

China-US 5G Competition: Narrow Economic Competition and Broad Security Competition

Qixin Zhang^{1,a,*}

¹Arts, Design & Architecture, International Relations, University of New South Wales, Sydney, 2017, Australia

a. z5443015@ad.unsw.edu.au

**corresponding author*

Abstract: Currently, China and the United States are competing in various fields. Among them, science and technology, especially the field of 5G, is the primary area of competition between the two countries. It not only involves science and technology but also plays a decisive role in national security in the economic, political, military, and other fields. This paper explores whether the China-US 5G competition is economic or security competition from offensive realism. Besides, this paper also examines the role of economic ties and the international community in providing flexibility in the formulation of China-US 5G security strategies. This paper validates the underlying assumptions of offensive realism and supplements the literature that has previously neglected this theoretical perspective and the flexible factors of security competition. These findings suggest that with survival as the goal, great powers continuously take steps to maintain national security and maximize their survival prospects. The research results show that the China-US 5G competition is a broader national security competition based on economic competition.

Keywords: China-US competition, 5G, offensive realism, security issue

1. Introduction

Competition between the US and China has intensified over the past few decades. The two countries compete not only in the military and “high politics” but also in the non-military and “low politics” domains. Mastering 5G is critical for China and the US to gain technological dominance and competitive advantage. Against the backdrop of the transformation of the US-China trade war into a technology war, China and the US are racing to deploy 5G wireless networks to gain a leading position in standard-setting and the global supply chain.

From an offensive realist perspective, the first part of this paper discusses the economic nature of the Sino-US 5G competition from the perspective of market structure. The second part analyzes the Sino-US 5G game between the military level and the security level. The final part attempts to fill the gaps in the previous literature on offensive realism and analyzes from the perspective of Sino-U.S. economic cooperation and the domestic interests of US allies. It is concluded that, in a broad sense, the Sino-US 5G technology competition is a flexible security competition.

2. Literature Review

2.1. US-China Competition in the Context of Power Shift

According to the theory of power transfer, the current world power shows a trend of transferring from the United States to China, and the Sino-U.S. relationship shows a trend of predominantly competition under this background [1].

As the research theory of this paper, the realist theory argues that the Thucydides Trap has plunged China and the United States into a new Cold War of security competition [2], that security dilemmas are further driving China and the United States to strengthen military investment [3], and that quality friends will play an important role in helping the two compete [4]. Against the above background, the United States has ‘hegemony’ and ‘containment’ as its policy goals towards China [5], while China aims to become a regional hegemon [2]. The two states are more willing to compete than to cooperate [2].

In addition, there is a complex and subtle relationship between the national economy and national security [5][6], and technological innovation is a determining factor for economic growth [7]. The US-China trade war further corroborates the importance of 5G to economy and security, and to national competition [8].

2.2. The importance of 5G

The critical status of 5G is recognized [9]. The 21st-century competition between the US and China has gradually shifted towards the high-tech sector [10]. 5G technology-related standards and platforms will play a decisive role in high-tech manufacturing [11]. Against the backdrop of the US-China trade war, the importance of 5G in the economic field is further highlighted. Mastering the 5G standard is a prerequisite for dominating the global supply chain [12]. It will bring nearly 3 million jobs and generate lucrative revenues for the relevant technology and telecom companies [13].

Besides, as a new generation of mobile communication technology, 5G, occupies an important position in other fields of international technical standards of technology leadership, military, and other national security [14]. However, it may be affected by the vulnerability of the virtual network [15], providing more entry points for malicious national security actors [16]. Therefore, the potential for 5G to aid espionage and potential damage to infrastructure poses a threat to national security [17].

2.3. China-US 5G competition

In addition, scholars and policymakers have paid attention to the relevance of the U.S.-China 5G competition to the national economy and security.

As a further extension and new area of focus of the US-China trade war, the US-China 5G competition can be seen as an economic issue [18][19]. The literature in this area can be divided into international market and domestic investment. From an international market perspective, 5G technologies are linked to global digital markets and supply chains. Competitive winners can enhance their country’s technological independence [20], and boost domestic firms’ participation in the international market [21]. From a domestic investment perspective, China has surpassed the United States as the world’s largest investor in 5G R&D [22], with significantly lower costs of mobile network access and accelerated ubiquity [23]. Compared to China, the United States lacks comprehensive 5G equipment providers [23]. There are contradictions in the construction of small base stations on the ground and investment conditions for 5G deployment such as siting and licensing policies still need to be improved [24] [25].

In addition, 5G’s close ties to China’s economy and supply chain have led some scholars to view the U.S.-China 5G rivalry as a security issue in a broader sense [13]. Chikermane [26] evaluates the

national policy, legal, and political advantages available to potential suppliers of 5G, such as Huawei, in the cyber domain and concludes that the role of 5G technology as a security strategy is far beyond technological competition. This contention is further reflected in the evolving dynamics of US-China relations [17] and the shifting 5G securitization preferences and attitudinal changes towards China in European countries, which serve as a sub-battleground for US-China 5G rivalry [27].

However, the collected literature lacks an analysis of the rationality of 5G as a security issue from an offensive realism perspective. At the same time, the past literature ignores the flexibility factor of China and the United States (especially the dominant country, the United States) in formulating strategies in the face of 5G security competition. This paper will remedy and explore the above two parts.

2.4. Offensive realism

Offensive realism refers to countries' pursuit of unlimited power to ensure survival. Hegemony is the inevitable beginning of relations between major powers, and rising countries will inevitably become enemies of the dominant countries in the existing system [28]. Compared with neorealism and traditional realism, offensive realism is more pessimistic, reflected in its emphasis on the decisive role of military strength in the struggle for hegemony. Offensive realism believes that the economic strength of a rising country will inevitably be transformed into military strength and that a country can only achieve security by developing military strength without limits [28]. Pursuing an offensive military strategy has made offensive realism the most radical in the post-Cold War era.

3. Discussion

3.1. US-China 5G Competition Justified as an Economic Rivalry

The market structure of 5G technology primarily reflects the nature of Sino-US 5G competition in economics. Market structure classifies and distinguishes different industries according to the degree and nature of competition in services and goods [29]. Market structure is usually measured by factors such as barriers to entry and market share [29].

Patents are key to measuring industry entry barriers [30]. Currently, China is in a dominant position in the Sino-US 5G economic competition. By 2024, the number of patents applied for by Chinese companies (Huawei, ZTE) will account for 23.9% of the patents under the current ETSI standard, which is much higher than American Qualcomm's 8.6% [31]. In addition, a 2023 report by LexisNexis emphasized that only 10% to 20% of all 5G patents applied for worldwide are actually necessary [32], which may reflect the fact that applying for patents is one of the means of market competition in the 5G economy. The 2019 report by IPlytics further reflects China's dominant position in patents and technology in the 5G economic competition: Chinese companies own 1,529 standard-essential 5G patents, accounting for 36% of all standard-essential 5G patents, 14% ahead of US companies, thus greatly enhancing China's 5G competitive advantage and 5G industry barriers [33].

Judging from market share, by 2020, the number of 5G base stations in China will exceed 2.3 million, and Huawei and ZTE will control about 41% of the global telecommunications infrastructure [34][35]. China is expected to become the first market with one billion 5G connections in 2025 [34]. Furthermore, China's 5G connections will account for one-third of the global connections in 2030 [36], which will add nearly \$290 billion to the Chinese economy [34]. Compared to China's 5G market deployment, the US focuses on the most profitable and fastest growing area of 5G services, which will help the US's independent 5G network revenue exceed \$6.2 billion in 2030, leading the US region with a compound annual growth rate of 52.2% [37]. Overall, China's 5G deployment and 5G mid-band deployment could reach 95% by the end of 2024, about 5% higher than North America

[38]. The increase in 5G and mid-band deployment provides good coverage and high capacity for economic activities in related industries, such as electric vehicles, home appliances, and semiconductors, thereby enhancing the competitiveness of the country's economic development [32].

3.2. US-China 5G Competition is a Security Competition in a Broader Sense

However, in a broader sense, the US-China 5G competition is not only an economic issue but also a national security threat [39].

Pursuing patents and market share in economic competition is only the surface of the Sino-US 5G competition. The Sino-US 5G competition can be traced back to the intellectual property rights and state subsidy disputes in the Sino-US trade war [40][41]. Peter Navarro, the senior US trade adviser, has bluntly stated that Section 301 targets "Made in China 2025" [18], whose core objective is to enhance China's technological leadership in high-tech fields such as electric vehicles, artificial intelligence, and information technology through government subsidies and mobilizing state-owned enterprises to acquire intellectual property rights before 2049 [12]. Given that 5G technology plays a crucial role in the data transmission of mechanical equipment, including vehicles, machines, and sensors [32], it has emerged as the primary focus of the US 301 provision and the implementation of "Made in China 2025."

The reason for the US interest in 5G is that 5G involves all security dimensions [9]. 5G is a natural domain for a new arms race [42], and key parts of 5G infrastructure are decisive for the integrity of military communications [43]. As Huawei became the world's leading supplier of 5G base stations in 2020 [44], Washington further increased concerns that Huawei could be used as a spying tool to monitor its military information and control military-critical infrastructure [45]. In the US 5G decoupling strategy towards China, the Trump administration has restricted companies from supplying Huawei with necessary high-end semiconductor components and taken measures such as the "clean network" policy and the listing of Huawei on the entity list, requiring that all data entering and leaving US diplomatic facilities be transmitted only through trusted 5G equipment, thereby reducing the risk of Huawei stealing confidential military information [46][47][48]. Meanwhile, to ensure the long-term integrity of the 5G supply chain, the US has proposed nine task policies aimed at improving innovation capabilities and increasing funding to support research and development of cybersecurity architectures such as cellular communications [49]. In addition, the US has pressured other countries, with the Five Eyes alliance and other US partners such as Belgium, France, and Lithuania restricted from using Huawei equipment in 5G network construction [48].

Chinese 5G leader Huawei and related scholars have responded to US concerns and restrictions on China's 5G in the field of national security. Huawei stated in 2019, according to which Clifford Chance concluded, that Chinese law does not give the Chinese government the power to force telecommunications equipment companies to install eavesdropping equipment or engage in acts that endanger the integrity of the network [50]. Huawei holds about 20% of the world's 5G patents and does not need to steal intellectual property [50]. ITU secretary-general Houlin Zhao also said that the US's accusations against Huawei and China's 5G are driven by politics and trade rather than evidence [51]. Similarly, Roissyam and Nugroho's 2023 study argues that the US does not have strong evidence to prove Huawei's espionage and that the US's restrictive measures against Huawei and China's 5G are intended to gain information on China's geopolitical hegemony [46].

In response to US restrictions on China's 5G, the Chinese government and Huawei have taken corresponding measures. The Chinese government has released China Standard 2035, which aims to control emerging technology rules rather than commodity production, thereby enhancing China's voice in international technology standards such as 5G [52]. Furthermore, China has signed 52 standard cooperation agreements with countries along the Belt and Road and has provided support to technology companies such as Huawei through the Digital Silk Road [53]. With this support, Huawei

has completed the construction of more than 70% of 4G networks in Africa and signed the first commercial standalone 5G network with the African wireless operator Rain [54] [55]. At the same time, Huawei launched the 5.5G multipath evolution solution [56]. In 2024, Huawei and South African operator MTN completed the first 5.5G network trial in South Africa [57].

Since 2020, Huawei has become the world's leading supplier of 5G base stations and continues to enhance 5G technology and coverage [44]. No US manufacturer of 5G network equipment can compete with Huawei [46]. China has a relative advantage in China-US 5G security competition [46].

3.3. Limiting Describing the US-China 5G competition as only a security competition

The complexity and multidimensionality of the U.S.-China relationship mean that only categorizing the U.S.-China 5G competition as a security competition, or a zero-sum competition of sorts, is equally limiting. The different dimensions of their relationship are evolving at different speeds and directions [58]. The 5G competition is still influenced by both the economic cooperation between the two states and the international society.

For one thing, trade exchange is of great significance to the development of two countries' national powers [12]. According to offensive realism, great powers are equally inclined to use the military and every possible opportunity to sacrifice the interests of their rivals and gain hegemony while safeguarding their own [28]. The necessary trade agreement cooperation requires both countries to balance competition and cooperation in the security dimension of 5G technology. This argument can be made at two levels of state-civilian economic interaction. First, the national security part of cooperation would reduce the risk of a 5G "full decoupling" [39]. Under the threat of China's refusal to reach a trade deal, Trump lifted restrictions not related to the area of international security on Huawei's 5G at the G20 meeting [59]. The subsequent Biden administration also switched to a semi-decoupled 'small yards and high walls' strategy [60]. This shift also safeguards the private sector's economic interests and its dominance of S&T innovation. Second, the U.S. private sector may need to have long-term technology-related business dealings with Chinese companies. A complete restriction of Chinese technology would further aid China's self-sufficiency, which could result in the loss of important business revenue for the US [61]. And this revenue is crucial for 5G technology development and increasing national power [61].

Second, the US may be unable to control the situation where its allies choose to cooperate with China because of national interests. In Europe, the main battleground for the US-China 5G competition [8], the US and the allies indeed need to cooperate in co-constructing large-scale 5G network standards. However, American allies have reacted differently to this. Countries such as Germany opposed the American restrictions on working with Huawei due to their national interests (Huawei could help the 5G RAN for development) [46]. In addition, Huawei's bid for supplying 5G equipment to Dutch operator KPN was 60% lower than that of Sweden's Ericsson. The Dutch authorities decided to stick with Huawei in the less vulnerable parts of the network [61]. While Sweden has banned Huawei from the 5G spectrum domestically for private companies, Ericsson's chief executive criticized the Swedish government over fears of Chinese retaliation against Ericsson's investment in Sweden [62]. The above analyses further validate that the China-US 5G competition, considering only the security dimension of 5G technology, is one-sided and that national economic interests and international repercussions should also be taken into account [61].

4. Conclusion

This paper analyzes the China-US 5G economic competition from the angle of entry barriers and market share and innovatively discusses the 5G security game between China and the United States represented by the Huawei incident from the perspective of offensive realism. The paper ultimately

concludes that the competition between China and the United States in 5G technology is economic, but in a broader sense, it is more of a security competition. This article makes up for the lack of literature analyzing the China-US 5G competition from the offensive realism perspective.

When analyzing China-US 5G competition, it is also necessary to consider the reality of the competition between China and the US. The US's neglect of 5G technology cooperation will increase the risk of China's technological self-sufficiency and fail to provide sufficient funding for 5G research and development. In addition, US allies may choose to cooperate with China for the sake of their interests, which may affect the construction of the US's 5G infrastructure and standards. Paying attention to the flexible factors of 5G security competition is crucial to deploying the state's security strategy.

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