

5G: investment opportunities and geopolitical implications of fifth-generation mobile networks



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EXECUTIVE SUMMARY

This paper outlines the main areas of application of 5G technology in the business world and the potential benefits of fifth-generation mobile networks on economic growth and job creation, both in Italy and Europe. The analysis focuses on investments and costs associated with the deployment of 5G infrastructure and the purchase of licenses from telecommunication companies. Other types of obstacles that can limit the ability of the business world to reap the benefits of 5G are also covered. Among these, we find the clash between the American and the Chinese capitalism. This fracture, which can determine the exclusion of Huawei from the list of companies authorized to supply 5G equipment in Europe, can potentially have a substantial economic impact. Huawei is currently ahead of European competitors such as Ericsson and Nokia and, also thanks to the absence of a US-based telecommunications champion, it is best positioned to offer 5G equipment at competitive conditions. US and European strategic efforts to preserve technological sovereignty and defend national security create a need to develop a Euro-american answer to Huawei. The final part of this paper deals with this need and analyzes the different solutions proposed to this issue. Among these, we devote particular attention to the possible creation of a modular, interoperable 5G network.

INTRODUCTION

In the 2000s, 3G networks marked the beginning of the era of mobile Internet navigation. Later, in the early 2010s, 4G technology improved the performance of older 3G networks by offering an increased broadband and lower latency. 4G provided the infrastructure which enabled the rise of many of the giants of the digital economy that we witnessed in recent years. Moreover, it allowed the transition of social media from desktop to smartphone and the success of ride-hailing and delivery services such as Uber and Uber Eats. Now, 5G networks promise to offer even better performances, not only for the end-consumers but also for those businesses and organizations that will be able to integrate 5G technology in their production processes and final products. However, governments' choices concerning their 5G strategies will force them to take a stand on the Sino-american clash for technological supremacy, an issue they have not faced before. China is currently better positioned than the US for the delivery of 5G equipment. Consequently, any decision to exclude Huawei from a country's internal market for 5G will represent a subordination of strictly economic considerations to political ones. At the same time, the US and Europe will have to come up with a competitive answer to Huawei that can allow for the realization of an efficient 5G infrastructure, both in terms of costs and performance.

1. HOW 5G CAN INCREASE PRODUCTIVITY AND SPUR INNOVATION IN THE BUSINESS WORLD

Lucas Willegoda

The 'International Telecommunications Union¹ (ITU) highlighted three macro-areas where 5G technology can offer growth opportunities to businesses who will be ready to take advantage of them. These are *enhanced or extreme mobile broadband*, *ultra-reliable low latency communication* and *massive machine type communication*. An overview of them is presented in the following.

The first of these three areas is **enhanced or extreme mobile broadband (eMBB)**. 5G technology can be seen as a natural development of already-existing 4G networks, and it will therefore allow for better performances than the ones that are currently possible. Improvements will manifest themselves under three different profiles²:

- a. Increased broadband capacity. This will allow 5G networks to guarantee high performances also within densely populated areas such as urban centers and public spaces that host big events;
- b. Increased connectivity. Remote areas will finally enjoy widespread access to broadband;
- c. High performances even within moving vehicles, such as trains and automobiles.

These changes will not only improve the navigation experience of end-users, but also open up new possibilities for enterprises and businesses. In the past, 4G created the conditions that allowed the consumption of multimedia content from mobile phones. The spreading and the success of social media such as Instagram and applications such as Uber are results of opportunities provided by 4G. In this sense, 5G technology will represent a further step towards the creation of a digital society where it will be possible to stream a movie in 4K definition while on the bus without buffering issues. The potential benefits provided by this development in terms of improved product quality and *user experience* are clear, especially for those companies whose business models rely on the offering of media services to their users. Another advantage offered by eMBB concerns the improvement of workplace productivity resulting from the possibility to have smooth and professional communication even outside the office. 5G technology will therefore favour the transition towards practices such as smart working and distance learning, which have already gained traction during the COVID-19 pandemic.

Lastly, eMCC will enable new and innovative products and applications requiring a high-performing connection in order to succeed in going mainstream. Among these, we find products that exploit *virtual reality* (VR), *augmented reality* (AR) and live translation services. The technological know-how behind these innovations is in fact already available. However, their potential for commercial success is severely limited by the lack of mobile networks fast enough to support them. 5G mobile networks are set to change this.

¹ [Setting the Scene for 5G: Opportunities & Challenges](#), International Telecommunications Union, 2018

² [What is enhanced Mobile broadband \(eMBB\)](#), Sacha Kavanagh, 5G.co.uk

The second macro-area is represented by **Ultra Reliable Low Latency Communications (URLLC)**. 5G is set to drastically decrease network latency, which in turn will open up a wide range of potentially high-impact economic and business opportunities. Network latency is defined as the time lag within which data is transferred from an original source to its intended final destination. A low latency, paired with a high precision in the information transfer process, allows for real-time communication among objects connected to the same wireless network. This condition represented the major hurdle towards the realization of IoT (*Internet of Things*)³ systems, i.e., systems of interconnected devices that exchange data over a network. An example of technological transformation promoted by URLLC is represented by autonomous drive systems for self-driving vehicles. In this case, it is clear how speed and accuracy in the transfer of information is of primary importance. Other examples are the somministrazione of health services from remote or work processes automation and *smart manufacturing*. In the latter case, whereas work processes automation is certainly not a new concept in business, 5G technology will allow for the robotization of even extremely complex operations. The most cited case is the production of semiconductors.

Finally, the last macro-area is **Massive Machine Type Communications (mMTC)**. While URLLC stressed the importance of 5G's precision in the real-time transfer of data, mMTC is based on the possibility, enabled by 5G, to cover wide geographic areas. Hundreds of thousands of devices per square kilometer, each with a low-mid level of technological sophistication, will be allowed to exchange data among each other. The main field of application of mMTC will be within *smart cities*. Within this context, mMTC will allow a multitude of interconnected devices to monitor a metropolitan city's air quality or to collect data to predict extreme weather events.

To sum up, the coming of 5G has the clear potential to boost profit margins thanks to increased productivity and efficiency, to improve communications both within-companies and between companies and clients as well as open up new business opportunities.

1.1 5G IN ITALY: THE UNCERTAINTY AROUND THE ESTIMATION OF COSTS AND BENEFITS

5G technology is set to have a significant impact on the world economy. Widely reported figures estimate the increase in global GDP directly determined by the implementation of 5G to be around 13.2 trillion dollars by 2035. Within the same period, 22.3 million new jobs will be created just in the value chain of 5G⁴. In Europe, a research commissioned by the European Commission estimated the economic benefits brought by 5G to be as high as 113.1 billion euros per year starting from 2025⁵. The number of new jobs created, according to the same research, will be 2.3 millions. Lastly,

³ [5G systems: enabling the transformation of industry and society](#), Ericsson.

⁴ [The 5G Economy](#), IHS Markit, 11/2019

⁵ [5G Deployment could bring millions of jobs and of euros benefits, study finds](#), European Commission, 09/2016

in Italy, a study commissioned by Huawei and carried out by Ernst & Young⁶ estimated an 80 billion euros increase in GDP in the next 15 years.

The other side of the coin is represented by the costs related to the creation of the 5G infrastructure and to the purchase of licenses from telecommunication operators. These investments are far from negligible: The European Commission⁷ expects those costs necessary to reach its connectivity targets (among which we find 5G coverage in all urban areas) to be around 500 billions euros. In Italy, according to the above-mentioned Ernst & Young study, costs for the deployment of 5G infrastructure and purchase of licenses will amount to 25 billion euros.

It is worth remembering that these numbers should be treated with caution, as they are the result of computations carried out in conditions of high uncertainty. The benefits of 5G are merely potential, and it will be the task of single companies to reap them. The digital readiness of each country's industrial and entrepreneurial systems, together with the single implementation strategies taken by public authorities, will be the key to a successful 5G strategy. On this issue, a report by Nokia⁸ investigating the 5G readiness of enterprises can help us better understand the business context around 5G. The report focused on eight countries (Australia, Finland, Germany, Japan, Saudi Arabia, United Kingdom, South Korea and US) and highlighted how only 7% of the surveyed companies are currently at the deployment stage of 5G. These 5G ready companies are the same ones which better navigated the current COVID-19 pandemic and, more in general, registered higher growth rates in the last years than their counterparts. This result highlights how the 5G revolution will accelerate a pre-existing process of polarization between companies which are better equipped to face the challenges of the digital era and companies which are not. This is further supported by the fact that one third of the surveyed companies expressed their concern about the possibility of being put out of business because of their lack of tempestivity in implementing 5G.

The Nokia study also highlighted the regional dimension of this phenomenon of polarization. If 12% of US companies are classified as 5G ready, the same numbers for German, Finnish and British firms are 3%, 2% and 4% respectively. Whereas Italy is not considered in the Nokia study, its well-known lag in the creation of a digital economy suggests the percentage of Italian 5G ready companies to be even lower. This is even more evident when we examine the main barriers to the implementation of 5G highlighted by the Nokia report: the limited availability of infrastructures (especially in rural areas) and the lack of the digital competences that are necessary to understand and exploit the potential of this new technology. The issue of the lack of digital competences is of particular salience in the Italian context. Italy, in fact, is at the very bottom of Europe in the category *Human Capital and Digital Skills*, according to the 2020 edition of the Digital Economy and Society Index (DESI)⁹. Finally, on the infrastructure side, it must be noted that a good fiber infrastructure is a prerequisite to unlock the full potential of 5G technology.

⁶ [5G, per l'Italia impatto economico senza precedenti](#), CorCom, 05/10/2019

⁷ [5G deployment: State of Play in Europe, USA and Asia](#), Policy Department for Economic, Scientific and Quality of Life Policies (commissioned by the ITRE Committee of the European Parliament)

⁸ [Business readiness for 5G](#), Nokia, 2020

⁹ [Human Capital and Digital Skills](#), Digital Economy and Society Index Report, 2020

The most optimistic forecasts on the impact of 5G in Italy need to be read in the context of the digital gap that still separates Italy from other European and global actors. Such a gap can impact the upside potential of 5G. Another consideration concerns the costs associated with the purchase of 5G services from the telecommunications operators. These costs will reflect those sustained from the telcos when purchasing the licenses for the use of 5G frequency spectrum - the higher the initial investment from a telco, the higher the price it will be forced to charge to compensate the initial expense. In Italy, these licenses have been auctioned to telco companies in 2018 for 6,5 billion euros¹⁰, a record in Europe¹¹. Telco operators will have to make up for this initial investment, and charging higher prices will definitely be an option.

Finally, an assessment of the benefits and costs that 5G technology can bring to Italy cannot be complete without an analysis of how the current geopolitical situation might affect the strategic choices on 5G. The market for the supply of 5G equipment is currently dominated by three companies: Ericsson, Huawei and Nokia. Among the three, Huawei seems to be the readiest and the one that can offer the most competitive prices. However, its close ties to the Chinese government, increasingly perceived as a threat in the Atlantic bloc, might determine its exclusion from the construction of 5G networks in Italy and in Europe. If geopolitical considerations will prevail on economic ones, the additional costs to be sustained by European countries, as a result of the restriction of Huawei, are estimated to be around 3 billions euro per year in the next decade¹². In Italy, according to the EY report, a delay of twelve and eighteen months in the realization of 5G infrastructure will result in additional costs for the telcos of 4-5 billions euro. Italian firms would also be expected to lose between 2,9 and 4,3 billions because of a decrease in their competitiveness. Estimating the impact of 5G in Italy is not straightforward, and to do so one needs to consider the current situation in the country and the sensitivity of costs to several factors. In particular, geopolitical issues surrounding 5G networks and their realization have the potential to increase costs and cause delays in the rollout of the infrastructure. Undoubtedly, the 5G revolution is a unique chance to develop a digital economy in a country that still lags behind its European peers in this aspect. Finally, it must be stressed that to refrain from investing in such a disruptive technology as 5G will negatively affect Italy's competitiveness *vis-à-vis foreign* competitors.

¹⁰ [Conclusa la gara del 5G: totale delle offerte 6.550.422.258,00 euro](#), Ministero dello Sviluppo Economico, 02/10/2018

¹¹ [5G: il record italiano al confronto con gli altri Paesi UE](#), Lorenzo Principali e Domenico Salerno, Agenda Digitale, 19/10/2018

¹² [The Economic Impact of Restricting Competition in 5g Network Equipment](#), Oxford Economics, 06/2020

2. 5G IN THE CLASH BETWEEN POLITICAL CAPITALISMS

Edoardo Crivellaro

5G represents the most evident manifestation of a recent, growing trend: the politicization of technology. Often, at our latitudes, we tend to observe technological development with the lenses of romanticism and idealism, hence motivated by a search for progress disconnected from the dimension of realpolitik and state power. It is frequent to hear about scientists and researchers as a global community, united by the same intentions and exclusively dedicated to improving the living conditions of human beings. However, reality is crueler and less ethereal: behind every investment in research and development there are States or private companies depending (at least in part) on them.

The 5G, both for reasons of relevance of the above-mentioned technology and for the historical circumstances, has the merit of bringing back the order of the addendums to its 'natural' state, i.e., to the pre-eminence of the strategy on the economy. The fifth-generation network can be framed as part of a clash between opposing political capitalisms, the Chinese and American ones, fighting for global primacy. In political capitalisms, economic cost-benefit analyses are subordinate to the national security needs of the respective actors: this is why the geopolitical aspect of 5G is the Gordian knot of the discussion. On the other hand, as Alessandro Aresu reminds us in his book "The Powers of Political Capitalism", Adam Smith clearly said that "defense is more important than wealth".

2.1 CHINESE STRATEGY, HUAWEI AND THE AMERICAN REACTION

As we have previously mentioned, the Chinese geopolitical strategy on 5G should be analyzed taking into account three key years: 2025, 2035 and 2049. The first represents the year by which the People's Republic intends to achieve global technological leadership, bridging the gap with the West, according to the Made in China 2025 plan; the second is contained in the China Standards 2035 strategy (to be published by the end of the year), through which Beijing aims to increase its weight in the institutions and bodies that set the standards for next-generation technologies (such as 3GPP and ITU); the third, finally, is the date of the centenary of the founding of the People's Republic of China, by which the Dragon must have surpassed the United States as the first power on the planet (in Xi Jinping's calculations). The U.S.' geopolitical power has been weakened by the financial crisis and the need to focus on the threat of terrorism. China, by thinking long-term and leveraging the amount of data generated in its internal market, hopes to take advantage of this and undermine the U.S.' technological leadership.

However, 5G is the most striking and surprising case of a total American underestimation and a contemporary Chinese advance: Huawei was in fact chosen as a valuable Trojan horse of Beijing telecommunications, to be used to penetrate the American sphere of influence and take away from Washington the exclusivity in the use of satellite country data. The Shenzhen company has quickly become the global number one in telecommunications thanks to loans, credit lines and tax benefits from the Chinese government, quantifiable in about 75 billion in State aid, according to the Wall

Street Journal. Regardless of the truthfulness of the numbers, it is not in question that Huawei has grown and developed in a protected and favorable environment, which allowed it to build a solid foundation before entering the international markets. In addition, the Chinese company has increased the connectivity of the African continent, which since its inception in Kenya in 1998 has enabled at least 50% of Africa to equip itself with a 4G network. The Chinese are still studying history, which teaches us how easily technological dependence can be converted into (geo)political dependence. When Washington became aware that the threat posed by Huawei was not only economic in nature, but profoundly strategic, it ran for cover: in December 2018, the arrest of Huawei's CFO in Vancouver has represented the start of an economic warfare and legal warfare (lawfare) with sanctions, pressure on Google to revoke Huawei's use of Android and block the supply of semiconductors to the Chinese giant. In addition, the U.S. has launched a campaign of pressure on allied countries to desist from the idea of giving Huawei the benefit of building the national 5G network, fearing risks to the security of citizens' data resulting from the link between the Shenzhen giant and the Beijing government. The last two countries to have succumbed to U.S. pressure by banning Huawei are Sweden and the Czech Republic, joining countries such as Australia, Great Britain, New Zealand, France, Japan, Taiwan and Singapore.

In the face of this situation, Italy is still very divided: some government factions are inclined to "wink" at China, while others which retain Atlanticism as a "polar star" are oriented towards the pro-American alternatives. Rome, however, may have launched a signal on October 22, when, according to Reuters, the Golden Power Committee of Palazzo Chigi has blocked a 5G network supply contract between Huawei and Fastweb¹³.

The debate in question is therefore eminently geopolitical: Huawei undoubtedly offers quality services at an advantageous price, but the decision will not be taken on the basis of a purely economic evaluation, in spite of the economicism that characterizes our ruling classes, but it will be a geopolitical choice concerning also the international position of our country.

Vulnus cogent in the credibility of the American demands, however, is the absence of an alternative made in USA to Huawei, an element that leads the United States to bet (at least in part) on two European companies, Nokia and Ericsson, aware that the first-mover advantage of Beijing is now a fact.

2.2 WILL THE US RELY ON MODULAR NETWORKS?

The U.S. administration launched last August the "Clean Network" program, which aims to create a network of countries united by the desire to defend themselves "from aggressive intrusions of malicious actors, such as the Chinese Communist Party", thus countering the influence of Beijing in the telecommunications sector. The Clean Network, in the vision of the European Council on Foreign

¹³ [Italy vetoes 5G deal between Fastweb and China's Huawei: sources](#), Reuters, 10/20

Relations, represents not only a form of containment, but also a real American roll-back against China¹⁴.

However, the search for a replacement for Huawei must start from a crucial question: why is an American Huawei not there? The answer lies in the consolidation processes of the telco industry occurred between the 90's and 2000's, which led to foreign acquisitions of U.S. operators like Motorola and Lucent. Just Motorola, in 2003, was about to acquire Huawei for 7.5 billion dollars, a deal that would have changed, and by much, the contemporary history of telecommunications. In the words of former CIA analyst Martijn Rasser and Ainikki Riikonen, research assistant at the Center for a New American Security (CNAS), "the U.S. has let the market forces act freely instead of implementing an industrial policy aimed at creating a national champion"¹⁵. In short, the USA rested on its laurels with an available 4G technology in their availability, underestimating the importance of investing in the next generation.

Today, the hypothesis of creating a U.S. industrial champion has waned, even after the refusal of Oracle and Cisco to enter the market again. The opportunity, suggested by the same attorney general William Barr, to subsidize or enter the capital of the two main European companies of 5G, Nokia and Ericsson, has gained consensus. A few days ago there was news of an interest in the acquisition of Nokia by Microsoft, which would be interested in the 5G business of the Finnish company¹⁶. This second hypothesis, although more attractive and less expensive with respect to the "endogenous" option, raises some perplexities to some experts in the field: first of all, on this ground the first-mover advantage of Huawei would remain almost scratched but, secondly, such a choice risks to feed a consolidated and inefficient oligopolistic industry. The limited number of suppliers generates, in fact, problems regarding the diversification of the supply chain, an element of crucial importance to ensure the resilience of the networks. Just the need to ensure integrity, security and diversification has led to the development of a third way, whose keywords are modular architecture and open interface. This new model would make it possible not to bind a State to a single supplier, leveraging the principle of interoperability of services and equipment offered. The modular nature of open interfaces makes possible what it has not been until now: replacing a single component of a supplier without having to restructure the network from scratch.

The Center for a New American Security has suggested that the United States should pursue a strategy based on the interoperability and modularity of fifth generation networks, considered as the only option to change the current status quo, which sees China in advantage¹⁷. The five benefits of this strategy would be the following:

¹⁴ ["The Clean Network Program: Digital Age Echoes of the "Long Telegram"?"](#) , Council on Foreign Relations, 10/20

¹⁵ ["Open Future, The Way Forward on 5G"](#) , Center for New American Security, 07/20

¹⁶ ["Microsoft In The Frame To Buy Nokia \(Again\), Analysts Forecast"](#) , Forbes, 10/20

¹⁷ ["Open Future, The Way Forward on 5G"](#) , Center for New American Security, 07/20

1. Greater diversification of vendors, able to encourage American "software companies" to take an interest in the industry, overcoming the barriers of entry that now make it unattractive;
2. Lower implementation costs. For example, Rakuten, a Japanese company that has put into practice a project based on open interface and modular architecture, claims that the cost of the network is about half that of traditional ones;
3. Interoperability, which guarantees to mitigate risks and revitalize the market;
4. The security, directly resulting from the interoperability mentioned in point 4;
5. The growth of the market and the creation of new opportunities for operators.

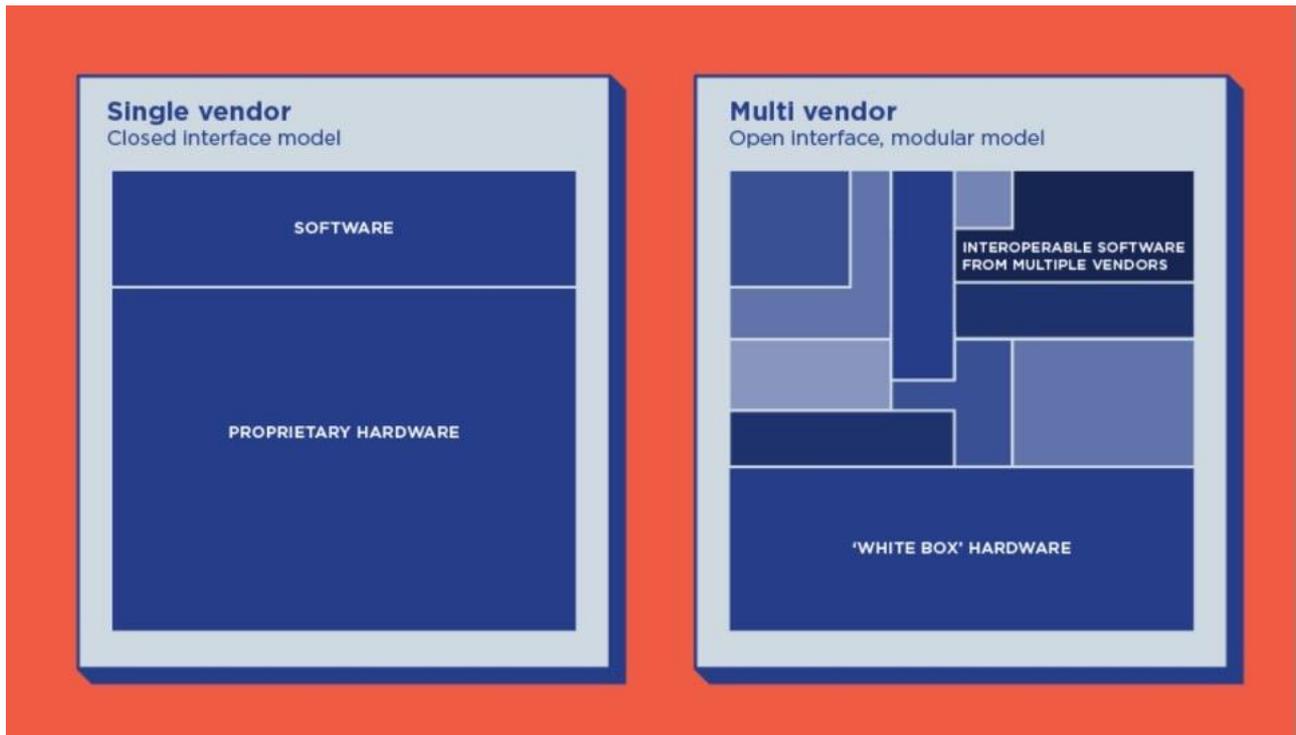
A last option, among those now on the table, would be instead to entrust the Pentagon with the task of setting up a national 5G network, whose management would then be transferred to the private sector for civil purposes¹⁸. The proposal was suggested directly by Trump's chief of staff, Mark Meadows, but the idea is considered also by other influential figures in the U.S. such as Eric Schmidt, former CEO of Google and now Chairman of the Defense Innovation Board, who said that the best strategy to avoid "national emergency" (= stay behind China on 5G) would involve the Pentagon as the creator of a network to share with the private sector.

2.3 CREATIVE DESTRUCTION AND THE DECOUPLING OF 5G ECOSYSTEMS

Chinese and Americans are well aware that digital is physical, that data do not travel in the ether but run along tangible backbones, from submarine cables to telecommunication antennas. As Jayne Stewell, head of infrastructure for Google, effectively summarized, "people think data is in the cloud, but it's not. It's in the ocean. The physicality of digital reinforces the inseparable link between technology and national security, and between technological development and bureaucratization of the world. Ultimately, as Aresu stated, "the history of capitalism is a graveyard of the telecommunications elite"¹⁹, but it will be crucial to understand how the schumpeterian creative destruction will be governed and who will come out as a winner. In this sense, it is likely that technological decoupling will directly affect the telco sector and 5G, leading to the formation of at least two ecosystems for fifth generation networks, one Chinese and one Euro-American. However, the world is no longer classifiable in black and white as it was during the Cold War, so shades of gray will be the real object of contention. Italy could be one of them, if it has not already become one.

¹⁸ "E se il 5G americano lo facesse il Pentagono? L'idea anti-Cina dalla Casa Bianca", Formiche.net, 10/20

¹⁹ Aresu A., *Le potenze del capitalismo politico*, Milano (2020), La Nave di Teseo



Fonte: Center for a New American Security

3. CONCLUSIONS

In conclusion, 5G represents an indispensable technology to ensure the competitiveness and attractiveness of the national economic industry, which cannot ignore the potential for digitization and connectivity that only the fifth generation networks will be able to guarantee. The digital society of the future will be based on connection speed, low latency and coverage of large geographical areas made possible by the 5G infrastructure, a fundamental driver for technologies and realities such as the Internet of things (IoT), autonomous driving, smart cities and smart manufacturing. However, the new networks risk further polarizing the market, dividing it between 5G ready and technologically immature companies. Italy in this respect risks to suffer more than other countries, in light of the chronic lack of digital skills and inadequate infrastructure, especially in rural areas: it is therefore necessary to bridge this "digital lag" to avoid starting this new and exciting game already outnumbered.

However, it will be the geopolitical aspect that will dictate the agenda of 5G, determining how to implement the network, and not the economic cost-benefit analysis. The fifth generation network is a decisive part of the clash between political capitalisms of China and the United States, and is part of a context of increasing politicization of technology. In Italy it would be first of all opportune to become aware of the pre-eminence of strategy on the economy, of the security needs on those of the market, having clear that every choice on new technologies will have an immediate reflection on the international position of the country. By virtue of this, it is appropriate that every evaluation on 5G is all-inclusive and multidisciplinary, not only sectoral and specific: it is therefore necessary to overcome the archipelago system that often characterizes our country, stimulating more connections and synergies between ministries, security agencies, business sector and academia. The establishment of a group of experts with transversal skills could be a useful solution to foster the confrontation and debate necessary to formulate realistic and conscious solutions. Only through integrated and flexible frameworks it will be possible to govern new technologies, reconciling the constraints of geopolitics with the opportunities of the economy.

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