Research on the layout and value space of China's 5G industry——Based on the Sino-US "trade war" perspective

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Abstract: At present, no matter in the technical field or the commercial field, China has no doubt become the leader in developing the 5G industry. Based on the perspective of Sino-US trade war, this paper analyzes the layout and value space of China's 5G industry, and believes that technological innovation is the first driving force and an important means to seek a leading position in the international market. Take practical measures from the aspects of policy design, industrial layout and technical standards.

1. Introduction
It has been two years since the Sino-US trade war. It is well known that one of the backgrounds and purposes of the US trade war is to curb China's high-tech development. In particular, China's "Made in China 2025" in the past few years, focusing on the high-end high-tech market, has provoked the nerves of the United States. The United States launched a trade war to combat China's Huawei and ZTE. This has completely exposed the ulterior motives of the United States to launch a trade war. It hopes to continue to control the global hegemon by curbing China's development of a new round of industry and technological revolution represented by the 5G industry. The purpose of status. In 2019, it was called the 5G first year. All countries are in the process of preparing for the 5G process, and strive to get the "admission ticket" in the 5G field as soon as possible to seize market share in advance. As the world's technology powerhouse, the United States' performance in the 5G field is very unsatisfactory, and even its own 5G process still has many problems. This has further spurred the United States to fight endlessly in the trade war. Although the Sino-US trade consultation is still under further negotiation, for the time being, the situation is still not optimistic. Based on the perspective of Sino-US trade war, this paper analyzes the layout and value space of China's 5G industry, and then proposes measures to develop 5G industry in China under the background of increasingly fierce national science and technology competition.

2. The status quo of China's 5G industry development - comparison with the United States

2.1 China's 5G industry infrastructure layout
At present, China has undoubtedly become a leader in the development of 5G industry. In terms of 5G infrastructure investment, China is not only very successful in its 5G construction, but also very willing to share 5G results with other countries and is in a leading position. Since 2015, China's spending on wireless communications infrastructure has increased by about $24 billion compared to the United States. Not only that, but China also plans to invest another $400 billion in 5G over the next five years. As far as China's Huawei is concerned, the company currently holds more than 65 5G contracts. Huawei equipment has helped many countries start construction of 5G. Nowadays, it is clear
that the world's 5G pattern is more advanced. The United States, which has already seen the reality, is no longer reluctant. Recently, the country has once again changed its attitude and tried to win more opportunities for its own enterprises. From November 20th to 23rd, 2019, the "World 5G Conference" will be held in Beijing. China will cooperate with the global economies to discuss the application of 5G technology and industrialization.

2.2 China's 5G industry has unquestionable technological advantages
Whether it is technology, industry or application, China's fifth-generation mobile communication (5G) is in a leading position in the world. From a technical point of view, in the field of 5G, the number of international standard texts proposed by China accounts for about one-third of the world, and the number of patents owned by China is also the highest in the world. Huawei is the world's most patented 5G patent. From the industrial point of view, China has developed key links in the 5G chip, mobile phone, base station and other industrial chains earlier in the world, and has already put into production and use. From the application point of view, China has long defined that it will start 5G commercial use in 2020, and will issue 5G licenses in advance this year. This is also a leading international, which lays a high starting point for us to achieve 5G leadership. And foundation. Achievements in the field of mobile communications are also typical representatives of key national technologies under the conditions of market economy to tackle the new national system. Under the open competition conditions of domestic and foreign markets, domestic production, learning, research, and use are closely coordinated under the leadership of the government to jointly promote technological innovation in this field. At the same time, China's huge market has also greatly promoted the development of mobile communication technology, forming a benign cycle innovation situation and innovation system that the market application drives the network, the network drives the whole machine, and the whole machine drives the development of chips and other components.
Figure 2. Number of 4G users in China in 2014-2015 (100 million people)

2.3 China’s 5G industry technology standards lead the world
The global 5G opening trend is unstoppable. 5G is the world’s 5G, and the global 5G depth integration is unstoppable. 5G is the first mobile communication technology to develop a globally unified standard from the beginning. 1G adopts separate national standards such as the United States, Britain, France and Japan. At the beginning of 2G, regional standards set by Europe and the United States have emerged. 3G has begun to appear international standards, but in the end, multiple standards coexist, and 4G international standards are also divided. FDD-LTE and TD-LTE. After 5G, the global academic community and the industry reached a consensus that countries no longer submit standards separately, but jointly develop unified technical standards, which has fulfilled the wishes of the international mobile communications field for many years. The international 5G industry chain is also deeply integrated. It is called you, I have you. 5G will have a better development prospect. The door of the Internet of Things will be opened in the 5G era, and will expand to various industries and fields, extending to all aspects of the economy and society, changing human consumption patterns, transforming human production methods, and providing support for the high-quality development and governance of society.

Figure 3. Progress of China’s Internet Development
3. The space and value development prospects of China's 5G industry

3.1 5G technology represented by 5G mobile phones will lead new technologies, new products and new opportunities

China plans to promote 5G scale experimentation and commercial trials in 2018, and achieve nationwide 5G commercial use by 2020 in accordance with the country's overall goal. Major changes have taken place in the 5G industry, starting with the large-scale adoption of 5G mobile phones. Due to the significant increase in the design and manufacturing difficulty of 5G mobile phones, more components are used. It can be predicted that the unit price of 5G mobile phones will increase by 280-600 yuan, and the mobile phone industry chain will benefit significantly. In 2020, 30% of mobile phones will support 5G communication, and the value of 5G mobile phones will increase by about 400 yuan. The new market demand will reach 138.4 billion yuan. With the acceleration of penetration rate, 2021-2022 will be added every year. More than 120 billion market demand. In 2018, 5% of mobile phones will have 5G communication capabilities. In 2020, the penetration rate will reach 30%, and in 2022, the penetration rate will reach 75%.

Table1 5G mobile phone unit price market to improve space demand

| Category                              | 2018 | 2019 | 2020 | 2021 | 2022 |
|---------------------------------------|------|------|------|------|------|
| Global smartphone shipments (100 million units) | 14.33 | 16   | 15.32 | 18.23 | 19.12 |
| 5G mobile phone penetration rate       | 1.40% | 8%   | 30%  | 45%  | 50%  |
| 5G mobile phone shipments (100 million units) | 0.29 | 1.5  | 3    | 8.6  | 10   |
| Average unit price increase (yuan)     | 600  | 500  | 456  | 365  | 296  |
| 5G mobile phone upgrade space (yuan)   | 148  | 412  | 123  | 1278 | 1598 |

It can be predicted that under the leadership of 5G, global smartphones will experience rapid growth, and will grow by 10% in 2020. 5G mobile phones will also penetrate rapidly in 2020, reaching 35%, with shipments reaching 579 million, 5G mobile phone antennas. It will show explosive growth and will reach 35.2 billion yuan in 2022.

Figure 4 5G mobile phone market scale
3.2 5G industry commercialization stimulates unlimited development prospects
With the commercialization of 5G in 2020, it is expected that the number of 5G connections in China will increase rapidly over time, reaching 428 million by 2025. When 5G is commercialized, various types of terminals will appear to support the first deployed 5G network. As the scale effect appears, the price of 5G terminals will decrease over time. Although some applications of 5G have new requirements for the form of terminal equipment, the smartphone will still be the main terminal type when 5G is launched. GSMA Intelligence predicts that by 2020, two-thirds of mobile connections in global mobile connections will be smartphones, while China's figure is close to three-quarters, currently 53% and 71% respectively. The penetration rate of 5G smartphones will increase further by 2025.

![Figure 5. 5G network user growth after commercial growth expectations](image)

3.3 China's three major telecom operators in the development of 5G industry space
In the first half of 2019, China Mobile's net customers increased by 9.98 million, and its operating income reached 389.4 billion yuan, down 0.6% year-on-year. In the first half of 2019, the telecommunications business revenue was 672.1 billion yuan, a year-on-year decrease of 0.03%. In response to these challenges, on the basis of the “big linkage” strategy and the “four-wheel drive” integration development, China Mobile has solidly promoted transformation and upgrading, comprehensively deepened reform and innovation, actively deployed 5G development, and fully implemented the “5G+” plan: 5G+ 4G, 5G + AICDE, 5G + Ecology and 5G + X create a broader value space for "5G +". By 2035, 5G applications will bring a 4% increase in economic output to the global economy, and industrial-oriented applications will account for about two-thirds of the economic value created by the entire 5G. The 5G value chain will cover a wide range of technology companies. By 2035, the 5G value chain itself will generate 3.5 trillion US dollars of economic output, about 24 trillion yuan, while creating 22 million jobs. Among them, China's total output is 984 billion US dollars (about 6.8 billion yuan), employment opportunities 9.5 million, ranking first in the world.

| Operator        | Time  | Plan                                      |
|-----------------|-------|-------------------------------------------|
| China Mobile    | 2017  | Initial validation phase in several cities|
|                 | 2018  | Multiple city trial phases                |
2019 | Expand the scale of the trial and the number of cities
2020 | The whole network 5G base station reaches the scale of 10,000 stations

| Year | Action | Operator |
|------|--------|----------|
| 2016-2018 | Complete 5G laboratory construction | China Unicom |
| 2017 | Solve the core technology of 5G technology | China Unicom |
| 2018 | Complete the core research of 5G technology | China Unicom |
| 2019 | Complete base station layout construction | China Unicom |
| 2020 | Complete basic networking | China Unicom |
| 2016-2018 | Solve the core technology of 5G technology and build a core laboratory | China Telecom |
| 2018-2020 | Complete technical verification to achieve basic layout | China Telecom |
| 2020-2025 | Ongoing research and commercial | China Telecom |

4. China's 5G industry layout and value space optimization measures

4.1 Accelerate the application of 5G industry business model

Large-scale use of 5G networks will be the first in the enterprise network market. The automotive and transportation, logistics, energy, public facilities monitoring, security, financial and other enterprise markets will give operators the greatest opportunity for increased revenue. With the gradual improvement of operators’ 5G network coverage, 5G networks will realize core network virtualization, edge computing and flexible IT business process management. Chinese operators are actively collaborating with ecosystem players and communicating with vertical industry users to determine technical solutions and business models. Find the investment point for 5G network construction, focusing on 5G deployment mainly in urban areas, investing in small base stations, new antennas and main equipment. China Mobile operators have already completed two rounds of 5G testing, commercialization in 2020, and construction of more than 10,000 5G base stations. China Unicom plans to build about 1,000 stations before commercial use in 2020. These will enable operators to break through the traditional business model of network connectivity.
Figure 6. Sources of revenue for operators in the 5G era

4.2 Accelerate 5G applications and layout in key areas
From the perspective of the 5G industry chain segmentation, the market scale changes of base station antennas, base station radios, communication network equipment, small and micro base stations and indoor distribution, fiber optic cables and optical modules are basically consistent with the construction progress of 5G base stations. The overall market size of China’s 5G industry will reach 1.00 billion yuan, which is nearly 50% higher than the overall market size of 4G industry. It is estimated that the number of intelligent networked vehicles directly driven by 5G will reach 130 million in 2020-2025. It is necessary to deeply study the application of technologies such as 5G and accelerate the development of autonomous driving technology. It is necessary to promote the integration of multi-industry development and promote the rapid growth of the Internet of Things market, which will provide new impetus for sustained and steady economic growth. It is necessary to increase the promotion of smart terminals represented by ARNR and smart phones, and launch related products.

4.3 International Vision to Improve 5G Industry Planning and Value Chain Improvement
Create a 5G industry development environment, explore an inclusive and prudent supervision system, and comprehensively coordinate the construction of 5G networks. Develop the government's guiding role, coordinate the "production, learning, research" forces, coordinate the development of 5G technology research and standards, promote operators to synchronize optimization, speed up synchronization, strengthen interconnection and improve the overall quality of the network. Increase the protection of intellectual property rights and actively expand the application field of 5G services. Promote the construction of a new generation of infrastructure, promote the sharing and sharing of 5G networks, and promote the openness of enterprise stock resources and the construction and sharing of new facilities. Build a fusion application innovation and verification environment for 5G technology, establish a 5G technology into a civil service platform, widely collect 5G applications, deepen cooperation with countries related to the “Belt and Road”, give full play to the role of China-ASEAN and other platforms, and pass the 5G industry fair., the summit forum, the industry promotion meeting, etc., to build a China-ASEAN 5G cooperation platform.
5. Conclusion
5G technology represents a new direction of development, hiding huge development potential, and will have a tremendous impact on social life. The Sino-US trade war has further sounded the alarm of China’s focus on technological innovation. It must vigorously promote innovation and achieve new technological breakthroughs around some core technologies. In the context of the Sino-US trade war, prioritizing the optimization of the 5G industry is an important measure for China to seize the world’s technology market. In this context, China must increase the layout of the industrial chain and the promotion of the value chain, and seize the opportunities in the new round of technology and industrial revolution.

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