

5G as Geopolitical Power Struggle: The New Neutral Approach of Balance and Safety in Technology Controlled World Explained through a Case Study of Serbia

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Abstract: 5G is a critical sensitive technology that could endanger public safety. Recent progress of Huawei in the number of patents relating to 5G caused a trade war over the issue, with multiple actions from the U.S., including restrictions towards Chinese companies. This paper seeks to explore the issue of 5G around global security and the struggle for geopolitical dominance. Identified gap in the literature is related to the question if there is a safe side in terms of choices that countries make around 5G vendors. Earlier studies have not considered this question appropriately in a comprehensive way, because of one sided look and policy approach. The second question attempts to find the best solution for countries to escape dominance of 5G vendors, ensure high safety and avoid potential hazards. To put 5G technology in context, we present geopolitical issues around a global information infrastructure, provide information into China's 5G strategy and history of tech struggles between China and the U.S. We further present emerging geopolitical safety issues regarding 5G technology and elaborate Serbia's geopolitical turmoil related to 5G. In conclusion we classify countries based on their position about this issue to the West, the East and the Neutral corpuses. The focus on Serbia and politics of 5G diversity is then examined to conclude that this geopolitical position of 5G Neutrality could be beneficial for the balanced world in which new technologies will be a base for multilateral dominance. This paper is limited in technical and legal analysis of the issue. Further research should propose encryption and quality control standards together with legal framework, to ensure diversity in social interest.

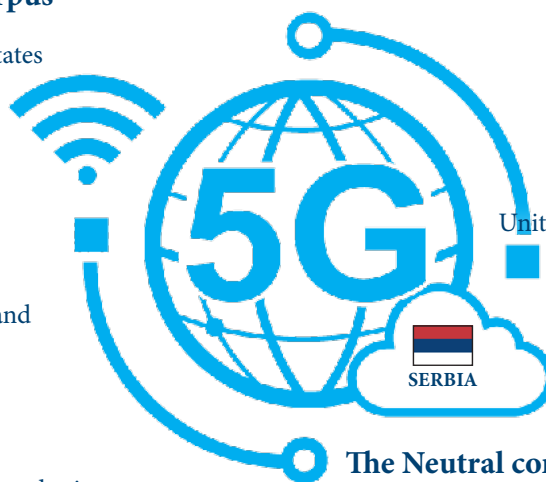
Keywords: Huawei, 5G technology, geopolitics, security, public safety.

Graphical abstract

The West corpus



The East corpus



The Neutral corpus

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INTRODUCTION

5G is the latest upgrade of data transfer technology that will be the backbone of various fields in the future. Autonomous vehicles, industry 4.0, education, finance and medicine will be just some branches that will undergo major changes under the influence, or rather backed up by 5G technology. Concrete applications could be seen in the Internet of Things, machine to machine and smart networks. This advanced data protocol is substantially higher in latency, speed, bandwidth, capacity and frequency than current 4G technology (Gallagher & DeVine, 2019). The telecommunications advance every four to 14 years. This includes transition from 1G to 2G (five years), from 2G to 2.5G (5 years), from 2.5G to 3G (4 years) and from 3G to 4G (14 years), as noted by Saghezchi et al. (2017). The estimate is that the shift from 4G to 5G will take 8 years. Essential difference between previous and future technology in telecommunications is much more than the speed of transfer. Issues that go around this cutting-edge information infrastructure concern architecture, infrastructure, information, privacy, security and standards.

5G infrastructure is envisioned to be vital for security, economy and safety being interwoven into various processes throughout interconnected global economies. 5G would interfere with transportation, information and communication across industries and sectors. Both physical and virtual assets would be touched and controlled through 5G. These would most likely be roads, ports, energy, railways, broadband, telecommunications, health, banking and finance. It would touch both private and public sectors. The technology is envisioned to be at the forefront of the fourth industrial revolution, smart cities and self-driven cars. The official 5G Strategic Action Plan of the European Union (European Commission, 2021) from 2016 envisions a high capacity 5G network as a key asset for Europe's competitiveness, as revenues in that sector will reach €225 billion per year by 2025. In a text about Industry 4.0 as a possibility for the EU's economic post Covid-19 recovery, Benabdallah (2021) points towards 5G as an important ingredient for different digital applications such as the Internet of Things, the cloud and artificial intelligence to create major changes in manufacturing, which is the backbone of Europe's economy. Benabdallah (2021) provides an example of independent 5G implementation in the EU. He noted Foxconn's plant in Komárom, Hungary, a manufacturer of high-end servers and gaming computers, which launched the first industrial private 5G network in that country.

The basic security challenge relating to 5G is the tremendous power possessed by its service providers, to inspect or manipulate data that go through its network, which opens possibilities for different kinds of misuse. The following paragraphs list some of possible dangers relating to manipulation of 5G infrastructure.

Service providers of 5G technology can cause mayhem to governments, citizens, financial institutions and businesses, at a level unparalleled to anything before. Thus, identifying risks and vulnerabilities of 5G technologies is critical for societies of the future. What if self-driven cars are sent confusing signals, traffic lights get "confused" to create accidents, business secrets revealed, airlines or railways disrupted and fake news created by AI (Chikermane, 2019). He pinpoints spyware as a threat for the security infrastructure or financial systems. Risk management thus stands as the most important process for nation states.

Chances are that military technology will be controlled through 5G infrastructure as well. Korać (2018) outlines capabilities of remote AI driven weapons used in arm conflicts



around the world today. What if control of this powerful military force is taken over by hackers, terrorists, algorithms or some country to establish global domination? It may be useful to foresee this and many other nightmarish scenarios in order to prepare counter-measures and prevent disastrous consequences.

Liebetau and Christensen (2021) examine strikes by the Mirai botnet, as one of the largest and most enduring botnets to show that these aspects of cyber security are becoming ever more prominent together with the development of 5G technology. The technology targets computers with low security regimes, such as those used for home cameras to create a massive army of bots capable of taking down any online entity, including parts of the network or the whole Internet as a matter of fact. This happened once in September of 2016 when huge parts of the US were taken down from the Internet. Automated bots could be used as well in propaganda wars as described by Pavlovic and Bojic (2020).

Meese et al. (2020) list 5G as one of the most prominent conspiracy theories during the Covid-19 era in Australia. There are two kinds of conspiracy theories to this regard, one that 5G lowers the immune system making the people exposed more vulnerable to the virus. The other narrative promoted on social media is that 5G directly causes Covid-19. It is possible that the idea of 5G being harmful is promoted as part of a geopolitical struggle. The global chip shortage may slow down the introduction of 5G technology. The shortage of the crucial semiconductor, which is estimated to last until 2023, is caused by Covid-19 pandemics and the increasing demand for electronics, such as the latest smartphones, smart homes and electric vehicles (Gooding, 2021).

Kaska et al. (2019) present 5G as a prime geopolitical issue. He highlights cyber espionage as the main concern to conclude that 5G cannot be isolated from the civilian or the defense domains.

GEOPOLITICS AROUND 5G

Being one of the first actors in 5G development, Huawei's Chief Scientist of Future Networks Richard Li took part in international activities to promote the newest 5G standards and trends as the Chairman of ITU's Group on Technologies for Network 2030. The Initiative includes members from Japan, Russia, China and the United States (International Telecommunications Union, 2018).

Besides China's Huawei and China Mobile, other Asian corporate players in the 5G arena include South Korea's SK Telecom and Korea Telecom. 5G was launched across China in 2019. Companies developing 5G technology in the Americas are AT&T, Verizon and T-Mobile. They managed to establish 5G in 19 the U.S. cities, where they have been testing smartphones. The European Union has its 5G players too. The biggest ones are Ericsson and Nokia. The commercial 5G network was launched in Switzerland in 2019.

On the other side, in the United States, president Barack Obama announced a US\$400 million research and development budget deployed for 5G technologies in 2017 (Coldewey, 2018). After that, in 2019, President Donald J. Trump had a similar statement, when he once again introduced the United States' 5G Initiative. Despite these announcements progress in the U.S. development of 5G has been slow paced.



However, the struggles between China and the U.S. over 5G technology consist of multiple events with pressures from law and security apparatus. For example, the U.S. arrested Huawei's top management official in December 2018. Meng Wanzhou was on Canadian territory, when taken into custody and then extradited for multiple charges including obstruction of criminal investigation, trade secret theft and violations of Iran sanctions (Sanger et al., 2019). Furthermore, the Western governments labelled Huawei's 5G technology as dangerous for global safety. Multiple papers assess security issues related to Huawei from similar standpoints. The most concern is produced by the Chinese state background, especially the low level of democracy in that country, as interpreted by some authors.

Critical approach towards China has been demonstrated by many papers. This country is described as poor in its human rights record and high in surveillance and dystopic approach to its citizens (Qiang, 2019). 5G vendor companies from China have been identified as partners of the Chinese military (Ford, 2019). Also, Chinese companies have an obligation to cooperate with Chinese intelligence and big ones should have communist party cells (National Intelligence Law [NIL], 2017; Lucas, 2019). These are arguments pointing towards the conclusion that Chinese companies cannot be considered as safe and trusted 5G partners. On the other side, a critical approach towards the West is lacking in papers related to 5G strategic decisions.

The U.S. and its allies have been exercising intense diplomatic pressures to minimize the spread of Huawei's 5G contracts all over the world. The reaction came from China's Ministry of Foreign Affairs condemning the U.S. for unreasonable use of its judicial system against foreign companies (Ministry of Foreign Affairs of the PRC, 2019). At the same time, trade negotiations took place between the U.S. and China, placing 5G infrastructure development as an important political economy and global issue.

As noted by some media reports, the U.S. and the EU made an unofficial diplomatic alliance to oust China's vendors from their markets (Cerulus, 2021). That means that European vendors, such as Swedish Ericsson and Finland's Nokia will have the main roles, because the U.S. vendors lack behind them in terms of technology development.

At the same time, Open 5G architecture is being developed by some Telecoms, a situation which introduces diversity, but also new security risks, as the technology might be prone to cyber-attacks. Open RAN technology is aimed to provide security and diversity by design. This solution should divide software and hardware, which will enable increased competition and innovation ("Openness, innovation and," n.d). Cerulus (2021) reports for Politico on a recent security conference in Prague attended by high-level officials from various countries, including the U. S., the UK, Japan, Australia, India, the EU and others. They called for a diverse and competitive marketplace which prevents dependence on a small number of suppliers, especially those considered to be risky. The Prague Proposal points towards "open and interoperable networks" based on highly secured technical standards.

In practice Open RAN, solution will open market for smaller vendors from the U.S. and Japan that would not be competitive otherwise, but it will also open possibilities for compromising networks by spies, hackers and cyber-terrorists. European vendors Ericsson and Nokia warned that the Open RAN is not mature enough, the point which was endorsed by Arne Schönbohm, the President of the German Federal Office for Information



Security. The EU cyber authorities are working hard to finalize analyses on the Open RAN concept. It is the fact that big European and Chinese vendors have to lose the most from the new competitive Open RAN. Across the ocean, the U.S. legislators have been supporting the Open RAN idea because they lack competitive 5G vendors from their country. The progress from vendors such as Erickson and Nokia in Europe led the EU officials to call for opening up the vendor market, as reported by Politico (Cerulus, 2021).

According to the reviewed literature, we have detected policy analyses showing clear support for one side in the 5G geopolitical struggle in most cases. We lack a scientific approach in the matter to provide a comprehensive overview and offer recommendations that will direct the scientific debate towards geopolitical stability, balance of powers and prevent potential 5G security issues. Based on this, we aim to provide comprehensive balanced review to answer the following research questions:

RQ1: Can societies trust any vendor either from the West or the East, in terms of safety, security and lack of misuse?

RQ2: What is the best geopolitical solution related to 5G to ensure multilateral stability and security?

To meet the noted aims we introduce issues around the global information infrastructure, China's 5G strategy, and recent history of tech struggles between China and the U.S. and geopolitical 5G security threats. At the end we focus on the case of Serbia, a country in a specific geopolitical position between the influences of both the West and the East. We draw conclusions from the case study of Serbia's 5G position.

We intend to employ the methods of content analysis (Berelson, 1952; Krippendorff, 1980; Hsieh & Shannon, 2005; Elo et al., 2014). Both conceptual and relational content analysis will be used to detect the existence of concepts in previous research inquiries and examine the relationships between concepts in them. The combined approach will be used to get the most comprehensive review of both policy and scientific papers with a final aim to get objective conclusions and recommendations. Sample analysis includes both scientific and policy papers written on the topic of the 5G geopolitical power struggle. Research will be focused on examination of the data for specific concepts related to geopolitical issues on 5G and directed at answering the above noted questions. The idea is to analyze the results drawing conclusions and generalizations.

GLOBAL INFORMATION INFRASTRUCTURE

Controlling global information infrastructure has always been a priority in the struggle of imperial states. This tendency could be noticed in early ambitions to control wireless telegraphy news by the German government to more recent development of Internet technology (Schiller, 2011). Additionally, global news media networks have been supporting political ambitions, while soft influence has been globally spread through the film industry, especially by Hollywood's transnational corporations. However, things have been changing in terms of impact, when internet and smartphone technologies took stage. Soft influence in terms of news reporting and culture turned to the social media and games industry in the recent decade. Although the U.S. companies triumphed in the tech sector, controlling social media and hardware innovation, introducing leading platforms such as



Facebook, Twitter, Instagram, and devices such as smartphones and tablets, lots of development has been done in cooperation with Chinese companies. In this process Western corporations used cheap production of their Eastern counterparts, which created tech giants such as Huawei in China and Samsung in South Korea. Multibillion corporations from the East have been getting hold of the cutting-edge innovation in hardware and software, but also mastering the latest infrastructure of the future – 5G technologies. This development comes as a challenge for the U.S. companies, which are far behind, given the fact that Chinese Huawei has almost unlimited assets.

Using diplomatic strings to support its economic interests has been a custom in the U.S. foreign policy. Imperial expansion of that country has been in fact connected to its growing power in controlling the global information network (Hills, 2002). Relationship between imperialism and communication systems gradually became critical discourse considering various theories, exploring transnational expansion of media corporations (Boyd-Barrett, 2015). This was followed by a spree of debates involving developing countries about New World Communication and Information Order, with a goal to resist cultural imperialism, tackling the questions of information flow, media policies and infrastructure governance. The initiative inspired the forming of the World Summit on Information Society (Chakravartty, 2006). More recent developments have seen expansion of the U.S. based ICT monopolies through technical standards, patents, copyright law, brands and both software and hardware products. Companies such as Cisco, Apple, Google and Microsoft have been leading the U.S. domination in the tech sector. Some authors label this expansion as a military-digital complex that includes collection and processing of vast amounts of data for surveillance purposes (McChesney, 2013). The power of the U.S. owned social media could be seen in many examples, one of them being the overthrow of the Egyptian government during the Arab Spring revolution and the case of Edward Snowden who revealed mass spying on world's citizens (Greenwald, 2014). Thus, tech companies have their significant role in the geopolitical struggle, while the question remains whether they control governments or vice versa.

Although the Internet technology was developed by the U.S. Department of Defence, which transferred its powers to the non-governmental organization ICANN, heavily influenced by the United States, the uprising economies of Brazil, China, and India have been challenging power over extraterritorial points, by increasing influence on key internet infrastructure, such as underwater cables, exchange points and data centres” (Winseck, 2017, p. 228).

The Central Cyberspace Affairs Commission was established in 2014 under the leadership of President Xi Jinping (Miao et al., 2018). China has been promoting cyber sovereignty and multilateralism agenda, as opposed to multistakeholderism, that is reflected in supranational entities and multinational corporations. The President of China Xi Jinping stated, “We should respect the right of individual countries to independently choose their own path of cyber development, model of cyber regulation and Internet public policies, and participate in international cyberspace governance on an equal footing” (Ministry of Foreign Affairs of the PRC, 2015). Practice to gather developing countries to produce strong opposition to the U.S. in the Internet governance has been practiced by China through Wuzhen World Internet Conference, CyberBRICS, the Forum on China-Africa Cooperation, Belt and Road Initiatives (Belli, 2019). Tang (2020) looks at the issue from



the prism of media imperialism and geopolitics of extraterritorial infrastructure. The author asks to which extent the U.S. government will be able to shape the future of 5G technology. According to the above, it could be concluded that China has the desire to lead developing countries in alternative Internet regulatory order, therefore posing as a threat to the U.S. power in economic and geopolitical contexts.

CHINA'S 5G STRATEGY

Huawei's initiative to develop 5G technologies was named Vision2020. The company started employing resources and concrete actions in the largest research and development activity in human history that was initiated in 2010, at the time of full launch of the current 4G technology. After nine years from that point, Huawei managed to develop and test its first 5G compatible chipset called Balong 5000, six months before it was planned (Strumpf, 2019). According to the sources from Huawei, the company made 91 contracts with different countries on implementing infrastructure for 5G technologies. At the same time, it was announced that Huawei's phones of the latest 5G generation would cost US\$600, which would be dramatically less than planned prices of the competition from the West. Huawei is a global rising tech giant, but at the same time, an important factor in the geopolitical battle for global dominance between the East and the West.

The State Council of China notes 5G as a strategic national determination to get a lead in the global ICT sector. Made in China 2025 Initiative outlines the future priorities in the tech sector in the period of 10 years. Basing the development on manufacturing and infrastructure, China aims to rise up in the development and innovation of cutting-edge products: semiconductor chips, AI algorithms and neural networks. Despite the fact that the Initiative did not declare such goals, Chinese counterparts in the West understood it as determination to push the U.S. from the throne of global dominance and geopolitical power. Chinese plans have not been promoting such an agenda. On the other hand, they clearly articulate 5G technology to be of key importance.

China had an early 5G start investing US\$400 billion, while the United States followed with US\$24 billion less. Seriousness of this state level project could be seen in formation of IMT-2020 5G Promotion Group by the Ministry of Industry and Information and the Ministry of Science and Technology in China. The Group gathers representatives of mobile phone companies and academia in overseeing 5G development, which is being conducted by national companies China Telecom, China Mobile, ZTE and Huawei. IMT-2020 gives certificates to major domestic and international 5G actors, Huawei being one of them, that made the first probes of the 5G radio field in Beijing's Huairou district.

Chinese state documents that pinpoint 5G as strategic technology that is being developed by major state actors include Made in China 2025, issued in 2015, 13th Five-Year Plan, issued in 2015 and two reports on the work of the government in 2017 and 2018. These documents highlight the importance of 5G technology calling for comprehensive breakthrough especially in the domains of routing switching technology, architecture of networks and large capacity optical transmission. Other documents note emerging industries supported by the Chinese state: hardware, AI, mobile terminals, display technologies, sensors, wearables and 5G. The need and resilience to drive new information revolution is clearly



noted in the Chinese state documents. Ultra-wideband and commercial applications, applying IPv6 are listed as priorities. Also, government calls to speed up activities on new energy, AI, 5G, new materials and biopharmacy therefore highlighting new forward thinking and active approach in reshaping the world, contrary to the tendencies in previous passive Chinese decades. Additionally, the Chinese Government reports from 2018 update state plans with some new terms such as new energy vehicles, the Internet of Things and aircraft engines, with the need to create demonstration zones both for testing and showcasing new technological breakthroughs.

China Academy of Information and Communications Technology (China Academy of Information and Communications Technology, 2017) predicts US\$939 billion of direct economic output from 5G technologies, accumulating US\$432 billion economic value and employing 8 million people. Multilateral forums created by China to spread its technological and economic influence include Belt and Road Initiative, with special focus on Europe and Forum on China-Africa Cooperation, aimed at trade and infrastructure development (Shen, 2018).

RECENT HISTORY OF TURMOIL BETWEEN CHINA AND THE U.S.A. RELATED TO TECH COMPANIES

The rise of China as ICT power came after a long domination of American companies. These were Cisco in routing equipment, Intel in semiconductors, Qualcomm in chipsets, Oracle and Microsoft in software and Apple in smartphones. Chinese leaders created a state strategy with the main task to promote innovative industries in the post crisis period after 2008. The goal was China's rise as a leading superpower in global digital capitalism. Its 13th Five-Year development plan featured ICT as the highest priority to catalyze domestic reforms (Hong, 2011). Global digital scene started shifting to the benefit of China with rising technological conglomerates Alibaba, Tencent, TikTok, Baidu, JD.com and NetEase. This affected the tech scene dramatically, decreasing the U. S dominance in the field (Yeo, 2016). Chinese tech strategy aims to triumph in international markets by 2025. With over 80.000 employees working in the research and development sector, Huawei outweighs any western tech company in that regard.

“China with achievements” is a translation of the word “Huawei” from Mandarin. Privately held Huawei corporation is one of the largest suppliers of telecom devices and services in the world. Established in 1987 in Shenzhen China, the company has been spreading operations to 170 countries with revenue of US\$123 billion in 2019. Huawei focuses on carrier, enterprise and consumer markets. Part of the infrastructure carrier business concerns 5G technology, including AI, operation and maintenance. Except for this, the company is most famous in public for its hardware products: phones, tablets, PCs, etc. Research & Development (R&D) are important for Huawei with more than US\$ 18 billion invested in 2019, which is 15% of annual revenues. Huawei's R&D and innovation centers are spread around the world. Focus on 5G technology development started in 2009, thus making the company first to deploy this technology in commercial use. As for presence on the mobile phones market Huawei has 14.6% global share. Its telecommunications equipment sales encompass as much as 28% of the global market. Most of the revenues Huawei acquires in



China (59%), EMEA (24%), Asia Pacific (8.2%) and Americas (6.1%). As for the historical outlook at the development of the company, the strategy to start from the developing world proved successful. Huawei started international expansion in African, Asian and Latin America underserved markets. First international offices of the company were established in Hong Kong (1995), Russia (1997), Kenya (1998), Brazil (1999), while entry to the European and U.S. markets started after 2000 (Huawei 2019 annual report, 2019).

As for the U.S. market, Huawei had multiple drawbacks attempting to enter the market as a carrier. In the first instance the company wanted to buy 3Com corporation. After the deal was blocked by the U.S. government in 2008, Huawei had another try to do the similar investment. This time it was 3Leaf Systems in 2011. Open letter of Huawei to the U.S. government called for fair treatment of the company, during the same year when the second deal was blocked. The U.S. followed up with a report of its special committee in 2012, marking Huawei as a security threat and calling the executive authorities to ban further the attempts of the company to enter the U.S. market (Wen, 2017).

Being in private ownership of its employees, with zero stocks in hands of the Chinese government, Huawei states it has no links to intelligence agencies whatsoever. According to the official statement, the company has not received any request to add spyware to its systems. Anyways, this would not be possible, as Huawei does not own or operate networks outside China. Trust of its customers is important to the company, concludes Huawei (Huawei facts, 2021). On the other hand, the U.S. security community accuses the Chinese government of financing Huawei and assisting it in intellectual property theft. Additionally, Huawei has been funded by the Chinese military, National Security Commission and intelligence network ("U.S. intelligence," 2019). As written by Boyd-Barrett (2015), mass media in the West often depict Huawei as a Chinese state project connected to the military and intelligence complex of that country.

The next incident in this "trade war" was the arrest of Huawei's CFO Meng Wanzhou in Canada as a consequence of the U.S. warrant on accusations of industrial theft, breaking sanctions imposed towards Iran and obstruction of criminal investigation. She was also accused of intellectual theft including intellectual property: Tappy the robot, developed by TalkTalk. A Canadian court decided to execute extradition to the U. S., although the decision is not final, because of the appeal filed by Meng's lawyers (Levy, 2019). Days after Wanzhou's arrest in December of 2018, former Canadian diplomat Michael Kovrig was arrested in Beijing by Chinese security apparatus accused of endangering national security. Kovrig was interrogated throughout the day, without legal support, placed in strict isolation without the possibility to go outdoors (Hoffmann et al., 2020).

Intensive diplomatic lobbying across the world has been conducted by the United States, primarily among its allies, members of NATO. The subject of lobbying is the latest mobile phone and data infrastructure – 5G and the fact that Huawei had been most advanced in developing it. On the other hand, Huawei's competitors from the western hemisphere have been lagging behind in the development of 5G, thus incapable of delivering the final product, attested infrastructure for the newest cutting-edge data transfer protocol. Huawei's products have been labelled as insecure and compromised in security standards.

The U.S. diplomacy had a significant effect, such as in the case of the UK, which decided to gradually push Huawei out of its market. The U.S. Department of Commerce followed up with another restriction imposed on the Chinese company in May of 2020, this time



regarding its access to chip suppliers (Hille, 2020). Other actions imposed by the U.S. towards Chinese companies, in order to protect domestic telecom companies, included sanctions towards ZTE corporation in 2018 (Morgenson & Winter, 2020). Thus, treatment towards Huawei is not an exception, which makes the U.S. government highly protectionist in terms of the domestic telecom economy.

However, there are two sides to every coin, and so does this story. On the other side in China, a U.S. company Qualcomm had a hard time. The company was fined, after being put through a legal proceeding. The Chinese National Development and Reform Commission made a ruling that Qualcomm broke antimonopoly law in China. After this, Qualcomm and the Chinese commission reached an agreement on further business processes, so that company would meet legal requirements. Qualcomm's array of goods is significant for 5G technology and they present an important counter-stone of future communication networks, security protocols applied in driverless cars and AI (Fuscaldo, 2021).

Further actions of the U.S. against China may have permanent negative effects on the U.S. economy, because of potential escalation of the trade war and consequences of further actions by China. Response from China in this trade war may harm tech giants including Qualcomm, Broadcom, and Apple, who rely on Chinese chip makers for different products.

GEOPOLITICAL SECURITY THREATS AROUND 5G

Complex position of European countries in terms of 5G is described by Rühlig et al. (2019). The authors cite China's Ambassador to the European Union (EU) warning of "serious consequences" for economic and scientific cooperation. Europe's vulnerability is at stake: European countries depend on China's position in the value chain, while on the other hand, the United States dominates the software sector and is Europe's trusted strategic partner. In another paper, Rühlig and Björk (2020) argue that while skepticism towards China is reasonable, a ban on Huawei is not an effective solution for achieving network security.

However, the bottom point is about the trust and relations of the country that needs to make decisions about procurement of 5G technology and service providers of the technology. As a matter of fact, things are not that simple. Chikermane (2019) asks what the guarantee is that 5G equipment from Sweden, South Korea, Finland or the U.S. would not consist of components from China's companies. He assumes that quality control performed by trusted companies delivering the final product should be enough to be trusted.

As stated by Christopher Ashley Ford, in the capacity of the Assistant Secretary at the Bureau of International Security and Non-Proliferation: "[...] products and technologies from Huawei, Tencent, Alibaba, Xiaomi, Lenovo, and other companies have already been used in the research, production, and repair of weapons and equipment for the PLA (Chinese People's Liberation Army). These companies have also provided support services for China's military industry in areas related to electronics, aerospace, shipbuilding, and weapons – all of which, incidentally, are key military-civil fusion target areas when it comes to foreign technology acquisition – to enhance the core competitiveness of China's national defense science and technology sectors" (Ford, 2019). Articles 7, 9, 12 and 14 of the National Intelligence Law (NIL) of the People's Republic of China bind Chinese com-



panies and individuals to support China's intelligence agencies, while promising incentives and benefits for companies and individuals that contribute to national intelligence efforts. Also, Chinese companies may receive intelligence work from Chinese intelligence agencies. Therefore, support to intelligence efforts is a legally binding requirement for Chinese companies, which could be concluded by reading articles 14 and 7 in conjunction (NIL, 2017). Another obligation of Chinese companies is to establish cells of the Communist Party of China in all larger companies. Officials of the party participate in the policymaking for these companies (Lucas, 2019). If the major political party in China has such deep ties with private companies delivering 5G infrastructure, this increases risks for consumers, and countries using Huawei's equipment.

On the other hand, there is a lack of critical analysis of potential U.S. dominance in 5G technology. For the sake of this argument we must point towards some historical facts. The U.S. was the first and only country to use the atomic bomb during wartime in the Japanese city of Hiroshima on August 6, 1945 causing 80,000 deaths ("American bomber," 2010). This made an important prerequisite for global dominance of the U.S. after WWII. The so-called humanitarian military interventions have been executed multiple times by the U. S., especially since the fall of the Soviet Union in the 1990s. After the terrorist attack of 9/11 in 2000, military interventions have been increasing as part of war on terror. For example, the U.S. invaded Iraq in 2003 to establish democracy in that country (Bokat-Lindell, 2021). The U.S. has been criticized for human right violations of war prisoners in Guantanamo Bay, an episode that decreased its reputation and influence in the world (Malinowski, 2008). This was the period in which the U.S. had the ultimate global power, otherwise called the New World Order (Tunander, 1991). Finally, the largest leak in intelligence history has shown that the U.S. had been spying citizens across the world as part of the Prism operation, which was revealed by Edward Snowden (Greenwald, 2014). As in the case of China, tech companies in the U.S. have been cooperating with the military and government organizations in that country on multiple projects (Agence France-Presse [AFP], 2021).

The following part of this chapter lists some particular cases related to decisions of individual countries on 5G vendors in regard to above noted issues.

Although the United Kingdom had been installing network equipment from Huawei for 15 years, at some point the Chinese company was completely excluded from the market (Sutherland, 2020). To gain the confidence of its western partner, Huawei decided to form Cyber Security Evaluation Center in the UK, which was further criticized by the government committee. Faced with growing U.S. diplomatic pressure, the parliamentary majority decided to limit the presence of Huawei in the UK. Finally, an outright ban was adopted leading to complete exclusion of Huawei.

The only country in Europe dominated by Chinese 5G vendors is Cyprus. According to Birn's report, 80% of 5G infrastructure in that country is covered by Huawei, while 20% by Swedish Ericsson, the state of things that potentially create risks for local cyber security and independence of political decisions (Vou, 2021).

Not only western states are skeptical towards Huawei. Asian countries are slow in accepting Chinese 5G technologies, as well. Some of them, like Vietnam have already rejected Huawei, based on complicated diplomatic relations with China. Although Huawei's offer is the cheapest among 64 companies in the race for 5G, there is a risk that comes with this,



as written by Boudreau and Uyen (2019) in their Bloomberg article. Complicated history promotes China as Asia's a super power with imperialistic tendencies. Therefore, some countries choose other less risky sides, at least by their political estimates. This sentiment could be seen in feelings of major public, such as in Vietnam where only 10% of Vietnamese viewed China in favourable manner compared to 84% supporting the U.S. bid in 5G procurements (Global indicator database, 2019).

As for Australia, David Irvine, the Chairman of Foreign Investment Board, stated on 19 August 2019: "National security concerns" and policy equivalence with China remain the overriding feature of excluding Chinese firms from Australia's telecommunications sector" (Australian Government, 2019).

Government of India set up 5G Forum in 2017 to build strategy for national deployment of 5G infrastructure to conclude that early application of the technology could maximize benefits because of country's research and development focus and production of semi-conductors. Digital India's initiative builds regulatory framework with no compromise regarding security (Jaisal, 2020).

Huawei's techno-economic advantage and security concerns for India are discussed by Chikermane (2019). Given the fact that Chinese government is criticized as authoritarian, the main threat identified by this author is a concern of state interference with corporations using 5G, potential Huawei's customers, as it does with domestic companies in mainland China. As 5G infrastructure will be critical, this means special attention should be given to security concerns. Problems noted by the author are relations between China and India, which include lots of challenges and opposite positions, such as problematic border between two countries. However, special attention is given to the Chinese law that makes it obligatory for companies under its jurisdiction to share intelligence with the government. Chikermane (2019) further identifies six aspects of the matter that need to be considered leading to the decision on 5G infrastructure procurement and whether Huawei would be the right organization to take that job. He notes that Huawei is not typical private company and that low price of its services may hide an invisible one – a threat to Indian security. Describing China as a hostile country, the author concludes that no Chinese company should be left to operate in India.

A CASE STUDY: COMPLEXITY OF SERBIA'S NEUTRAL GEOPOLITICAL POSITION AND 5G

Further, we analyze diplomatic struggles related to 5G through the case study of the Republic of Serbia. To get more insight into the delicate position of Serbia, we provide basic information about the country, followed by a historic background and description of current multilateral ties between Serbia and China. The same kind of recapitulation is given for Serbia and the United States. Finally, we introduce the status of Serbia in terms of 5G and related developments. All these elements are needed to make a viable conclusion about Serbia's 5G case.

Located in the South-East of Europe, the Republic of Serbia is a country of roughly 7 million people, situated in southern Pannonia Plain and Central Balkans (Serbia, 2021). Being a developing country, Serbia is a unitary parliamentary constitutional republic. The



country is a member of the following international organizations: UN, CoE, OSCE, PfP, BSEC, CEFTA and AIIB. Current strategic goal of the Republic of Serbia is joining the European Union by 2025. In its current state, Serbia was formed after the breakup of Serbia and Montenegro in early 2000s. Before that, Serbia was a part of the Federal Republic of Yugoslavia. The country has been adhering to the policy of military neutrality since 2014. Diplomatic relations between China and the Federal Republic of Yugoslavia were established by the exchange of diplomatic notes in 1955 (Ministry of Foreign Affairs of the Republic of Serbia, n.d.). Close ties to China, established in the socialist period, were maintained until the current day. However, in recent times, according to the Serbian Ministry of Foreign Affairs, key points in the partnership between the Republic of Serbia and the People's Republic of China were in 2009, 2013, and then in 2016, when it was raised to the level of strategic cooperation. Serbia and China mutually abolished the requirement of obtaining an entry visa for citizens of both countries in 2017. This goes in line with the Chinese economic expansion abroad, which was called the Belt and Road Initiative, as the ongoing global infrastructure investment effort, proclaimed by the Chinese government in 2013 and then incorporated in the Constitution of China in 2017. Since that time, China has had massive investments in projects across 70 countries, such as ports, skyscrapers, railroads, roads, airports and tunnels. The People's Republic of China is one of the most important trade partners of the Republic of Serbia with 3.2 billion euro of traded goods between two countries in 2021. The Major recent infrastructure projects in Serbia, financed by China, have been the Pupin's Bridge, the construction of the Milos Veliki highway, the reconstruction of the Kostolac Thermal Power Plant and the ongoing trilateral project to modernize the railway track Belgrade-Budapest. The already blooming relations between two countries were deepened during the Covid-19 pandemic in 2020, when China had been donating medical supplies and vaccines to Serbia (Beta, 2018). To sum it up, according to the above noted, the relations between Serbia and China have been very close and the best possible since official establishment of diplomatic ties.

Serbia-the United States relations were established in 1882 (U.S. Department of State, 2021). At that time, Serbia was a kingdom. Early on, multilateral relations had been very good. The two countries were allies during World War I. As for World War II, the United States supported the Serbian royalist over their rivals, who prevailed. This resulted with Yugoslavia becoming a communist state. Despite that, Yugoslavia broke its close ties to the Soviet Union in late 1940s to become a founding member of the Non-Aligned Movement (Perišić, 2018). This move defined its neutral geo-political position between East and West, but closer to the U.S. than to the Soviet Union. Yugoslavia was supported by the U.S. with billions of dollars in foreign aid and soft loans for infrastructure projects, which considerably increased the living standard of its citizens. Some historians say this was actually a strategic effort of the West to show the Soviets how people live better in socialist Yugoslavia, when compared to the Soviet Union ("Srbi plaćaju," 2020). Of course, strategic alliances of this kind were not promoted in the public sphere, as Yugoslavia was a non-aligned country. During the breakup of Yugoslavia in the 1990s, the United States engaged in high intensity conflict with Serbia. This included sanctions against Serbia and the NATO bombing campaign in 1999. The period after political changes in Serbia in 2000 opened a new era in diplomatic ties between the two counties, which included the investments of U.S. companies in Serbia amounting to \$4 billion. Additionally, diplomatic and political ties between Serbia



and the U.S. have been growing stronger ever since. However, this has not been proclaimed in the domestic public, as it would be unpopular. In line with that, some Serbian politicians and tabloid press have been expressing negative opinions about the U.S. in order to get political points and votes in the elections. The U.S. support to secession of Kosovo on top of 1999 NATO bombing campaign might be among crucial reasons why 13 per cent of Serb respondents perceive the U.S. as the greatest enemy of Serbia, behind Croatia and Albania (Vuksanovic, 2021a). This public opinion issue has been dealt with by a PR campaign “You are the world”, initiated by the U.S. Embassy in 2018, to present individual success stories of Serbs in the U.S. and the examples of cooperation and understanding between the two countries (Matović, 2018). Specific targets and results of such effort are unknown, as they have not been made public. Thus, the current relations between Serbia and the U.S. are highly developed in terms of economic cooperation, although public opinion of Serbs about the U.S. is poor. It may be important to highlight the U.S. influence in the EU and also among the Albanian political elites. That might be crucial, in light of Serbia’s intention to join the EU and preserve Kosovo within its borders.

Total investments in the telecommunication sector was EUR 714 million in Serbia in 2019, which is twice more than in the year before that. A part of this investment was EUR 353 million for distribution of media content and 216 million for mobile telephony. Telecommunication market was valued EUR 1,75 billion in 2019. The income of mobile phones market measured 60% out of the total income in the sector. There are three mobile networks on the market: Telecom Serbia with 43.8% of users, Telenor with 31.2% of users and A1 with 24.4% of users. Interestingly, phone calls and SMS messaging have been decreasing, while data transfers, such as use of the Internet, have been increasing rather quickly, as much as 60% per year from 2015 to 2019 (Obradović, 2021).

Further, we present developments in Serbia related to 5G infrastructure. 5G in Serbia is officially handled by the Serbian Agency for Electronic Communications and Postal Services (RATEL). The Agency made a statement about the expected bid for procurement of 5G equipment by the end of 2020. However, this was postponed due to the Covid-19 pandemic. The plan to hold the bid during 2021 was further delayed to 2022 (Čavić, 2020). The Ministry of Telecommunication dedicated the 2.66 GHz and 3.6GHz bands for 5G in October of 2020. The RATEL agency further proposed the allocation of the 700 MHz band for 5G services (Janković, 2021).

Huawei has highly developed vendor related operations in Serbia’s telecommunication sector. First of all, the company made an ongoing 150-million-euro contract with state owned Telekom Serbia to modernize its landlines and network equipment. Additionally, Huawei closed a deal with privately owned Telenor mobile network provider for the introduction of 5G technology (Ralev, 2019). Later, the company partnered with the Serbian Interior Ministry to install a Smart City security system in Serbia’s capital city. The system, which is currently active, employs numerous AI cameras with face recognition features across Belgrade. The surveillance network is criticized by domestic NGOs, while being under the eye of the international public because of potential human rights violations (Roussi, 2021). Huawei had active cooperation with multiple ministries and officials in the Serbian government, including the Ministry of Tourism, Trade and Telecommunications. Two sides signed a memorandum of understanding for the Smart City project in 2019, and a strategic partnership agreement related to the broadband network in 2017.



As for diplomatic events related to 5G, contrary to some other countries that have been signing memorandums of understanding with their U.S. partners, the Serbian president had signed the Washington agreement in September of 2020 (Ruge, 2020). The document mentions 5G, among other issues, in the package related to normalization of the relations between Serbia and Pristina, as signed by President Aleksandar Vucic and separately by Kosovo's Prime Minister Avdullah Hoti at the White House, in the presence of the American President Donald Trump. The ninth point of the agreement was related to 5G procurements. Two sides stated they would commit to acquire 5G technology from trusted vendors. Additionally, where problematic equipment is already present, both parties would commit to its removal, in a timely manner. What "trusted vendors" meant has not been defined, but political analysts speculated this point in the agreement is meant to disqualify Huawei. The agreement had not foreseen any formal legal consequences if two sides would fail to execute the defined points. The statement related to 5G in the agreement meant nothing as such, but it indicated some kind of political maneuver, possibly for an election race in the U.S., as declared by some analysts (Bjelotomic, 2020; Vuksanovic, 2020). However, the diplomatic maneuver in Washington received an epilogue when Serbian officials stated that transparent and neutral procedures would be undertaken by the Republic of Serbia in regard to 5G bids, the ones which would enable all operators to purchase 5G equipment from any manufacturer (Vasovic, 2020).

Possibly as a response to what happened in Washington, Huawei opened the Innovations and Development Centre in Belgrade, just a few weeks after signing of the Washington agreement in September of 2020. Serbian Prime Minister Ana Brnabic and the Chinese ambassador to Belgrade Li Manchang attended the event. The Serbian Prime Minister stated the Centre would contribute to Serbia's strategic goals to develop the ICT sector, especially towards AI related industries. She added that Serbia had been working with Huawei on various technologies, as preconditions for the introduction of 5G. This was followed with words from the President of Huawei Western Balkans Li Mengqun who expressed hope in an open and fair business environment for ICT infrastructure. He added, "together, we can make Serbia a world leader in the digital era with ubiquitous connectivity, digital platforms, and pervasive intelligence" (Dragojlo, 2020).

To conclude, the geopolitical position of the Republic of Serbia is complex in terms of state's decisions related to 5G. Multilateral history, sentiment of the public and behind the door diplomatic trade might all be deciding factors in the 5G race. As previously noted, Serbia has always been on the crossroads of the bi-polar world, a situation outcoming with both benefits and harsh consequences. Closeness of Serbia and China has been demonstrated through a recent spree of investments within the Belt and Road Initiative. On the other hand, political closeness to the U.S. is also present. Although the U.S. has pressure buttons in its hands, it is questionable how much its diplomacy is willing to use them when the opinion of the Serbian public about the U.S. is considered. Finally, we could have seen that the Serbian government would like to let mobile networks decide about a company that would provide 5G technology for them.

Firm strategic decisions regarding 5G procurements have been made so far by either the closest U.S. allies, or the countries with a high level of hostility towards China. Estimated lower price of Huawei's 5G technology might be a good reason, even for the Western countries, to think twice. Thus, Serbia's decision to delay the 5G bid could be reasonable,



giving a chance for more technologies to be developed. The goal would be to offer a choice to mobile phone providers, a situation in which all major 5G companies are present in the Serbian market.

DISCUSSION AND CONCLUSION

Leading the game of global innovation is crucial for economic, political and security domination over the world. As China emerges to the throne of leading superpowers, a new constellation of bipolar or multipolar world order might be a reality. We have seen, however, that this process cannot be smooth, because of the ongoing turbulent trade war between the U.S. and China. Stakes are high, especially for the United States, and thus the struggle is intensive and developing on multiple battlefields: scientific, legal, political, diplomatic, etc. The U.S. diplomatic efforts succeeded in slowing down the advance of Huawei and the Chinese 5G technology spread in the world, so that time is saved for companies in the West developing 5G technologies.

New cutting-edge ICT developments will be essential in the future and amongst them, the crucial place is occupied by 5G technology. Previous chapters present global information infrastructure, China's 5G strategy, history of turmoil between China and the U.S. related to the tech sector, geopolitical 5G security threats and a case study on complexity of Serbia's geopolitical position in terms of 5G.

Previous analyses look at the 5G related security and politics from a single perspective, outlying arguments either from Chinese, European or the United States perspectives. That is why as an extension of the scientific analyses done so far this study aims to give a comprehensive global review around 5G related geopolitical standpoints and concerns. Thus, we introduced various geopolitical and security arguments from different parts of the world, considering often neglected points. That is how we built a comprehensively rich outlook that could help us see how the 5G future will look like and how it will impact geopolitical power and security.

Potential security risks identified in the previous research are terrorist attacks related to traffic, fake news, military, e-government, financial systems, cyber espionage and others (Chikermane, 2019; Liebetau & Christensen, 2021). Attackers may include countries, terrorist groups, hackers and even AI algorithms.

However, we focus on geopolitical security threats and solutions for 5G in that context. Worries around China include the fact that Chinese companies have been supporting China's military industry (Ford, 2019). Also, support to intelligence efforts is a legally binding requirement for Chinese companies (NIL, 2017). Finally, larger Chinese companies are obliged to establish cells of the Communist (Lucas, 2019). On the other hand, corporations from the IT sector in the West have established projects with the U.S. government and military agencies (AFP, 2021). Additionally, revelations of Edward Snowden and other whistleblowers indicate that the U.S. government has global monitoring and spying operations, which is ethically and legally questionable (Branum & Charteris-Black, 2015). According to the analyzed literature, we conclude that societies cannot trust any 5G vendor either from the East or the West in terms of potential safety hazards, security incidents



and misuse in the future. This is the answer to the first research question posed in the introduction of this paper.

According to the above presented, we have identified three corpuses of countries in terms of geopolitical 5G position: The West, supporting the U.S. and European 5G vendors, the East, supporting Chinese 5G vendors and finally the Neutral countries, with influences from both sides. The West corpus consists of the U.S., Canada, Europe, Australia, India, Vietnam, New Zealand, Japan, Taiwan, Bulgaria and North Macedonia. The East corpus consists of China, Russia, Qatar, Saudi Arabia, United Arab Emirates, South Africa, Turkey, Malaysia, Nepal, Bahrain, Kuwait and Oman (Buchholz, 2019; Vuksanovic, 2021b). The new Neutral corpus possibly emerging is represented by Serbia. To illustrate this complex geopolitical position outside the “two worlds”, a case study is provided for Serbia.

Grasping control over big data and information infrastructure may be an important aspect of sovereignty. 5G infrastructure is a public resource awarded by states to individual companies (Deibert, 2008; Lips & Koops, 2005).

Thus, the identified solutions relate to quality control performed by trusted companies and risk management done on the level of nations. Making informed decisions is a must for all countries. Case study of Serbia indicates that balancing between geopolitical stakeholders in the 5G race could be a winning combination for countries outside the core of West and East corpuses. Using Open technology, such as Open RAN that is currently being developed, could provide backbone to the diversity and security in geopolitical context.

Generally, we recommend improved encryption with vendor diversity to achieve maximum security. Additionally, quality control should be performed by special bodies with members from all companies on the market. Although the presented papers usually label China's 5G technology as insecure, the best possible safety could be achieved if all 5G technology providers are present in each market, which would prevent domination of either western companies or China. This would dramatically decrease potential for misuse of 5G technology, as countries would always have alternative providers of 5G infrastructure. Thus, control and domination of one superpower over another in terms of 5G would not be possible, which would provide high public safety in relation to 5G technology.

Thus, a combination of smart political decisions about acceptance of diverse 5G vendors and implementation of the right technologies that enable this for the Neutral corpus of countries could provide a more stable multi-polar world guaranteeing peace and stability for years to come. The solution would be in those Neutral countries that would get additional power and international relevance by having the possibility to use more vendors, including those from the West and those from the East.

According to the above noted, the best solution for countries is to allow all vendors to operate in local markets, including the big players from Asia, Europe and Americas, but also small companies as well. This is the answer to the second research question posed in the introduction.

The future research should focus on Neutral countries, those that choose vendors from both sides of the world to ensure stability and increase their power. The inquiries should examine political and legislative solutions to ensure diversity in the interest of both individual countries and the world. Further inquiry should also go into details regarding technical requirements for improved encryption, such as the Open RAN technology.



CONFLICT OF INTEREST

There is no conflict of interest related to this paper.conflict of interest

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