

WOLFGANG MÜLLER

5G MOBILE TELECOMMUNICATIONS: AN ECONOMIC PROJECT OF QUESTIONABLE BENEFIT

CHINESE 5G OUTFITTERS HUAWEI: A DANGER TO WHOM?

High-speed 5G mobile telecommunications networks, we're told, will modernize the nerve pathways of the economy and thus assist in the emergence of key innovations like Industry 4.0 or autonomous vehicles. There will be no additional benefits for private households. The introduction of 5G has been accompanied by the US trade war against China's Huawei Group, the leading supplier of equipment for the latest mobile telecommunications standard. For the first time in a long while, the US sees its technological dominance threatened.¹

MOBILE TELECOMMUNICATIONS: A CAPITALIST SUCCESS STORY

The digital mobile telecommunications success story began in 1990, when member countries of the European Conference of Postal and Telecommunications Administrations (CEPT) agreed on a standard for digital mobile telephony, known as the Global System for Mobile Communication (GSM) or second-generation mobile communications networks (2G). The new GSM-based digital networks replaced a patchwork of incompatible analogue mobile phone networks with limited capacity, impractical mobile phones, and a limited pool of customers. In Germany, the "D" networks (D1: Telekom, D2: Mannesmann Mobilfunk) replaced the analogue "C" network. The new European standard was adopted internationally. With the digitalization of speech, music, and images, telecommunications and computer technology merged. The number of connections possible simultaneously increased exponentially. A huge market in mobile telecommunications emerged, offering completely new products and services. This prodigious leap in the productive forces revolutionized the relations of production in numerous economic sectors. Established industries and quasi-monopolistic suppliers disappeared, new suppliers and industrial sectors emerged. Around the world, investors rushed to get into the new market. Almost everywhere in the West, state telephone monopolies were privatized. Their decades-long symbiosis with their in-house suppliers (in former West Germany, the "official construction companies" Siemens, SEL, and T&N) had come to an end.

The global triumph of mobile telephony began with GSM. Many countries on the capitalist periphery which had lacked the money for nationwide landline networks went straight to digital mobile technology, which costs only a fraction of landline infrastructure—even if base stations throughout the country are connected to mobile telecommunications centres, and through them to the internet via fixed lines. In large parts of Africa, Asia, and Latin America, the mobile phone is therefore the first means of communication ever to connect people in remote areas and enable contact with markets, educational institutions, and health clinics.

While GSM does facilitate phone calls and SMS, it does not enable the transmission of larger amounts of data. Only with the arrival of the 3G standard—defined in 2000 and also known as the Universal Mobile Telecommunications System (UMTS)—did faster data transmission become possible. UMTS thus provided the prerequisites for surfing the internet, transmitting images, and making video calls. Mobile phone companies were suddenly corporate giants, the "Masters of the Universe". In 2000 Vodafone swallowed up Mannesmann's mobile telecommunications division for 190 billion euros in one of the biggest takeovers in economic history.

Mobile Communications Companies: Not a License to Print Money

At the turn of the millennium, when the 3G frequency spectrum in the rich countries of the West was being auctioned off, mobile telecommunications companies entered into

a bidding war. At the German auction alone, then-Finance Minister Hans Eichel raised over 50 billion euros. Then came the big hangover. The providers had miscalculated their investments; their business cases didn't work out. They had been the ones to build the expensive new networks, but the big money in mobile internet was made by platforms like Google, Facebook, Amazon, and Alibaba. Moreover, it would take almost ten years for the smartphone to become available as an affordable mobile computer with "killer" apps—such as Google Maps and YouTube—that would popularize mobile internet, bringing it to billions of people—some of whom might now have access to a bank account for the first time.

Ever since the investment bonanza, the likes of Vodafone and T-Mobile have been heavily in debt, generating less and less revenue in relation to their customer base. Per customer, monthly revenues in Europe have fallen from 35 US dollars in 2006 to 20 US dollars in 2019.² Moreover, in Europe 26 providers compete in a geographical area roughly the size of the US, where the market is highly monopolized and in the future only three providers will operate.

In 2010 the 4G standard of mobile telecommunications, best known by the name Long Term Evolution (LTE), arrived with even higher data rates and shorter loading times. This time, however, providers held back on investing in the network. This is one reason for the insufficient network coverage and poor quality of mobile telecommunications in Germany. Inadequate government regulation of mobile phone companies has led to the fact that dead spots on freeways and agonizingly slow mobile internet are unfortunately the norm in many rural areas.

5G MOBILE TELECOMMUNICATIONS: AN ECONOMIC PROJECT, SUPERFLUOUS FOR PRIVATE USERS

Since 2019, mobile phone companies in various parts of the world have been setting up networks based on the new 5G mobile telecommunications standard, nationwide in South Korea and China, for example. In the history of technology, 5G is the fifth generation of mobile telecommunications. So far, mobile internet has been the driving force behind its development: ever-higher data speeds have led to an ever-increasing volume of data. 5G is more than just another step in the development of digital mobile telecommunications. With 5G, data can be transmitted 50 to 100 times faster than with 4G (LTE)—that is, at approximately one gigabit or one billion bits per second. One hundred times the number of terminal devices can be networked per base station than with 4G.³ At the same time, it reduces power consumption by up to 90 percent. Private customers or office workers are unlikely to need such speeds. According to a study of internet traffic in the editorial offices of the *Wall Street Journal*, reporters used only a fraction of the data volume available under 4G, even if they watched several video streams simultaneously.⁴ At most, users should notice a difference between 4G and 5G when uploading pictures and videos, and gamers can look forward to streaming at ultra-high speeds in the future.

5G Is Supposed to Open Up Completely New Economic and Industrial Applications

The 5G wireless standard defines three different categories of applications. Firstly, 5G mobile telecommunication offers mobile broadband and thus a much higher dataflow. It will

make it possible to carry out medical procedures via the network (telemedicine), or transfer technical drawings to a technician's data glasses. Military drones can follow potential targets on the basis of up-to-the-second images. Secondly, 5G enables wireless, time-sensitive communication between machines and systems while maintaining maximum system availability. This is critical for Industry 4.0. In the future, entire production plants and mobile robots will be reconfigurable via mobile telecommunication. Real-time communication is also required for automated driving systems and autonomous vehicles on docks or factory sites and for mobile industrial robots. In industrialized agriculture, autonomous combine harvesters and agricultural machinery require fast mobile communications and continuous network coverage. Finally, 5G enables wireless control of machines and equipment over a high signal range, high energy efficiency, and a battery life of up to ten years. In this Internet of Things (IoT), it will be possible to network billions of devices that only occasionally send and receive the smallest amounts of data. As part of the "smart city" concept, new applications are being tested for water meters, traffic lights, electricity meters, parking guidance systems, and street lighting. In order for 5G networks to meet these very different requirements, more and more network functions are being shifted from hardware to software. In this way, a wide variety of virtual subnets can be built. With 5G, data and programmes that are currently stored in the cloud, such as at Amazon or Google, can be transferred to mobile-signal hotspots installed at factory sites. This ensures minimal latency. That is because the data no longer pass through the cloud, but instead directly to a base station located nearby. Multiple base stations send the same signal to the receiver simultaneously in a coordinated manner, ensuring fail-safe performance. One of the advantages for companies is that the data is processed directly on-site. This means that company secrets are better protected. T-Mobile and Vodafone, whose traditional business is under massive price pressure, expect 5G to open up new business opportunities with higher profit margins.

Will 5G Become the "Nervous System" of Modern Economies?

5G mobile is a foundational technology that provides the most modern communication infrastructure for a wide range of commercial and military applications. These are the advantages touted by its advocates. But will 5G networks ultimately replace existing network structures and firms' in-house networks? Is 5G really needed to turn technologies such as vehicular automation, Industry 4.0, smart homes, or smart cities—the implementation of which is partly questionable—into profitable business ventures? Will 5G infrastructure boost the valorization of capital? Or is 5G a technical marvel desperately searching for its social value? There is no doubt that 5G can produce a multiplier effect for a whole range of other technologies. But history teaches us that this can take time: many years passed before the combination of digital mobile telecommunications and the internet became big business.

Despite the fact that the benefits are doubtful, an estimated 1,000 billion US dollars will flow into expanding 5G networks in the next few years. That is because the first companies and countries to develop and implement 5G will set the global standards and hope to gain competitive advantages. That certainly applies to China, where the rapid expansion of 5G

will create the world's largest market with an estimated 600 million private 5G users by 2025. China is where the party is, as far as network suppliers are concerned. 5G infrastructure costs a fortune, which is why Chinese telecoms firms are working together to build the new networks. By October 2019, 85,000 5G base stations had already been rolled out in China, and by the end of 2019 over 130,000 stations were reportedly offering 5G coverage in metropolitan areas.⁵ 5G is also a path to industrial modernization for China. According to calculations by state planners, a large part of the presently installed production base, in Germany for example, will not be able to keep up with the high degree of precision that Chinese 5G-controlled systems will deliver.

But is there really no alternative to 5G? Even 4G networks can quickly connect thousands of sensors in a production facility. Free Wi-Fi or Bluetooth networks are just as feasible for time-sensitive applications. In his book *The 5G Myth*, William Webb compares the wagers on faster data speeds with the aviation industry: "5G could end up like the Concorde – a masterpiece of engineering with benefits for only a tiny minority."⁶ In the spring of 2019, the EU Commission proposed a "technology-neutral" Wi-Fi-based system with a 5G option for autonomous vehicles, but in the end withdrew its proposal due to pressure from the car lobby. The fact that China is the world's largest car market and that autonomous vehicles in China are 5G-based is probably the main reason for this.

THE WEST'S DILEMMA: HUAWEI LEADS IN 5G

From today's perspective it is difficult to assess if and when 5G will become the gold standard of telecommunications infrastructure. What is certain, however, is that China's Huawei Group will play a major role. That is a problem for the West. Huawei was founded in 1987 by former military officer Ren Zhengfei. Today the group has over 180,000 employees worldwide. It had a turnover of 123 billion US dollars last year and is number two in terms of smartphone unit sales. Above all, Huawei is the leading developer of mobile networks—well ahead of Ericsson and Nokia—with a market share of 28 percent in 2018. By February 2020, Huawei had already signed 91 contracts for 5G equipment with network operators around the world, 47 of which were in Europe and 27 in Asia.⁷ Huawei products are low-priced and technologically advanced. In 2018 Huawei invested 15.1 billion US dollars in research and development, more than twice as much as the Scandinavian competition combined. Huawei accounts for most 5G patent applications. Huawei is also a leading developer of chips, sensors, and software for connecting industrial production and logistics with the internet. In 2018, this market amounted to 44 billion US dollars with an annual growth rate of 25 percent. In China, the "factory of the world", Huawei can set the new standards because, unlike with 5G mobile telecommunications, in this sector there are no universally accepted guidelines. In the industrial internet, Huawei's OceanConnect cloud platform is in direct competition with the cloud business of US companies Google and Amazon.

How the West Lost the Race for 5G

Given the potential importance of 5G for the technology sector and the economy as a whole, it is astonishing that no US company is able to supply the entire range of 5G equipment, from antennas to base stations, to backbone servers, to

the computers associated with high data transfer rates and databases in the core area of mobile telecommunications networks. There was a time when Bell Labs, the former research department of the US telephone company AT&T that produced various Nobel Prize winners, was the mecca of telecommunications. But in the 1990s the US liberalized telecommunications—as did Germany, Great Britain, and other countries. Established network suppliers such as Lucent Technologies, which had emerged from Bell Labs, suddenly faced numerous new competitors in a deregulated market. At the turn of the millennium, the huge Chinese market offered a way out: the heads of the world's largest network suppliers made a pilgrimage to Beijing and pledged to locate their technologies and production facilities in China. In return for access to this huge market, China demanded that Chinese business partners and Chinese state research institutes be given access to the technologies and know-how. In 1999 John Roth, then-head of the Canadian telecoms firm Nortel Networks, said: "We have a long-term commitment to China's market, to help develop a local, world-class telecommunications industry."⁸ The rest is history. Nortel and other companies, including Siemens, have successfully helped build China's current leadership position in communications. But they were unable to maintain their own status. In 2009 Nortel declared insolvency, and many Nortel researchers began working for Huawei. The US network supplier Lucent Technologies, mentioned above, was acquired by Alcatel in 2006 and is now part of Nokia. Siemens gradually phased out its telecoms division after the year 2000. Today, only two other providers offer the full range of 5G equipment aside from Huawei, namely Ericsson and Nokia.

Vendor-neutral radio access networks (OpenRAN)—which represent an alternative to manufacturer-bound 5G equipment from Huawei, Nokia, and Ericsson—are currently still under development.⁹ T-Mobile—with its takeover of the US mobile telecommunications provider Sprint currently dependent on the good will of the Trump administration—is also working in this area. With OpenRAN, mobile phone data is, technically speaking, no longer transmitted via a fixed mobile connection, but instead in the form of data packets. According to insiders, however, this form of transmission still leads to considerable performance losses because equipment sourced from different suppliers is not optimally aligned. In addition, open 5G software would jeopardize the lucrative business models of US technology companies such as Cisco and Oracle, which are based on in-house technologies.

A CONFLICT OF SYSTEMS: THE US WAR AGAINST HUAWEI AND EUROPE'S ROLE IN IT

The US has declared war on Huawei. At the request of the US judiciary, the Canadian government had Meng Wanzhou, Huawei's chief financial officer and daughter of the company founder, arrested in Vancouver in December 2018. She is alleged to have violated sanctions against Iran and to have carried out industrial espionage. The US government demands her extradition from Canada. But the US's real concern is its hitherto unchallenged dominance in digital technologies. The US sees itself threatened by its "systemic rival" China, and especially by Huawei. A US National Security Council dossier on 5G put it succinctly: "We are losing." Huawei is the leader in 5G.¹⁰ So the Trump administration banned all US companies—especially those that continue to lead on

chip technology — from doing business with Huawei in early 2019.

The US is publicly selling the trade dispute with Huawei by pointing to an alleged threat to its national security: China could supposedly access sensitive data via back-doors in Huawei products and use cyber-attacks to paralyse critical infrastructure in the West. Beijing's influence on Chinese companies poses a threat to America's economic and national security, according to Christopher A. Wray, director of the Federal Bureau of Investigation.¹¹ The thief is screaming: "Stop thief!" So far, however, the US has not provided any evidence against Huawei. On the other hand, there is a great deal of evidence that US secret services, but also the German Federal Intelligence Service (BND), have carried out espionage using backdoors in the products of technology companies such as Cisco or Siemens.¹² Of course, using the same argument as the US government, China could prohibit the use of 5G base stations or smartphones equipped with 5G chips from US companies.

Parallel to the sanctions, the US has launched a diplomatic offensive against Huawei, portraying the company as an extension of the Chinese state. In July 2017 there was a meeting of the Five Eyes surveillance alliance of the intelligence services of the US, Great Britain, Canada, Australia, and New Zealand. It was about 5G. As a result, Australia and New Zealand completely excluded Huawei from the development of 5G networks. The British government decided to cooperate with Huawei in early 2020. The *Financial Times* quoted US Republican Senator Tom Cotton in February 2020: "allowing Huawei to build the UK's 5G networks today is like allowing the KGB to build its telephone network during the Cold War."¹³ While it is true that UK mobile telecoms companies are not allowed to install Huawei equipment at the core of new networks, with 5G network intelligence is collected mainly on the periphery, at base stations. In addition, Huawei's share of the new 5G equipment may not exceed 35 percent by value. This decision costs Vodafone alone around 500 million euros. This is because network operators use Huawei components in their 4G infrastructure. If Huawei had been completely excluded, the British network operators would also have incurred the great expense of replacing the better part of their 4G equipment. It would have delayed the launch of the new 5G networks by several years. Until now, Germany's three network operators (Telekom, Vodafone, and Telefónica) have also been using Huawei equipment. Excluding the company entirely from bidding for German 5G network contracts would cost billions of euros and would considerably delay construction of the networks. Karl-Heinz Streibich, President of the German Academy of Science and Engineering (acatech), has argued that as a leading exporter, Germany should "position itself strategically [...]. A hard, comprehensive 'no' to Huawei would be tantamount to a partial economic boycott."¹⁴

Spy versus Spy: Huawei and the Fall of the West

In Germany, the ideologically super-charged debate over Huawei and 5G oscillates between the hypocritical morality of Western values, European industrial policy, and security considerations. According to Julianne Smith, Director of the Asia Program of the German Marshall Fund of the United States, "when Chancellor Angela Merkel decides whether to rely on a low-cost but high-risk supplier from China, it is a question of German values and democracy."¹⁵ Nancy

Pelosi, the Democratic US congresswoman and speaker of the House of Representatives, made a similar statement at the Munich Security Conference in February of 2020. In late 2019, the *Süddeutsche Zeitung* was already predicting a total meltdown: "5G supplies the nerve pathways of a networked society in which, in the worst case, a single order from Beijing could be sufficient to stop Huawei updates from reaching Germany."¹⁶ The trans-Atlanticists of the CDU/CSU and the Greens are singing the same tune. The Chinese technology corporation is placed under a general suspicion of inevitably being a tool of the evil machinations of the Chinese Communist Party. The investigations conducted so far by Germany's Federal Office for Information Security (BSI) and the British secret service are more objective. These authorities have examined Huawei technology for possible security holes for China's "snoops" and have not found any defects. Admittedly, in IT experience has shown that even the most extensive software tests do not find all the bugs. Early this year, the EU Commission for its part published 5G security recommendations¹⁷ for its members that do not rule Huawei out completely, and the German government, parallel to its deliberations on 5G — expected to be concluded in the next few months — is also planning an anti-espionage agreement with the People's Republic of China.¹⁸

After decades of industry sell-outs in the US and partly in Europe, industrial policy is back on the agenda. The state is suddenly supposed to intervene in security-relevant industries such as telecommunications and to act as an ideal total capitalist. In February of this year, US Attorney General William Barr suggested that the US and its allies should consider proposals for US ownership of controlling stakes in Ericsson and Nokia.¹⁹ Share prices of both companies jumped by more than five percent. Another option is state-guaranteed credit lines so that Nokia and Ericsson can offer conditions comparable to those of Huawei. Referring to the geopolitical interests of the EU, a former prime minister of Finland has pointed out that this is a rare opportunity to establish European 5G dominance.

LEFT-WING POSITIONS ON 5G AND HUAWEI

5G is undoubtedly an economic project, and the potential benefits will mainly accrue to large corporations. Even in the longer term, the upgrade is unlikely to benefit society at large. For these reasons, neither tax breaks nor subsidies should flow into 5G development. But despite all the reservations about the introduction of ultra-fast 5G mobile in Germany, a campaign to prevent it is unrealistic. On the other hand, the conversation about 5G offers the chance to address Germany's deplorable nationwide high-speed data coverage and its mobile infrastructure, which is falling behind Albania's. At present, it is all the more important to insist on massive development of landline and mobile networks and to call on the German Federal Network Agency, as the state regulator, to impose tough conditions on network operators. That is in the interests of society as a whole, as well as small and medium-sized businesses, which often do not have access to high-speed internet.

The dominant political discourse around Huawei concerning the roll-out of 5G networks in Europe is ideologically over-heated and sanctimonious. When it comes to China, market fetishists suddenly call on the state to intervene. Western secret services have been proven to make systematic use of communication infrastructures for espionage and

sabotage. There is no evidence whatsoever to support the assumption that China, as it rises, is also doing this with the help of Huawei. Why should the public in Europe choose this of all moments to trust the arguments of the US government? For Europe and Germany, a complete exclusion of the Chinese supplier Huawei is out of the question anyway. Economic relations with China are too close for that. For Europe to boycott Huawei and thus fully take the side of the US in its economic war against China would further weaken Europe's position vis-à-vis both the former hegemon, the US, and the rising world power, China, and further deepen political divisions in Europe.

Wolfgang Müller is a social scientist and computer scientist who worked for IG Metall Bavaria until 2014. He lived in China for several years and regularly publishes on development and industrial relations in China.

1 This article was written before the most recent US sanctions against Huawei were announced in May and August 2020. **2** "Vodafone's search for the G-spot: No wonder telecoms firms view 5G with trepidation," *The Economist*, 22 August 2019. **3** For a clear overview of 5G technology, see Dušan Živadinović, "Die Technik hinter 5G: So funktioniert das neue Funknetz," *Heise-online*, 2 April, 2019, www.heise.de/-4355865. **4** Quoted in "Vodafone's search for the G-spot". **5** See *Financial Times*, 30 October 2019. **6** William Webb, *The 5G Myth: When Vision Decoupled from Reality* (London: 2018), 156. **7** Patrick Beuth, "Huawei hat 5G-Verträge mit 47 europäischen Providern," *Spiegel Online*, 21 February, 2020, www.spiegel.de/netzwelt/netzpolitik/huawei-hat-5g-vertraege-mit-47-europaeischen-providern-a-3b44bd94-7279-4858-ac0a-aa29cbea1e7d. **8** Quoted in: Kyngé, James/Fildes, Nic, "Huawei: The indispensable telecoms company," *Financial Times*, 31 January, 2020, www.ft.com/content/24b01f0e-441e-11ea-a43a-c4b328d9061c. **9** "America does not want China to dominate 5G mobile networks," *The Economist*, 8 April, 2020. **10** Defence Innovation Board, *The 5G Ecosystem: Risks and Opportunities for DoD*, (Washington: 3 April, 2019), https://media.defense.gov/2019/Apr/03/2002109302/-1/-1/0/DIB_5G_STUDY_04.03.19.PDF. **11** Cf. *Frankfurter Allgemeine Zeitung*, 30 January, 2018. **12** At the beginning of 2020 it was revealed that the Central Intelligence Agency (CIA) and the National Security Agency (NSA) together with the BND had also spied on NATO partners for decades, as part of Operation Rubicon. The allegedly tap-proof telecom equipment supplied by Siemens had special back doors for the secret services. **13** Kyngé/Fildes: "The indispensable company". **14** Karl-Heinz Streibich, quoted in: Moritz Koch and Dietmar Neuerer, "Ex-Chef der Software AG: 'Wir brauchen die Stärke Europas'," *Handelsblatt*, 28 October, 2018, www.handelsblatt.com/politik/deutschland/karl-heinz-streibich-ex-chef-der-soft-ware-ag-wir-brauchen-die-staerke-europas/25155940.html?ticket=ST-572002-z5T72Sc-qyUKCcBgYy6ll-ap4. **15** Julianne Smith, "Um welche Werte geht es hier eigentlich?," *Süddeutsche Zeitung*, 13 February 2020, www.sueddeutsche.de/politik/5g-china-usa-meinung-1.4796321. **16** Christoph Giesen, "Im Dienste der KP," *Süddeutsche Zeitung*, 3 November 2019, www.sueddeutsche.de/wirtschaft/kommentar-im-dienste-der-kp-1.4665546. **17** European Commission, *Cybersecurity of 5G networks – EU Toolbox of risk mitigating measures*, 29 January 2020, <https://ec.europa.eu/digital-single-market/en/news/cybersecurity-5g-networks-eu-toolbox-risk-mitigating-measures>. **18** For a detailed account of the political discussion surrounding Huawei, see Jörg Kronauer, "Die Schlacht um Huawei," *German Foreign Policy*, 19 February 2020, www.german-foreign-policy.com/news/detail/8191/. **19** See *Financial Times*, 8 February 2020.

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