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The Role of 5G Technology in Superpower Rivalry between the United States and China: An Offensive Realist Approach¹

Abstract: The article aims to explain the importance of 5G technology in pursuing power and shaping the international competition between two superpowers: the USA and China. Accordingly, the research focus of this article is to explain how and why 5G technology is being used by China and the U.S. as a key instrument in their growing geopolitical rivalry. The study is framed within the theoretical approach of offensive realism. It is based on the primary assumption that superpowers like China and the United States tend to increase their power not only by expanding their armed forces and territorial conquests but also by using every possible opportunity to do so. The article researches two questions. What is the importance of 5G technology in the rivalry between China and the U.S.? How has the development of communication technologies influenced countries and their ability to shape the international environment? 5G technology is considered more than just the next generation of wireless connectivity, as it goes beyond traditional forms of use and addresses a new category of users. It is a structure intended to facilitate a new category of goods and services: smart cities, autonomous vehicles, automated factories, digital services, and robotization of decision-making processes.

Keywords: *modern technologies, economic development, digitization, 5G, offensive realism, artificial intelligence*

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Introduction

The Cold War victory of the United States over the Soviet Union formed a new, hegemonic-liberal international order with one unipolar center – the U.S. The dynamic development of China has led to the erosion of this order, which has become increasingly polarized. The relations between the hitherto hegemon – the USA – and the hegemonic pretender – China – have taken on a more confrontational character, as illustrated in restoring forgotten practices like trade wars. The range of geopolitical, global challenges facing the U.S. (Russia's invasion of Ukraine could be seen as one such challenge in 2022) do not change the fact that the U.S. perceives the rivalry with China as “the most serious, long-term challenge” (China ‘most serious long-term challenge’ to world order, Blinken says, 2022). The U.S. National Security Strategy of October 2022 reinforces this belief and identifies China as the only country willing and able to change the world order (The U.S. 2022 National Security Strategy, 2022). Similarly, the Chinese Communist Party and its leader Xi Jinping also see relations with the United States increasingly in terms of rivalry (Kine, 2022).

The military advantage of the United States over China in the third decade of the 21st century seems indisputable. In the face of difficulties in establishing competition in armaments, China has consciously and consistently focused on increasing its economic potential and technological development. The current economic philosophy, which is the inspiration for the Chinese authorities, assumes that long-term growth is not achieved through traditional capital accumulation anymore but through technology and innovation. One of the main goals of President Xi's program is to transform China from the “factory of the world” to the “center of innovation” (Rogers, 2016).

The accelerated and effective modernization of the Middle Kingdom gave it instruments of increasing impact on the world order and international politics². The growing assertive approach of China has elicited more and more firm reactions (U.S. restricts Chinese access to semiconductors, 2022). China has officially announced that it plans to become the world's largest superpower by 2049, thus surpassing the United States (Xi's Vow of World Dominance by 2049, 2022). Modern information and communication technologies (5G, artificial intelligence, quantum computing) are to make this possible. They are planned not only to accelerate the modernization and development of the army but also to monitor and control societies, economies, and governments within and outside of China (Fricke, 2020). This will be done by digital means previously managed physically, e.g., by analysts, military intelligence, etc., and in new, faster ways on an unprecedented scale.

² The superpower status of China is still under discussion. While the position of China in political and military fields could be controversial, economic and technological achievements are said to be out of the debate. China is a world leader as an industrial producer, exporter, economy (Purchasing Power Parity), foreign exchange reserves holder, and patent submitter.

According to Jason Dean, artificial intelligence will play the same role as electricity in the past (Dean, 2017). Artificial intelligence (code-software) and 5G (infrastructure-hardware) will, therefore, be the key to controlling geographical space and five dimensions (land, sea, air, space, and cyber)³. It will be used not only for military operations and political projects. Above all, it will be a tool for shaping the interoperability of socio-economic areas. In this assessment, the planned finale of the *Chinese Hundred Year Marathon 1949–2049* can, therefore, be considered to be aimed at replacing the US-led world order. It will be done with alternative economic and digital networks while building military power (Pillsbury, 2016).

In observing the transition from 4G to 5G standards, an essential element will be the change in the balance of power between global technology companies and indirectly between the countries they come from. The contested hegemony of the West in the area of international production systems based on high-tech (and thus decision-making) has to face the challenge posed by new economic and technological powers, especially China. They openly articulate their intentions and want more influence in establishing global rules, production, and information structure. The new 5G network is to serve this purpose.

Technological competition is speeding up and becoming more and more ruthless, with only two main players participating. The U.S. and China already host seven of the largest A.I. company giants. According to the PwC report, these two countries will account for as much as 70% of the profits generated by AI (PwC Report, 2017). The U.S. and China understand that 5G can be the key to global governance through data⁴. It will be a tool not only for commercial activities but also for control and power (Strittmatter, 2020). Some experts are confident that 5G hardware and software suppliers can gain control over all security dimensions. That would give a trump card in the superpower game.

³ 5G technology is a hardware technology that creates technical space for a new dimension of communication. AI is a software that could be used within a 5G structure. According to the technical limitations of 3G and 4G, the full potential of AI could not be used. The author uses those terms together in the paper as they are functionally connected.

⁴ Data security is one of the most important factors in choosing the deliverer of 5G technology. It has been proved that some companies install so-called “backdoors” or leave vulnerabilities in security systems. Many of them appear to be related to conscious intelligence activity. Practices of pressure companies to collect data from their devices are alleged. For example, a case of Nokia phones with an Android system. As a condition of Chinese market access, the company was forced to build a “backdoor” that sends data to a web server in the Chinese network. The problem broke out when phones were sold out of China. In 2018, it was revealed that software from XIONGMAI, a Chinese camera supplier, has a built-in algorithm to access millions of cameras. This is believed to be related to code provided by Huawei for its HiSilicon SOC on which the camera is based. These and other incidents indicate that Chinese agencies may order access to devices shipped to China to aid surveillance efforts. Due to the nature of the code environment, it is challenging to maintain separate code sets for Chinese and non-Chinese audiences. When the same devices are shipped outside China, the so-called “back door” can still extract information.

Theoretical Assumptions and Research Goals

The article aims to explain the importance of 5G technology in building power and shaping the international order by two superpowers: the USA and China. The scale and nature of this process and the fact that it involves global superpowers led the author to draw on the framework of offensive realism as valuable and appropriate for this research.

Realism is one of the fundamental paradigms in international relations that almost created and identified the discipline. It is a theoretical perspective recognizing the primacy of the state, considering power as the main point of reference for attempts to interpret international reality (see Carr, 1939; Morgenthau, 2005; Niebuhr, 1959; Waltz, 1959; Waltz 1976). According to realists, the power calculus is the most decisive factor in states' policies.

Power is perceived as the only "currency" of international politics and the subject of permanent rivalry. Offensive realism is a creative continuation of this approach proposed by John M. Mearsheimer. This theory describes characteristics of the superpowers' policies towards each other, emphasizing their constant tendency to increase their power at the expense of rivals. Mearsheimer – as a realist – is mainly interested in great powers because they, in his opinion, shape international relations.

Offensive realism is also a structural theory of international relations which means it recognizes that the surrounding environment determines the behavior of states. Like defensive realism, it assumes that states function in an anarchic environment in which everyone must selfishly look after their security. The main instrument for ensuring existential safety is to gain strength and power. The difference between defensive and offensive realism comes to light regarding how much power is needed to keep oneself safe. Defensive realists recognize that the international structure is not conducive to the limitless expansion of power but rather to maintain the balance of power. Preserving power, not increasing it, will be states' primary goal.

On the other hand, offensive realists argue that the international structure forces you to increase power constantly, and the ultimate goal is to gain the position of the hegemon. Only it guarantees the achievement of the essential state for the country – security. According to the assumptions of this doctrine, the international system forces great powers to maximize their power because only it guarantees security. Superpowers in the international environment must be aggressive and strive for hegemony (Mearsheimer, 2001). This approach may explain the growing rivalry between superpowers in building the global 5G network, which may be essential for increasing one's power over the rival.

In order to achieve the goal of the paper set at the beginning, two research questions were posed:

- what is 5G technology, and what does it mean for the rivalry between the U.S. and China;
- how has the development of communication technologies affected the influence of countries and their ability to interfere with the international environment?

In order to answer the above questions, this research tries to prove that China and the USA, rival superpowers, are looking for ways to increase their power using every circumstance and instrument. The emergence of the 5G network is another field of this competition and a natural area for a new arms 'race'.

The study will explain the importance of building a 5G network for power building. This is important because this technology is said not to be just the next generation of mobile communication but a systemic solution that will affect socio-economic relations. The approach in this study is based on assumptions and hypotheses referring to offensive realism:

1. For the assessment of offensive realism, it is not important whether the countries seek conquest and increase their power by expanding their armed forces but whether they use every opportunity to increase their power at the expense of their rivals.
2. Analysis of states' policies striving to maximize power explains states' intentions and behavior.
3. Superpowers do not seek the balance of power and the status quo but hegemony. Only this state is found safe.

The research was based on an inquiry into primary and secondary sources. The first group comprises official documents, statements, national programs, and strategies. They answer questions about official goals and present the perception of decision-makers and authorities. Secondary sources include analyses in books, peer-reviewed articles, and reports of think tanks and academic journals. These sources help to confront official political lines with reality. Academic observations and expertise help to understand the real nature of dynamics. The article presents debates on the subject, finally presenting its own remarks and conclusions.

Technological Evolution or Revolution?

Telecommunication technologies were the axis around which globalization processes accelerated. The concept and development of mobile telephony played a considerable role in shaping the modern world and information society. Although the original ideas were about telephone mobility and voice calls, subsequent generations brought technological and conceptual changes (from analog voice calls to digital data exchange). There were different stages of the evolution of mobile communication technology:

1. **1G – Voice calls.** 1G mobile networks were used in the early 1980s with voice communications and limited data exchange capabilities (early ~2.4 Kbps capabilities). 1G networks used analog signals to connect cell users between a network of base stations (hosted in cell towers) using standards such as AMPS and TACS.
2. **2G – Short Message System (SMS).** In the 1990s, 2G cellular networks spawned the first digitally encrypted telecommunications, which improved voice quality, data security, and data capacity while supporting limited data transfer using the GSM standard. In the late 1990s, 2.5G and 2.75G technologies improved data transmission

speeds (over 200 Kbps) using the GPRS and EDGE standards, respectively. This later 2Gs introduced data transmission using packet switching, which served as a milestone in 3G technology.

3. **3G – Limited data transfer: multimedia, text, Internet.** In the late 1990s and early 2000s, 3G networks were introduced with faster data transfer speeds by fully converting to packet data switching. This enabled data streaming, and the first commercial 3G service was launched with mobile Internet access, fixed wireless access, and video calls in 2003. 3G networks have now increased data speeds to 1 Gbps in stationary mode and 350 Kbps in mobile mode, using standards such as UMTS and WCDMA.
4. **4G – Real data: dynamic access to information, mobile device.** In 4G, up to five 20 MHz channels can be linked together. The technology is about five to seven times faster than 3G, offering theoretical speeds up to 150 Mbps. This corresponds to a maximum potential speed of around 80 Mbps in the real world. With a standard 4G network, you can download a 2 G.B. H.D. movie in 3 minutes and 20 seconds, while on a standard 3G network, it would take over 25 minutes. In many countries, the standard for 4G has been adopted as LTE (Long Term Evolution).

The transition between generations of wireless technology has had significant commercial, competitive, and security implications. For instance, Europe, led by Germany, then Finland, gained the first competitive advantage in 2G. As a result, companies such as Nokia and Ericsson were able to introduce more advanced devices earlier than others and were able to switch to 3G in 2000. At the time, the U.S. was still trying to deploy 2G. Thanks to this, the European wireless technology industry led the world. Meanwhile, American companies needed help to maintain technological contact. Europe lost this advantage during the transition to 3G when E.U. regulations that required time-consuming spectrum auctions were implemented.

The weakness of European companies was exploited by Japan, which took the initiative in the field of 3G. In the U.S., implementing 3G networks took many years, resulting in enormous costs for American companies. The technological slippage of the United States resulted in the loss of thousands of jobs and significant profits. Many wireless technology companies collapsed or were absorbed by foreign companies during this period. However, the U.S. has learned from past mistakes regarding 4G and 4G LTE. American companies became more innovative and took the leading position in implementing modern solutions. This made them the largest producer of devices and – more importantly – software (applications, operating systems). With these experiences in mind, it is unsurprising that another participant joined the game – China, a country undergoing a real digital revolution.

These examples explain the reasons for the ruthless race in building a global 5G network. The experience gained so far clearly shows the massive advantage of the first technology supplier. Moreover, while in the early stages, the race was mainly about the largest possible market share and competitive (technological) advantage, the current competition is about

something more: control over data, security, and the ability to influence users. That is why the main topic recurring in network-building discussions is whether the leaders will dominate all the others. The subject of the discourse is also whether this dominance will be structural, i.e., will it provide economic and technical benefits permanently or for a longer time, especially since it is no longer a discussion about the 5G network and more about the entire 5G ecosystem (Bonds et al., 2021).

First Mover Bonus

Historical changes between wireless generations suggest that the country that was the first to introduce particular solutions to the market can count on a privileged position. Firstly, it generates revenues of billions, which will be accompanied by creating many jobs in modern sectors. The result of this will be the positioning of its own economy at the top of the value-added curve. This curve is related to the product life cycle and the corresponding values generated during its lifetime. The production process comprises several phases: research and development, design, marketing, logistics, branding, product development, manufacturing, and assembly. The most value, and thus income, is provided by those phases that are unique and original (and therefore expensive), such as design, research, and development, marketing. Simple, repetitive assembly activities provide the most negligible benefits. This explains why rich countries willingly move production lines to markets with low labor costs, leaving development and research centers at home.⁵

Thus, it became crucial for leading economies to gain a technological advantage and the privilege of setting standards that producers and consumers will follow⁶. In this way, it is possible to promote and force others to use technological solutions that are most convenient from our point of view.

On the other hand, countries that lagged in the technology generation changes were obliged to adopt the leading country's standards, know-how, and architecture. They did not participate in the process of technological development and consumption of market potential (Medin & Louie, 2021).

An interesting example was the transition from the third to the fourth generation (LTE). This efficiency leap led to the rapid adoption of new phones with new semiconductor-based technologies that could carry much more data and were much faster computationally. American companies like Apple, Google, Facebook, Amazon, Netflix, and countless others have created new applications and services that have taken advantage of this bandwidth. As the LTE standard was implemented in other countries, the same phones and applications

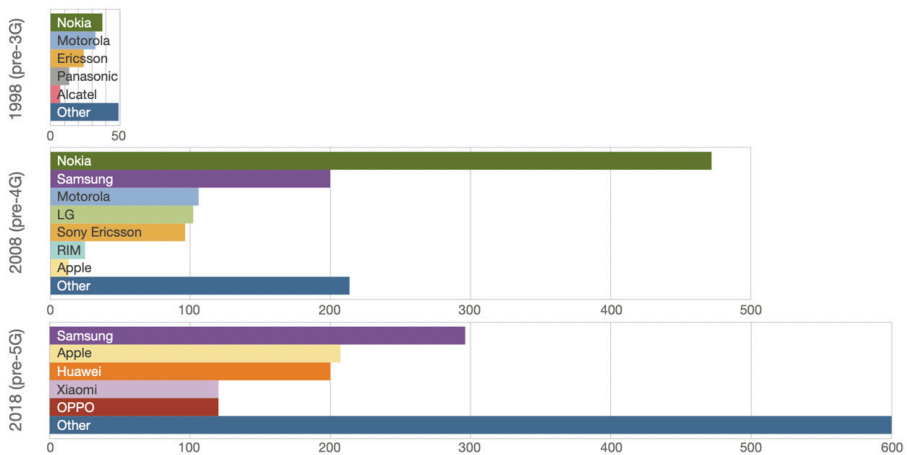
⁵ A good example was the production process of iPhones – devices in older versions were marked “designed in California, assembled in China.”

⁶ An example of a standard in mobile communication was GSM (Global System for Mobile Communications), a concept that originated in Europe.

spread worldwide. This initiative helped reinforce the U.S.'s global dominance in wireless and internet services and created a wireless ecosystem designed and manufactured by American high-tech industry.

The small number of companies capable of producing 5G technology suggests a highly competitive international market with significant barriers to entry. Only nine companies sell 5G radio equipment and 5G systems to operators: Altiostar, Cisco Systems, Datang Telecom, Ericsson, Huawei, Nokia, Qualcomm, Samsung, and ZTE (Townsend, 2019). However, this list is slowly getting longer.

Figure 1. Devices sold in millions



Source: Bonds et al., 2021.

What is the 5G network?

Unlike previous generations, the goal of the 5G standard is not to strengthen connections between individual users. It was built to provide the technical infrastructure to introduce new technologies such as high-precision robotics, artificial intelligence, autonomous vehicles, and all those devices that constitute the Internet of Things.

According to experts from the Center for Strategic and International Studies, 5G technology will have the same importance for development as the Internet had 25 years ago (CSIS, 2021). It is not just a new generation of mobile telephony. This is an entirely new concept of wireless communication, aimed not only at people but also at machines. Its parameters will allow innovative ideas in manufacturing goods (full robotization of factories), smart cities, autonomous vehicles, management (algorithms replacing mid-level managers), implementing artificial intelligence in all aspects of life, etc., real.

The latest generation of fifth-generation wireless networks has been launched with high expectations and no less fear. To understand the changes 5G will bring, it is worth comparing its features with the capabilities of previous-generation 4G systems (known as 4G Long-Term Evolution or 4G LTE). From the perspective of the service recipient, the 5G standard proposes a real revolution, as it supports mass communication between machines. 5G increases the maximum device density from 60,000 per square kilometer (4G standard) to 1 million devices per square kilometer. In 5G, up to five 100MHz channels can be linked together, providing speeds approximately 20-100 times faster than 4G and 4G LTE (Kim & Hong, 2019). While some 5G technologies will be deployed on the currently used radio band and will achieve a slight increase in effectiveness (LTE is already quite well optimized), the full development of 5G will require a much larger frequency spectrum to provide users (people and machines) with another leap in efficiency.

Taking into account the wide variety and number of machines that connect to wireless networks, businesses have faced a significant problem: network bandwidth so far. Although the standard was sufficient for users (watching movies, music, entertainment, using applications, and communication), machines still could not exchange as much data as needed. This was one of the leading development problems (Bonds et al., 2021).

The fifth generation of telecommunications technologies (5G) is the answer of technology companies to three needs: ensuring a stable connection to an increasingly dense “ecosystem,”; enabling continuous streaming of vast amounts of data, and guaranteeing connectivity with very high data rates (Mariani & Bertolini, 2019).

The 5G network has been designed to meet these needs for multidimensional and versatile use. It was decided that it would have a layered structure to ensure this. Each element will have a different function and, thus, a different specification. There will be three main layers that together will make up the entire network:

1. Enhanced Mobile Broadband eMBB – high-speed data transmission and mass information processing in almost real-time. This part of the 5G architecture will be dedicated to transmitting mobile communication, including traditional communication between people. Thanks to the new transmission technology, the speed of data exchange will increase tenfold compared to the current one, reaching a peak of 10 gigabytes per second (5G Strategy for Poland, Ministry of Digitalization, 2018).
2. Massive Machine Type Communications mMTC – will enable the connection of nearly 100 times more devices than today, with a higher bit rate, up to 1 Gb/s, and minimal delays. The service is vital for implementing and developing smart cities or the Internet of Things. Thanks to the low latency in communication between devices, this section of the 5G network will transmit all data at the speed necessary for their proper functioning in a limited area – e.g., autonomous vehicles or medical robotics (especially surgical). This layer will cope with the increasing density of devices connected to the network.

3. Ultra-Reliable Low Latency Communications **URLLC** is a technology that, thanks to minimal delays of 1 millisecond, will enable real-time connections and use them in critical applications. Potential applications: autonomous vehicles during route analysis, production automation, medicine, etc.

The layered structure of the network means that some companies or countries can prioritize individual layers depending on goals and needs. This can be for higher device density – for example, extending the Internet of Things or serving large groups of people, such as in football stadiums or attending mass concerts. For others, data rates for video streaming or low latency (the time between sending and receiving data) for navigation in an autonomous vehicle will be necessary. Still, other states may want to track people with coronavirus 2019 (COVID-19) contacts among their population or implement large-scale monitoring of their residents, etc.

It is estimated that the transition from 4G to 5G will drastically affect the future of global communication networks and fundamentally change the communication environment. 5G is not only robotics but also the improvement of automated decision-making processes. 5G will increase the ability to connect multiple systems into a more comprehensive network while sharing real-time information, improving communication between services, geographies, and domains, and creating a typical picture of reality to improve situational awareness.

It is expected that 100 billion devices will have access to the 5G network. More importantly, 5G will also appear in all aspects of social life and become an integral part. In other words, machines can move safely and work more efficiently when they can “see and hear” the world around them. This means a new ability for machines – the new dimension of optimization, achieved based on complex data sets with newly acquired sensory potential. It will lead to autonomous decision-making. The creators of 5G claim that the devices will revolutionize all areas of life.

5G in China's Strategy

The Chinese fully know they somehow ‘missed’ the industrial revolution and paid for it with the so-called Age of Humiliation. In the face of modern digitization processes and the “Big Data” era, they no longer want to make this mistake (Strittmatter, 2020). Thus, China has developed investments, scientific research, and industry of the latest technologies on a historic scale.

A real symbolic milestone in Chinese leaders’ perception of new technologies is the famous loss of the undefeated Go master from China, the world leader Ke Jie. He lost all games to the Alpha Go program in 2017⁷. This result caught the attention of the Chinese government, which quickly unveiled an ambitious program in artificial intelligence (Mo-

⁷ Compared to chess (by the way IMG Deep Blue defeated Gari Kasparov in 1997), Go is a more complex game. The board is cut with nineteen vertical and horizontal lines, requiring non-linear thinking,

zur, 2017). Two advisers to the Chinese State Council on Artificial Intelligence described AlphaGo's victory in Seoul as a kind of Chinese Sputnik day (Ding, 2018).

The Chinese government and leading Chinese enterprises have started actively promoting the commercial deployment and experimentation of new 5G applications. It is estimated that around 430 million people in China will have access to 5G by 2025, accounting for a third of all 5G users worldwide. The Chinese authorities have prioritized 5G technologies (and currently work on 6G) as a critical factor for future economic development and international competition. China ranked first in the world in 6G patent applications, representing 40 percent of total patents (Watanabe, 2021).

In external policy, China's goal is to build a global Digital Silk Road, which would be based on Chinese dominance – as the leading producer of 5G hardware and software. Since 2005, China's Huawei has become the leading telecommunications equipment supplier for British Telecom's 21st Century Network, and today it is the largest telecommunications provider in the world. It has implemented or submitted bids in almost 60 countries for expanding regional components of the 5G network – the backbone of artificial intelligence and future deep machine learning (DML) technologies (Yu, 2019). Huawei announced that it participates in smart city-building programs in over two hundred cities in forty countries (Strittmatter, 2020).

Moreover, Huawei has signed 46 commercial framework agreements to construct and deploy 5G networks worldwide, 25 in Europe, and has exported about 100,000 5G base stations. Huawei products were crucial in implementing 5G infrastructures in over 288 investments, almost 30 percent of the fifth generation of telecommunications equipment used worldwide (Xinhua, 2019).

If China becomes a leader in the field of 5G infrastructure and systems in the future, the entire ecosystem will naturally have Chinese components. According to experts, this would pose a severe threat to the security systems of all countries that would have them (Medin & Louie, 2021). It would also provide an effective instrument for influencing the international environment – decision-making centers and societies.

The Chinese are already experimenting with the use of 5G networks and artificial intelligence within society. A good example is the Social Credit System – the world's most extensive surveillance system based on integrating databases and using artificial intelligence that monitors and assesses the "credibility" of all people, companies, and institutions. It is based on a unique points system (a system of rewards and penalties), creating categories and assigning them to individual users depending on the result obtained. Another example is the Xueliang (Sharp Eye), which connects data banks and camera systems nationwide. The system is predicted to be an "all-seeing eye." The official aim of the program is to fight crime by quickly identifying people, and that would guarantee efficient prevention

counting many combinations, and a 'network' concept. After completing the first two steps in chess, the player has four hundred possible moves, and in Go, there are one hundred thousand.

and punishment. The system recognizes people not only by their faces but also by their walking style (Dixon, 2018). Under the 13th Five-Year Plan, China is to build a surveillance network system that will cover all regions by 2020 (The 13th Five-Year Plan For Economic). Meanwhile, the province of Xinjiang (with a vast minority of Uyghurs) has been turned into a laboratory for digital surveillance. According to Adrian Zenz, it is a modern version of the Cultural Revolution (Zenz, 2018).

There are also reports of the foreign expansion of the Chinese idea in social control systems. Human Rights Watch illustrated a case in which ZTE, a Chinese telecommunications giant, installed a system in Ethiopia that allowed the government to supervise the opposition (Ethiopia: Telecom Surveillance Chills Rights, 2014).

In order to have greater influence on the development of 5G networks, the Chinese government recognized technical standards as a matter of strategic importance. It has also prioritized the problem of Chinese intellectual property in 5G standards. This strong emphasis on the standardization process is aimed at implementing and commercializing 5G technology by Chinese companies. As the standard creator, they can gain a significant part of the profits and revenues in this crucial industry.

The New U.S.-China Rivalry

The political hegemony of the United States is also an economic hegemony: with the most innovative economy, competitive advantage in the modern technology sector, and the dollar's dominant role in the global financial and commercial system. As mentioned, the USA joined the race in communication technology development quite late. Only the fourth generation (smartphones, data) made it possible for the U.S. to gain a competitive advantage and obtain the status of a leader as a hardware and software (actually the entire applications environment) producer.

The difficult beginnings of the Chinese telecommunications industry (poor quality, lack of experience, and technological backwardness) meant that initially, the Americans were quite condescending about the problem of rivalry with China. When Bill Clinton 2000 was asked about the Chinese government's attempts to crack down on the Internet, he argued that controlling the Internet is not technically possible (Clinton's Words on China, 2000). The world seemed to share this opinion. Meanwhile, the Chinese quickly built a new, cybernetic Chinese Wall (The Great China Firewall⁸), introduced effective network monitoring instruments, and proved that the Internet could be effectively controlled.

The rivalry between China and the U.S. for power is a struggle for markets, technology, and the concept of gaining a competitive advantage. The Chinese introduced an alternative to the U.S. form of doing business. American companies such as Google, Uber, and Facebook

⁸ Interestingly, the Chinese Internet is more of an intranet than the Internet. If China were cut off from the world, most Chinese people would not even notice.

create one product they offer on the global market. Chinese companies invest in local start-ups, adapting to local conditions and absorbing local ideas. This makes their products very popular in the Global South and displaces American, “globalized” products (Lee, 2019).

The apogee of competition was brought by implementing 5G technology. The struggle between companies from China and the U.S. turned into governmental conflict. Firstly, the U.S. introduced administrative restrictions, eliminating the most prominent Chinese companies from its market. Secondly, they began to demand a similarly restrictive approach from their allies. Thirdly, the American side is trying to slow down China’s technological development by banning the export of high-tech components to the Chinese market. Experts from the Institute for National Security Studies found that Americans, despite these efforts, are no longer able to take the initiative in the race (Segev & Orion, 2020). The Chinese are already leading the way in producing hardware, including smart devices. Silicon Valley is still a leader in the field of software.

In response to these threats, in January 2021, the Biden administration took an interest in this area, raising the need to develop the 5G network and addressing problems of technical limitations (frequency availability). Gina Raimondo, then-candidate for Secretary of Commerce in January 2021, stated: “The race for 5G is on. I want America to win and lead. What we need to do is – and the president clarified – to develop a national network development strategy for public and commercial use” (Todd & Martin, 2021).

The White House argued that leadership in wireless technology would let the U.S. win in the technology information age, stating, “In the information age, the nation that is the world leader in wireless technology wins. We must accelerate 5G development and deployment to maintain America’s lead” (Kratsios, 2018).

The American establishment is aware that in recent years, U.S. technological leadership has eroded in several key segments, often giving way to foreign competition. Most of the chips used in American mobile devices are manufactured outside the USA: in Taiwan (66 percent) or South Korea (another 16 percent). Moreover, American companies have entirely disappeared in several sectors; for example, they have exited the RAN mobile base station business, and foreign companies (mainly Huawei, ZTE, Nokia, and Ericsson) are now the only competitors in this market.

For the Chinese, developing artificial intelligence and 5G has become the top priority. The difference between the U.S. and China is even in their approach to the concept of development. While U.S. technology companies must adapt innovations to the existing infrastructure, the Chinese are experimenting with interdependent development when infrastructure is created for artificial intelligence. An example of such an approach is the city of Xiong (Cartier, 2018).

The race between the two powers may have yet another result: it will drive a new wedge not between them, but between them and the rest of the world, under the principle of “the winner takes all”. A good example is the Internet. It was supposed to be a platform of equal opportunities and chances. Meanwhile, it has become practically dominated by

monopolists (Google – search engine, Facebook – social networks) or possibly a few major players (Amazon, Alibaba).

Discussions and Analysis

The development of the 5G network is even compared in the literature to the invention of Gutenberg or the steam engine. Some experts emphasize that 4G has changed our habits and the organization of life, and 5G is expected to change society and the way goods are produced (Kania, 2019). 5G will not only accelerate the speed of people surfing the Internet but also bring revolutionary changes to all aspects of social life. It was estimated to contribute to global gross domestic product (GDP) growth by 0.2 percent annually from 2020 to 2035. This will have an economic impact of US\$12,000 billion (Campbell, 2017). That is why it is said that 5G technologies will provide the framework within which the next “industrial revolution” will evolve. It could be a technological leap that the Massachusetts Institute of Technology has compared to the shift from typewriters to computers (Qualcomm, 2017).

Interestingly, although the West started research into telecommunications technologies, China will likely be its greatest beneficiary. This global shift will result from two fundamental shifts: from the Age of Discovery to the Age of Applications and from the Age of Expertise to the Age of Data (Lee, 2019). In both cases, due to the conditions it has developed (enormous data resources and the pro-technology policy of the state), China is gaining an advantage over the US.

The rivalry between two superpowers, especially when it takes the form of an open conflict, can be understood as a struggle for power in the sense of offensive realism. Using 5G (infrastructure) and AI (software) as instruments of the fight can be seen as a continuation of politics through digital means. Therefore, these instruments should be seen not only as an element of industrial (r)evolution but also as a means in the politics of competition. Thus, they fulfill the assumptions presented in the introduction.

Successive generations of weapons have served states as an instrument to gain an advantage over others. The traditional global presence of the United States was guaranteed by treaty alliances and an international network of military bases and personnel. New technologies can revolutionize this order, and both players are fully aware of it (Frickie, 2020).

From the U.S. point of view, apart from the observed decline of its hegemony, there is another serious threat – the depreciation of the preferred vision of the world. When China was admitted to the world trading system, it was believed that capitalism and free trade would bring freedom to China. The next step was the Internet, which was supposed to build the subjectivity and independence of citizens. Meanwhile, we are dealing with a situation where China controls capitalism and the Internet (Strittmatter, 2020). Chinese authoritarianism, supported by modern technology, will be an attractive model and supplier of systems for other authoritarian countries. Sebastian Heilmann, an expert on China, even named it digital Leninism. Moreover, the technological revolution in China challenges the

assumptions of market liberal theories, according to which progress is not possible under the conditions of an authoritarian regime” (See Sen, 2000). Elizabeth Woyke (2018) of MIT notes, “While the U.S., E.U., Japan, and South Korea defined development for generations past, today China is at the forefront of the technological revolution.”

Conclusions

Answering the questions posed in the introduction, it is worth underlining the properties of the new 5G technology:

- can change the technology of manufacturing goods and global supply chains, relocating the places where the greatest added value is obtained;
- will accelerate social changes (e.g., pauperization of the lowest earners and elimination of middle-level managers, emergence of new social services);
- will create more effective conditions for the production of goods and the use of new technologies (artificial intelligence);
- create instruments for comprehensive control of social and economic life (vast amounts of data collected and analyzed in real-time) both internally and internationally;
- will be applicable in all social, economic, and military areas.

The observation of the evolution of communication technologies indicates the great importance of the “first mover” bonus. A leading country not only wins the markets and achieves the most significant profit but also imposes standards and can maintain significant control over data and information. The digitalization process will cause the amount of data to cascade incrementally. Unlike previous generations, it is no longer just about wireless communication but the whole system influencing all socio-economic areas. No wonder both powers are engaged in a fierce technological war.

5G will be an essential instrument for both China and the U.S., not only to gain an advantage in the area of armaments but, above all, to accelerate the modernization of the economy and gain a competitive advantage, shape the international system of production and distribution of goods; collecting and controlling data (political, financial, etc.). In other words, there is more income, control, and power.

Conclusions from the observations of the development of this sector have already led to a reorientation of China in both fields:

- economic – a shift from prioritizing mass competition, cheap labor, and export volume in favor of accelerating the independent production of goods with high added value)
- and social – digitalization of social processes, monitoring, administration, and service.

They also led to an expansive attitude as a technology provider for other countries. On the other hand, the U.S. has begun to defend the remaining technological advantage more aggressively and negotiate more assertively with partners and allies.

The scope and form of this rivalry are still developing. Its importance increases when we take one more factor into account. Any technology can be used for good or bad purposes, and it is worth remembering when liberal values and democracy are going through difficult times.

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