



CHINA'S NATIONAL SOCIOECONOMIC STRENGTH IN SCIENCE AND TECHNOLOGY DEVELOPMENT

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ABSTRACT

Structured abstract - Creating a breakthrough for China's national strength on the basis of prioritizing science and technology development is a particular and important aspect of China's development orientation in the context of the Industry 4.0. These have intrigued the authors in the research that the policies for building China's socioeconomic national strengths should be studied thoroughly.

Purpose: The Central Leading Group for Cybersecurity and Informatization and Central Cyberspace Affairs Commission's operations and their effectiveness should be studied thoroughly to know more about the national strengths of China.

Method/design/approach: This study has been conducted in qualitative approaches. The research is largely based on the documentary method and the observation method of the Communist Party of China in order to assess the strategic direction of the country's socio-economic development.

Results and conclusion: The development of science and technology has also been identified by Chinese leaders as an important strategic issue related to national development and security. The development level of science and technology, especially achievements in the high-tech field, has become a fundamental foundation for China's national strength contemporarily. However, one of China's major weaknesses also lies in the high-tech field, while the country has not mastered a number of core technologies. The Chinese number of patents is large but the quality is not corresponding.

Research implications: Among the major findings, the United States and its allies have recognized the competitive threats of China's reforms and breakthroughs in science and technology recently. Since then, there have been drastic countermeasures, turning the high-tech into a front line in the strategic competition with China.

Originality/value: This can be explained by the fact that methodical, synchronous, and focused institutions and policies, supported by huge financial resources, are helping China transform strongly from a "follower" to a "frontier" country, even being a "pioneering" in science and technology globally.

Keywords: China, Institutions, National Strength, Public Policy, Science and Technology, USA.

A FORÇA SOCIOECONÔMICA NACIONAL DA CHINA NO DESENVOLVIMENTO DA CIÊNCIA E TECNOLOGIA

RESUMO

Resumo estruturado – Criar um avanço para a força nacional da China com base na priorização do desenvolvimento de ciência e tecnologia é um aspecto particular e importante da orientação de desenvolvimento da China no contexto da Indústria 4.0. Isso intrigou os autores da pesquisa de que as políticas para construir as forças nacionais socioeconômicas da China devem ser estudadas minuciosamente.

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Objetivo: As operações do Grupo Central Líder para Segurança Cibernética e Informatização e Comissão Central de Assuntos Ciberespaciais e sua eficácia devem ser estudadas minuciosamente para saber mais sobre os pontos fortes nacionais da China.

Referencial teórico: Modelos do Grupo Central Líder para Segurança Cibernética e Informatização e Comissão Central de Assuntos Ciberespaciais.

Método: Este estudo foi realizado em abordagens qualitativas. A pesquisa é amplamente baseada no método documental e no método de observação do Partido Comunista da China, a fim de avaliar a direção estratégica do desenvolvimento socioeconômico do país.

Resultados e conclusão: O desenvolvimento da ciência e tecnologia também foi identificado pelos líderes chineses como uma importante questão estratégica relacionada ao desenvolvimento e segurança nacional. O nível de desenvolvimento da ciência e tecnologia, especialmente conquistas no campo de alta tecnologia, tornou-se uma base fundamental para a força nacional da China contemporânea. No entanto, uma das principais fraquezas da China também está no campo de alta tecnologia, enquanto o país não domina uma série de tecnologias essenciais. O número chinês de patentes é grande, mas a qualidade não é correspondente.

Implicações da pesquisa: Entre as principais descobertas, os Estados Unidos e seus aliados reconheceram as ameaças competitivas das reformas e avanços da China em ciência e tecnologia recentemente. Desde então, houve contramedidas drásticas, transformando a alta tecnologia em uma linha de frente na competição estratégica com a China.

Originalidade/valor: Isso pode ser explicado pelo fato de que instituições e políticas metódicas, síncronas e focadas, sustentadas por enormes recursos financeiros, estão ajudando a China a se transformar fortemente de um país "seguidor" para um "fronteiriço", sendo até mesmo um "pioneiro" em ciência e tecnologia globalmente.

Palavras-chave: China, Instituições, Força Nacional, Política Pública, Ciência e Tecnologia, EUA.

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1 INTRODUCTION

Since the reform and global integration dated back to 1978, China has emphasized the fundamental role of science and technology in the national synergy. The former Chinese leader, Deng Xiaoping, has identified science and technology development as one of the "four modernizations", a key factor to bring the country to "prosperity and power" (Marcia Aparecida Zampier et al., 2022). Recently, President Xi Jinping has reaffirmed the view that science and technology is the number one productive force. Mr. Xi has emphasized that cyber security and digitization are important strategic issues related to national security and national development, affecting the work and life of the vast majority of people. Therefore, it is necessary to follow the major global trends by innovating and developing, striving to build China from a big hub of computer networks into a digital powerhouse. He, then, has declared that without cyber security there is no national security, while without digitization there is no modernization (Orazio Coco, 2021). Being aligned with these, the 20th National Congress of the Chinese Communist Party (CCP) has raised a number of important requirements to thoroughly grasp the organic relationship between science and technology and China's national strength in the current period:

- Consistently consider the physical economy as the key to economic development, while promoting new-style industrialization, accelerating the construction of China into a powerhouse in manufacturing, product quality, and transportation, with the power of digital networks, and the power of digitization.



- Persistently consider science and technology as the number 1 productive force, talents as the number 1 resource (Phan Minh Duc, 2022), and creativity as the number 1 driving force to foster the implementation of the strategy of national renaissance by science and education, the superpower strategy on talents, and the strategy based on creativity to stimulate development, paving the way to develop new fields, new racetracks, and constantly creating new dynamics, and new advantages for development.
- Maintain the core role of innovation in the overall construction of China's modernization.
- Perfect the CCP Central Committee's unified leadership for science and technology work, consolidating a new-style institution nationwide, strengthening the power of science and technology in the national strategy, optimizing allocation of creative resources, and enhancing the overall performance of the national creative system (Xi Jinping, 2022).

In fact, the development of science and technology, especially in new and high-tech fields, has become an extremely important aspect and foundation for China's integrated national power in China's domestic and international political life (Catherine Owen, 2017). Science and technology have been becoming a core factor, a basic fulcrum for China to develop and rise strongly, playing an increasingly pivotal role in the competitive advantages of China's domestic and foreign synergy, mainly against US superpower and its Western allies (Haojia He et al., 2022). As a result, China is on its path of striving to become one of the world scientific-technological powers. Its dream is developing rapidly in high technology, catching up quickly, and even surpassing the US and the highly developed Western countries in some specific fields.

In order to make a breakthrough in science and technology, China does create effective supports from the public sectors through effective policy mechanisms and several governmental investment actions, not leaving the private sector and the free market alone. The centralized political institutions have enhanced a quick mobilization of state, social and market resources in the country modernization process, with the goal of reaching the pinnacle of science and technology advancements in the world. This, at last, may help fulfil the realization of "The revival of a Great China".

2 METHODOLOGY AND THEORETICAL REFERENCES

This study has been conducted in qualitative approaches. The researchers' assessments are based on the analysis of the mechanism and organizational structure; in which, the Chinese State conducts activities related to the digitization of the economy. That was expressed from the very beginning through the directions of the Communist Party of China and the individual senior leadership of the country. Afterwards, the research is specified by the arrangement of the organizational tools and resources to perform mandatory tasks in achieving the final goals. The research, then, is largely based on the documentary method and the observation method of the Communist Party of China in order to assess the strategic direction of the country's socio-economic development. The analysis of the results as well as the challenges of those organizational mechanisms will contribute to the effectiveness assessment of China's public policies with regard to the development of science and technology as the national socio-economic foundations.

President Xi Jinping has said that today's digital revolution is being renewed day by day, profoundly affecting fields such as politics, economy, culture, society, and military. Digitalization and economic globalization promote each other, the digital network has penetrated all aspects of social life, fundamentally changing the way of life and production of mankind. In terms of digital networks, China has become one of the top countries in the world; on the other hand, in terms of innovation autonomy, it is still relatively backward, while the



development bottleneck is still quite obvious (David M. Lampton, 2016). In response to this new situation, on February 27, 2014, the CCP Politburo established the Central Leading Group for Cybersecurity and Informatization, headed by President Xi Jinping. Then, in March 2018, it has been upgraded to the Central Cyberspace Affairs Commission. The major tasks of the Commission revolve around the theme of "Building a global powerhouse in digital networks", focusing on developing own and strong-enough technology, building comprehensive digital services, thriving network culture, establishing good digital infrastructure, forming a powerful digital economy, building a team of high-quality cybersecurity and digitalization talents, and actively implementing bilateral and multilateral international cooperation on digital networks. The Leading Group's and Central Commission's operations and their effectiveness should be studied thoroughly to know more about the national strengths of China:

- The Central Cyberspace Affairs Commission does not stop at the government level, but rather a higher-level leadership, agenda, and coordination structure at the CCP Central level. Therefore, capacity of the coordination has been improved, overcoming the inadequacies in regulating the working relationship related to the major focal points of the CCP Central Committee, the CCP Central Military Commission, and the National People's Congress of China.
- The Central Cyberspace Affairs Commission not only leads the field of digitization, but also places the field of cybersecurity in a prominent position. The role of cybersecurity has been emphasized and arranged in a whole within the national digital strategy, meeting the urgent requirements of network security in the new context. Cybersecurity and digitization are now seen as "two wings of a bird" or "two wheels on the same axle". They are consistently connected.

3 RESEARCH FINDINGS

3.1 China Strives to Become a Global Powerhouse in Digital Networks

The first Conference of the Central Leading Group for Cybersecurity and Informatization in 2014 has emphasized that the arrangement and implementation of the Cyber Power strategy, which should be promoted in alignment with the goal of "The second 100-year vision". The strategy of building a network power needs to be promoted synchronously with the goal of "The second 100-year vision", towards the goal that the self-innovation capacity which is being significantly enhanced, while the digital economy has been fully developed, and the network security has been strictly guaranteed.

The "Digital Silk Road" plan, launched in 2015, is an important channel for China to internationalize domestic industrial and technological standards. One common practice is that digital infrastructure development projects in aid-receiving countries often have constraints on technology procurement from Chinese companies and system integration, according to Chinese technology standards. The "China Standards 2035" program, released at the end of 2020, has established global standards for the next generation of technologies, focusing on emerging technologies such as 5G technology, artificial intelligence, Internet of things, cloud computing, big data. Towards the goal of internationalizing the national standard system, China's tech giants have all played a pioneering role in setting technology standards regionally, internationally, and globally.

On December 27, 2021, the Central Cyberspace Affairs Commission has published the "14th National Digitalization Master Plan" (hereinafter referred to as the Master Plan). This Master Plan is an important component of China's system of national development plans, which lay out the arrangement for China's digital development during the 14th "Five-Year Plan" period". The Master Plan also recognizes that digitization has entered a new stage of



development, which is to accelerate the development of digitalization and build a digitized China to conform to the new development situation, seize the opportunities in the digital revolution, create national competitive advantages, and accelerate the building of national socialist modernization.

The Master Plan emphasizes the persistence of using Xi Jinping Thought on Socialism with Chinese characteristics and on the Internet Power as a guideline and closely follows to coordinate and promote the implementation of the overall layout of the "Five Tastes of Unity" and coordinate promote the strategic "Four of Comprehensiveness". The Master Plan requires firmly grasping the new development concept, persisting in the work rhythm of "moving forward in stability", taking the promotion of high-quality development as the theme, taking the construction of a digitalized China as the goal, focusing on accelerating the development of digitalization, promoting the attractive and leading role of digitalization in socio-economic development, promoting the synchronous development of new-style industrialization, digitization, urbanization and modernization of agriculture (Philip C. C. Huang (黄宗智), 2017), and accelerating the construction of a modernized economic system. The Master Plan requires creative reform as the basic driving force, perfecting the creative system and development environment, arousing creativity, and enhancing development dynamism. It is to take meeting the people's increasing living needs as the basic goal, coordinating development and security, promoting the modernization of the national governance system and capacity, strengthening the construction of digital society, digital government, digital people's life, making the masses feel more happy and secure in the process of digitalization, and providing a great impetus to usher in a new process of comprehensively building a modernized society, towards the realization of "The second 100-year vision". By 2025, the construction of a digital China needs to make a decisive step forward, and the level of digital development is significantly raised. In particular, the digital infrastructure system should be increasingly complete, the basic digital creation system should be formed, the quality and efficiency of digital economy development should reach the world's advanced level. Along with these, the levels of digital government have to be comprehensively improved, the capacity to ensure digitalized people's lives has to be significantly enhanced, and the digital development environment has to be more and more perfect.

3.2 China has Developed Digitization-Industrialization Integration

China believes that, in the new development context, only by closely combining the characteristics of the digital age and the industrial history, taking the digitization-industrialization integration as the main axis can it seize opportunities in the process of moving towards industrialization, providing additional impetus to upgrade the industrial transformation process model. This direction is reflected in the following two aspects:

On a large scale (in the whole society), implementing the "Internet +" Action Plan (2015), China strives to deeply integrate the achievements of the internet sector into other areas of socio-economic development, promoting technical progress, improving efficiency, renovating organizations and enhancing the vitality of the physical economy. Thereby, the country is able to form a new socio-economic life with the Internet, which serves as a key creative and technical infrastructure. More specifically, using the internet to promote the further development of manufacturing, agriculture, energy, environment, e-commerce, finance, has fostered the birth of new industries with a strong background. Being the main technical platform, the Internet has been applied more and more deeply into the fields of people's lives such as health, education, transportation, and public services. Thus, the Internet-based industry ecosystem has become a new economic growth engine (Feng Yang et al., 2019). The Internet has got a critical role in promoting people's business and creativity, providing more state-of-



the-art public services. This is when the development landscape, which links the cyber world and the physical economy, is basically formed. By 2025, an ecological system of Internet-related industries with the characteristics of smart, service-oriented and harmonious devices should be formed at the determination of the country. Nevertheless, the Internet will become an important driving force for socio-economic creative development.

As a development spearhead, China has been launching important projects in the field of smart manufacturing (Zhangsheng Liu et al., 2021). This has become a new development trend of the global manufacturing industry, while intelligent production equipment and methods will widely replace traditional production methods. The "Made in China 2025" strategy, which has been announced by the Chinese Government in March 2015, identifies 10 major key areas for the development of the manufacturing industry: (1) next generations of informatics technology; (2) high-level numerical control machine tools and robots; (3) aerospace equipment; (4) marine engineering equipment and high-tech ships; (5) advanced orbital traffic equipment; (6) energy-saving and new energy sources; (7) electrical equipment; (8) agricultural equipment; (9) new material, and (10) biomedical and high-performance medical devices. China has organized research and implementation of smart manufacturing projects, researched to determine project goals and roadmap to master smart manufacturing technologies and products, and smart/digital factories.

Since 2014, China has started implementing strong foundation industry projects, supporting the aerospace industry's supply of important materials, and conductive equipment components. Next, China will break through a number of key areas, implementing innovative projects in high-end equipment, organizing the production on large aircraft, aircraft engines and turbines, gas, and high-level numerically controlled machine tools, etc. The 20th National Congress of the CCP assessed that a number of China's key core technologies have had breakthroughs, and emerging industries are strategic. strong development strategy, in a number of fields such as manned spacecraft, Mars moon exploration, underground seabed exploration, supercomputers, navigation satellites, quantum information, nuclear power engineering, building giant airplanes, biomedical products, etc. achieved great results, entering the ranks of creative nations (Xi Jinping, 2022).

Regarding the operating structure, the "Made in China 2025" action plan has been announced by the Chinese Government in March 2015. In order to successfully conduct the plan, China established a Leading Group to build a national manufacturing power headed by a Deputy Prime Minister, established a Strategy Advisory Committee. The strategy to build a state manufacturing powerhouse is headed by a Vice President of the National Assembly, and at the same time published many documents, research achievements, and green books detailing the implementation of the "Made in China 2025" plan. ". As for the roadmap, China's strategy is divided into 3 steps. Step 1 is that within 10 years from 2015 to 2025, China strives to enter the ranks of the world's manufacturing powers. Therefore, the "Made in China 2025" is the first 10-year action platform (2015-2025) in the strategy. Accordingly, by 2020, China will basically complete industrialization. This is when the position of a major country in the manufacturing sector has been further consolidated, and the level of digitization of the manufacturing industry has been significantly enhanced. China, then, will have mastered key and core technologies in a number of key areas, raising their competitiveness in a number of dominant fields. Product quality will be significantly improved. Digitization, networking, and the application of artificial intelligence will have made remarkable progress, whereas consumption of energy, materials and emissions will significantly be reduced. By 2025, Chinese consumption of energy, raw materials and emissions of key industries will meet the world's most advanced standards. A series of transnational companies and industry complexes then will be formed to make the China's national status in the global value chains will be markedly enhanced. Furthermore, Step 2 is from 2025 to 2035; in which, China's manufacturing



industry as a whole will reach the level of a middle power in the world. This is when the creative capacity is strongly enhanced, and key industrial areas are with important breakthrough developments, while the dominant occupations are capable of driving global innovation. In the country, the industrialization is carried out comprehensively. Lastly, the Step 3 is from 2035 to the middle of the 21st century. This is when the status of China's manufacturing industry is further consolidated, entering the ranks of the leading powers in the manufacturing field. At this time, the key manufacturing sectors are capable of driving innovation and exhibit clear competitive advantages. Having a complete industry system with the most modern technology, China can become a global leader.

3.3 Some Major Achievements of China in the Process of Digitalization

3.3.1 Breakthroughs in High-Tech Products and Services

China has developed rapid breakthroughs in high technology, quickly catching up, and even surpassing the US superpower to pioneer in some fields.:

(1) China overtakes the US in terms of mobile payments, e-commerce, application of facial recognition technology, and surveillance technology. With a competitive advantage of a large population, China has got a fast-growing and vibrant e-commerce market. Especially, surveillance technology and face recognition sensor system are widely applied in the field of civil and daily life.

(2) In 5G technology, China has gone far ahead of the US in terms of scale, speed, coverage as well as 5G applications in industrial production. While the US is testing 5G in industries, China already has a strong 5G ecosystem. Some major enterprises have fully operated 5G. For example, the port of Xiamen (Fujian province) has been fully automated in 2020 with 5G network. At the moment, the popular Chinese 5G equipment, accounting for more than 40% of the global market share, has penetrated deeply into the telecommunications infrastructure of developed capitalist countries. In 2001, Huawei, founded in 1987, has just started to enter the global market by establishing a subsidiary in the US. With the support of the State, Huawei has broken through veteran rivals, becoming the leading enterprise in the 5G race. Even in 2020, despite heavy sanctions from the US and its allies, thanks to the government's support to deploy large projects in the domestic market, Huawei still led the games, accounting for 31.7% of the global share of 5G equipment (Abhishek Verma, 2022).

(3) China is no less competitive than the US and its allies in emerging technologies such as artificial intelligence, quantum computing, and automatic electric vehicles. Although the electronic chip industry is still facing major shortcomings, it still is on a strong development momentum. According to Semiconductor Industry Association, in 2020, the number of electronic chips sold have increase by 30.6% to reach 39.8 billion USD.

3.3.2 Building a Number of Key Enterprises in Information Technology and Telecommunications

China has successfully established a number of leading enterprises in information technology and telecommunications of the new generation with definite tasks. To achieve this goal, China has used many measures such as financial subsidies, preferential access to cheap land, tax reductions, and loosening regulations for domestic high-tech enterprises to freely develop. Other measures have also been taken to tighten the management of foreign enterprises (in the case of Facebook, Google), and to put pressure on foreign companies to transfer technology in return for market access (Yifei Sun, Ke Wen, 2007). Businesses that take advantage of the above context have developed rapidly, becoming leading corporations, playing



a key role in reaching out to regional and international markets. They are Alibaba in e-commerce and payment electronic algorithm; Tencent on video games, e-commerce, and e-finance; Baidu on online searching engine, telecommunications technology and online games; Huawei in information technology, high technology, software, mobile phones and electronic chips; Xiaomi on hardware and mobile phones; ZTE on electronic chips, semiconductors, and digital technology. Among them, Byte Dance has recently become well known to the world with the Tiktok spearhead social network that attracts more than 2 billion people around the world to follow.

3.3.3 A Successful First step in the Internationalization of Digital Standards

Up to now, China is gradually conquering the international digital space through diversified technology products with competitive prices. Upon systems like BeiDou satellite navigation system, and data centers, commercial application platforms, China has built more than 30 transboundary land-based fiber optic cables and more than 10 international undersea cable lines, with technical capacity to monitor the flow of information exchange on the Internet, from fiber optic cable systems, to Internet access, and local data repositories. Apart from this, China is at the forefront of smart city development in Central Asia, the Middle East, and Africa (Mingjiang Li, Angela Poh, 2019). E-commerce has also been vigorously promoted with dozens of partner countries, especially in the three continents of Asia - Europe - Africa, creating favorable conditions for Chinese enterprises to strongly penetrate these markets..

4 RESULTS DISCUSSION

4.1 Some Key Results

Firstly, the information and telecommunications network has been comprehensively improved. China is promoting the synchronous construction of foundation equipment for communication activities, promoting the implementation of the unified information network project in the air and on the ground. At the same time, efforts have been made to develop network security techniques, products and equipment. It also seeks to optimize the distribution and construction of military electronic information testing sites. Its BeiDou satellite navigation system is said to be able to compete with the US GPS global positioning system. China is also a pioneer in sending quantum communications satellites into space and leading the world in 5G satellite technology.

Second, developments in the space sector are being dramatically enhanced for both military and civilian purposes. China has accelerated the synchronous construction of space infrastructure equipment to serve both military and civilian needs, fostering the implementation of a series of important projects such as heavy transport rockets, space nuclear engine equipment, space exploration equipment, and conducting synchronous management of a series of important dual-use works and projects such as the spaceflight service system. China has taken the BeiDou satellite as the focal point to create a breakthrough development, which is able to promote the sharing of satellite resources and satellite data between the military and civilian parties, and to actively explore, research, operate and share satellite launching systems and space exploration. China has joined the ranks of great powers in the field of space exploration eventually.

Third, the ocean and polar fields of technology (mainly in the Arctic) have made significant progress. China strives to develop technologies such as deep-sea exploration, construction of a deep-sea space station, a floating nuclear power station on the sea, active research and development of high-end icebreakers, and scientific exploration of the polar region



with rescue ships, polar transport ships and ships for exploration and exploitation of polar resources and other equipment serving the marine sector. The strength of China's naval force has been extremely being enhanced, which is superior to the past, compared with smaller countries in East Asia.

4.2 Some Major Internal and External Challenges in Digitalization

4.2.1 The Current overall Development Level of the Smart Manufacturing Industry is Still Inadequate

At present, China can be considered as a big country in manufacturing but not yet a manufacturing powerhouse, because there is still a large gap compared with the other developed countries. Among which, the US, as the center of global science and technology innovation, is in the leading position, followed by EU and Japan. The second group is low-level manufacturing countries, mainly consisting of a few emerging countries. The last group is resource exporting countries, mainly consisting of OPEC countries, Africa, and Latin America. China is currently in the second group. Hopefully, this ranking is unlikely to change radically in the short term.

Compared with other countries with the most advanced science and technology, the development level of China's science and technology in general and the manufacturing industry in particular still takes simple expanded reproduction. The task of renovating and upgrading the manufacturing industry through smart products, techniques and equipment still has a long way to go. There is an optimistic Chinese public opinion that the service industry has surpassed manufacturing to become the second largest manufacturing sector of the national economy, and that China can "ignite" the stage of industrialization development, going straight to the economic structure with the service industry as the core competency. However, in the view of Mr. Miao Wei, former Minister of Industry and Information Technology of China, this is far from reality. Because, along 300 years of world industrialization, it can be seen that industrialization is the core content of modernization, while manufacturing is the most important pillar of technical innovation. The economic giants such as the US, Germany, Japan, Great Britain, and France all have rose from a manufacturing powerhouse. If the manufacturing sector does not develop well, the service sector will lack strong support. Without a solid physical economy, the service industry will be like a "tree without roots" and modernization will be difficult to realize. Up to now, the China's manufacturing industry has been assessed as taking a simple expansion of reproduction as the main development path. The task of renovating and upgrading the traditional manufacturing industry through smart products, techniques and equipment is still very urgent and arduous (Chun Liu, Krishna Jayakar, 2016).

4.2.2 US blocks China's Access to Advanced Electronic Chips

Chip plays a pivotal role in every electronic product, from smartphones to cars, spacecraft and artificial intelligence core processor, so it is the key to a country leading in technology. China has not yet overcome its long lag behind the US in chip technology (Yuhong Wang et al., 2022). Moreover, the US is seeking to comprehensively restrain China from developing autonomous capabilities in electronic chip technology. For manufacturing tools, the US strictly controls advanced nanochip manufacturing equipment and tools not to fall into the hands of China by banning companies including foreign companies from using US equipment or tools in their production. All chip makers that sell chip products to Chinese companies will be on the US blacklist. In terms of production, in order to increase the rate of domestic chip, the US, on one hand, promotes the expansion of domestic production (Intel has decided to build



2 chip factories in Arizona with a budget of 60-120 billion USD); on the other hand, it attracts allies to set up chip factories in the US (TSMC has committed to invest 12 billion USD, Samsung Electronics is to invest 17 billion USD). In terms of circulation, the US cooperates with countries and regions to build a global advanced chip supply chain without the participation of China. As for chip technology researching, the US restricts joint academic research and development participation between US and Chinese companies, laboratories, and educational institutions in the high-tech sector.

4.2.3 US and its Allies Shrink China's 5G Technology Market

5G technology is not only important to the telecommunications industry and mobile networks, but also is the foundation for next-generation technologies such as artificial intelligence, big data, internet of things and more. Therefore, the country that wins the 5G race will have the upper hand in many areas of the future, and in the world leading power competition. The US is thought to be lagging behind China in this race (Nigel Inkster, 2019). Chinese 5G equipment now accounts for more than 40% of the global market share, creeping into telecommunications infrastructure in the US's allies. Therefore, the US seeks to restrain China from developing 5G technology. Influenced by the US, some countries such as Australia, Japan, the UK and New Zealand have boycotted Chinese 5G technology and equipment. The US has lent money to developing countries to buy 5G equipment from Ericsson, Nokia and Samsung Electronics, persuading developing countries and countries in Central Europe and Eastern Europe to build 5G networks without using equipment from China. At the same time, the US is promoting its own development of 6G technology to reverse the situation.

4.2.4 Overall Capacity in Innovation, Especially in Core Technology is Not Strong

The capacity for autonomous innovation is generally not strong, while the level of research and design of most equipment is not high. China is still dependent on foreign countries for core technology (Bin Guo et al., 2013). China has surprised the world by becoming the country with the largest number of domestically registered patents in the world. However, patents demonstrating breakthroughs in technology, design, process, or idea account for only about a fifth of the total number of patents registered in China. There exists a gap, not a small gap in terms of quality between China compared to many Western countries and Russia in the field of research and manufacturing of strategic weapons and high-tech foundational weapons technologies. Many strategic weapons researched and manufactured by China (fighters or submarines) have "hulls" of domestic goods, while "intestines" are from imported goods. China has not yet reached the level of precision metallurgy that can make advanced aircraft engine components, a device that requires safe operation under very high temperatures over long periods of time. Engines developed by China can only work for a few hundred hours, while engines made in Russia or the West can operate for several thousand hours before having to be replaced. China is also blamed for copying the design of key weapons from Russia (fighters, air defense systems, missiles, tanks) and many other countries without legal transferring.

4.2.5 The start-up Business Sector in the High-Tech Field is Still Inadequate

The network of start-ups in the field of high science and technology still has many shortcomings. China has cultivated tens of thousands of startups with the aim of turning them into leaders in the fields of cloud computing, robotics and artificial intelligence, but the overall picture is not as optimistic as being expected by the Chinese government (Yubao Chen, 2017). China's 10 largest technology companies are undervalued by 50% compared to the top 10



companies in the same industry in the US. Many startups are tolerated by officials to achieve local development goals and business interests. In the first 10 months of 2020, there were 58,000 companies registered as businesses related to the field of electronic chips; however, some of them invest money in fashion, construction and other fields. In fact, they have changed their business registration in order to access capital and land at preferential prices. At least 6 semiconductor projects that worth 1 billion USD have collapsed. The government has to tighten related regulations to overcome the above pitfalls. But it wasn't long before those strict regulations have been enacted, China's 10 largest tech companies have lost \$1.7 trillion in market capitalization, and international investors have fled China for fear of profit risks.

4.2.6 The United States Pursues a Policy of “Surpassing and Preventing”

Undeniably, the technological hegemony in the world that the US has held for nearly a century is facing a great challenge from China. Since World War II, the US has always been a pioneer in most of the key technologies, creating a global technology ecosystem which is led by the country. The situation has been changing remarkably, while China is breaking through to narrow the development gap with the US. The US wants to capture a large market share in the high-tech sector in China, and wants Chinese enterprises to play the role of outsourcing products for it. But in reality, what have happened is far from this expectation. In the Chinese market, the US high-tech giants (GAFA) are all facing fierce competition and do feel certain pressures by the relevant strict regulations of the government, while others have to accept the technology transfer to penetrate this huge market.

In the countermeasures against China's breakthrough development in technology fields, the US has cited national security reasons to prevent and punish Chinese tech giants. Under President Barack Obama, the US accused Huawei and ZTE of national security risks, and hindered Huawei from entering the US market (Jie Zhou et al., 2022). By the time of President Donald Trump, the US was sharply spearheading Chinese technology companies. In January 2018, AT&T was forced to withdraw from a smartphone distribution agreement with Huawei. Even just before his resignation, President Donald Trump still hit Huawei with a "heavy hand" by signing orders to revoke licenses and denying approval for dozens of licenses to supply components of Huawei. When President Joe Biden came to power, the technology sector has been elevated to the center of America's response strategy to China, with the view that the US led the world not only with military power but also with the power of the most advanced technology. The Biden administration has just continued the tough policy of its predecessor, launching trillion-dollar financial packages and deep tax cuts to quickly accelerate the development of high technology, ensuring the autonomy and maintain a leading edge in the field. At the same time, the US has strengthened consultations and works closely with allies to curb China's breakthrough in every high-tech field.

5 CONCLUSION

China has upheld scientific and technical innovation and close coordination between military and civilian forces in the field of defense technology as a national strategy, relying on civil engineering to accelerate speed of modernization of the country, especially in defense (William A. Callahan, 2014). Creating a breakthrough for China's national strength on the basis of prioritizing science and technology development is a particular and important aspect of China's development orientation in the context of the industrial revolution. 4.0. The development of science and technology is identified by China as an important strategic issue related to national development and national security. In which, science and technology are emphasized as the number 1 productive force, bringing "prosperity and "power", while without



cybersecurity there is no national security, and without digitization, there is no modernization. The development level of science and technology, especially achievements in the high-tech fields, has surely become a fundamental foundation for China's national strength in the current context (Jiangnan Zhu, Jie Lu, 2013).

Some unified leadership institutions aim to create a breakthrough for national strength on the basis of prioritizing scientific and technological development towards the realization of China's strategic goals on the international scale; in which, the objectives covered are the great revival of the Chinese nation. The common feature of these goals is that together they contribute to the elevation of China's national power to a new height, gradually helping China move towards a superpower position in international socioeconomic life (Claude Zanardi, 2016). These institutions are established and deployed methodically, synchronously with a focus and are supported by large financial resources, showing remarkable results. These help China transform strongly from being a "follower" to a "frontier" country, even a "pioneer" in science and technology in some recent years.

However, one of the major weaknesses in China's high-tech sector is that the country has not mastered a number of core technologies, while having a large number of patents but not at high quality, and it still has to rely heavily on foreign inventions. These limitations have hindered the process of a China that can reach the status of a science-technological power. Moreover, the American superpower and its allies have recognized the danger of China's reforms and breakthroughs in science and technology with the power they bring to China. Since then, there have been drastic countermeasures, turning the science-tech competition into a frontline in the strategic competition between major global giants.

LEADERSHIP AND OPERATING INSTITUTIONS

Regarding the strategic leadership structure, on January 22, 2017 the CCP Politburo has established the Central Committee for Civilian Military Integration Development, chaired by Chinese leader Xi Jinping. This is the central decision-making and coordinating body for important civil and military integration development issues, unified leadership in the development of in-depth military-civilian integration, and planning and development in the field of defense science and technology industry. About the advisory structure, the China National Defense Science and Technology Industry Development Strategy Committee is the strategic entity for the development of the defense science and technology industry, which frequently receives comments from ministries, manufacturing sectors, unit leaders, and related experts to make full use of the forces and resources of the military forces in different areas, through exchange, consultation and research for the cause of development and improvement. The country's defense-industrial engineering and technological innovation has been energized from the outside. In terms of professional structure, in order to speed up the transformation of scientific and technical research results into production to meet market demand, China has also built innovation centers in the manufacturing industry; the first of which should be the national innovation centers.

FINANCIAL POLICIES AND MECHANISMS

In terms of general policy mechanism, the Chinese government has invested heavily in state-owned and private defense companies, promoting the reduction of barriers between these two groups of companies, and emphasizing the cooperation between the military and civilian. Related processes and procedures are simplified, regulations related to licenses for the development and production of weapons and military equipment are relaxed to facilitate the participation of private companies for easier access to the defense sector. In order to continue



to improve the regime of management of scientific and technical achievements in the field of defense technology, China has synchronously developed a mechanism to apply these achievements into practice, promoting the two-way transfer and application of achievements between the defense technology field and the civil sector.

In terms of financial policy, the government has also spent large financial resources, while also ensuring that market inputs are maintained at a high level. At the national level, there are funds with billions of dollars in capital such as the National General Circulation Fund, the Emerging Industry Investment Fund, the Advanced Manufacturing Fund. The local levels have also established funds to support industrial production upgrading in their area. The quite similar feature of the above funds is that the government tries to guide investors in the market rather than taking the capital support function as the main one. Accordingly, the government chooses to spend an initial amount of money only, then banks and other investment companies and venture capital funds will have to participate in the investment.

As for the overseas talents, China has implemented a long-term strategy to invest and attract well-trained Chinese in the most advanced developed countries in the world (Chengxin Pan, 2009). In the early period of reforming and opening up to the world, China has sought to rapidly increase the number of elite students who came back from their study in the US and developed capitalist countries in order to quickly learn and catch up with scientific and technological advances globally. Since the years 2007-2008 of the Asian financial crisis, China has made great strides in science and technology but is still being labeled as the "world factory" that mainly performs outsourcing function, and is heavily criticized for the production of counterfeit goods (Erbiao Dai, 2016). Especially, at the time of the financial crisis, China has launched a breakthrough program, called Thousand Talents, which has successfully created a wave of returning overseas Chinese talents. They, including many engineers and start-ups from Silicon Valley, were about to start a business in China. That has been contributing to the explosive development trend of Chinese high-tech companies in the very near future.

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