAT I LEARNED THIS WEEK

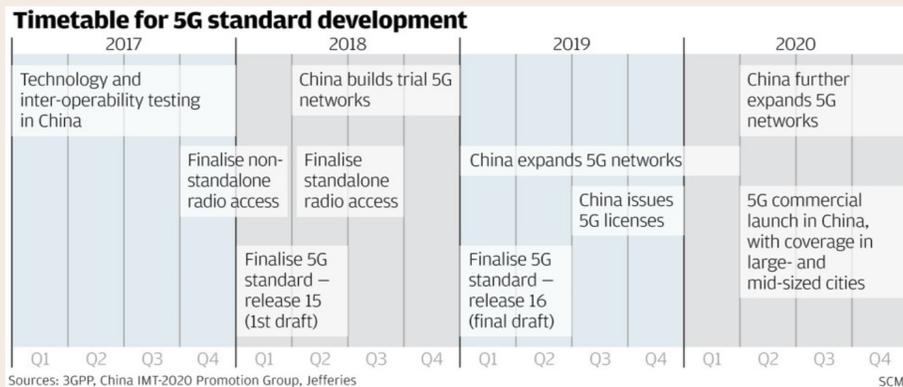
Excerpt from October 19, 2017

3 China is on-track to lead the world in 5G wireless—catapulting the nation to a leading technology innovator. *Huge new winners and losers will follow.*

China is recasting itself as a leading innovator across a broad range of technologies. In recent *WILTWs*, we have argued that China is making great strides in **AI, quantum computing, robotics, space exploration, genomics, supercomputing and semiconductors**. More than any other technology, its leadership in 5G—the next generation of smartphone devices—represents the opportunity for China to cement its place as a leading global innovator. The nation's status as already the world's largest wireless market combined with recent innovation in 5G wireless technology positions it to gain increasing influence in setting the global unified standard for 5G mobile technologies.

China is investing heavily in 5G—evidenced most recently by ZTE producing a record download speed of 19 gigabits per second (Gbps), and a low latency of only 0.416 milliseconds (ms) using its proprietary chips. The nation is set to deploy a nationwide 5G network by 2020—ahead of most other countries. **The Middle Kingdom is estimated to be investing up to \$400-plus billion to build out a nationwide 5G network—potentially up to 2x as much as the U.S.**

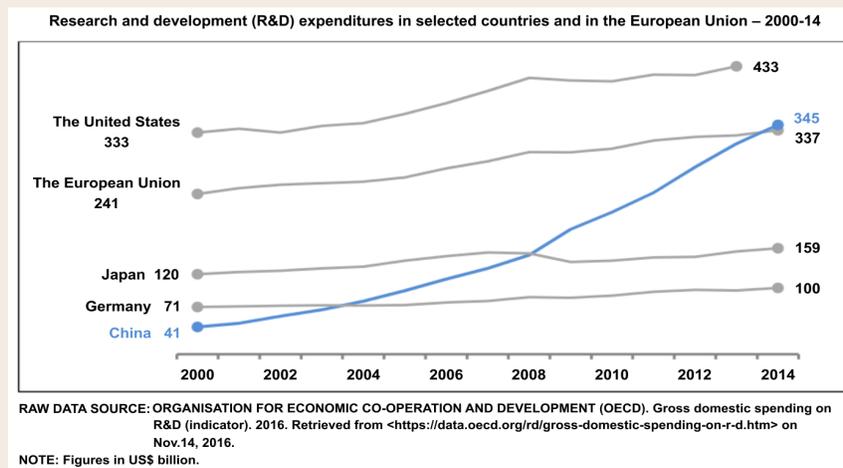
By 2025, China could have over 400 million 5G wireless subscribers—exceeding all other nations. The country's friendlier regulatory environment will speed the roll-out. In the U.S., companies need multiple approvals from government agencies. In contrast, Qi Bi, president of the China Telecom Technology Innovation Center, notes that **China allows wireless companies to build cell towers quickly—providing the nation with 10 times as many towers than in the U.S.**



Source: South China Morning Post

What are the implications? First, China’s unparalleled work ethic surpasses that of Silicon Valley. As Peter Diamandis observes, in China, the mantra is “9-9-6”, or “9-12-6”—meaning entrepreneurs work from 9 AM to 9 PM (or midnight), six days per week.

Second, thwarted by the U.S. and other nations in recent semiconductor acquisitions, **China is increasingly recruiting the world’s top talent to improve its homegrown technology.** China is directly leveraging President Trump’s initiative to limit H-1B visa immigration for technology talent, to bolster its own recruitment. **If the U.S. is run by lawyers, then China is run by engineers, notes David Dodwell of the Hong Kong-Apec Trade Policy Group.** The implications of this arrangement are enormous. China is on-track to surpass the U.S. in overall R&D spending by 2020. Indeed, **40% of Huawei’s 170,000 employees are reportedly working in pure research.**



Source: OECD via Panorama Internacional

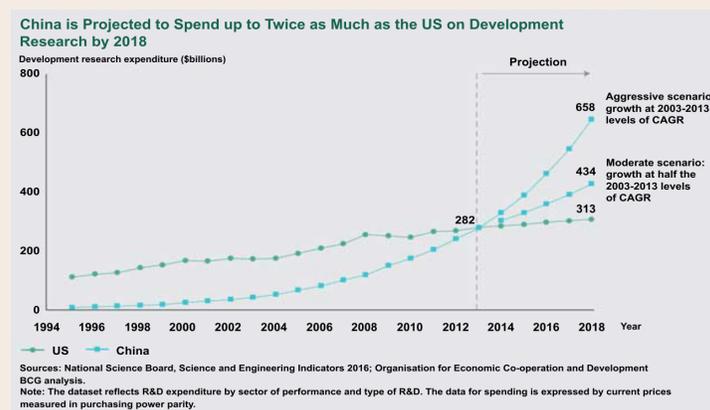
Third, China's push for a bigger share in the design of next-generation wireless standards will likely give it more than 10% of the "5G-essential" IP it already owns. If successful, not only will this increase China's global influence, notes *The Financial Times*, **it will also raise its bargaining power with foreign patent holders as well as help lower costs for its telecommunications equipment makers and chip companies.** Qualcomm, which owns 12.5% of the patents essential for the current 4G standard, will be negatively impacted.

Fourth, China's relentless drive to push forward cutting-edge technologies means it will **increasingly challenge the U.S. for global technology leadership.** Many Chinese wireless leaders are showing relative strength, yet are trading at discounted cash flow multiples.

Consider the following:

- **China is on a trajectory towards global technological dominance.** Innovation is the overriding focus of its 13th five-year plan (2016-2020). According to *Asian Scientist*, priority science projects are: quantum communications and computation; brain research; national cyberspace security; deep space exploration; clean energy and efficient use of coal; industrial, medical and military robots; gene science; big data applications; deep-sea experimental platforms; and a new Arctic observatory/Antarctic station.

Recent technology strides are visible across the board, whether it is AI, robotics, lithium-battery development, 3D-printed blood vessels made from stem cells, or low-cost drones. China has already surpassed the U.S. in spending on later stage R&D that transforms discoveries into commercial products. At its current rate of spending, China will invest up to twice as much as the U.S. by 2018:



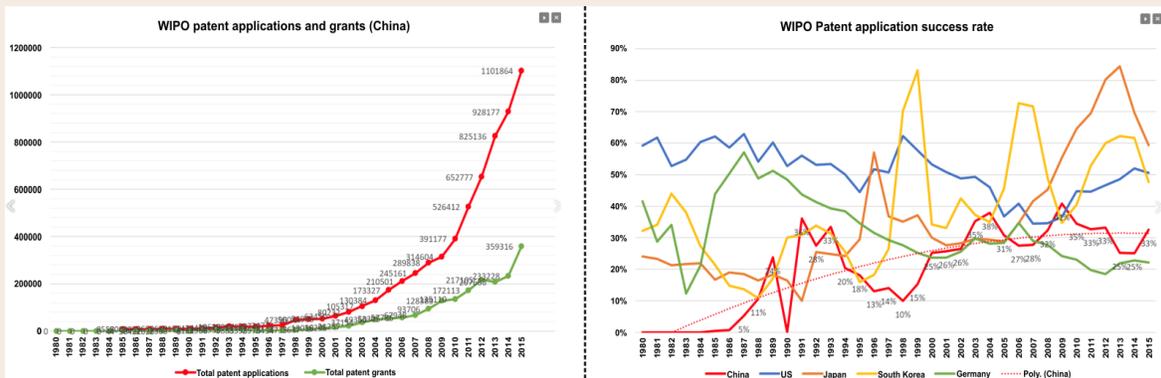
Source: Boston Consulting Group

- **China is targeting U.S. semiconductor leadership.** In 2014, China announced plans to match the technology of the world's leading semiconductor firms by 2030—allocating \$100 to \$150 billion in public and private funds to achieve it. Within ten years, China plans to produce 70% of the chips consumed by the Chinese industry versus only about 15% today (see *WILTW* February 4, 2016). **Second-tier Chinese mega cities—Wuhan, Chengdu, and Hefei—are competing aggressively with each other to garner semiconductor investment.**

Last year, China declared that it had built the world's fastest supercomputer—the Sunway TaihuLight—using domestic chip technology—a first for China, which had previously relied on U.S.-sourced microchips. The TaihuLight has processing power of 125 petaflops (one quadrillion arithmetic operations per second) and more than triples the prior record holder—China's Tianhe-2. **The TaihuLight is five times more powerful than the fastest U.S. system.** Recently, China accelerated the development of exascale systems (an exascale is 1,000 petaflops)—aiming to launch a third prototype by June 2018—ahead of the U.S.

- **The strengthening of China's intellectual property rights (IPR) is a key innovation driver.** Before 1985, China had no patent law. In 2011, China became the top patent filer in the world, notes an analysis in *The Diplomat*. **In 2015, it surpassed all other countries as the top patent issuer with over 350,000 patents issued.** In the process, IP enforcement has undergone a major transformation—with courts hearing over 130,000 IPR cases in 2014. By contrast, **in the U.S., less than 12,000 patent, trademark and copyright cases were heard last year.** The expansion of Chinese IPR enforcement has also seen several major international victories. Moreover, the court system is efficient. Beijing's IP court concludes cases within 125 days on average, versus 18 months in Europe. In the U.S., the median time-to-trial alone is 2.4 years, according to PwC.

China's patent application success ratio is rising—lagging behind only Germany, South Korea and the U.S, which are declining (see charts).



Source: World Intellectual Property Organization

- **China’s blossoming entrepreneurial ecosystem helps to drive success.** The “all-powerful CEO” is a key component of China’s start-up culture. In contrast to Silicon Valley, where a CEO may “guide” or “influence” his team, when Chinese CEOs make a decision, the company takes it and runs, as Peter Diamandis observes.

The massive availability of capital is also a critical driver. Restrictions on the outflow of capital imposed by the Chinese government, encourages wealthy investors to put money with entrepreneurs. In China, the typical Series A ranges from \$15 million to \$100 million. Today, **over 14,000 new companies are registered daily** in China.

- **Leading Chinese wireless-equipment makers and operators are poised to outperform, including:**
 - ✓ **ZTE** (763 HK, 29.50 HKD) – is doubling its 5G R&D and is the second-largest holder of 5G IP after Huawei—trading at 14.7x EV/EBITDA,
 - ✓ **China Mobile** (941 HK, 79.15 HKD) – will build 5G networks in major cities in 2018 and launch full services by 2020—trading at 3.2x EV/EBITDA.
 - ✓ **China Telecom** (728 HK, 4.07 HKD) – is conducting 5G trials in six cities and will launch commercial services in 2020—trading at 3.3x EV/EBITDA.
 - ✓ **China Unicom** (762 HK, 11.36 HKD) – is developing 5G technologies jointly with Qualcomm—trading at 4.1x EV/EBITDA.