

SAINT-PETERSBURG STATE UNIVERSITY

As a manuscript

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**The Russian factor in the technological confrontation between China and the
United States in the context of the formation of the new international system**

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INTRODUCTION

Relevance of the topic of research. The structure of the international system is widely discussed in the discipline of international relations. Since the end of the Cold War, the main issue in the structure of the international system has been the choice towards unipolar or multipolar. However, with the growing comprehensive national strength of China and the relative decline of the U.S. strength, the concepts of multipolar and unipolar structures are no longer the only possible models of the international system. The bipolar structure has become a new subject of analysis with increasing importance. Moreover, traditional studies of the international system have mainly focused on the three main areas of economics, politics, and the military, and have neglected the role of science and technology. Nevertheless, science and technology, especially the Fourth Industrial Revolution, play an increasingly important role in international relations and have a profound impact on the evolution of the international system.

After the global financial crisis of 2008, the concept of "Thucydides' Trap" was applied to the analysis of Sino-American relations, as the comprehensive national strength of the United States was relatively weakened, while China's strength was constantly increasing. China is catching up with the United States in science and technology, making the United States feel more uncertain and insecure. As a traditional hegemonic power, the United States is trying to restrain China's development, especially in science and technology. With the development of the 4IR, the scientific and technological confrontation is becoming the forefront and the essence of the strategic rivalry between China and the United States. Currently, relations between China and the U.S. are at their most tense since the establishment of diplomatic relations between them.

In today's world, China, Russia and the United States are the three most active geopolitical players in the international arena. With the restoration of Russia's power and the accelerated rise of China, the debate about the "strategic triangle" has once again become more acute. In this context, the Russian factor will play an important role in the Sino-US scientific and technological confrontation. Scientific and technological cooperation is seen as a key pillar of Sino-Russian partnership and one of the most promising areas of cooperation. However, both China and Russia face unprecedented pressure in the field of science and technology. On the one hand, the technological rivalry between China and the United States is fierce. On the other hand, Russia has been subjected to strict Western sanctions and controls on technology exports after a special military operation in Ukraine. Thus, China and Russia need to strengthen cooperation to jointly break the Western technological blockade.

Overall, the topic of the study is very relevant.

The extent of scientific development of the topic. In the domestic and foreign scientific literature there are many materials related to this topic of research. These studies have analyzed this problem from different points of view, which provides an opportunity for a deeper understanding of the topic of work.

First, there is much debate among scholars as to whether the current international system is a multipolar structure or a bipolar one. On the one hand, some scholars support the idea of a multipolar structure of the international system. Cui Liru expressed a strong belief in multipolarity, believing that the world has entered the era of multipolarity and the core of a multipolar system is "the decentralization of the U.S. hegemony".¹ D. Shapiro argued that instead the emergence of a truly multipolar world

¹ Cui Liru. The Evolution of International Configuration and the Construction of the Order in the Multi-

has turned from a trendy prediction into an actual reality. Moreover, it is also no coincidence that both the multipolar structures of the late nineteenth century and the current one are in the periods of industrial revolutions.² According to Chen Zhimin, the world is becoming multipolar, which is the reality of our era. The multipolar structure of the world includes three aspects: economic power, military power and ideological power. At present, only economic multipolarity has largely taken shape.³ Based on Xue Fukang, the international system is not only a comparison of power, but also the actions of states. If China is not willing to act as the leader of one camp, the international system cannot be bipolar, but only multipolar.⁴

On the other hand, more and more scholars believe that the international structure is not multipolar, but bipolar. Yan Xuetong stated in 2013 that the international system is evolving toward a bipolar structure, and predicted that by the end of 2023, China will become another actor of the two "poles".⁵ According to Jin Canrong and Zhao Yuanliang, China has the prerequisites for becoming a superpower. The material basis for China to become a world power is not only GDP, but also the volume of industrial production.⁶ Øystein Tunsjø believed that China is strong enough to serve as the second

Polar Era (First Part) // *Contemporary International Relations*. – 2016. – No.1. – pp. 1–5.

² Jacob Shapiro. Multipolarity and its Impact on U.S.-Russian Relations. [Electronic resource] // Valdai. URL: https://ru.valdaiclub.com/a/highlights/mnogopolyarnost-i-eye-vliyanie/?sphrase_id=618238

³ Chen Zhimin. A model of governance in a multipolar world // *World Economy and Politics*. – 2013. – No.10. – pp. 4–23.

⁴ Xue Fukang. Bipolar Structure: Unnecessary and Impossible // *World Affairs*. – 2012. – No.23. – p. 45.

⁵ Yan Xuetong. *Inertia of History*. – Beijing: CITIC Press Group, 2013. – 259 p.

⁶ Jin Canrong, Zhao Yuanliang. An Exploration of Conditions for Building a New Type of Major Power Relationship between China and the United States // *Looking for A Road*. – 2017. – Vol. 4. – No.7. – pp.114–133.

"pole" in the world. But today's bipolar system is different from that of the Cold War.⁷ According to A. Dynkin, today the bipolar structure of the international system is becoming apparent. The confrontation between the United States and China will become the main one in the post-pandemic world.⁸

Second, many scholars have launched a heated debate about whether Sino-US relations have fallen into the "Thucydides trap". On the one hand, some scholars believe that China and the United States have already fallen or will soon fall into the "Thucydides trap". According to D. Lampton, Sino-American relations are approaching a tipping point, when their fundamental pillars are collapsing.⁹ R. Zoellick believed that China and the United States were in danger of falling into the Thucydides Trap because of mutual mistrust and fear.¹⁰ Jin Canrong argued that Sino-US relations have now fallen into the "Thucydides trap" in terms of structure.¹¹ D. Sukhanov argued that the possibility of escalating controversy between Washington and Beijing remains at a fairly high level, which has sufficient potential to develop into a large-scale battle of the great powers in

⁷ Tunsjø Ø. The return of bipolarity in world politics: China, the United States, and Geostructural Realism. – New York: Columbia University Press, 2018. – 288 p.

⁸ Alexander Dynkin. The confrontation between the United States and China will become the main one in the post-pandemic world. [Electronic resource] // RIAC. – 2020. URL: <https://russiancouncil.ru/analytics-and-comments/comments/protivostoyanie-ssha-i-kitaya-stanet-glavnym-v-postpandemicheskoy-mire/>

⁹ David Lampton. A Tipping Point in US-China Relations is Upon US. [Electronic resource] // US-China Perception Monitor. URL: http://www.uscnpm.com/model_item.html?action=view&table=article&id=15789

¹⁰ Robert Zoellick. U.S., China and Thucydides. [Electronic resource] // The National Interest. URL: <https://nationalinterest.org/article/us-china-thucydides-8642>

¹¹ Jin Canrong. Sino-US relations and the Thucydides Trap. [Electronic resource] // Center for China and Globalization. URL: <http://www.ccg.org.cn/archives/28222>

the near future.¹² According to A. Zapolskis, a war between China and the United States is only a matter of time.¹³

On the other hand, some scholars believe that Sino-US relations will not fall into the "Thucydides trap". D. Holmes believed that trend lines in East Asia point to competition or even conflict. But trends are not destiny. How events unfold depends mainly on the decision-makers in Washington, Beijing and other regional stakeholders.¹⁴ Wang Yiwei believed that the "Thucydides Trap" was not inevitable. Because relations between major powers have always been a dialectical unity of cooperation and competition.¹⁵ J. Nye argued that the relationship between China and the United States is also fundamentally different from that between Athens and Sparta.¹⁶ According to A. Shalak, "Thucydides' Trap" cannot be extended to all the major conflicts of our time, just as it is impossible to explain the contemporary confrontation between China and the United States.¹⁷

Third, Russian scholars remain divided as to whether the conflict between

¹² Dmitri Sukhanov. U.S.-China: Will the Thucydides Trap Work? [Electronic resource] // RIAC. URL: https://russiancouncil.ru/blogs/dmitry_sukhanov/sshakitay-srabotaet-li-lovushka-fukidida/.

¹³ Alexander Zapolskis. "Thucydides' Trap": Why War between the U.S. and China is Inevitable. [Electronic resource] // NEWSFRONT. URL: <https://news-front.info/2018/11/20/lovushka-fukidida-pochemu-vojna-mezhdu-ssha-i-kitaem-neizbezhna/>

¹⁴ James Holmes. Beware the "Thucydides Trap" Trap. [Electronic resource] // The Diplomat. URL: <https://thediplomat.com/2013/06/beware-the-thucydides-trap-trap/>

¹⁵ Wang Yiwei. "Thucydides trap" does not have to exist. [Electronic resource] // China Think Tank. URL: http://www.china.com.cn/opinion/think/2016-07/14/content_38880718.htm

¹⁶ Nye J.S. How not to deal with a rising China: a US perspective // *International Affairs*. – 2022. – Vol. 98. – No. 5. – pp. 1635–1651.

¹⁷ Alexandr V. Shalak. American-Chinese Confrontation from the perspective of Thucydides Trap. // *Russian & Chinese Studies*. – 2021. – Vol. 5. – No. 2. – pp. 110–118.

China and the United States is a new Cold War. On the one hand, V. Kashin and I. Timofeev believed that although Sino-US competition has sharply escalated in the past few years, its limit has not yet been reached. Moreover, China and the United States also maintain close economic ties.¹⁸ According to A. Dynkin, the bipolarity of the 21st century will be asymmetrical, not as unambiguous as in the last century. Russia maintains a strategic balance with the United States, and China maintains an economic balance.¹⁹ C. Lukonin argued that the modern world is deeply integrated, and globalization is advancing rapidly. China has long been deeply integrated into the world economic system. Therefore, China does not want to enter a full-scale confrontation with the United States and prefers to choose a middle path between confrontation and cooperation.²⁰ V. Petrovsky emphasized that no country wants to sacrifice its economic interests by joining the anti-Chinese coalition.²¹

On the other hand, some Russian scholars believe that the essence of the Sino-American conflict is a new Cold War. V. Nikonov believed that the United States launched the Cold War to maintain and consolidate its global dominance and position at the top of the global food chain by preventing the rise and destruction of alternative centers of power. But in the face of conflicts imposed by the United States, China will not

¹⁸ US-China Relations: Moving Towards a New Cold War? [Electronic resource] // RIAC. URL: <https://russiancouncil.ru/en/analytics-and-comments/analytics/us-china-relations-moving-towards-a-new-cold-war/>

¹⁹ Head of IMEMO RAS: confrontation between the U.S. and China will become the main thing in the post-pandemic world. [Electronic resource] // TASS. URL: <https://tass.ru/interviews/8936527>

²⁰ It's impossible to make China repeat the fate of the USSR. [Electronic resource] // Interfax. URL: <https://www.interfax.ru/world/720050>

²¹ M. Pompeo's Speech: The Beginning of the U.S.-China Cold War? [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/27009>

flinch.²² A. Romanov stated that Sino-US relations are deteriorating rapidly and irreversibly. After the publication of the *U.S. Strategic Approach to China* in April 2020, there has been a return to Cold War-style bloc thinking. At the same time, China is also focusing and accumulating the potential for long-term rivalry with the United States.²³

Moreover, Russian scholars also have different opinions on Russia's position in the Sino-American conflict. A. Maslov²⁴, V. Petrovsky²⁵, Y. Tavrovsky²⁶ believed that cooperation with China should be strengthened, and Russia should fight against the United States together with China. However, I. Danilin²⁷, A. Serenko²⁸, A. Torkunov²⁹ and

²² Cold War 2.0? But is the first one over? [Electronic resource] // Nezavisimaya. URL: https://www.ng.ru/ideas/2020-10-22/6_7997_coldwar.html

²³ China-US Conflict: A Second Cold War Threat? [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/26601>

²⁴ Alexey Maslov: The U.S. will create a new concept of globalization. [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/27022>

²⁵ Russian-Chinese Relations in the world context 2022-2023. [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/38470>

²⁶ Russian Scholar: Russian-Chinese Cooperation Brings More Stability to the World. [Electronic resource] // China daily. URL: <https://cn.chinadaily.com.cn/a/202303/20/WS641821a1a3102ada8b234659.html>

²⁷ The U.S. and China: War for Technological Leadership. [Electronic resource] // RIAC. URL: https://russiancouncil.ru/analytics-and-comments/interview/ssha-i-kitay-voyna-za-status-tekhnologicheskogo-lidera/?sphrase_id=97346284.

²⁸ "The Role of the Wise Monkey. Political scientist Serenko on Russia's position in the confrontation between the U.S. and China. [Electronic resource] // Rambler. URL: <https://news.rambler.ru/other/44114330-rol-mudroy-obezyany-politolog-serenko-o-pozitsii-rossii-v-protivostoyanii-ssha-i-kitaya/>

²⁹ China-US Conflict: A Second Cold War Threat? [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/26601>

A. Arbatov³⁰ believed that Russia should conduct a more flexible policy in the Sino-US conflict and keep its distance from China on some issues in order to maximize its interests.

The purpose of the study is to give new impetus to the development of Sino-Russian relations by examining the structure of the international system and analyzing how Russian factors will affect the technological confrontation between China and the United States.

In order to achieve this purpose, the study proposes a number of **tasks**:

- 1). characterize the international system, including its definition, history of development, and influencing factors;
- 2). identify the influence of science and technology, especially the 4IR, on the international system;
- 3). define the concept of the "Thucydides Trap" in Sino-US relations;
- 4). analyze the Sino-US technological confrontation, including its causes, process, and influences;
- 5). define the "strategic triangle" theory in Sino-US-Russian relations;
- 6). explore Sino-Russian science and technology cooperation, including its history, present status, problems, and policy proposals.

The object of the study is the current structure of the international system and the Russian factor in the scientific and technological confrontation between China and the United States.

The subject of the study is the relationship between the new technologies presented by the 4IR and the configuration of the international system, as well as the

³⁰ The emergence of a new bipolarity promises a threat to Russia, Moscow must be an independent center of power - experts. [Electronic resource] // Interfax. URL: <https://www.interfax.ru/presscenter/710923>

interaction of trilateral relations between China, the United States and Russia in the context of the formation of a new system of international relations.

Statements of scientific novelty:

1). After the end of the Cold War, the main question in the structure of the international system was whether to choose unipolar or multipolar. The bipolar structure became a new subject of analysis with increasing importance.

2). Traditional studies of the international system have largely focused on the three main areas of economics, politics, and the military, and have neglected the role of science and technology. This study focuses on the impact of technology, especially the Fourth Industrial Revolution, on the international system.

3). The current scientific and technological confrontation between China and the United States differs from the traditional geostrategic rivalry in both content and form. This was the first time that the strategic rivalry between the great powers focused primarily on the nonmaterial geography of humanity. Neither China nor the United States had much experience from which to draw.

4). There is a phenomenon of interaction between three actors in international relations, which is commonly referred to as a triangular relationship. A typical example is the triangular relationship between China, the United States and the USSR. In recent years, with the restoration of Russia's power and the accelerated rise of China, discussions about the "strategic triangle" between China, the United States and Russia have again intensified. Moreover, as a traditional scientific and technological power and a participant in the Cold War, Russia's role in the scientific and technological confrontation between China and the United States cannot be ignored.

The theoretical significance of this study is that it improves the neorealist perspective for the study of the international system from a scientific and technical

perspective. The work also combines traditional theoretical concepts, such as Thucydides' Trap and the Strategic Triangle, with the contemporary international situation and new international events. In addition, the introduction of the English and Chinese sources contributes to a comprehensive study of the issue.

The practical significance of this study is that it will provide new ideas for Chinese and Russian scholars and employees engaged in research in related fields. The analysis of the current international system and the problems existing in Sino-Russian scientific and technological cooperation promotes the quality of cooperation between China and Russia and will give a new impetus to the relations between the two countries. In addition, the results of this study can be applied in research, practice, and teaching.

The theoretical and methodological basis of the work. The theory of "neorealism" or "structural realism" by K. Waltz will be applied to the study of the international system. Neorealism believes that the structure of international relations is determined by the distribution of power in international politics. According to Waltz, "the inherent propensity for war in the international system (characterized by him as the main dependent variable) is explained by the polarity of that system (the independent variable). Relying on systemic principles, from the perspective of which the propensity for war is seen as a property of the system, and polarity as its structural characteristic".³¹

In the analysis of the Sino-US technological confrontation the theory of "offensive realism" proposed by J. Mearsheimer will be applied. This American political scientist believes that the main goal of any country is survival, so countries will primarily seek to ensure their own security. The country never knows how much power it needs to ensure its survival, so it seeks to maximize its own power in order to become the most

³¹ Waltz K. N., Theory of international politics. – Long Grove: Waveland Press, 2010. – 251 p.

powerful country in the international system. In addition, Mearsheimer also made predictions and analysis of Sino-American relations. He concludes that China will not be able to change its position in the structure of the international system peacefully. China will inevitably struggle for hegemony in the APAC, like the U.S. hegemony in the Western hemisphere. The U.S. policy will be aimed at containing China and trying to limit its regional hegemony.³²

The main methods of research are methods of analysis and empirical observation. K. Waltz developed a neorealist approach to the study of international relations. Developing a methodology for the study of international political realities, the political scientist came to the conclusion that it would be most reasonable to use a systematic approach. Therefore, the systematic approach was also used in the research process. In addition, the method of statistical data analysis was used to study the comprehensive national strength of each country. According to certain statistical indicators, such as size of territory, population, GDP, military expenditures, etc., a country's strength can be analyzed and grouped together. The analysis of the international situation using this method has the features of objectivity and systematicity. The comparative method was used to analyze the comprehensive strengths of China and the United States and their respective scientific and technological advantages. Moreover, the structural-functional approach and historical method were also used in the research process.

The main statements made for the defense:

- 1). The question of the international system is widely debated in international

³² Mearsheimer J. J., China's unpeaceful rise. – CURRENT HISTORY-NEW YORK THEN PHILADELPHIA-, 2006, 105(690).

relations. The current debate in the field of international relations is whether the world is multipolar or bipolar. Existing studies of the international system mainly focus on three main areas: economics, politics, and military affairs, ignoring the role of science and technology. However, the development of science and technology is a fundamental driving force for the transformation of the international system. The new round of scientific and technological revolution and industrial transformation has an incalculable impact on human society, which will change the position of national competitiveness in the world and provoke a profound restructuring of the international system. Consequently, this paper focuses on the impact of science and technology, especially new technologies in the 4IR, on the international system. After analysis and comparison, this paper concludes that the 4IR accelerated the formation of a bipolar structure between the United States and China. In the future, the 4IR will also stabilize the bipolar structure and prolong the duration of the bipolar system.

2). In the context of the formation of a new system of international relations, the concept of the "Thucydides Trap" has been applied to the analysis of Sino-American relations. In recent years, due to increased competition between China and the United States, discussions about the "Thucydides Trap" have intensified. G. Allison suggested three objective conditions for the relationship between the two countries to fall into the "Thucydides Trap". At present, as China's aggregate national power is steadily increasing, the power gap between China and the United States is narrowing, forming a bipolar structure of the international system. Therefore, the United States has changed its perceptions of China and adjusted its strategy toward China. Moreover, the United States views China as its main competitor in several documents and pursues a policy of suppression and containment in an attempt to delay China's rapid rise. Thus, we can conclude that Sino-US relations have fallen into the "Thucydides Trap". In fact, modern

wars such as trade, technology, networked information and public opinion have erupted between China and the United States. Among these, the fiercest and most central is the technological confrontation. The root cause of the Sino-US technological confrontation is the dominant power taking action to halt and suppress the rising power's technological development because of the threat that the rising power's technological power threatens to establish its own global hegemony. The application of traditional geopolitical means to the sphere of high technology will not only reduce the potential of global scientific and technological development and affect the normal functioning of the mechanism of globalization, but will also cause potential international conflicts.

3). In international relations there is a phenomenon of interaction between the three actors, which is commonly referred to as a triangle relationship. L. Dittmer developed the theory of "strategic triangle" and proposed four possible models. According to the analysis, the current China-US-Russia triangle is more like the model of "stable marriage", in which the United States opposes both China and Russia, and China and Russia maintain close relations. In the context of the Sino-US scientific and technological confrontation, Russia will achieve greater diplomatic flexibility to balance China and the United States and become a stabilizer in the new bipolar structure. Sino-Russian scientific and technological cooperation has a long history. Despite the bumps in the road, it has also achieved remarkable achievements. At present, because of the deepening of bilateral relations between China and Russia, the scope and quality of Sino-Russian scientific and technological cooperation is expanding. On the one hand, with the arrival of the 4IR, advanced technology will have a significant impact on the international configuration and distribution of international power. China and Russia continue to deepen cooperation and exchanges in advanced technological fields on the basis of independence. On the other hand, we are currently facing a "major change unseen in a

century" and the international environment is complex and volatile. Western countries, led by the United States, are "politicizing" science and technology and are adopting a series of sanctions and export control measures against China and Russia in an attempt to suppress the technological progress and economic development of China and Russia. Therefore, Sino-Russian scientific and technological cooperation is of great relevance and meets the national interests of both countries.

The results of the study were approved at the following conferences:

- 1). In July 2021, participation in the conference "IX World Peace Forum" held by Tsinghua University, Beijing.
- 2). In August 2021, participation in the conference "Chinese Institutional System" held by Fudan University, Shanghai.
- 3). In March 2022, participation in the academic conference Russia-Ukraine War and its Impact on China held by Center for International Security and Strategy of Tsinghua University, Beijing.
- 4). In March 2023, participation in the academic conference "Sino-US Technology Confrontation" held by Tsinghua Center for US-China Relation, Beijing.

Publications of the research results. The main conclusions of the study are reflected in 3 scientific articles of the graduate student, which were published in scientific journals recommended by the Higher Attestation Commission (VAK) under the Ministry of Education and Science of the Russian Federation and included in the RSCI:

- 1). Wang Congyue. The impact of the fourth industrial revolution on international configuration // Political Science Issues. – 2022. – Iss.12. – No. 10. – pp. 3422–3430. DOI 10.35775/PSI.2022.86.10.021
- 2). Wang Congyue. The technological confrontation between China and the United States: the front and core of the Sino-US strategic game // World Politics. – 2023.

– No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

3). Wang Congyue. "Thucydides Trap" in Sino-US Relations // Society: Politics, Economics, Law. – 2023. – No.5. – pp. 56–61. <https://doi.org/10.24158/pep.2023.5.8>.

The structure of the dissertation. The work consists of an introduction, three chapters, a conclusion, and a list of references.

The first chapter, *The Impact of Science and Technology on the international system*, will review the international system and analyze the impact of the 4IR on comprehensive national power and the international system.

The second chapter, *The Sino-us technological confrontation: the front and essence of the Sino-US strategic rivalry*, will define the concept of the "Thucydides Trap" and explore the Sino-US scientific and technological confrontation.

The third chapter, *Russian factors in Sino-US technological confrontation*, will explain the "strategic triangle" theory and analyze Sino-Russian scientific and technological cooperation.

CHAPTER 1. THE IMPACT OF SCIENCE AND TECHNOLOGY ON INTERNATIONAL SYSTEM

1.1.The discussion of the international system

The international system is a fundamental issue in the discipline of International Relations. Its definition has also been widely discussed by scholars. B. Buzan and R. Little argue that without a concept of international system, it would be difficult to justify international relations as a discipline.³³ In fact, the influential schools such as realism, liberalism, constructivism and the English School generally study from international system.

1.1.1.The definition of the international system

The power theory demonstrated by realism, the international cooperation and international institution emphasized by liberalism, the conceptual interaction and social construction interpreted by constructivism, and the international society advocated by the British School, to some extent, can be said to be the elaboration of the international system. Scholars have provided various definitions and frameworks to understand the international system.

One of the earliest and most influential frameworks was developed by the 17th-century English philosopher T. Hobbes. According to Hobbes, the international system is a "state of nature" in which nations are in perpetual competition and conflict in pursuit of their own interests. This perspective views the international system as anarchic,

³³ Buzan B, Little R. The Idea of "International System": Theory Meets History[J] // International Political Science Review. – 1994. – Vol. 15. – No. 3. – pp. 231–255.

without any central authority to regulate behavior.³⁴

A contrasting perspective was developed by the German philosopher I. Kant in the 18th century. Kant argued that the international system could be transformed into an "alliance of free nations" through the establishment of a universal moral law and the promotion of commerce and trade between nations.³⁵

In the 20th century, scholars developed more detailed and complex definitions and frameworks for understanding the international system. According to H. Bull, international system is formed when two or more states have sufficient contact between them, and have sufficient impact on one another's decisions, to cause them to behave - at least in some measure - as parts of a whole.³⁶ Based on K. Waltz, the composition of the structure depends on two major parts: the anarchy, which is as the fundamental organizing principle of the international system, and the distribution of power among states. In this unit/system structure, the system (the international structure) determines the unit (the state), although there is a bilateral interaction between the unit and the system. The behavior of a political unit is fundamentally determined by its position in the international system, rather than its internal attributes. The change in structure, and the consequent change in the international system, is caused by the change in the balance of power of the various units.³⁷ Yan Xuotong argued that international system refers to the anarchic society with the states as the main actors. It is composed of

³⁴ Hobbes T. *Leviathan*. Edited by J. C. A. Gaskin. – London: Oxford University Press, 2008. – 576 p.

³⁵ Kant I. *Perpetual Peace: A Philosophical Essay*. Translated by Smith M. C. – Project Gutenberg, 2016. URL: <https://www.gutenberg.org/files/50922/50922-h/50922-h.htm#tnote>.

³⁶ Bull H. *The Anarchical Society A Study of Order in World Politics*. – 2nd edition. – London: MACMILLAN PRESS, 1995. – 329 p. – p. 9.

³⁷ Waltz K. *Theory of International Politics*. – New York: Random House, 1979. – 251 p.

three elements, namely, international actors, international configuration, and international norm. Changes in any one of these elements will lead to changes in the international system.³⁸ R. Keohan and J. Nye put forward the interdependence theory, which holds that the interdependence between states is the core of the international system. Besides, they also put forward the concept of "international institution", which includes international organizations, international regimes, and international conventions in the international community. They argued that international institution is the key factor to influence the international system.³⁹

For the international system, A. Wendt argued that neorealism regards the structure of the international system as the distribution of material power and believes that the state is the main actor in the international system. Neoliberalism regards the international system as material power plus international institution. While recognizing the state as the main actor in the international system, it emphasizes the role and significance of non-state actors such as international organizations and transnational corporations to the states. It believes that despite the existence of power politics in international interaction, international cooperation, international regimes, and international conventions caused by interdependence are also a normal state of international relations. Constructivism, on the other hand, regards the international system as the distribution of ideas. Through the interaction of ideas, mutual views and attitudes will be formed among countries, and the sum of which constitutes the subjective

³⁸ Yan Xuetong. *Analyses of International Relations*. – 3rd edition. – Beijing: Peking University Press, 2017. – 366 p.

³⁹ Keohane R., Nye J. *Power and Interdependence: World Politics in Transition*. – Boston: Little, Brown, and Company, 1977. – 300 p.

structure of the international system.⁴⁰

According to realism, the international system is the power politics with the nations as the main actors under the state of anarchy. Power politics is mainly manifested in two aspects: the distribution of global power and the strategic relationship between these main actors.⁴¹ The difference in strength objectively forms the hierarchy of the international society. And the different relations between states or group of nations lead to the integration or exclusion of various international strategic forces, thus making this hierarchy much clearer. The formation of an international system is the result of a relatively stable balance of power in the world that has gradually developed from quantitative change to qualitative change through continuous growth and decline and re-differentiation of major powers in the world. The disintegration of an international system is due to the fact that this stable balance of power has been broken and can no longer be maintained. The international system reflects the major contradictions of the international society in different historical periods. The competition among great powers around the major contradictions show the contrast and development trend of international forces.

1.1.2. The Concept of Polarity

In the historical process of studying the international structure, terminology that can clearly describe and introduce the international system in different periods has been sought. Many scholars have used various terms, such as hegemony, empire, imperial power, giant and etc. Since the 1970s, the concept of "polarity" has been used to define the structure of international system.

⁴⁰ Wendt A. Social theory of international politics[M]. – Cambridge: Cambridge University Press, 1999. – 447 p.

⁴¹ Waltz K. N., Theory of international politics. – Long Grove: Waveland Press, 2010. – 251 p.

K. Waltz argued that the prerequisite for becoming a "pole" is that a state in the following areas, such as population size, territory, natural resources, economic capacity, as well as military forces, far exceeds other countries, and has an opportunity to meet its goals.⁴² Similarly, A. Tarifa listed four crucial components of becoming a polar actor: political power, economic power, military power, and technological power.⁴³ Yan Xuetong believed that "pole" is a concept borrowed from physics by international relations scholars to describe the shape of the international configuration. International relations borrowed "pole" to refer to the opposing dominant forces in the international system. Although there is no consensus definition of the concept of "polarity", in most cases "pole" is regarded as the dominant major power for a certain period.⁴⁴

Hence, "polarity" is regarded as the most important role in the international system and the most significant causal variable in the analysis of the international configuration. The concept of "polarity" implies that one state or coalition of states with strong comprehensive power have a leading role and important influence on world affairs. The polar actors are so important that the international configuration will change as they enter or leave the structure of international system. In addition, it should be pointed out that the international system is not static, and the power of various actors will rise or fall to different degrees, so as to form a new structure. This evolution can be called polarization.

⁴² Waltz K. *Theory of International Politics*. – New York: Random House, 1979. – 251 p.

⁴³ Tomja A. *Polarity and International System Consequences // Interdisciplinary Journal of Research and Development*. – 2014. – Vol.1. – No.1. – pp. 57–61.

⁴⁴ Yan Xuetong. *Analyses of International Relations*. – 3rd edition. – Beijing: Peking University Press, 2017. – 366 p. – p. 49.

1.1.3. The Basic Division of International System

According to the concept of polarity, several basic forms of international system are divided: unipolar, bipolar, multipolar, nonpolar, asymmetric multipolarity and etc.

Unipolar structure is a distribution of power and influence in which only one great power possesses absolute comprehensive power, and no state or group of nations can threaten its status in the international system. Researchers use the term "bipolarity" to distinguish a structure in the international system, in which two actors, characterized by opposite extremes, have the greatest impact on global affairs. Multipolar structure can be defined as an international structure, in which the power and influence are distributed at least among three poles. The concept of nonpolar structure is proposed by R. Haass. In this structure, the centers of power are not only states, but also regional and global organizations, militaries, a variety of nongovernmental organizations (NGOs) and corporations. Besides, power is distributed among actors of nation-states, large scale economic commercial entities, multinational corporations, religious groups, terrorist group, NGOs, and others, rather than being concentrated.⁴⁵ Samuel P. Huntington believed that none of the traditional polarity could be used to characterize the international structure, in which the United States is the "lonely superpower". At the same time, several major powers, such as Russia, China, Japan, European Union, as well as regional powers like India, Brazil, also play very important roles in the contemporary international society. In this structure all participants are dissatisfied and seeking changes. However, due to the huge gap between the United States and major powers, these actors have neither the strength nor the desire to directly challenge the United States. This structure is neither

⁴⁵ Haass R.N. The Age of Nonpolarity // Foreign Affairs. – 2008. – Vol. 87. – No. 3. – pp. 44–56.

unipolar nor multipolar, but a transitional stage between them. This structure can be called as asymmetric multipolarity.⁴⁶

1.1.4. The Evolution Trend of International System

A brief review of the evolution trend of the international system after the WWII is beneficial for a profound understanding of today's international structure.

After the end of the WWII, the United States and the Soviet Union, which were reliable allies in the war, did not continue to cooperate as expected to safeguard world peace. On the contrary, due to differences in strategic intentions and ideology, the United States and the Soviet Union quickly moved towards confrontation. Since the United States and the Soviet Union had super military power and basically monopolized the right to handle international political affairs, bipolar configuration in the context of Cold War was taken shape. This bipolar structure has the following characteristics. First, the participants in the American-Soviet bipolar structure were two competitive groups, namely NATO and the Warsaw Treaty Organization. Secondly, the United States and the Soviet Union had superior military strength, and only these two countries possessed the strategic capability of global deterrence. Thirdly, the confrontation between the two poles was not only in the military field, but also in the ideological sphere. Fourthly, international power was distributed between the two super actors, and they had the ability to oppose the union of any states.⁴⁷

In the early 1990s, with the fall of Communism in East Europe and the disintegration of the Soviet Union, the United States emerged as the only largest political,

⁴⁶ Huntington S.P. The lonely superpower // Foreign affairs. – 1999. – Vol. 78. – No. 2. – pp. 35–49.

⁴⁷ Wagner R.H. What was bipolarity? // International Organization. – 1993. – Vol. 47. – No. 1. – pp. 77–106.

economic and military power of the world. C. Krauthammer was the first to use the concept of unipolarity in his article, arguing that the immediate post-Cold War world is not multipolar, but is unipolar. The center of world power is the unchallenged superpower, the United States, attended by its Western allies.⁴⁸ In the unipolar system, the polar actor is so formidable that other actors cannot be counterbalanced. According to Krauthammer, during the last decade of 20th century, the gap between the United States and other powers widened, making the features of unipolar structure clearer. This distinct structure continued until the global financial crisis in 2008.⁴⁹

1.1.5. The Debate on the Current International System

After the global financial crisis of 2008, with the decline of the United States and the rapid rise of other powers, especially China, the debate on whether the development direction of the international system is multipolar or bipolar has arisen in the international relations circle.

On the one hand, multipolarity is the mainstream theory on the current evolution trend of international system. "Multipolarity Theory" holds that the world is forming several power centers. The United States remains the only superpower, but the EU, Russia, Japan, China and the vast number of developing countries and groups of nations are playing an increasingly important role in international affairs, creating a counterbalance to the United States. Therefore, multipolarity is characterized by the joint dominance of various international actors in international affairs. In this structure, the absolute dominant position of the United States relatively declines, while the influence of

⁴⁸ Krauthammer C. The Unipolar Moment // Foreign Affairs. – 1990. – Vol. 70. – No. 1. – pp. 23–33. – p.23. <https://doi.org/10.2307/20044692>

⁴⁹ Ibid.

other international actors gradually increases.

In Russia, the concept of multipolarity is usually associated with Yevgeny Primakov. Indeed, the former Minister of Foreign Affairs of the Russian Federation marked the start of the transition to multipolarity as a key trend in contemporary international life back in 1996.⁵⁰ During his visit to New Delhi as Prime Minister in late 1998, Primakov proposed a plan of trilateral cooperation between Russia, China, and India (RIC) as a practical mechanism for promoting global multipolarity.⁵¹ Cui Liru expressed strong confidence in multipolarity, believing that the world has entered a multipolar era and the unipolar structure no longer exists. The ability and will of the United States to dominate international affairs have been greatly weakened, while the core of the multipolar system is "De-Centralization of US hegemony".⁵² J. Shapiro argued that the emergence of a truly multipolar world has gone from being a trendy prediction to a present reality. The arrival of multipolarity has defined international political dynamics for a generation. No corner of the world will be left out of the transition to multipolarity.⁵³ Besides, it is also not a coincidence that the last multipolar environment of the fin de siècle and the current period were and are periods of Industrial Revolution.⁵⁴ Based on

⁵⁰ E.M. Primokov. International Relations on the Eve of the XXI Century: Problems, Prospects. // The International Affairs. – 1996. – No. 10. – C. 3–13.

⁵¹ Andrey Kortunov. Why the World is Not Becoming Multipolar. [Electronic resource] // RIAC. – 2018. URL: <https://russiancouncil.ru/en/analytics-and-comments/analytics/why-the-world-is-not-becoming-multipolar/>

⁵² Cui Liru. The Evolution of International Configuration and the Construction of the Order in the Multipolar Era (First Part) // Contemporary International Relations. – 2016. – No.1. – pp. 1-5.

⁵³ Jacob L. Shapiro. The Arrival of Multipolarity and Its Impact on US-Russia Relations. [Electronic resource] // Valdai. – 2021. URL: <https://valdaiclub.com/a/highlights/the-arrival-of-multipolarity-and-its-impact/>

⁵⁴ Ibid.

Chen Zhimin, the world is becoming multipolar, which is the reality of our era. The multipolar structure of the world includes three aspects: economic power, military power and ideological power. At present, only the economic multi-polarization has basically taken shape. Although China's economic aggregate is huge, its GDP per capita is still significantly lower than that of the US. Besides, power spreads from the states to non-state actors. Thus, multipolarity will remain the dominant feature of the future world.⁵⁵ According to Xue Fukang, the international system is not only a comparison of power, but also act of states. The bipolar structure is nothing more than full competition and even confrontation between the two camps led by the United States and China. Therefore, if China is not willing to act as the leader of one camp, the international system cannot be bipolarized, but only multipolar. In other words, the international system will also be determined by China's strategic choices⁵⁶

On the other hand, although China and Russia officially reject the view of bipolar structure, more and more scholars argue that international configuration is not multipolar, as most analysts believe, but bipolar. "Bipolarity Theory" believes that since the 2008 financial crisis, the gap of the comprehensive strength between China and the United States has narrowed rapidly. At the same time, the gap between these two "poles" and other major powers, such as Britain, France, Germany, Russia, Japan and etc. is widening. Therefore, according to the law of historical development, the current international system is transitioning from unipolar to bipolar.

Yan Xuetong presented in 2013 that the international system is evolving

⁵⁵ Chen Zhimin. A model of governance in a multipolar world // World Economy and Politics. – 2013. – No. 10. – pp. 4–23.

⁵⁶ Xue Fukang. Bipolar Structure: Unnecessary and Impossible // World Affairs. – 2012. – No. 23. – p. 45.

towards bipolar structure and believed that by the end of 2023 China will become the other actor of the two "poles". However, he also admitted that although China may become a superpower in 2023, the gap between China and the United States has only narrowed to an order of magnitude. In addition to economic power, it will take much longer for China to catch up with the US in terms of political, military and cultural power.⁵⁷ According to Jin Canrong and Zhao Yuanliang, China has the prerequisites to become a superpower. In the next ten years, China will steadily occupy the second place in the world and even have the ability to surpass the United States. The material basis for China to become a world power is not only GDP, but also the output of manufacturing, which China has overtaken the United States in 2010. While in the heyday of Germany, Japan and the Soviet Union, the output of manufacturing was only about 70% of that of the United States.⁵⁸ Tunsjo argued that China is strong enough to serve as the second "pole" in the international system. But he also stressed that today's bipolar system is different from that of the Cold War.⁵⁹ Based on Alexander Dynkin, the bipolar structure of the international system is becoming apparent. The confrontation between the United States and China will become the main one in the post-pandemic world.⁶⁰ In addition,

⁵⁷ Yan Xuetong. *Inertia of History (China and World in Future Ten Years)*. – Beijing: CITIC Press Corporation, 2013. – 259 p.

⁵⁸ Jin Canrong., Zhao Yuanliang. *An Exploration of Conditions for Building a New Type of Major Power Relationship between China and the United States // Looking for A Road*. – 2017. – Vol. 4. – No. 7. – pp.114–133.

⁵⁹ Tunsjø Ø. *The return of bipolarity in world politics: China, the United States, and Geostructural Realism*. – New York: Columbia University Press, 2018. – 288 p.

⁶⁰ Alexander Dynkin. *The confrontation between the United States and China will become the main one in the post-pandemic world*. [Electronic resource] // RIAC. – 2020. URL: <https://russiancouncil.ru/analytics-and-comments/comments/protivostoyanie-ssha-i-kitaya-stanet-glavnym-v-postpandemicheskom-mire/>

President of France M. Emmanuel Macron pointed out in his speech to Ambassadors' conference in 2019 that Europe will disappear with the obliteration of this Western period, and the world will be centred around two main focal points: the United States and China.⁶¹

1.1.6. The Variables that Determine the International System

Both "Bipolarity Theory" and "Multipolarity Theory" reflect specific facts of the current world situation. "Bipolarity Theory" shows that after the 2008 global financial crisis, China's comprehensive national strength has been continuously enhanced, rapidly narrowing the gap with the United States and widening the gap with other countries. "Multipolarity Theory" reveals the emergence of various international forces, from great powers to small and medium-sized states, which can find their own positions in the international system and play their unique roles in different fields of international relations.

Obviously, "Bipolarity Theory" only focuses on one cause variable: national power. The trend of the international system can be judged by the strength of each country (absolute power) and the changes in the strength comparison among countries (relative power). Power is a whole and consists of many parts. In order to measure the strength of various states more accurately, "Bipolarity Theory" also refers to some composite indicators of comprehensive national strength, involving economic, industrial, cultural, military and other fields. For instance, GDP is the primary criterion of Yan's "Bipolarity Theory". He pointed out that at the end of the Cold War, the GDP of Japan and Germany was two-thirds and one-third of the GDP of the United States, respectively. However,

⁶¹ Ambassadors' Conference – Speech by M. Emmanuel Macron, President of The Republic. [Electronic resource] // La France en Lettonie. – 2019. URL: <https://lv.ambafrance.org/Ambassadors-conference-Speech-by-M-Emmanuel-Macron-President-of-the-Republic>

today Japan's GDP has dropped to less than one third of that of the United States, and Germany's GDP is even less than one quarter. In the meantime, China is the only country in the world that is continuously narrowing the gap with the United States. In the past ten years, the difference in GDP between China and the United States has decreased from 10.9 trillion dollars to 7 trillion dollars, and the ratio of China's GDP to that of the United States has exceeded 60%.⁶² In the military sphere, the United States still has an advantage over China, but the gap between them will narrow in the future. According to SIPRI, China's military expenditure reached 293 billion dollars in 2021, more than one third of that of the United States. In that year, China's military expenditure grew by more than 4.7%, which was much higher than the world average of 0.4%. Moreover, China's military expenditure has risen for 27 years in a row. On the other hand, military expenditure of the United States in 2021 was 1.4% lower than in 2020.⁶³

"Multipolarity Theory" does not completely ignore the elements of power, otherwise it will not pay attention to the formation of other power centers and the counterbalance the United States. However, its arguments point more to the descriptive international political events and phenomena, rather than various measures of the overall national strength itself. For example, they put more emphasis on the establishment of economic cooperation mechanisms such as the G20 and BRICS, on the development of regional organizations such as the African Union and the Arab League, and on the collective voting of the Security Council, etc. Thus, "Multipolarity Theory" concludes that some major powers jointly dominate international affairs, while other international actors also play important

⁶² Yan Xuetong. *Inertia of History (China and World in Future Ten Years)*. – Beijing: CITIC Press Corporation, 2013. – 259 p.

⁶³ SIPRI Yearbook 2022. [Electronic resource] // SIPRI. URL: https://www.sipri.org/sites/default/files/2022-06/yb22_summary_en_v3.pdf

roles. However, the concepts of "dominant right" and "important role" are very vague and difficult to be quantitatively analyzed, so they cannot directly measure the power of each state. Although the "Multipolarity Theory" also selects some economic indicators, such as the proportion of GDP of emerging economies, developing countries and BRICS in the world, however, the economy is only a part of the comprehensive national power and other forces such as politics, military and culture are rarely mentioned. Even these economic indicators themselves have the defect of generalization of comparison objects, which focus on the overall data presentation and ignore the different contributions of individual actors. For instance, from 2008 to 2021, the GDP of BRICS has indeed increased significantly. In 2021, it reached 24.72 trillion dollars, surpassing the total of the United States. However, if China is excluded, the GDP growth of the other four countries is still very limited (See Figure 1).

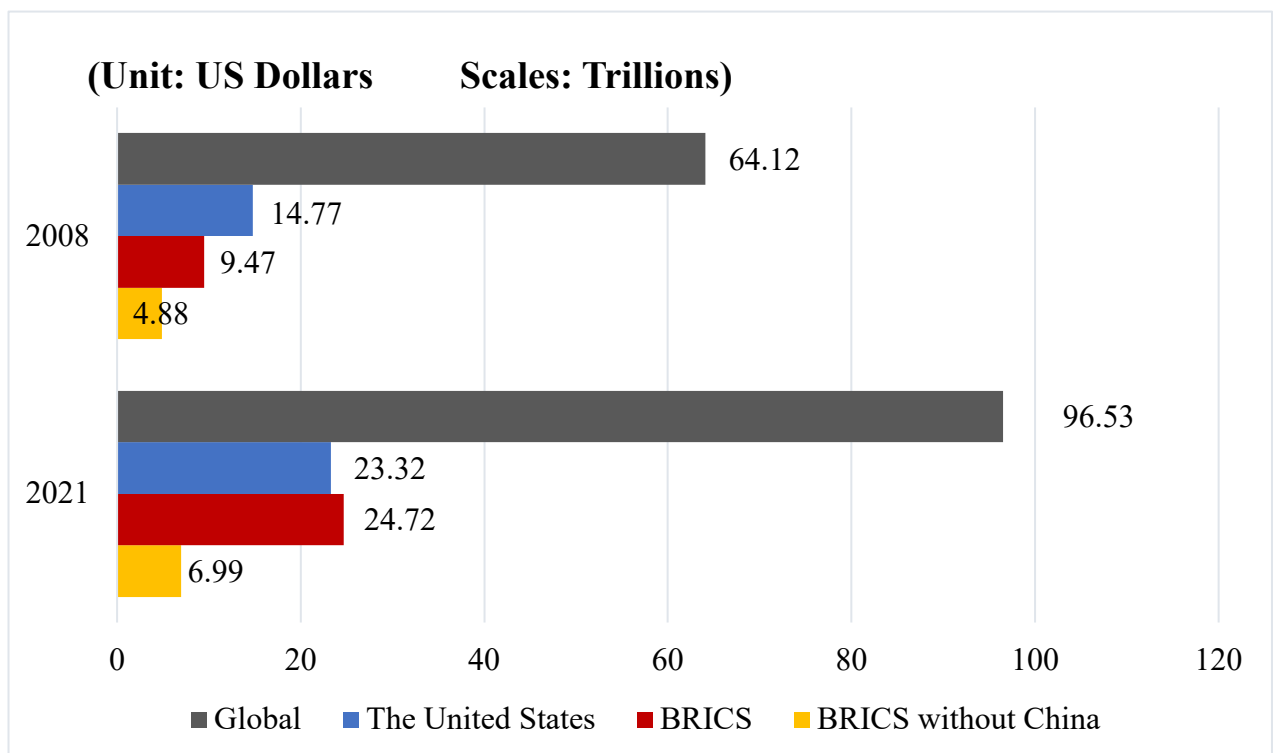


Figure 1. GDP in 2008 and 2021 - Global, U.S., BRICS and BRICS without China.⁶⁴

⁶⁴ Data from the World Bank, available at:

Therefore, the outstanding performance of individual subjects is obviously not representative and cannot reflect the overall level. In addition, emotional tendencies and value judgments are also brought into the demonstration process of "Multipolarity Theory", which is not conducive to the objectivity of academic research.

To sum up, "Bipolarity Theory" regards comprehensive national strength as the primary basis for judging the international system and selects indicators in different fields according to the components of power. "Multipolarity Theory" has also noticed the influence of strength factors, but it has not paid enough attention to it, and the accuracy of measuring the strength of various states is insufficient. Moreover, in the process of argumentation, it is partial to those superficial phenomena that cannot directly reflect national strength.

The structure of the international system refers to the distribution of power among states, and "polarity" refers to superpowers whose strength and influence are significantly higher than those of other actors. Therefore, when discussing the factors that determine the international system, it is necessary to return to the factors of power. Besides, the selected arguments must fully reflect the changes in the relative strength among countries. Hence, comprehensive national power can be considered as a scientific and objective variable that determines the international system.

1.1.7.Components and Quantification of Comprehensive National Power

There are great differences in academic circles on the components and quantification of comprehensive national power, but there is a certain consensus on the

view that comprehensive national strength is divided into soft power and hard power. A. Mahan identified the elements of comprehensive national power as geographical position, physical conformation, length of coastline, size of population, character of the people and form of the government.⁶⁵ H. Morgenthau argued that there were nine elements of national power, including geography, natural resources, industrial capacity, military preparedness, population, national character, national morale, the quality of diplomacy, and the quality of government.⁶⁶ According to Yan Xuetong, the comprehensive national strength consists of four elements: political, military, economic and cultural factors. Among them, political factor is the operational power, while military, economic and cultural factors are the resource power. The application of operational power to resource power determines the size of comprehensive national strength.⁶⁷ Hence, although the components of strength these scholars put forward are different, they all include both hard power and soft power.

The measurement of comprehensive national strength is also a significant part in the process of studying the international system. In his 1975 book *World Power Assessment*, R. Cline came up with an equation: $Pp = (C+E+M) \times (S+W)$, where Pp = perceived power; C = critical mass (population + territory); E = economic capability; M = military capability; S = strategic purpose; W = national will.⁶⁸ His formula makes it

⁶⁵ Mahan A.T. *The Influence of sea power upon history, 1660-1783*. – London: Methuen, 1965. – 557 p.

⁶⁶ Morgenthau H.J. *Politics among nations: The struggle for power and peace*. – New York: Knopf, 1978. – pp. 117–155.

⁶⁷ Yan Xuetong. *Inertia of History (China and World in Future Ten Years)*. – Beijing: CITIC Press Corporation, 2013. – 259 p. – p.18.

⁶⁸ Cline R.S. *World Power Assessment: A Calculus of Strategic Drift*. – London: Routledge, 1975. – 173 p.

clear that soft power and hard power are multipliers of comprehensive national strength, that is, comprehensive national strength is the product of soft and hard power rather than the sum of them. Therefore, when a multiplier is zero, the overall national strength is equal to zero. For example, in 1991, when the Soviet government was not determined to safeguard national unity, even though the Soviet Union had super-strong military power, it could not prevent the collapse of the state.⁶⁹ Similarly, Yan Xuetong proposed an equation: comprehensive national power = political power × (military power + economic power + cultural power).⁷⁰ Besides, in order to find a valid measure of comprehensive national power, Chang Chin-Lung put three tentative power equations to the test. Through comparative analysis, the following equation was proved to have more theoretical relevance and better strategic implications.

$$\text{Power} = \frac{\text{Critical Mass} + \text{Economic Strength} + \text{Military Strength}}{3}$$

$$\text{Critical Mass} = \frac{\text{nation's population}}{\text{world total}} \times 100 + \frac{\text{nation's area}}{\text{world total}} \times 100$$

$$\text{Economic Strength} = \frac{\text{nation's GNP}}{\text{world total}} \times 200$$

$$\text{Military Strength} = \frac{\text{nation's military expenditures}}{\text{world total}} \times 200^{71}$$

1.2. The Impact of Science and Technology on International System from Historical Perspective

The existing research on the comparison of national strength mainly focus

⁶⁹ Cline R. *The Power of Nations in the 1990s: A Strategic Assessment*. – Lanham, Maryland: University Press of America, 1994. – 152 p.

⁷⁰ Yan Xuetong. *Inertia of History (China and World in Future Ten Years)*. – Beijing: CITIC Press Corporation, 2013. – 259 p. – pp. 18–19

⁷¹ Chang C.L. A measure of national power[C] // *Proceedings of the 2004 International Seminar at the National University of Malaysia, Bangi, Malaysia*. – 2004.

on three basic fields: economic, political and military. However, science and technology are playing an important role in promoting economic development, industrial upgrading and military modernization. Therefore, it is not feasible to ignore the impact of science and technology on international system. The international system emerged with the progress of science and technology as well. Before the 16th century, the regions of the world were not closely connected, and it was difficult for powerful countries to exert great influence on distant regions. After entering the 16th century, with the development of navigation technology, some countries began to cross the continents and oceans, and marched to all parts of the world on a large scale, turning a series of countries and regions into colonies.

The historical experience of mankind tells us that the emergence of any scientific and technological revolution will further widen the strength gap between the countries which are the first to acquire new technologies and other countries. Since the 16th century, many scientific and technological revolutions have taken place in the world, each of which has profoundly affected the international system.

1.2.1.The First Industrial Revolution and Its Impacts on International System

In the middle of the 18th century, the first industrial revolution began in Britain. It was a great revolution in the history of mankind, ushering in a new era in which machines replace handicraft industry, marked by the widespread use of steam engines. The first industrial revolution is not only a technological revolution, but also a profound social transformation. It has not only exerted great influence on the politics and economy of various countries, but also played an immeasurable role in the formation of the international system. Through this scientific and technological revolution, Britain's comprehensive national strength became stronger and stronger. The Great Britain

defeated France, which was relatively backward in science and technology, and achieved maritime hegemony. It also acquired a large number of colonies in North America, Asia and Africa. The Great Britain became the first industrial country in the world, completely changing the traditional mode of production. France, Germany, the United States and Russia followed Britain in joining the industrial revolution. The first scientific and technological revolution also played an important role in promoting the development of international relations. As astronomy, geography, navigation and other aspects have been greatly developed, exchanges among continents and countries have become more frequent, forming a new international system in which the East is subordinate to the West. Britain took the lead in completing the first industrial revolution and became the superpower, which established the unipolar structure under British primacy.

1.2.2.The Second Industrial Revolution and Its Impacts on International System

The second scientific and technological revolution took place in Germany and the United States in the middle of the 19th century. It started with the invention of the electrical machinery and was marked by the wide application of electric power. It not only promoted the transformation of production technology from general mechanization to electrification and automation, but also enormously changed the features of the whole society and world politics. Compared with the first scientific and technological revolution, the second scientific and technological revolution had a deeper impact on the international system. In the process of this revolution, the iron and steel industry, aviation industry, transportation and other fields have all developed rapidly. From then on, mankind has entered the era of electrical appliances, which eventually led to the formation of modern international relations. Thus, international relations are truly global and integrated. Every country in the world has become a part of world politics, inevitably

influenced by the rest of the world. Britain, which was originally advanced in industry, was slow to respond to the electric power revolution and did not attach importance to the introduction of advanced science and technology. As a result, its industrial technology and equipment gradually lagged. On the contrary, Germany and the United States have seized the opportunity of the second industrial revolution. They paid attention to the research and application of advanced science and technology and finally made some achievements. Later, Japan, Russia and other countries also joined the second industrial revolution. As different countries were developing at different speeds in this scientific and technological revolution, and there was also a huge imbalance in the distribution of power among countries. Some countries with great advantages in politics, economy, military and other aspects sought a dominant position in international affairs. At the same time, for their own interests, these countries began to compete for Britain's world hegemony on a global scale. The great powers' struggle for world hegemony eventually led to two world wars, and established Versailles-Washington System and Yalta System successively. With the transfer of science and technology center in the global scope, the comprehensive strength of each country also changed, resulting in the corresponding changes in the international configuration. The United States and Germany, which took the leading position in the second scientific and technological revolution, as well as Japan, Russia and other countries, also began to challenge the unipolar structure under British primacy, thus forming a multipolar world.

1.2.3.The Third Industrial Revolution and Its Impacts on International System

The third scientific and technological revolution was a giant leap in the history of human development. This scientific and technological revolution, marked by inventions and applications such as electronic computers, bioengineering, space

technology and atomic energy, has greatly promoted the development and transformation of human society in various fields such as politics, economy and culture. In 1945, the U.S. successfully tested the world's first atomic bomb, and atomic energy became a new industrial energy resource. From 1950s to 1970s, space technology developed quickly. In the 1970s, the fast development and popularization of microcomputers had a huge impact on human life. Since the 1970s, biological engineering, ocean engineering and other projects have also sprung up and developed rapidly. These technologies have played important roles in the evolution of international system. The third scientific and technological revolution began in the U.S. On the one hand, the United States had a solid material foundation. The two world wars not only did not bring losses to the United States, but also enabled the United States to accumulate huge wealth, which provided sufficient material guarantee for the technological revolution. On the other hand, the United States attached great importance to the development of science and technology after the end of the WWII. The U.S. government actively encouraged individuals to work on new inventions and also took active measures to promote and develop progress in science and technology, setting the stage for the third scientific and technological revolution. The development of science and technology has greatly enhanced the country's economic strength. Many advanced technologies have been applied to the military field, which greatly improved the country's military strength. Under such circumstances, the gap in economic and military power between the United States and the Soviet Union gradually increased, which eventually served as one of the reasons for the collapse of the Soviet Union and the end of the bipolar structure, and finally established a unipolar international system dominated by the United States.

The progress of science and technology is directly related to the transformation of the international system. Although science and technology cannot

change the nature of international relations, it can have a giant effect on the elements of comprehensive national strength, such as politics, economy, culture and military, and thus play a huge role in promoting the transformation of the international system. The progress of a country's science and technology means that this country's comprehensive strength and its international position are enhanced, so that it is able to challenge the existing international configuration. It can be said that the development of science and technology is the driving force for the transformation of the international system.

1.3.The Fourth Industrial Revolution and Its Impacts on Comprehensive National Power

K. Schwab, Founder and Executive Chairman of the World Economic Forum, published a book titled *The Fourth Industrial Revolution* in January 2016. Since then, the term "Fourth Industrial Revolution" (4IR) has been used to describe and analyze the impact of emerging technologies on almost the entire field of human development in the early 21st century, from the evolution of social norms and national political attitudes to economic development and international relations.⁷²

The concept of the 4IR affirms that technological change is the driving force of transformations related to all industries and all areas of society. The idea of the 4IR is often confused with "Industry 4.0", which was proposed by the German government in 2011 to apply digital technology to manufacturing. Subsequently, the United States put forward the industrial development strategy of "Industrial Internet", while as a big emerging country, China put forward the strategy "Made in China 2025". However, there are differences between these strategies and the 4IR. These strategies are an important

⁷² Thomas P., Nicholas D. The fourth industrial revolution: Shaping new era[J] // Journal of International Affairs. – 2018. – Vol. 72. – No.1. – pp. 17–22.

part of the 4IR framework. They oriented to the local industry, while the 4IR refers to the profound changes faced by the whole society and the whole world. In view of the velocity, scope and system influence, the 4IR breakthrough speed is unprecedented. Compared with the previous industrial revolution, the development speed of the 4IR is exponential rather than linear.⁷³ Basically, the 4IR represents a series of major transformation in the way that political, economic and social values are created, exchanged and distributed.⁷⁴ With the continuous development and cross integration of Internet, artificial intelligence(AI), 5G, Internet of Things, new energy, 3D printing, nanotechnology, biotechnology and quantum computing, the new round of scientific and technological revolution and industrial transformation are bringing incalculable effects on human society, which will reshape the position of national competitiveness in the world and trigger a profound adjustment of the international system. As it has already been argued that comprehensive national power is an essential factor in assessing the international configuration, and hard power and soft power constitute comprehensive national power, this part will discuss the impact of the 4IR on hard power and soft power.

1.3.1.The impact of the 4IR on hard power

On the one hand, the 4IR will have a significant impact on the country's economic strength. The future growth of the world economy will depend more and more on digital economy rather than traditional natural resources.⁷⁵ If a country cannot keep up

⁷³ Klaus Schwab. *The Fourth Industrial Revolution: What It Means and How to Respond*. [Electronic resource] // World Economic Forum. – 2020. URL: <https://www.weforum.org/agenda/2016/01/the-fourth-industrial-revolution-what-it-means-and-how-to-respond/>

⁷⁴ Thomas P., Nicholas D. *The fourth industrial revolution: Shaping new era*[J] // *Journal of International Affairs*. – 2018. – Vol. 72. – No.1. – pp. 17-22. – p.17.

⁷⁵ Wang Congyue. *The impact of the fourth industrial revolution on international configuration* //

with the digital economy, it will be marginalized, while those who master 5G will be more capable of turning data into wealth. Former U.S. President Donald Trump has expressed many times that 5G networks will be closely linked to the prosperity and security of the United States in the 21st century. The race to 5G is a race America must win. America needs to prevent 5G from being taken over by other countries.⁷⁶ From these statements, it can be concluded that 5G technology will not only determine the future of the United States, but also the future of the world. Since 2013, the network economy has gradually risen and developed at a very fast speed. At present, the development stage of the network economy is called digital economy. It also means that the future of human wealth will increasingly depend not on natural resources but on the digital economy. In other words, the world's most valuable resource will no longer be mineral or oil resources, but data resources.⁷⁷ The key technology of the digital economy is the mechanics of communication. In the past few years, the U.S. has taken the lead in the 4G market, leading the U.S. to prosper for many years and rapidly growing its public wealth. The U.S. forecasts that the leader of the 5G era will earn hundreds of billions of dollars over the next ten years.

Furthermore, as an important part of the 4IR, artificial intelligence will also influence the balance of economic power between countries. Like the steam engine,

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⁷⁶ Todd Haselton. President Trump Announces New 5G Initiatives: It's A Race 'America Must Win'. [Electronic resource] // CNBC. – 2019. URL: <https://www.cnbc.com/2019/04/12/trump-on-5g-initiatives-a-race-america-must-win.html>.

⁷⁷ The World's Most Valuable Resource Is No Longer Oil, But Data. [Electronic resource] // The Economist. – 2017. URL: <https://www.economist.com/leaders/2017/05/06/the-worlds-most-valuable-resource-is-no-longer-oil-but-data>

electricity and the Internet, AI will permeate every aspect of the production, distribution, exchange and consumption of human economic activities and become a new fulcrum for global economic growth. At present, AI can promote economic development in three ways. First, it can provide a new kind of virtual labor force for economic development through intelligent automation. Second, it can make the existing labor force and capital run more effectively. Third, it can increase economic benefits through technical diffusion in different industries. In June 2017, PwC released a report on the global AI research. In the report, PwC predicted that by 2030, AI could make an annual contribution of 15.7 trillion dollars to the world economy.⁷⁸ In September 2018, the McKinsey Global Institute released a report analyzing the impact of AI on the world economy. The report argues that AI would significantly improve global productivity. By 2030, AI will contribute an additional 13 trillion dollars, or about 16 percent higher cumulative GDP compared with today. This amounts to 1.2 percent additional GDP growth per year, matching or even outweighing the revolutionary effects brought about by some other general technologies in history.⁷⁹

On the other hand, the 4IR will greatly change the features of the traditional war and affect the country's military strength. Historically, at the beginning of the WWI, large warships were once regarded as decisive weapons in the sea battlefield. However,

⁷⁸ Sizing the Prize. What's the Real Value Of AI For Your Business And How Can You Capitalise? [Electronic resource] // PwC. – 2017. URL: <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>

⁷⁹ Bughin J., Seong J., Manyika J., Chui M., Joshi R. Notes from The AI Frontier: Modeling the Impact of AI on the World Economy. [Electronic resource] // McKinsey Global Institute. – 2020. URL: <https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy>

in the WWII, when aircraft carrier and submarine technology developed to maturity, a large number of fast-moving fighters could destroy large warships, and the elusive submarine posed a fatal threat to surface warships, thus completely changing the nature and style of naval warfare. It can be predicted that intelligence, miniaturization and low cost will become the development direction of modern warfare.

In the past few years, 3D printing technology has developed in a spurt type all over the world. It can use a variety of advanced materials to produce many customized products. As production has increased, 3D printing has been industrialized. At the same time, the capabilities and speed of 3D printers are increasing, which allow them to produce complex products in a short time. The biggest advantage of 3D printing technology is to avoid waste in the manufacturing process and significantly reduce the manufacturing cost, which is of great economic value.⁸⁰

In addition, the rapidly developing nanotechnology also has great potential in the military field, such as nanoexplosives, which were twice as powerful as conventional explosives. This means that the weapon becomes more destructive but becomes smaller. The use of nanomaterials, for another example, would significantly reduce the weight of the weapon platform. For unmanned aerial vehicles (UAVs), this means an increase in the combat radius and the time for staying aloft. Recent studies have shown that the application of nanomaterials can increase the battery capacity by 3 times and prolong the battery life by 4 times.⁸¹ The wide application of nanotechnology in materials, energy storage and release, stealth and other fields will have an important

⁸⁰ Garrett B. 3D printing: new economic paradigms and strategic shifts // Global Policy. – 2013. – Vol.5. – No. 1. – pp. 70–75.

⁸¹ Material from Russia will triple the capacity of lithium-ion batteries. [Electronic resource] // MISIS. URL: <https://en.misis.ru/university/news/science/2021-02/7240/>

influence on the operational range, load capacity, penetration capability of many military hardware.⁸²

Besides, during the war, AI will be fully applied in the three major fields of intelligence analysis, decision-making and weapon system.⁸³ In the field of intelligence analysis, AI can more quickly collect, process and analyze massive data and grasp the dynamics of the battlefield. In the field of decision-making, AI can help commanders free themselves from the complicated decision details, focus on the main decision, and improve the scientific nature of the decision. It changes the traditional operational command which mainly relies on the experience, intuition and prewar planning of the commander. AI can also assist the commander to adapt to the changing circumstances, design a variety of operational proposals, and then select the most appropriate troops at the most appropriate time and the most optimal location to complete the operational tasks with the highest efficiency. At the same time, AI can overcome the psychological limitations of human beings in the face of pressure and make decisions in a rational way.⁸⁴ In the field of weapons system, the biggest change is the use of smart weapons, which can perform a series of actions without human command: autonomously searching for targets, assessing threats, destroying targets, and evaluating effects. Advantages of smart weapons lie in the following three aspects. First, the speed and accuracy of attacks are

⁸² Altmann J. *Military nanotechnology: Potential applications and preventive arms control*. – London: Routledge, 2006. – 236 p.

⁸³ Elsa Kania. *Battlefield Singularity. Artificial Intelligence, Military Revolution, and China's Future Military Power*. [Electronic resource] // CNAS. – 2017. URL: <https://www.cnas.org/publications/reports/battlefield-singularity-artificial-intelligence-military-revolution-and-chinas-future-military-power>.

⁸⁴ Ayoub K., Payne K. *Strategy in the age of artificial intelligence*[J] // *Journal of strategic studies*. – 2016. – Vol.39. – pp. 793–819.

greatly improved. The traditional unmanned attack system relies on the subjective judgment of intelligence personnel when attacking targets, so it has randomness and lag, and even injures civilians by mistake. Secondly, AI can break through the limitation of human body function, perform dangerous and suicidal tasks instead of human beings, and reduce material losses, especially casualties of combatants. Thirdly, by effectively combining multiple intelligent robots to form "swarms" of UAVs, "wolf packs" of unmanned submarines, ground robots and "ant colonies" of unmanned tanks, the overall efficiency of the intelligent system can be maximized, so as to form an absolute advantage over the enemy in terms of scale, coordination and speed on the battlefield.⁸⁵ Nevertheless, it should be noted that the quantity and quality of nuclear weapons and their carriers are still decisive variables affecting the military strength of major powers. In terms of process, although artificial intelligence can improve the attack precision of nuclear weapons and shorten the reaction time of defense systems, this advantage still cannot change the result of the world being destroyed. Due to the limitations of international laws and regulations, international morality and other factors, nuclear weapons should still be used as a deterrent, essentially a psychological contest based on strength.

In the future, with the further innovation and integration of 5G, artificial intelligence, nanotechnology, biotechnology, new material technology, quantum technology and other leading technologies, emerging technology will make great contribution to the global economy and will also affect the balance of economic power among countries. When the 4IR is involved in the military field, major changes will take

⁸⁵ Paul Scharre. Robotics on the battlefield part II: The Coming Swarm. [Electronic resource] // CNAS. – 2014. URL: <https://www.cnas.org/publications/reports/robotics-on-the-battlefield-part-ii-the-coming-swarm>.

place in all aspects of the war, and the basic features, processes, mechanisms and even the ideology of the war will also undergo subversive changes. It can be said that countries that have gained advantages in science and technology can gain more opportunities in the hard power.

1.3.2.The impact of the 4IR on soft power

The emergence and popularization of newly developing science and technology are bringing mankind into the era of intelligent politics, which has a broad and profound impact on enhancing the capacity for national governance.

The significance of AI for improving government efficiency is self-evident. First, the real-time tracking and analysis of big data on the overall operation of the country by AI can help the government to grasp all aspects of the country's social life and make the scientific decisions more accurately. Second, AI can help the government to design the workflow more effectively, optimize the work procedure, and can replace manpower to do simple and repetitive but time-consuming work such as data collection, text writing, public consultation and public construction, which can help to reduce unnecessary waste of resources, personnel redundancy and corruption, and improve decision-making execution. Third, AI can help the government to provide personalized service measures according to the needs of different citizens, which can not only make the relationship between the government and the public more harmonious and promote government image, but also help citizens to participate in national political affairs better.

The role of newly developing science and technology in enhancing political power also applies to the diplomatic sphere. In bilateral or multilateral negotiations, for example, intelligent machines can overcome language barriers, synchronise all kinds of available data, save a lot of speech and gameplay time for representatives of all sides, and offer a range of decision-making schemes acceptable to both sides in cooperation with

the other side's intelligent machines. Moreover, intelligent machines can also avoid human errors and self-bias to the greatest extent and can provide the most possible win-win solution for all parties interested in cooperation.⁸⁶

New technologies have the advantages of greater timeliness, lower cost and better targeting in the war of cultural propaganda. First, propaganda robots can manipulate millions of user accounts simultaneously at very low cost. For example, about 48 million (15%) accounts on Twitter are controlled by robots.⁸⁷ Second, intelligent robots can track specific events on the Internet in real time, then create relevant content and respond almost synchronously, and distribute it in large numbers in a planned way, thus creating public opinion in the first place. This is especially important in the information age because people can only think of the first statement related to the event, even if it is wrong. For information that does not contribute to their own side, they can also deliberately confuse and launch an attack using public opinion to minimise the negative impact. At present, more than 10% of the content and 62% of the social media websites traffic are generated by robots. Thirdly, by tracking websites and content visited by users, propaganda robots can analyze users' personal data, such as personalities, political preferences, religious beliefs and interests, dynamically create and send content that specifically meets their specific psychological characteristics, and then imperceptibly

⁸⁶ Akin Unver. Computational Diplomacy: Foreign Policy Communication in the Age of Algorithms and Automation. [Electronic resource] // Edam. – 2017. URL: <https://edam.org.tr/en/computational-diplomacy-foreign-policy-communication-in-the-age-of-algorithms-and-automation/>

⁸⁷ Michael Newberg. As many as 48 million Twitter accounts aren't people, says study. [Electronic resource] // CNBC. – 2017. URL: <https://www.cnbc.com/2017/03/10/nearly-48-million-twitter-accounts-could-be-bots-says-study.html>

induce them to support their desired policy goals.⁸⁸

These advantages of propaganda robots can also play an important role in elections and political interference. In political elections, AI can influence voters' voting tendency through big data push on social media and targeted operation by third-party organizations. AI can also confuse the public by producing "fake news." AI can also be used to predict election results.⁸⁹ Besides, in the propaganda war, major powers will use their own technological advantages to launch all kinds of offensives by public opinion against small and weak countries. For instance, the "PRISM" program has exposed the U.S. government's monitoring of all its allies. In the past, the main means for developed countries to penetrate other countries' networks were to employ Internet Water Army, control local network communication enterprises and cultivate spokespersons, etc. However, with the technical advantages of artificial intelligence, they can fully use new network intelligent robots to achieve the goals of disturbing public opinion, creating social chaos and division with lower cost and higher efficiency. It can be said that with the further maturity of AI, it will play a more prominent role in the future political field.

In addition, computer chips, intelligent algorithms and big data are the core of AI. Its development needs to invest a lot of manpower and material resources. Coupled with the technical characteristics that computer chips and intelligent algorithms can be upgraded at an ultra-fast speed, AI is also likely to lead to a winner-take-all situation. Technological laggards will find it increasingly difficult to catch up with the leaders. The

⁸⁸ Shawn Powers, Markos Kounalakis. Can Public Diplomacy Survive the Internet? [Electronic resource] // ACPD. – 2017. URL: <https://www.state.gov/wp-content/uploads/2019/05/2017-ACPD-Internet.pdf>.

⁸⁹ The Use of Artificial Intelligence in US Elections. [Electronic resource] // CISS. URL: https://ciss.tsinghua.edu.cn/info/wzjx_mggc/5742

map of international geopolitics will also change accordingly.⁹⁰ French President E. Macron also pays special attention to the role of AI in defending sovereignty and safeguarding universal values, believing that it may change the democratic process of the country.⁹¹ It can be expected that with the help of intelligent networks, one country can launch political, cultural and value offensives against other countries.

The rapid development of emerging technology is bringing mankind into the era of intelligent politics. On the one hand, the 4IR can help improve the efficiency and image of government in the domestic. On the other hand, the impacts of the 4IR on international political interaction are also extensive and profound. Therefore, countries with advantages in the 4IR can benefit from the soft power competition.

In general, the 4IR has a significant impact on comprehensive national power. 4IR will help to improve the comprehensive strength of those countries that can actively seize the opportunities of scientific and technological revolution, and make the strength status of those countries that have missed the opportunities decline relatively, thus greatly affecting the balance of global power, especially among the great powers, from quantitative change to qualitative change.

1.4. The 4IR and Its Impacts on International System

The previous section has already proved that the new round of scientific and technological revolution will have an impact on the comprehensive strength of countries

⁹⁰ De Spiegeleire S., Maas M., Sweijts T. Artificial intelligence and the future of defense: strategic implications for small-and medium-sized force providers[M]. // The Hague Centre for Strategic Studies. – 2017.

⁹¹ Nicholas Thompson. Emmanuel Macron Talks to WIRED About France's AI Strategy. [Electronic resource] // WIRED. – 2018. URL: <https://www.wired.com/story/emmanuel-macron-talks-to-wired-about-frances-ai-strategy/>

that are the determinants of the international system. Therefore, this section will try to find out what impact the 4IR will bring to the international system by analyzing the comparison of the comprehensive national power of major actors in recent years and their positions in the 4IR.

1.4.1. Comparison of the comprehensive national power of major powers from 2008 – 2020

This part will comprehensively evaluate the economic, political, military and technological comparisons between major powers from 2008 to 2020.

On the economic front, according to the latest statistics of the World Bank, China's GDP surpassed Japan's to become the world's second largest economy in 2010. Since 2014, only the United States and China have exceeded 10 trillion US dollars in GDP, while the rest are below 5 trillion US dollars.⁹² The gap in GDP between China and the United States is also rapidly shrinking. By 2020, the ratio of China's GDP to that of the United States has exceeded 70%.⁹³ At the same time, the gap between China and other countries has widened significantly (See Figure 2). In terms of purchasing power parity, China's economic scale surpassed the United States in 2016.⁹⁴

⁹² Wang Congyue. The impact of the fourth industrial revolution on international configuration // Political Science Issues. – 2022. – Iss.12. – No. 10. – pp. 3422–3430. DOI 10.35775/PSI.2022.86.10.021

⁹³ GDP (current US\$) - China, United States. [Electronic resource] // The World Bank. URL: <https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?locations=CN-US>

⁹⁴ Ibid.

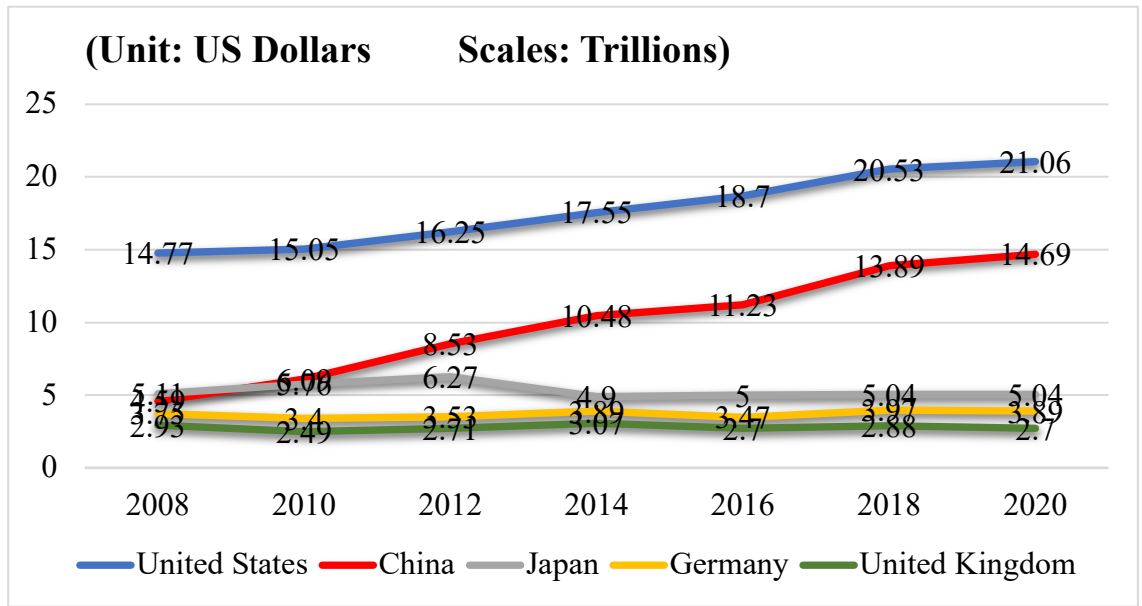


Figure 2: **GDP (current US\$) from 2008 to 2020 United States, China, Japan, Germany and United Kingdom.**⁹⁵

Regarding to GDP growth rate, although China's GDP growth rate has started to decline since 2010, it has remained stable at over 6% all the year round, while the GDP growth rate of the United States and some other countries is difficult to reach 3%. Therefore, it is generally believed that China's GDP will overtake that of the United States by 2030. Although India's GDP growth rate exceeded China's in 2014, it is only slightly higher than China's. Considering the current economic aggregate of India, it will continue to maintain a huge gap with the United States and China for a long time (See Figure 3).

⁹⁵ Data from World Bank, available at: https://data.worldbank.org/indicator/NY.GDP.MKTP.CD?end=2020&locations=CN-JP-DE-US-GB&most_recent_year_desc=true&start=2008&view=chart

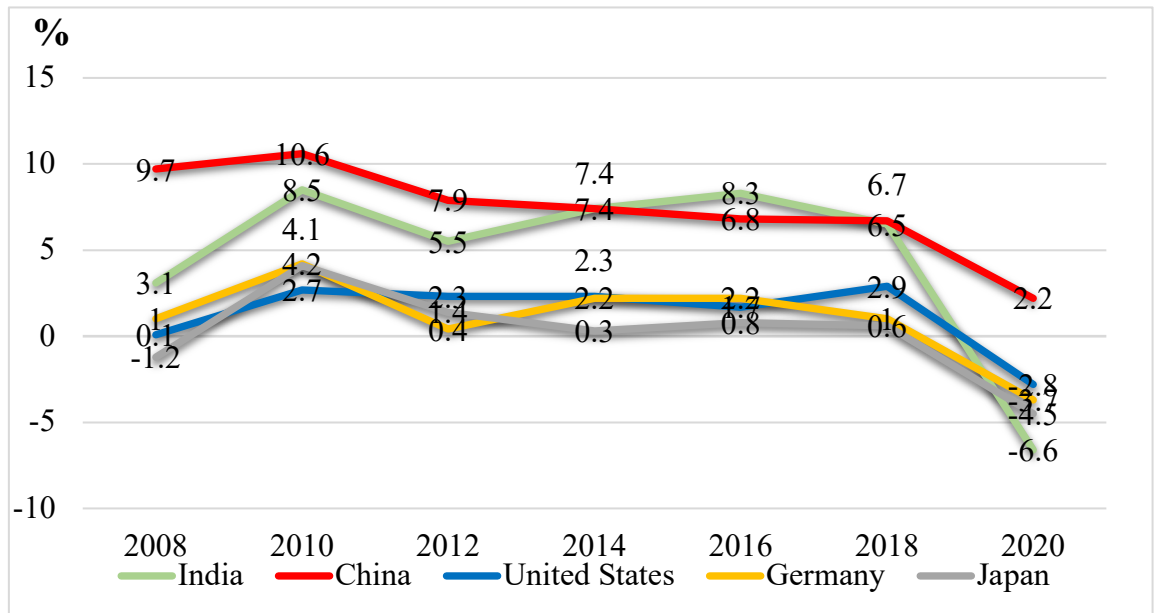


Figure 3: **GDP growth (annual %) from 2008 to 2020 - India, China, United States, Germany and Japan.**⁹⁶

Furthermore, China and the United States rank first and second in industry value-added, far ahead of the rest of the world. Meanwhile, China's manufacturing value-added exceeded that of the United States in 2010 and exceeded that of the United States and Japan combined in 2016. (Figure 4)

⁹⁶ Data from World Bank, available at: <https://data.worldbank.org/indicator/NY.GDP.MKTP.KD.ZG?end=2020&locations=CN-JP-US-IN-DE&start=2010&view=chart>

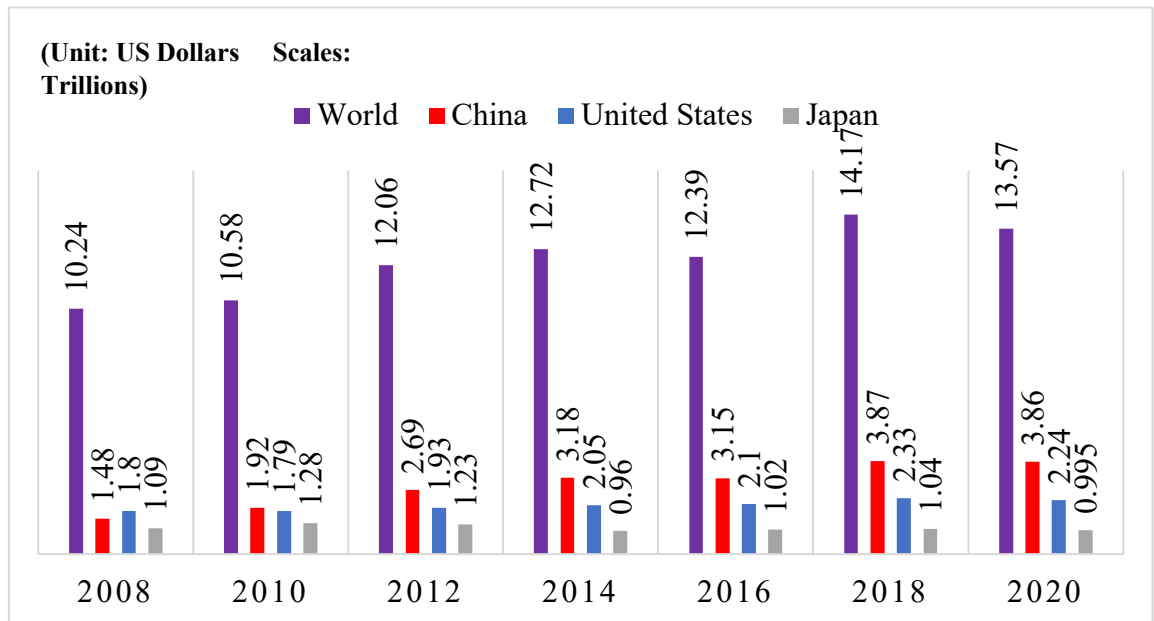


Figure 4: **Manufacturing, value added (current US\$) from 2008 to 2020– World, China, United States and Japan.**⁹⁷

On the political front, the United States, China, Russia, France and Britain are permanent members of the UN Security Council. The United States remains the most politically influential country in the world. The United States has many allies, including NATO members, which have ensured its influence in the international community.⁹⁸ The United States is used to exerting political influence in the name of international law and the international order, relying on its own strength and the policy of "carrot and stick". However, since Donald Trump took office, the United States has unilaterally withdrawn from many international organizations and its political influence has declined. In particular, the "Black Lives Matter" movement and Capitol riots in the United States have

⁹⁷ Data from World Bank, available at: https://data.worldbank.org/indicator/NV.IND.MANF.CD?end=2020&locations=CN-US-JP-1W&name_desc=false&start=2008&view=chart

⁹⁸ Wang Congyue. The impact of the fourth industrial revolution on international configuration // Political Science Issues. – 2022. – Iss.12. – No. 10. – pp. 3422–3430. DOI 10.35775/PSI.2022.86.10.021

dealt a heavy blow to the "democratic image" of the United States.⁹⁹ On the other hand, China's rapid integration into the world stage has made the United States wary of China's international influence, and with good reason. As China's international status continues to rise, China's influence in the international community is increasing, and the weight and status of diplomacy are becoming more and more important. China is playing an increasingly important role in various international organizations. On the one hand, China tells its story to the world through cultural exchanges, so that the world can understand the real China and the advantages of its institution and feel the charm of China's culture for thousands of years. On the other hand, China creates opportunities for other countries by assuming international responsibilities and building platforms. The Shanghai Cooperation Organization (SCO), the BRICS, the One Belt and One Road initiative and the Asian Infrastructure Investment Bank have all demonstrated China's strengthening position on the world stage and its growing political influence.¹⁰⁰

On the military front, only the United States and China in the world have reached the level of 100 billion US dollars in military expenditures. According to statistics from SIPRI, China's military expenditure reached 258 billion dollars in 2020, more than one third of that of the United States.¹⁰¹ The United States and China account for more than half of the global military expenditure (See Figure 5).

⁹⁹ Wang Congyue. "Thucydides Trap" in Sino-US Relations // Society: Politics, Economics, Law. – 2023. – No.5. – pp. 56–61. <https://doi.org/10.24158/pep.2023.5.8>.

¹⁰⁰ Ibid. – p.58.

¹⁰¹ What Does China Really Spend on its Military? [Electronic resource] // China Power. URL: <https://chinapower.csis.org/military-spending/>

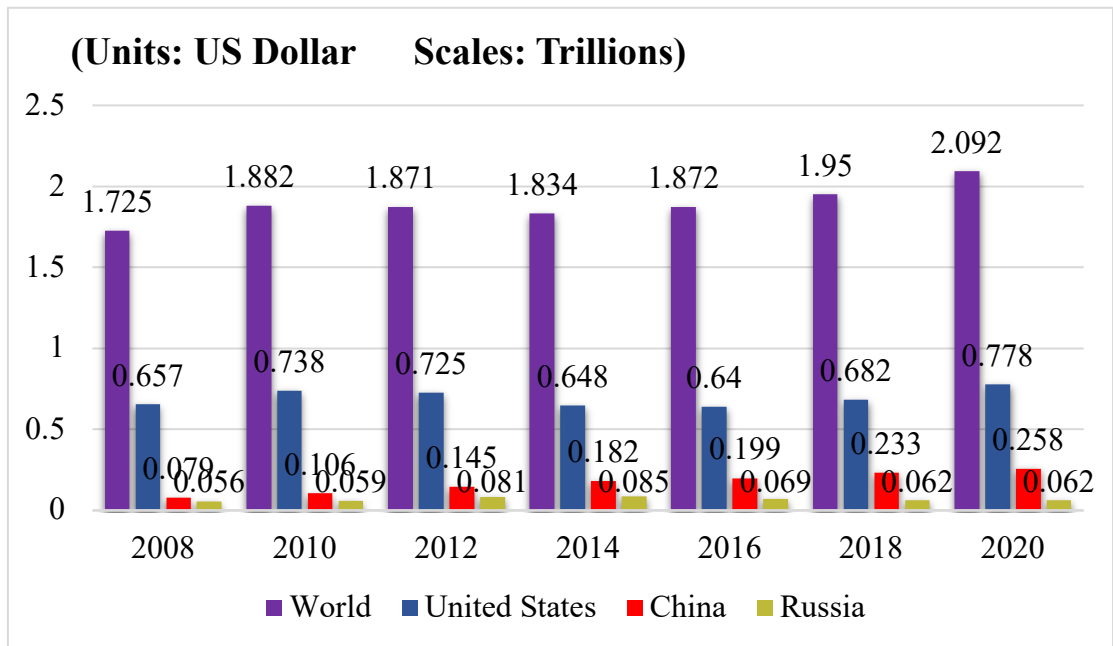


Figure 5: Military expenditure from 2008 to 2020– World, United States, China and Russian Federation.¹⁰²

On the one hand, the military power gap between China and the United States is gradually narrowing. The sustained and rapid growth of military expenditure has supported the development of military equipment. At present, China's navy ranks first in the world in the speed of building and launching naval vessels for service. China already has three aircraft carriers in service. According to this construction progress, China plans to complete the construction of ten aircraft carriers by 2049.¹⁰³ In the aerospace field, China has also made a number of achievements in recent years, closing the gap with the United States. Since China's military strength has developed relatively late, the military comparison between China and the United States will not undergo qualitative changes in a short time. On the other hand, with the exception of China, other great powers lack the

¹⁰² Data from SIPRI, available at: <https://www.sipri.org/databases/milex>

¹⁰³ Fisher R. A Chinese Navy with 10 Aircraft Carriers? It Could Happen [Electronic resource] // The National Interest. URL: <https://nationalinterest.org/blog/buzz/chinese-navy-10-aircraft-carriers-it-could-happen-95991>

corresponding industrial and economic strength to support them to overtake the United States in terms of equipment scale and technology. Moreover, due to economic difficulties, many major countries have even had to reduce the scale of their weapons. Russia's military power is still the second largest in the world, but with the exception of nuclear weapons, Russia cannot always compete with the United States in other components of military power and is even beginning to lag behind China. In addition, special military operations in Ukraine will also significantly drain Russia's military reserves and capabilities. Similarly constrained by economic might and military expenditure, the development of Japan's self-defense forces has also been limited. Besides, Britain and France gave up air-based and land-based nuclear forces and kept only sea-based ones.¹⁰⁴ It can be said that in the military field, China is gradually catching up with Russia and widening the gap with other powers.

In terms of scientific and technological innovation, China ranks second only to the US in R&D spending. In 2020, China's R&D spending was 49 percent that of the United States, 2.1 times that of Japan, 2.9 times that of Germany, and 2.9 times that of Canada, Italy and France combined. However, in 2016, China's R&D spending was 44% that of the US, 1.5 times that of Japan, twice that of Germany, and 1.5 times that of Canada, Italy, the UK and France combined. As can be seen, the gap between China's R&D expenditure and that of G7 countries has widened, and China's leading superiority is more obvious.¹⁰⁵ In 2022, China's spending on research and development reached 551 billion

¹⁰⁴ Nuclear Weapons Worldwide. [Electronic resource] // Union of Concerned Scientists. URL: <https://www.ucsusa.org/nuclear-weapons/worldwide>

¹⁰⁵ China's R&D spending is second only to that of the United States, leaving it behind other G7 countries [Electronic resource] // China Business News. URL: <https://www.yicai.com/news/101694703.html>

dollars, close to the 679 billion dollars spent on this purpose by the United States.¹⁰⁶ With the support of increased R&D Spending, China's Nature Index, which reflects the total number of high-quality papers in various countries, and the number of Patent Cooperation Treaty (PCT) applications are also growing rapidly (See Table 1).

Table 1. Top 6 countries on Nature Index (WFC: Weighted Tractional Count).¹⁰⁷

Years Countries	2015	2016	2017	2018	2019	2020	2021
U.S.	27,566	26,923	27,351	28,445	28,452	29,176	28,209
China	10,693	11,196	12,845	15,613	18,046	19,099	21,415
Germany	8,301	8,293	8,214	8,819	8,801	9,322	9,448
UK	7,344	7,296	7,330	7,683	7,857	8,221	8,126
Japan	5,063	4,804	4,782	4,936	4,916	5,291	5,197
France	4,858	4,851	4,745	4,923	5,078	5,114	4,935

In terms of PCT applications, China overtook Germany, Japan and the United States in 2013, 2017 and 2019 respectively to rise to the first place in the world (See Table 2).¹⁰⁸

¹⁰⁶ Leading Countries by Gross Research and Development (R&D) Expenditure Worldwide in 2022 [Electronic resource] // Statista. URL: <https://www.statista.com/statistics/732247/worldwide-research-and-development-gross-expenditure-top-countries/>

¹⁰⁷ Data from NatureIndex, available at: <https://www.nature.com/nature-index/annual-tables/>

¹⁰⁸ Wang Congyue. The impact of the fourth industrial revolution on international configuration // Political Science Issues. – 2022. – Iss.12. – No. 10. – pp. 3422–3430. DOI 10.35775/PSI.2022.86.10.021

Table 2. PCT applications of 6 major countries from 2011 to 2021.¹⁰⁹

Years Countries	2011	2013	2015	2017	2019	2021
U.S.	48,596	57,441	57,123	56,676	57,840	59,570
China	16,406	21,514	29,839	48,905	58,990	69,540
Japan	38,888	43,771	44,053	48,205	52,660	50,260
Germany	18,568	17,913	18,004	18,951	19,353	17,322
France	7,664	7,905	8,421	8,014	7,934	7,380
UK	4,844	4,847	5,290	5,568	5,786	5,841

On the one hand, China is consolidating its existing advantages; on the other hand, it is continuously catching up with relevant leading countries in relatively weak areas. It can be argued that the United States and China have jointly led the way in the fields of emerging technology. Therefore, the gap in science and technology between China and the United States is generally narrowing. At the same time, China is widening the gap with other countries.

In conclusion, since 2008, China has made great efforts to develop new science and technology, making its comprehensive national strength rise rapidly. In 2010, China's GDP overtook Japan's to become the world's second-largest economy. In the same year, China's manufacturing value-added also surpassed that of the United States, ranking first in the world. At the same time, China's influence in the international community is also increasing. In addition, China also ranks second in the world in military expenditure, which makes China's military strength catch up with Russia and close the gap with the United States. Moreover, China has also made a series of achievements in scientific and

¹⁰⁹ Data from WIPO, available at: <https://www.wipo.int/publications/en/series/index.jsp?id=35>

technological innovation. There is no doubt that China's comprehensive strength has firmly ranked second in the world and China has become the other superpower in the world. Judging from the growth rate, on the one hand, China is rapidly narrowing the gap with the United States. On the other hand, the gap between China and other great powers is widening as well. With the deep development of the 4IR and wide application of its achievements, the gap between China and other great powers will widen further. Hence, it can be concluded that the bipolar structure between the United States and China has begun to take shape.

1.4.2. Performance of major actors in the 4IR

Due to the fast iteration of the 4IR, with the Matthew Effect, the 4IR can also significantly enhance the comprehensive national strength and increase global wealth. However, the distribution of this influence among countries will be more unbalanced. In this sense, the 4IR will further widen the gap of comprehensive strength between countries. The 4IR has a subversive influence, but it still has a high dependence on the most critical information industry in the third industrial revolution. Therefore, the 4IR can also be seen as a further upgrade of the third industrial revolution. On the one hand, the United States, as the dominant country in the third industrial revolution, still holds a huge advantage in the 4IR. In terms of innovation spirit, basic theories, core algorithm, high-end chip, as well as the scale and quality of employees, the United States is obviously a global leader. On the other hand, China has the largest number of internet users in the world, constituting the most active group of data generation. In the meantime, China has the natural advantages of mass data and the largest market in the world that are incomparable in other countries. Hence, the United States and China now maintain a joint world leading position in the 4IR.

For instance, in the field of 5G, *The 5G Economy* published by IHS Markit

believes that 5G will become a positive source of global economic expansion and growth. By 2035, 5G will generate 13.2 trillion dollars in global economic output, which accounts for approximately 5% of global real output in 2035.¹¹⁰ Besides, IHS Markit predicts that the global real GDP will grow at an average annual rate of 2.5% during 2020-2035, with 5G contributing nearly 0.2% growth. From 2020 to 2035, the annual contribution of 5G technology to GDP will approach 2.7 trillion US dollars (See Figure 6).

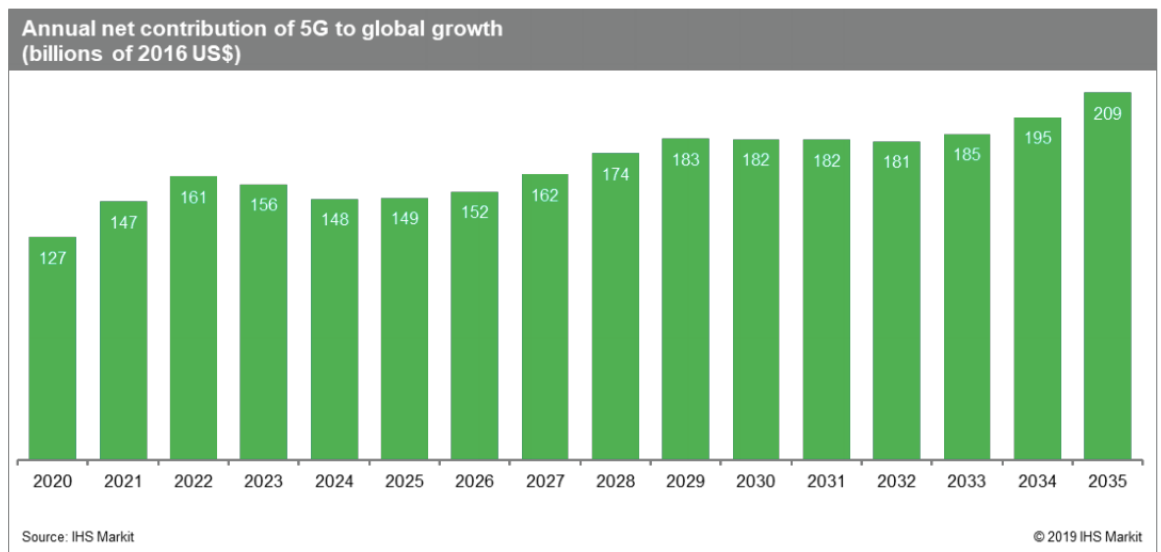


Figure 6: **Annual net contribution of 5G to global growth.**¹¹¹

Moreover, by 2035, the global 5G value chain itself will create 3.6 trillion dollars in output and 22.3 million jobs. China and the United States will benefit the most. Given the relative size of the population and investment, 5G will provide China with the most job opportunities (See Figure 7).

¹¹⁰ The 5G Economy: How 5G Will Contribute to The Global Economy. [Electronic resource] // Qualcomm. – 2019. URL: <https://www.qualcomm.com/media/documents/files/ihs-5g-economic-impact-study-2019.pdf>

¹¹¹ Ibid. – p.26.

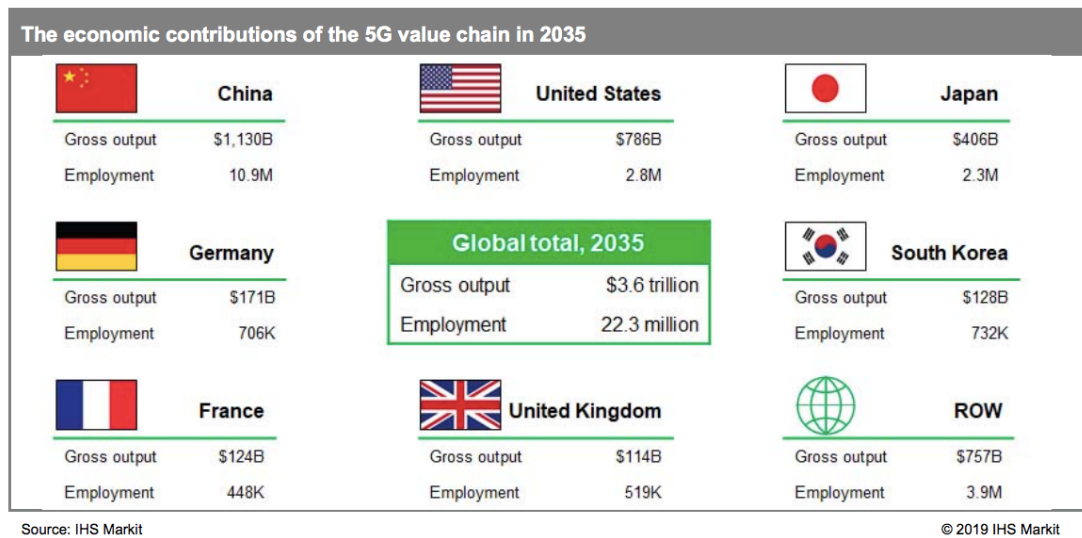


Figure 7. **The economic contributions of the 5G value chain in 2035.**¹¹²

In addition, IHS Markit forecast that seven countries will be at the forefront of 5G development: The United States, China, Japan, France, Germany, Britain and South Korea. Among them, the United States and China will dominate global 5G R&D and capital expenditure. From 2020 to 2035, the United States will invest 1.3 trillion dollars, accounting for 26.7% of global investment in 5G, while China will invest about 1.2 trillion dollars, accounting for 25.5% (See Figure 8).

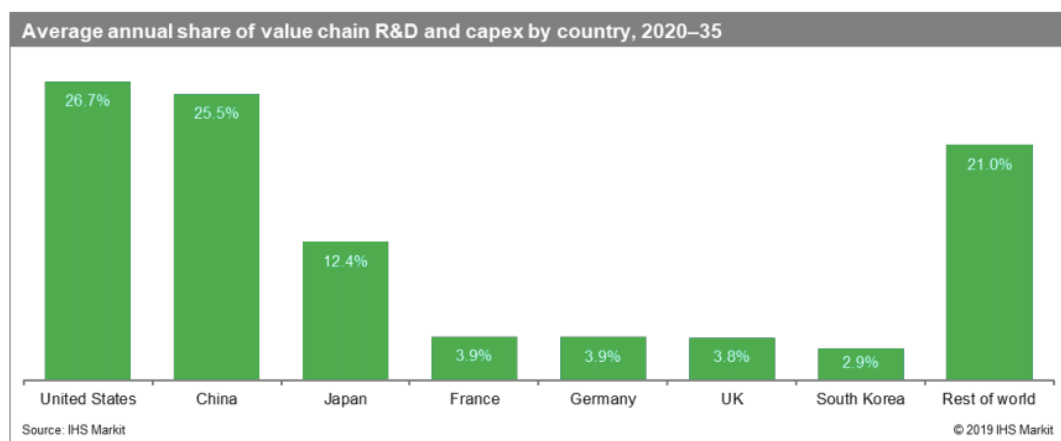


Figure 8. **Average annual share of value chain R&D and capex by country, 2020-**

35.¹¹³

¹¹² Ibid. – p. 25.

¹¹³ Ibid. – p. 24.

In May 2019, in *Geopolitics and the Global Race for 5G*, Center for Global Studies (CGS) states that The United States and China are leading the global 5G competition.¹¹⁴ Besides, with the help of Analysys Mason, CTIA conducted research and analysis on the current situation of global 5G competition. After comparing the 5G development of the United States, China, South Korea, Canada, France, Germany, Japan, Russia, Singapore and the United Kingdom, analysts came to the conclusion that China is the highest scoring country in leading group of countries, based on a strong push for early 5G launch combined with government commitment to achieving 5G success.¹¹⁵ At present, China has deployed 350,000 5G base stations, almost 10 times as many as the United States. By 2025, this number will exceed one million. Among them, Huawei has sent 10,000 5G base stations overseas. In *The 5G Ecosystem*, released by United States Department of Defense, it states that all the top ten Internet companies were American companies in 2009. While today, Chinese companies occupy four seats. If China continues to lead, China's development in the 5G field will reproduce the glory of the United States in the 4G field.¹¹⁶

In the field of AI, according to the report released by PwC, AI could make an annual contribution of 15.7 trillion dollars to the world economy, where China and North America are expected to become the greatest beneficiaries, gaining 10.7 trillion

¹¹⁴ Geopolitics and The Global Race For 5G. [Electronic resource] // CGS-bonn.de. – 2019. URL: <http://cgs-bonn.de/5G-Study-2019.pdf>

¹¹⁵ Global race to 5G- Spectrum and Infrastructure Plans and Priorities. [Electronic resource] // Analysys Mason. URL: https://api.ctia.org/wp-content/uploads/2018/04/Analysys-Mason-Global-Race-To-5G_2018.pdf. – p.2

¹¹⁶ The 5G Ecosystem: Risks & Opportunities for DoD. [Electronic resource] // DEFENSE INNOVATION BOARD. – 2019. URL: https://media.defense.gov/2019/Apr/03/2002109302/-1/-1/0/DIB_5G_STUDY_04.03.19.PDF

dollars (See Figure 9).

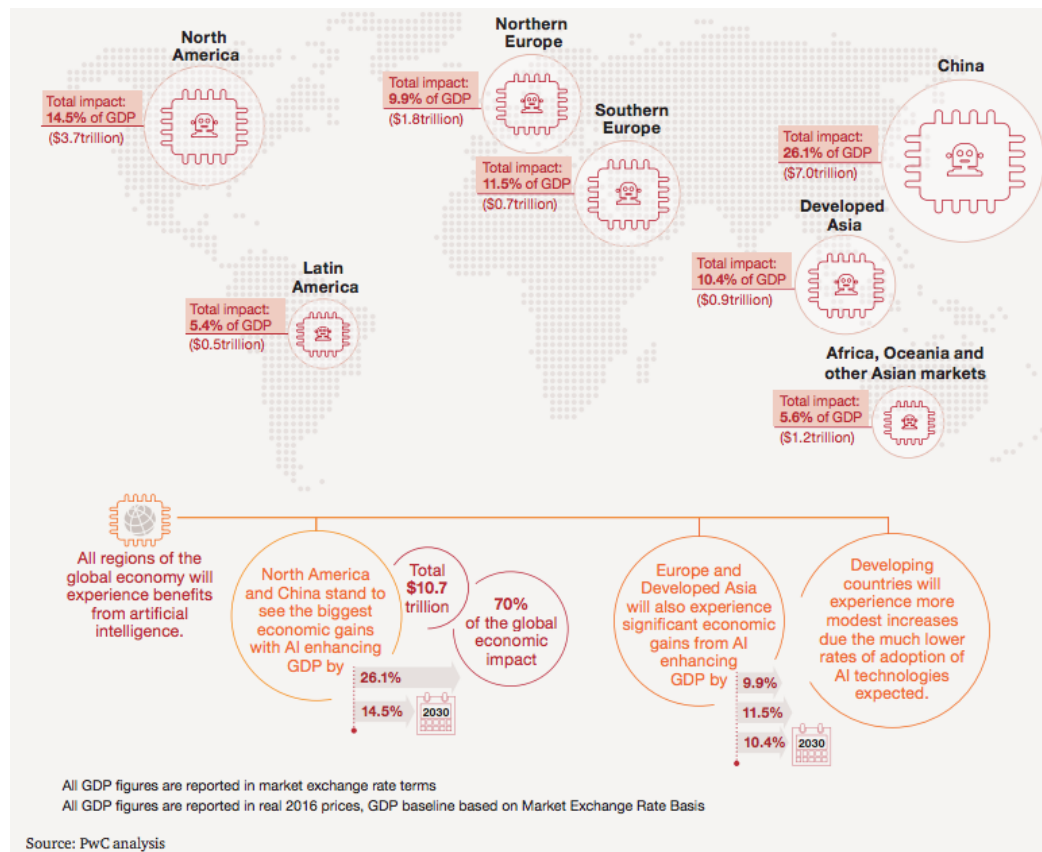


Figure 9. Which regions will gain the most from AI?¹¹⁷

Moreover, AI might widen gaps between countries, and the "AI divide" may further deepen the "digital divide". The leading AI countries and regions will witness an economic growth of 20% to 25%, while developing countries may only enjoy half as much.¹¹⁸ In addition, the core elements of the current AI technologies are algorithms, computing power and data. Countries with more computing resources, more advanced algorithms and more data, are more likely to gain advantages. In the future, data will

¹¹⁷ Sizing the prize. What's the real value of AI for your business and how can you capitalise? [Electronic resource] // PwC. URL: <https://www.pwc.com/gx/en/issues/analytics/assets/pwc-ai-analysis-sizing-the-prize-report.pdf>

¹¹⁸ Notes from The AI Frontier: Modeling the Impact of AI on the World Economy. [Electronic resource] // McKinsey Global Institute. – 2020. URL: <https://www.mckinsey.com/featured-insights/artificial-intelligence/notes-from-the-ai-frontier-modeling-the-impact-of-ai-on-the-world-economy>

become national strategic resources, leading to "algorithmic games" and "algorithmic hegemony". According to the report published by China Internet Network Information Center (CNNIC), up to June 2020, China had 939.84 million netizens, and 99.2% of them accessed to the Internet via the mobile network.¹¹⁹ With more graduate students specializing in AI-related sectors, China has more potential in talent supply. In addition, according to the report published by Tencent Research Institute, by June 2017, there were 2,542 AI enterprises worldwide, 1078 (42%) of which were in the US, with about 78,000 employees; 592 (23%) were in China, with about 39,000 employees; the other 872 AI enterprises were in Japan, UK, Singapore, Sweden, Australia, India, Israel and etc.¹²⁰ At present, the AI competition is dominated by giant enterprises, while major internet giants are shifting their research and development focus to the field of AI. Among the world's Internet giants, the United States has Apple, Google, Microsoft, Amazon and Facebook*, while China has Baidu, Alibaba and Tencent. The report, published by the Chinese Academy of Sciences in January 2020, analyses key technologies and industrial applications in each division of the AI field and reveals the ranking of global AI enterprises. The U.S. and China each accounted for half of the top 10 enterprises. (See Table 3)

¹¹⁹ The 46th Statistical Report on Internet Development in China. [Electronic resource] // CNNIC. – 2020. URL: <https://www.cnnic.com.cn/IDR/ReportDownloads/202012/P020201201530023411644.pdf>

¹²⁰ Comprehensive Interpretation of AI Industry Development in China and US. (In Chin.) [Electronic resource] // Tencent Research Institute. – 2017. URL: <https://www.tisi.org/15944>

* Meta Platforms Inc is recognized in the Russian Federation as an extremist organization and its activities are banned (including in relation to its product - the social network Facebook).

Table 3. Top 10 Global AI Enterprises.¹²¹

Ranking	Enterprise	Country	Established time
1	Microsoft	United States	1975
2	Google	United States	1998
3	Facebook*	United States	2004
4	Baidu	China	2001
5	DJI-Innovations	China	2006
6	Sensetime	China	2014
7	Megvii	China	2011
8	iFlytek	China	1999
9	Automation Anywhere	United States	2003
10	IBM Watson	United States	1911

To sum up, by comparing the comprehensive strength of several major countries in recent years, it can be found that, driven by the new round of scientific and technological revolution, China's economic, political, military, scientific and technological strength has significantly improved since 2008, making China firmly rank the second in the world in terms of its comprehensive strength. On the one hand, China is rapidly closing the gap with the United States. On the other hand, the gap between China and other great powers is widening as well. Hence, the bipolar structure between the United States and China has begun to take shape. What's more, the development and application of the 4IR are capital and technology intensive, so it needs the solid comprehensive national strength as a guarantee. Besides, scale is an important factor in the 4IR, which is more conducive to countries with populations of hundreds of millions

¹²¹ Data from *2019 AI Development White Paper*, available at: http://pdf.dfcfw.com/pdf/H3_AP202001171374280695_1.pdf

* Meta Platforms Inc is recognized in the Russian Federation as an extremist organization and its activities are banned (including in relation to its product - the social network Facebook).

of people, such as China and the United States. Through the analysis of the positions of major actors in the 4IR, it can be observed that the United States and China have their own advantages in the different fields of the 4IR, taking the obvious leading position in the world, and the gap with other countries may further widen. Considering the current comprehensive national strength of the United States and China, it can be concluded that the 4IR has accelerated the formation of the bipolar structure between the United States and China. In the future, the 4IR will further stabilize the bipolar structure and extend the duration of the bipolar structure.

Conclusions of the first chapter

The issue of international system is widely contested in international relations. At present, the international relations circle is full of controversy about whether the world is multipolar or bipolar. The existing research on the international pattern mainly focus on three basic fields: economy, politics and military, ignoring the role of science and technology. However, the development of science and technology is the fundamental driving force for the transformation of the international system. The new round of scientific and technological revolution and industrial transformation are bringing incalculable effects on human society, which will reshape the position of national competitiveness in the world and trigger a profound adjustment of the international system. In consequence, this chapter focuses on the impact of science and technology, especially the emerging technologies in the 4IR, on the international system. After analysis and comparison, this chapter holds that the 4IR has accelerated the formation of the bipolar structure between the United States and China. In the future, the 4IR will also stabilize the bipolar structure and extend the duration of the bipolar system.

CHAPTER 2. THE SINO-US TECHNOLOGICAL CONFRONTATION: THE FRONT AND ESSENCE OF THE SINO-US STRATEGIC RIVALRY

2.1.The "Thucydides Trap" in Sino-American relations

The world is undergoing "profound changes unseen in a century". After the global financial crisis in 2008, the concept of "Thucydides Trap" was applied to the analysis of Sino-US relations as the comprehensive national strength of the United States was relatively weakened and China's strength was continuously improved. At present, Sino-US relations have dropped to the lowest point since the establishment of diplomatic relations between China and the United States. Wars in the modern sense, such as trade wars, technological wars, public opinion wars, and network information wars, have actually broken out between China and the United States. With the Taiwan issue and the situation on the Korean Peninsula heating up, the possibility of a hot war between China and the United States is also rising. In this context, it is of great practical significance to discuss the "Thucydides Trap" in Sino-US relations.

2.1.1.The Origin and Concept of "Thucydides' Trap"

In the 1980s, the American writer H. Wouk used the "Thucydides Trap" to warn the consequences of the Cold War between the United States and the Soviet Union.¹²² The frequent use of the concept of "Thucydides Trap" began with G. Allison, an American political scientist. In 2012, Allison wrote an article in the British *Financial Times* titled *Thucydides's trap has been sprung in the Pacific* and argued that China and

¹²² Wouk H. Sadness and Hope: Some Thoughts on Modern Warfare // Naval War College Review. – 1998. – Vol. 33. – Iss.5. – pp. 123–132.

the United States are today's Athens and Sparta.¹²³ In June 2013, on the eve of the meeting between the leaders of China and the United States, Allison published a column in the *New York Times*, explaining the significance of "new type of major power relationship" proposed by President Xi Jinping in breaking the "Thucydides Trap" between China and the United States.¹²⁴ In September 2015, during President Xi Jinping's state visit to the United States, Allison elaborated on the concept of the "Thucydides Trap" and the possibility of war between the United States and China in *The Atlantic*.¹²⁵ In 2017, based on the above three articles, Allison officially published *Destined for War: Can America and China Escape Thucydides Trap?* In this book, Allison systematically expounds the concept of "Thucydides Trap" and related historical cases and applies this concept to the analysis of Sino-US relations. "It was the rise of Athens and the fear that this instilled in Sparta that made war inevitable."¹²⁶ The quotation of ancient Greek historian Thucydides in his *History of the Peloponnesian War* is quoted several times in Allison's book. According to Thucydides, the "rise" of Athens and the "fear" it caused to the established hegemony Sparta, was the fundamental reason that drove these two powerful city-states and their Allies into the war. Based on Thucydides' assertions, Allison further developed

¹²³ Graham Allison. Thucydides's trap has been sprung in the Pacific. [Electronic resource] // Financial Times. URL: <https://www.ft.com/content/5d695b5a-ead3-11e1-984b-00144feab49a>

¹²⁴ Graham Allison. Obama and Xi Must Think Broadly to Avoid a Classic Trap. [Electronic resource] // The New York Times. URL: <https://www.nytimes.com/2013/06/07/opinion/obama-and-xi-must-think-broadly-to-avoid-a-classic-trap.html>

¹²⁵ Graham Allison. The Thucydides Trap: Are the U.S. and China Headed for War? [Electronic resource] // The Atlantic. URL: <https://www.theatlantic.com/international/archive/2015/09/united-states-china-war-thucydides-trap/406756/>

¹²⁶ Graham Allison. *Destined for War: Can America and China Escape Thucydides Trap?* – Moscow, 2019. – p.6.

the concept of "Thucydides Trap". In the view of the political scientist, "Thucydides Trap" is the severe structural stress caused when a rising power threatens to upend a ruling one. In such conditions, not just extraordinary, unexpected events, but even ordinary flashpoints of foreign affairs, can trigger large-scale conflict.¹²⁷

2.1.2. The debate on "Thucydides Trap"

Destined for War: Can America and China Escape Thucydides Trap? aroused great repercussions as soon as it was published, and many scholars launched heated discussions around this topic.

On the one hand, some scholars believe that China and the United States have already fallen into or are about to fall into the "Thucydides Trap". For instance, according to D. Lampton, Sino-US relations are approaching a turning point when their fundamental pillars are being destroyed.¹²⁸ Robert Zoellick, former president of the World Bank, believes that China and the United States are in danger of falling into the "Thucydides Trap" because of mutual distrust and fear.¹²⁹ Jin Canrong argues that the United States is an established power and China is an emerging power with a clear structure. Therefore, structurally speaking, Sino-US relations have now fallen into the "Thucydides Trap".¹³⁰ After listing the areas of confrontation and options for possible military conflict, D. Sukhanov argues that the likelihood of the contradictions between Washington and

¹²⁷ Ibid. – p.36.

¹²⁸ David Lampton. A Tipping Point in US-China Relations is Upon US. [Electronic resource] // US-China Perception Monitor. URL: http://www.uscnpm.com/model_item.html?action=view&table=article&id=15789

¹²⁹ Robert Zoellick. U.S., China and Thucydides. [Electronic resource] // The National Interest. URL: <https://nationalinterest.org/article/us-china-thucydides-8642>

¹³⁰ Jin Canrong. China-US relations and "Thucydides Trap". [Electronic resource] // Centre for China and Globalization. URL: <http://www.ccg.org.cn/archives/28222>

Beijing escalating remains at a fairly high level, which has sufficient potential to soon develop into a large-scale battle of the great powers.¹³¹ Based on A. Zapolskis, although China tries to convince the world, including the United States, that they are developing peacefully, in fact the events are progressing according to the scenario of "Thucydides Trap", so a war between China and the United States is only a matter of time.¹³²

On the other hand, some scholars believe that China-US relations will not fall into the "Thucydides trap". For example, J. Holmes has doubts about this rather mechanical reading of Thucydides' history and argues for the importance of human decisions, actions, and interactions. Therefore, he believes that the trend lines in East Asia point to competition or even conflict. But trends are not fate. How events unfold will rest mainly with decisionmakers in Washington, Beijing, and other regional stakeholders.¹³³ Wang Yiwei believes that "Thucydides trap" is not inevitable. Because it is not in line with the relationship between China and other major powers. The relationship between major powers has always been a dialectical unity of cooperation and competition. Major powers should achieve mutually beneficial cooperation and turn points of conflict into prospects for interaction.¹³⁴ J. Nye argues that G. Allison misunderstood the Peloponnesian War and points out that it was not actually the result of the rise of Athens

¹³¹ Dmitri Sukhanov. U.S.-China: Will the Thucydides Trap Work? [Electronic resource] // RIAC. URL: https://russiancouncil.ru/blogs/dmitry_sukhanov/sshakitay-srabotaet-li-lovushka-fukidida/.

¹³² Alexander Zapolskis. "Thucydides' Trap": Why War between the U.S. and China is Inevitable. [Electronic resource] // NEWSFRONT. URL: <https://news-front.info/2018/11/20/lovushka-fukidida-pochemu-vojna-mezhdu-ssha-i-kitaem-neizbezhna/>.

¹³³ James Holmes. Beware the "Thucydides Trap" Trap. [Electronic resource] // The Diplomat. URL: <https://thediplomat.com/2013/06/beware-the-thucydides-trap-trap/>

¹³⁴ Wang Yiwei. "Thucydides trap" does not have to exist. [Electronic resource] // China Think Tank. URL: http://www.china.com.cn/opinion/think/2016-07/14/content_38880718.htm

to challenge Sparta. The relationship between China and the United States is also fundamentally different from the relationship between Athens and Sparta.¹³⁵ According to A. Sarak, the "global leadership" with which the US identified China is a taboo subject for China. The United States also does not experience fundamental fear because of the wave of greatness created by itself. Therefore, "Thucydides trap" cannot be extended to all the major conflicts of our time, just as it is impossible to explain the modern confrontation between China and the United States.¹³⁶

2.1.3. Are Sino-US relations falling into the "Thucydides trap"?

According to G. Allison, two countries will fall into the "Thucydides Trap" under the objective existence of the following conditions: firstly, there should be significant economic growth and an increase in the international influence of the "rising" power; secondly, there should be a change in the perception of it by the "dominant" power and its interpretation as a potentially dangerous object on the world stage; thirdly, a policy of containment and suppression of the "rising" power by the "dominant".¹³⁷

First, in the first chapter, it was concluded that, since the 21st century, China's comprehensive national strength has been continuously improved, especially after the global financial crisis in 2008, with the relative weakening of the United States' comprehensive national strength, the gap between China and the United States in comprehensive national strength has continued to narrow. Thus, a bipolar structure of the

¹³⁵ Nye J.S. How not to deal with a rising China: a US perspective // *International Affairs*. – 2022. – Vol. 98. – No. 5. – pp. 1635–1651.

¹³⁶ Alexandr V. Shalak. American-Chinese Confrontation from the perspective of Thucydides Trap. // *Russian & Chinese Studies*. – 2021. – Vol. 5. – No. 2. – pp. 110–118.

¹³⁷ Graham Allison. *Destined for War: Can America and China Escape Thucydides Trap?* – Moscow, 2019. – p.58.

international system has emerged.

Second, due to the rapid rise of China's comprehensive national strength, there seems to be a consensus in the United States that the long-standing policy of "engagement" with China has failed, and now China has become a strategic rival of the United States. After D. Trump took office, he emphasized "America First" and clearly listed China as a key competitor in the *National Security Strategy*.¹³⁸ This fact marked the beginning of the era of Sino-American strategic rivalry.¹³⁹ In the *Interim National Security Strategic Guidance* released by the United States in March 2021, China was regarded as the only competitor potentially capable of combining its economic, diplomatic, military, and technological power to mount a sustained challenge to a stable and open international system, and competition with China has become a diplomatic priority of the Biden administration.¹⁴⁰ Besides, J. Biden also clearly defined the Sino-US competition as being at the peak of confrontation. The current U.S. president has substantially revised the Trump administration's competition policy toward China centered on "America First", emphasizing the strengthening of competition with China by uniting allies.¹⁴¹

Third, the United States has adopted a series of containment and suppression

¹³⁸ National Security Strategy of the United States of America. [Electronic resource] // The White House. URL: <https://trumpwhitehouse.archives.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>

¹³⁹ Wu Xinbo. On China-US strategic competition // *World Economy and Politics*. – 2020. – No. 5. – pp. 96–130.

¹⁴⁰ Interim National Security Strategic Guidance. [Electronic resource] // The White House. URL: <https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf>

¹⁴¹ Zeng Yong. Rethinking the Polarisation of China and the United States // *Journal of International Relations*. – 2022. – No.2. – pp. 14–38.

policies against China in the name of competition in recent years, especially in the field of science and technology. During the Obama administration, the United States focused on promoting the strategy of "return to the Asia-Pacific", which is mainly to strengthen and expand its influence in this region, effectively contain the "threat" of China by strengthening the interdependence and cooperation among its Asia-Pacific Allies, so as to maintain its hegemonic status and other core interests in the Asia-Pacific region.¹⁴² The Trump administration's policy toward China has shifted dramatically toward strategic competition. During his tenure, the United States launched a trade war against China. In addition, the United States has imposed a series of sanctions on China in a variety of areas. At the same time, it has suppressed China in the field of science and technology, strictly limiting technology exports to China and bilateral personnel exchanges.¹⁴³ J. Biden has put the Indo-Pacific region at the center of America's global strategy since taking office. In February 2022, the U.S. government released *Indo-Pacific Strategy*. The strategy emphasizes the role of Allies and partners, and adopts all-round strategic competition against China through the establishment of small groups, essentially to contain China and maintain US regional hegemony.¹⁴⁴

Therefore, it can be concluded that China-US relations have fallen into the "Thucydides Trap". The strategic competition between the two countries is becoming increasingly fierce. Science and technology competition is the essence and core of Sino-

¹⁴² Huang Jichao. Analysis of Taiwan-Japan Relations in the Context of U.S. "Return to the Asia-Pacific" // *International Forum*. – 2018. – Vol.20. – No. 23. – pp. 39–45.

¹⁴³ Gong Ting. Sanctions Imposed on China by the Trump Administration since its Inception. // *Peace and Development*. – 2020. – No. 3. – pp. 38–57.

¹⁴⁴ Wei Z. The Biden Administration's Indo-Pacific Strategy and Its Impact on China. // *Chinese International Studies*. – 2022. – No. 3. – pp. 24–47.

US strategic competition.

2.2.Sino-US technological confrontation

Science and Technology play an important role in international relations. Throughout history, numerous technological innovations and their dissemination have revolutionized one or more countries, changing the balance of power in the region and even the world. A. Toffler listed the social changes and trends brought by the development of technology in his book *The Third Wave*. In *Human Network: A Bird's Eye View of World History*, W. McNeill and J. McNeil vividly described how the technological revolution played a key role in war, government organizations, people's beliefs and ultimately in the transfer of power between countries. As science and technology occupy an increasingly important place in the structure of productive forces, the rivalry and competition of the great powers and, above all, the United States and China in the scientific and technological sphere is increasing in the modern world.¹⁴⁵

2.2.1.Causes of Sino-US technological confrontation

In recent years, China's growing power has sparked a heated debate in the United States about policy towards China. Many American scholars believe that the U.S. policy of "engagement" with China has failed.¹⁴⁶ The release of the Trump administration's *National Security Strategy* (NSS) at the end of 2017 and the start of the trade war with China in March 2018 marked a new period of "strategic competition"

¹⁴⁵ Wang Congyue. The technological confrontation between China and the United States: the front and core of the Sino-US strategic game // *World Politics*. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

¹⁴⁶ Mearsheimer, J. J. The inevitable rivalry: America, China, and the tragedy of great-power politics [Electronic resource] // *Foreign Affairs*. URL: <https://www.foreignaffairs.com/articles/china/2021-10-19/inevitable-rivalry-cold-war>

between China and the United States.¹⁴⁷

In the field of science and technology, the global supremacy of the United States is once again threatened by the growing technological power of China. The historical experiences of US-Soviet rivalry and US-Japanese trade friction have told us that the US is used to applying a multilateral strategy of suppression and containment against the world's second largest economy to maintain its global hegemony.¹⁴⁸

The reasons are as follows: on the one hand, technological progress is seen as the "primary engine" for China's future political, economic and military power growth. On the other hand, technological leadership is regarded by the United States as the fundamental guarantee to ensure and maintain its relative power advantage and global hegemony. Therefore, the root cause of Sino-US technological confrontation lies in the measures taken by the maintained power to prevent and suppress the scientific and technological development of the rising power out of the fear that the rising power's technological strength might threaten their own global hegemony.¹⁴⁹

2.2.2. Specific measures taken by the United States

As China's scientific and technological strength has grown significantly, the United States has stepped up its crackdown on Chinese technology companies across the board. In August 2017, according to article 301 of the *U.S. Trade Act* of 1974, the United States launched an investigation against China, which was based on the protection of

¹⁴⁷ Huang Z. L., Han Z. Y. Analysis of U.S. Science and Technology Competitive Strategy towards China in the Context of the Sino - US Strategic Game // Seeking Truth. – 2022. – No. 2. – pp. 169–179

¹⁴⁸ Wu Xinbo. US Competitive Policy toward China and transformation of China-US Relations // China International Studies. – 2019. – No. 3. – pp. 7–20.

¹⁴⁹ Liu Wei. The Mystery of Advanced Technology Restrictions in Sino-US Trade Friction // Northeast Asia Forum. – 2019. – No. 2. – pp. 83–96.

intellectual property, and Sino-American trade tensions arose. The competition between China and the United States is not just about tariffs, trade deficit, violations of WTO rules and the protection of intellectual property rights. It is about who can dominant the key technologies and the new scientific and technological order. Therefore, the United States is crazily clamping down on China and pursuing the so-called "decoupling" of technology, which in essence is suppressing China's scientific and technological progress and economic development so as to maintain the scientific and technological hegemony of the United States, and then maintain its global hegemony. "Preventing China from building its own technology supply chain system and slowing down China's economic development is a consistent goal of the United States."¹⁵⁰ Accordingly, the United States has taken the following measures:

First, the US institutionalised the technological confrontation with China by passing the Act to contain China, thereby raising the overall competition between China and the US in supply chains and technology to a legal level. Since the Trump administration took office, most of the China-related bills in the US Congress have argued that they use China's internal and external challenges and take various measures to pressure China in various areas. The overall goal was to block the rise of China and maintain hegemony of the United States for a long time through strategic rivalry with China. After the Biden administration took office, the focus of proposals related to China in the US Congress shifted to technological competition and "human rights and democracy", especially competition in science and technology has become a key issue,

¹⁵⁰ U.S.-China: Cold War on the Technological Front. [Electronic resource] // Strategic Culture Foundation. URL: <https://www.fondsk.ru/news/2019/12/27/us-kr-holodnaja-vojna-na-tehnologicheskome-fronte-49777.html>

and proposals related to China on other topics are related to this (See Table 4).¹⁵¹

Table 4. The U.S. acts passed in recent years in the field of science and technology.

Time	Title of the Act	Main content
August 2018	The Foreign Investment Risk Review Modernization Act	The act expands the jurisdiction of CFIUS, extends the review period, and introduces the "filing" procedure that force certain transactions to be filed.
April 2021	The Strategic Competition Act of 2021	The act, jointly formulated by Democrats and Republicans in Congress, elevates the comprehensive competition between China and the US in supply chain and science and technology to a legislative level, institutionalizes and framed the science and technology war against China.
June 2021	The Innovation and Competition Act of 2021	The act emphasizes strengthening the influence of the United States in the digital field by cooperating with its allies, enhancing its own competitiveness while suppressing China's influence, and establishing a configuration of all-round strategic competition with China.
November 2021	The Security Equipment Act	The act tries to completely prevent the communication equipment of Huawei, ZTE and other Chinese companies from entering the United States telecommunications network.
February 2022	America COMPETES Act of 2022	The act declares to build an international supply chain with the United States as the core, selectively and limitedly opening up to China, decoupling and suppressing China in the high-tech field.
August 2022	CHIPS and Science Act of 2022	The act is implemented in five years with a total amount of 280 billion US dollars. Its core content is to solve the domestic chip security problems in the United States, promote the development of the domestic chip industry through domestic subsidies, and then curb the development of the chip industry in China and other countries.

Second, the United States block technology exports to China. First, the

¹⁵¹ Wang Congyue. The technological confrontation between China and the United States: the front and core of the Sino-US strategic game // World Politics. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

United States provided a legal basis and institutional guarantee for strict control of technology exports to China through legislation and administrative order. Then the United States expanded the scope of technology control and increased the punishment of entities that violated the control system. Finally, the United States has put more and more Chinese science and technology entities on its "entity list" and "military-related list". Due to the regulations of the United States, the export, re-export and transfer to the entities listed in the "Entity List" and "Military List" must be licensed by the Bureau of Industry and Security (BIS) of the United States Department of Commerce.¹⁵² If an entity is listed in the these lists of the United States, it is basically equivalent to the fact that the United States has cut off all transactions between them and American suppliers. By the end of 2022, the United States government has banned the export of more than 600 Chinese enterprises and groups in principle.¹⁵³

Third, the United States restricts the entry of Chinese capital, technology and researchers. According to G. Alicia, "the free flow of investment has also been limited, especially as regards technology. This is particularly the case of the US, after the reform of its Committee on Foreign Investment in the United States Committee (CFIUS), with the intent to block an increasing amount of China's M&A into US, especially on the high-end industrial sector."¹⁵⁴ In March 2018, the Trump government launched the trade war

¹⁵² Ibid.

¹⁵³ Entity List reflects gap between US and reality: China Daily editorial. [Electronic resource] // CHINADAILY. URL:

<https://www.chinadaily.com.cn/a/202208/24/WS6305fdaaa310fd2b29e7409f.html>

¹⁵⁴ Macro View of US-China Tech Competition: Where Are We and What to Expect? [Electronic resource] // Russia in Global Affairs. URL: <https://eng.globalaffairs.ru/articles/us-china-tech-competition/>

against China. In August, the United States Congress formally reviewed and passed the latest version of the *Foreign Investment Risk Review Modernization Act*. The new act expands the jurisdiction of CFIUS, extends the review period, and introduces the "filing" procedure that force certain transactions to be filed. The reform of the foreign capital review mechanism in the United States is considered to be mainly aimed at Chinese enterprises investing in the United States. In the same year, the US Department of Defense also released a research report entitled *China's Technology Transfer Strategy*, which asked the government to be vigilant about the risk that China's investment in US technology (including venture capital and start-up technology company financing) might cause the transfer of US key technologies to China.¹⁵⁵ Then, for reasons of national security, the US government banned the technological products of Chinese enterprises from entering the US market. In 2018, when the Sino-US trade war was in the heat, the Trump government announced that it would not allow Chinese technology companies such as Huawei and ZTE to enter the U.S. telecommunications market. The official reason is still to maintain the national security of the United States. In March 2021, the U.S. Federal Communications Commission (FCC) designated Huawei, ZTE and other Chinese companies as "threats to the U.S. national security". On November of the same year, the American president formally signed the *Security Equipment Act*, trying to completely prevent the communication equipment of Huawei, ZTE and other Chinese companies from entering the United States telecommunications network. Finally, the United States also used various administrative means to restrict the normal flow of Chinese experts,

¹⁵⁵ Brown M., Singh P. China's technology transfer strategy. // Silicon Valley, CA: Defense Innovation Unit Experimental Report. – 2018.

scholars, students and other scientific researchers on the grounds of national security.¹⁵⁶ In June 2018, the Trump government formally revised the previous visa provisions for Chinese students and scholars, changing the visa period for some students majoring in natural science and technology from 5 years to 1 year. In July 2021, the Biden administration even refused the visas of 500 Chinese students at one time.

Fourth, the US has targeted China's leading tech companies. According to A. Kennedy and D. Lim, in addition to introducing advanced technology from the outside by means of trade and acquisition, emerging countries can also take the lead in technology through their own efforts.¹⁵⁷ As China's leading private enterprise in the field of the fourth technological revolution, Huawei's cutting-edge technological strength is obvious to all, especially in the field of the 5G technology. However, the success of Huawei and other Chinese enterprises has also led the United States to target these representative technology-leading enterprises. First, the United States has strengthened export controls on Chinese technology companies and launched a series of investigations and sanctions against them. Moreover, the US has also blocked Chinese companies from entering its markets and those of its allies. For example, after the Trump government announced that Huawei was prohibited from participating in the construction of its 5G network communications, Australia announced in July 2018 that Huawei was prohibited from participating in the construction of its 5G network. Subsequently, the United States government began to exert pressure on Canada, the United Kingdom, New Zealand,

¹⁵⁶ Biden Keeps Costly Trump Visa Policy Denying Chinese Grad Students. [Electronic resource] // Forbes. URL: <https://www.forbes.com/sites/stuartanderson/2021/08/10/biden-keeps-costly-trump-visa-policy-denying-chinese-grad-students/?sh=37b906836419>

¹⁵⁷ Kennedy, A. B., Lim, D. J. The Innovation Imperative: Technology and US–China Rivalry in the Twenty-First Century // *International Affairs*. – 2018. – Vol.94. – No.3. – pp.553–572.

Germany and other countries to join the United States and Australia in blocking the Chinese telecommunication network equipment manufacturers represented by Huawei. Besides, the US has also taken some "dirty" measures to deal with Huawei, except for controlling technology exports and blocking the market. The CFO of Huawei, Meng Wanzhou, was detained at Vancouver airport on 1 December 2018 at the request of the U.S.¹⁵⁸ She was then illegally detained by the Canadian government for more than 1,000 days. This event caused a great international backlash.

Fifth, in addition to taking a series of measures to weaken China's scientific and technological strength, the United States has also increased its absolute power in the global scientific and technological landscape by promoting the reform of its domestic scientific and technological system, increasing investment in scientific research, revitalizing the semiconductor industry, and promoting the construction 5G networks. After the Biden administration came to power, the United States also tried to maintain and expand its leading position in the field of science and technology through "self-innovation" and "self-improvement". For example, the *Innovation and Competition Act* passed in June 2021 aimed to allocate \$200 billion to strengthen the U.S. science, technology, and research.¹⁵⁹ In addition, in the 2023 federal budget, the Biden government increased federal budget on research and development to \$191 billion, up 12.7% from 2022.¹⁶⁰

¹⁵⁸ What is known about Huawei CFO Meng Wanzhou's case. [Electronic resource] // TASS. URL: <https://tass.ru/info/7558965>

¹⁵⁹ Senate passes massive bipartisan bill to combat China's growing economic influence. [Electronic resource] // CNN. URL: <https://edition.cnn.com/2021/06/08/politics/bipartisan-bill-vote-china-competitiveness/index.html>

¹⁶⁰ Federal Budget Authority for R&D and R&D Plant for National Defense and Civilian Functions

In general, during the Trump administration, the United States suppressed China mainly by restricting technical exchanges, while under the Biden administration, the United States placed more emphasis on increasing its own power and cooperation with allies.

2.2.3. Comparative advantages of China and the United States in the Sino-US technological confrontation

On the one hand, the United States leads the way in basic research, core and key technologies, original innovations, and cutting-edge technological innovations.

First, the United States has a distinct first-mover advantage, leading or even monopolizing in many areas. In terms of hardware, US semiconductor companies, such as Intel, AMD, NVIDIA, Qualcomm, hold 46% of the global market share in 2021.¹⁶¹ The United States has a monopoly advantage in chip technology and operating systems. In contrast, China has been heavily dependent on chip imports, with a trade deficit of \$261.7 billion in integrated circuits in 2022.¹⁶² In terms of software, US operating systems, such as Microsoft, Android, IOS, hold almost 98% of the market share of both computers and mobile devices, which is absolute dominance.¹⁶³ In addition, the United States is far ahead of China in research and development and data storage. In short, the United States has built a technological system from software to hardware.

Totaled \$191 billion in FY 2023 Proposed Budget. [Electronic resource] // NCSES. URL: <https://nces.nsf.gov/pubs/nsf23323>

¹⁶¹ 2022 SIA Factbook. [Electronic resource] // SIA. URL: https://www.semiconductors.org/wp-content/uploads/2022/05/SIA-2022-Factbook_May-2022.pdf

¹⁶² How were chips sold in China in 2022? The official release of this data by Customs. [Electronic resource] // Tencent. URL: <https://new.qq.com/rain/a/20230115A0003K0>

¹⁶³ Operating System Market Share Worldwide. [Electronic resource] // Statcounter GlobalStats. URL: <https://gs.statcounter.com/os-market-share>

Second, the United States has dominated the development of international technical standards in recent decades and has formed a systematic market advantage with great discourse power. The degree of participation and leadership in the development of international technological standards is the embodiment of the level of technological innovation and technological competitiveness of the state.¹⁶⁴ In the past, Western countries have tightly controlled the setting of international technical standards to support global markets. On the contrary, China has become a late participant in the development of international technical standards, and in the process of participation, it often encounters obstacles set by the United States and other countries.

Third, the United States is the world's largest center of scientific and technological innovation, with the largest number of leading technology companies in the world, such as Apple, Google, Microsoft and so on. The top 10 global technology companies by market capitalization include the United States and China, but the United States holds eight of them while China has only two.¹⁶⁵

Fourth, the United States has an established system of higher education and research and leading technology companies that attract the best specialists from around the world. Moreover, the United States has provided them with a strong system of incentives and protection, as well as a relaxed and free environment for innovation and entrepreneurship. On the other hand, in China, due to the intensity of research work, low

¹⁶⁴ Sino-US strategic competition in technology: analysis and prospects. [Electronic resource] // US-China Perceptions Monitor. URL: http://www.uscnpm.com/model_item.html?action=view&table=article&id=27016

¹⁶⁵ Wang Congyue. The technological confrontation between China and the United States: the front and core of the Sino-US strategic game // World Politics. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

salaries of researchers, lack of political incentives and other factors, many specialists with higher education are unwilling to engage in scientific and technical work, which leads to a shortage of talented people in the field of high technology.

On the other hand, China also has its advantages in this technological confrontation.

First, the huge size of the Chinese market creates the conditions for technological innovation. China is an important trading partner and export market for the United States. For instance, the Annual Report of the U.S. Semiconductor Industry Association (SIA) shows that global sales of semiconductor chips reached a record level of 555.9 billion dollars in 2021, which is 26.2% more than in 2020. China remained the world's largest market with a volume of 192.5 billion dollars and accounted for 34.6% of the global figure.¹⁶⁶ Thus, the technological "decoupling" will block the supply of technology to China and at the same time deprive American companies of the Chinese market.¹⁶⁷ In addition, intelligent technologies associated with the 4IR require large-scale data collection and application, so data resources have become an important strategic resource and the main innovation factor of the country. China's huge population and scale of use have accumulated huge data for research and innovation of new technologies, creating a rich variety of application scenarios.¹⁶⁸

¹⁶⁶ 2022 SIA Factbook. [Electronic resource] // SIA. URL: https://www.semiconductors.org/wp-content/uploads/2022/05/SIA-2022-Factbook_May-2022.pdf

¹⁶⁷ Tech war: US chip equipment makers calculate revenue losses in the billions after Washington's curbs on China exports. [Electronic resource] // South China Morning Post. URL: <https://www.scmp.com/tech/tech-war/article/3196597/tech-war-us-chip-equipment-makers-calculate-revenue-losses-billions-after-washingtons-curbs-china>

¹⁶⁸ Wang Congyue. The technological confrontation between China and the United States: the front and core of the Sino-US strategic game // World Politics. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–

Second, China continues to increase its investment in scientific research in order to narrow the gap with the United States. In 1991, China spent only 0.72% of its GDP on research and development, compared to 2.6% in the United States at the time. But by 2020, China has spent 2.4% of its GDP on research and development, close to 3.4% in the United States.¹⁶⁹ According to the latest research report of the Aspen Institute, China's R&D spending has grown rapidly and steadily since 2000 and is expected to surpass that of the United States by 2025. At the same time, the United States is underinvesting in scientific innovation while recent R&D spending (% of GDP) is at its lowest level in 60 years.¹⁷⁰

Third, China has an effective institutional advantage and political environment. China attaches great importance to science and technology and creates a favorable policy environment for scientific and technological innovation. In recent years, China has released policy papers such as *Made in China 2025* and *13th Five-Year Plan for National Science and Technology Innovation* to support the scientific and technological innovation of social enterprises and focus on key projects. In addition, China also pays close attention to the advanced fields of science and technology, vigorously supports and promotes the technology related to the 4IR at the national level, such as the release of the *New Generation Artificial Intelligence Development Plan* in 2017.¹⁷¹ The advantage of socialism with Chinese characteristics lies in the concentration

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¹⁶⁹ Gross domestic spending on R&D. [Electronic resource] // OECD. URL: <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>

¹⁷⁰ 14 Facts about US Investments in Infrastructure and R&D. [Electronic resource] // ASPEN. URL: <https://www.economicstrategygroup.org/publication/14-facts-about-us-investments/>

¹⁷¹ Wang Congyue. The technological confrontation between China and the United States: the front and

of all forces for major affairs. Thus, China is able to coordinate resources from all sides to overcome scientific and technical difficulties.¹⁷²

Despite the above advantages, China still faces many problems and challenges in the technological confrontation. For example: how to create own innovation system; how to break the US technological blockade; how to deal with the economic downturn; how to increase the economic benefits of scientific research results and so on.¹⁷³ There is still a big gap in science and technology between China and the United States.

2.2.4. The global impact of the technological confrontation between China and the United States

Scientific and technological innovation is an important driver of human development. On the contrary, scientific and technological confrontation will have negative consequences for the international community.

First, the Sino-American technological confrontation will exacerbate already serious international conflicts and cause geopolitical crises. The technological revolution of the 20th century further strengthened the influence of science and technology on global politics and economics. In the period of a new technological revolution, artificial intelligence is a key factor that will affect the geopolitical and military power of the state

core of the Sino-US strategic game // *World Politics*. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

¹⁷² He Zili. Institutional Advantages of the Chinese Model in 70 Years of Development // *China Economic Transition*. – 2020. – No. 3. – pp. 44–51.

¹⁷³ Wang Congyue. The technological confrontation between China and the United States: the front and core of the Sino-US strategic game // *World Politics*. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

in the coming decades. The arms race of smart weapons has begun and will affect the direction of development of these technologies.¹⁷⁴ As competition between China and the United States in science and technology intensifies, technology is being used as a means and instrument of strategic rivalry. Under the strong impetus of the U.S. government, more and more countries are becoming involved in this technological confrontation.¹⁷⁵

Second, the Sino-US technological confrontation will cause a regression of globalization. Globalization has closely linked the trade of all countries, and an international division of labor has gradually formed. Therefore, globalization has indeed made the world a more efficient place, dramatically increasing productivity, and raising human civilization to a new level. However, the Sino-American technological confrontation has disrupted the structure of the global industrial chain and prevented the free circulation of intermediate products between countries.¹⁷⁶

Third, the Sino-US technological confrontation will accelerate the formation of technological bipolarity. One of the unavoidable consequences of the current technological "decoupling" promoted by the United States is that China seeks scientific and technological independence, thus forming the other technological camp. Some backward countries will be forced to choose between China and the United States. Currently, the United States is planning to form a technology alliance with "a coalition of democratic countries" in an attempt to compete with, or even confront, China in the field

¹⁷⁴ AHEAD: AI-NATIONALISM AND AI-NATIONALISATION [Electronic resource] // RIAC. URL: <https://russiancouncil.ru/ai>

¹⁷⁵ Ling Shengli, Luo Jingyu. The Biden administration's technology alliance: motivation, content and challenges. // International Forum. – 2021. – No. 6. – pp. 3–25.

¹⁷⁶ Liu Ru. Global Influence and Countermeasures of the China-US High Technology Divide. // China Scitechnology Think Tank. – 2020. – No. 11. – pp. 11–13.

of science and technology. The technology alliance would cooperate on telecommunications technology development and block the sale of advanced semiconductor technology to China.¹⁷⁷ On the other hand, due to the impact of China's "the Belt and Road" strategy and "Smart City" policy, the technological path pursued by more than 40 emerging countries is becoming dependent on China's technology and standards.¹⁷⁸

Fourth, the Sino-US technological confrontation has led the government-led technological competition to replace the market competition. Besides, the confrontation has made more and more countries realize that if they want to gain the advantage, they need to use the country power. Therefore, the government has come to the front from behind. The government has issued a series of development strategies and put forward development plans for specific industries, which means that the competition rules have changed fundamentally. They are no longer dominated by enterprises and market-oriented, but government participation. National security interests are paramount, and technological competition has also risen from enterprises to countries. For example, China issued *Made in China 2025* in 2016; In 2017, *Development Planning for a New Generation of Artificial Intelligence* was released. In 2019, the government of the Russian Federation approved a new state program *Scientific and technological development of the Russian Federation* and issued the *National Strategy for the Development of Artificial Intelligence for the period until 2030* in the same year. In 2018, the United States

¹⁷⁷ Is smoke rising everywhere? The Prerequisites, Principles, and Direction of Biden's Science and Technology Policy. [Electronic resource] // Fudan Development Institute. URL: <https://fddi.fudan.edu.cn/36/11/c21253a275985/page.htm>

¹⁷⁸ China-US tech war puts rest of the world in a fix. [Electronic resource] // Financial Review. URL: <https://www.afr.com/chanticleer/china-us-tech-war-puts-rest-of-the-world-in-a-fix-20221021-p5brtf>

announced the establishment of the Select Committee on Artificial Intelligence, and the Ministry of Defense established a joint artificial intelligence center. Besides, the American AI Initiative was launched in 2019.

Fifth, the Sino-US technological confrontation will further increase the technological gap between the countries. The new technological revolution will greatly increase the world's wealth, but the distribution of wealth among countries will be more unequal, with the countries that are leaders in science and technology benefiting more. In addition, the widespread use of new technologies will fill the shortage of human resources in developed countries, and, on the contrary, the "Demographic Dividend" of developing countries will disappear. Moreover, the leading countries in the field of science and technology will hinder the development of backward countries through technological restrictions, sanctions and other means. Finally, the leading countries in the field of science and technology are more attractive for intellectual resources and capital.¹⁷⁹

Conclusions of the second chapter

On the one hand, after the global financial crisis in 2008, the concept of "Thucydides Trap" was applied to the analysis of Sino-US relations. In recent years, with the increasing competition between China and the United States, there has been increasing discussion about the "Thucydides trap". G. Allison proposed three objective conditions for the relationship between the two countries to fall into the "Thucydides trap". At present, with the continuous improvement of China's comprehensive national strength, the power gap between China and the United States is narrowing, forming the bipolar

¹⁷⁹ Wang Congyue. The technological confrontation between China and the United States: the front and core of the Sino-US strategic game // World Politics. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

structure of the international system. Therefore, the United States has changed its view of China and adjusted its strategy towards China. What's more, the United States regards China as its main competitor in several documents and adopts policies to suppress and contain China, in an attempt to delay China's rapid rise. Therefore, it can be concluded that Sino-US relations have fallen into the "Thucydides trap". In fact, modern wars, such as trade wars, technological wars, public opinion wars, and network information wars, have broken out between China and the United States. Among them, the fiercest and most central is the technological confrontation.

On the other hand, the new technological revolution and the increasingly fierce competition in the global high-tech market have increased their importance in the geopolitical conflicts between China and the United States, and more generally in international relations. At present, scientific and technological competition has become the front and core of the strategic competition between China and the United States. It is predictable that high technology will become the dominator of the world economy and military power in the future.¹⁸⁰ In 2019, Russian President Vladimir Putin, when attending the first international conference on *Journey of artificial intelligence*, said that "artificial intelligence has great potential, whoever can master it will stand out, develop forward and gain huge competitive advantages."¹⁸¹ This reflects that the international community generally regards scientific and technological development as a zero sum competition. Applying traditional geopolitical means to high-tech fields will not only reduce the potential of global scientific and technological development, and affect the normal

¹⁸⁰ Ibid.

¹⁸¹ Conference on Artificial Intelligence. [Electronic resource] // President of Russia. URL: <http://www.kremlin.ru/events/president/news/62003>

operation mechanism of globalization, but will also cause potential international conflicts.

CHAPTER 3. RUSSIAN FACTORS IN SINO-US TECHNOLOGICAL

CONFRONTATION

3.1. The theory of "strategic triangle"

In international relations, there is a phenomenon of interaction of three actors, which is usually called the triangle relationship. M. White, a British scientist, discussed the triangle relationship in his book *The System of States*, published in 1977. He studied the triangle relationship from a historical point of view in one chapter.¹⁸² L. Dittmer, an American scientist, developed the "strategic triangle" theory in the early 1980s. The "strategic triangle" provides a clear trigonometric logic to our analysis and, more importantly, emphasizes the national interests of the participants (defined primarily in terms of national security and welfare). The "strategic triangle" considers the relationship between three sovereign states as an indivisible whole, and any actor is important enough for the other two, so that any change in the relationship between them will affect the interests of a third party. Moreover, the foreign policy of any of the three actors in relation to the second can be carried out either out of antagonism against the third, or as a result of relations with the third. L. Dittmer analyzes the "strategic triangle" using the point of view of game theory. He believes that the "strategic triangle" can be understood as an exchange game between three participants. L. Dittmer describes four possible configurations of the triangle: the "unit-veto triangle", which implies mutual antagonism between the three parties; the "stable marriage" - positive relations between two parties, each of which has a negative attitude towards the third; the "romantic triangle" - there is

¹⁸² Wight M., *Systems of States*. – Leicester: Leicester University Press, 1977. – 232 p.

a core "player" that has positive ties with two others, which in turn are weakly connected with each other or are in a state of hostility; the "triple alliance" - a strong positive relationship between the three parties (See Figure 10).¹⁸³

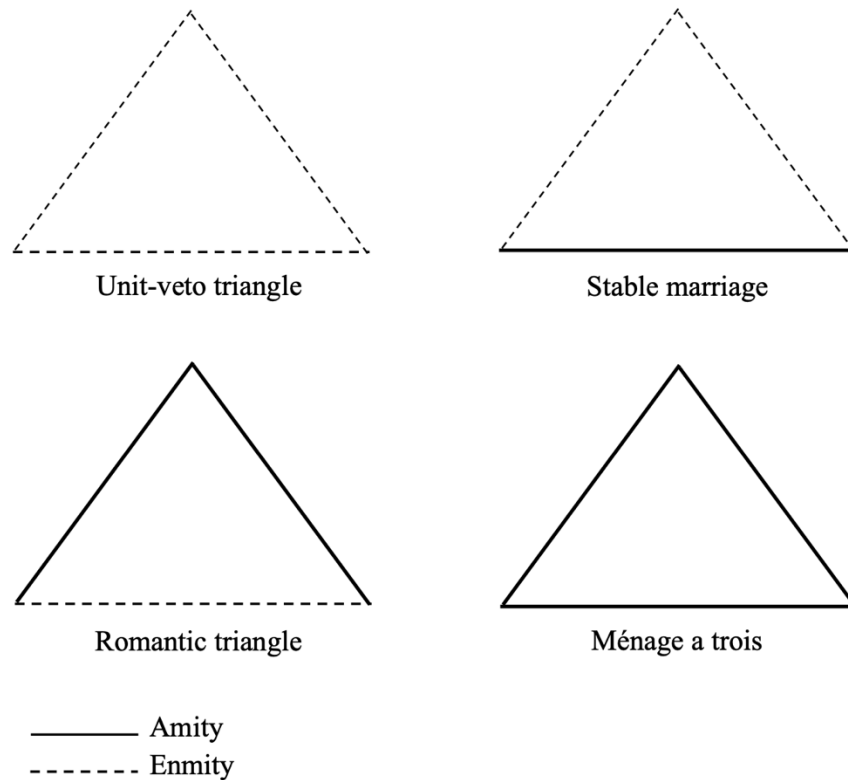


Figure 10. **Diagram of the "Strategic triangle"**

China, Russia and the United States are the three most active geopolitical actors on the international stage today. With the recovery of Russia's power and the accelerated rise of China, discussions on the "strategic triangle" between China, the United States and Russia have heated up again. On the one hand, the United States has simultaneously adopted a "dual containment" policy against China and Russia, which has expanded the areas of containment and increased its intensity. In December 2017, the Trump administration published its first *National Security Strategy* since taking office,

¹⁸³ Dittmer L., The Strategic Triangle: An Elementary Game-Theoretical Analysis. // World Politics. – 1981. – Vol. 33. – No. 4. – pp. 485–515.

positioning China and Russia as rival powers of the United States.¹⁸⁴ On the other hand, China and Russia are each other's most important strategic partners of cooperation. The deepening of the comprehensive strategic partnership of cooperation between China and Russia is a global diplomatic and foreign policy priority for both countries. At present, science and technology confrontation has become the front and core of Sino-US strategic competition. In addition, Russia has long been a player in the technology game. In recent years, a considerable part of the sanctions launched by the United States against Russia are technology sanctions. It can be said that the technological confrontation between the United States and Russia has already started, but the intensity is relatively low. If the United States and the Soviet Union began to contend for space during the Cold War, the history of scientific and technological rivalry between the US and the Soviet Union is even longer. China, the United States and Russia have cooperated in climate, energy, anti-terrorism, and other fields. However, with the outbreak of the Ukraine crisis and the deterioration of Sino-US relations, these limited areas of cooperation are difficult to play a positive role in improving relations between countries. Therefore, the current triangular relationship between China, the United States and Russia is more like a "stable marriage" relationship in the "strategic triangle" theory, that is, the United States confronts China and Russia at the same time, while China and Russia maintain a close relationship.

3.2.The confrontation between China and the United States from the perspective of Russia

In today's Sino-US-Russian triangular relationship, Russia is in the position

¹⁸⁴ National Security Strategy of the United States of America. [Electronic resource] // The White House. URL: <https://trumpwhitehouse.archives.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf>

of China during the Cold War. Due to the formation of the bipolar structure of the international system, the Sino-US issue has risen to the focus and core of the triangular relationship and become the basic background for the three countries to consider their mutual relations and policies. In this context, Russia will achieve greater diplomatic flexibility to balance China and the United States.¹⁸⁵ Since there are more connections between China and the United States than that between the United States and the Soviet Union, Russia has become a stabilizer in the new bipolar structure.¹⁸⁶ In addition, during the Cold War, the Soviet Union and the United States were competing technological powers, and there was a "Sputnik" highlight moment. Under this historical inheritance, Russia has a very clear understanding of the importance of scientific and technological development and has continuously introduced scientific and technological development strategies and reform measures. V. Putin has promoted the development of science and technology to the height of national sovereignty and security. What's more, as a participant in the Cold War, Russia has a unique understanding of the bipolar structure of the international system and the experience of competing with the United States. Therefore, it is of great significance to study Sino-US confrontation from the perspective of Russia.

3.2.1. Russia's views on whether the US-China conflict is a new Cold War

As a participant in the US-Soviet Cold War, Russia still has divided views on whether the Sino-US conflict is a new Cold War.

¹⁸⁵ Bi Hongye. "Strategic Triangle" or "Trilateral Interaction": Defining China-US-Russia relations in the new era // *International Review*. – 2022. – No. 3. – pp. 127–156.

¹⁸⁶ *Ibid.* – p.131.

On the one hand, some Russian experts do not believe that Sino-US relations are heading towards a new Cold War. V. Kashin and I. Timofeev believe that although Sino-US competition has intensified rapidly in the past few years, its limit has not yet been reached. There has not been any fundamental change in the U.S. policy. The United States still regards China as its main competitor, and military, technological and political deterrence will remain an important part of the U.S. foreign policy. Nor is China inclined to export its own ideological model and become openly involved in confrontation with the United States. Not only that, but China has not built an alliance against the West. China and Russia do not have a military-political alliance although their partnership is deep and the level of trust is unprecedentedly high. Moreover, China and the United States also maintain close economic ties, and American Allies are reluctant to take sides in a conflict because of China's market and trade links.¹⁸⁷ According to A. Dunkin, the bipolarity of the 21st century will be asymmetric, not as unambiguous as in the last century. Russia will form a strategic balance with the United States, while China and the United States will maintain an economic balance.¹⁸⁸ S. Lukonin and V. Petrovsky analyzed the differences between the Sino-US conflict and the US-Soviet Cold War from the perspective of globalization. Lukonin argues that during the Cold War between the United States and the Soviet Union, globalization had not yet emerged, and the Soviet Union had not yet integrated into the international economic system. However, today's world is deeply integrated, and globalization is developing rapidly. China has long been

¹⁸⁷ US-China Relations: Moving Towards a New Cold War? [Electronic resource] // RIAC. URL: <https://russiancouncil.ru/en/analytics-and-comments/analytics/us-china-relations-moving-towards-a-new-cold-war/>

¹⁸⁸ Head of IMEMO RAS: confrontation between the U.S. and China will become the main thing in the post-pandemic world. [Electronic resource] // TASS. URL: <https://tass.ru/interviews/8936527>

deeply integrated into the world economic system. Therefore, China is unwilling to start a full-scale confrontation with the United States and prefers to choose the middle path between confrontation and cooperation.¹⁸⁹ Petrovsky emphasized that the attempt to create an anti-Chinese alliance is an obvious strategic miscalculation and is obviously doomed to failure. And the U.S. attempt will even be opposed by its allies first because no one wants to sacrifice the benefits of pragmatic trade and economic cooperation with China.¹⁹⁰

On the other hand, some Russian scholars believe that the essence of the Sino-US conflict is the new Cold War. V. Nikonov believes that the United States launched the Cold War to maintain and consolidate its global dominance and position at the top of the global food chain by preventing the rise and destruction of alternative power centers. Although China's strategic culture is to avoid conflicts, and the highest level of a commander is not to win the battlefield, but to win without fighting, but in the face of conflicts imposed by the United States, China will not evade.¹⁹¹ A. Romanov said that Sino-US relations are rapidly and irreversibly deteriorating. Moreover, following the announcement of the *U.S. strategic approach toward China* in April 2020, group thinking with the spirit of the Cold War is returning. And China is currently concentrating and accumulating potential for long-term competition with the United States.¹⁹² There are also

¹⁸⁹ It's impossible to make China repeat the fate of the USSR. [Electronic resource] // Interfax. URL: <https://www.interfax.ru/world/720050>

¹⁹⁰ M. Pompeo's Speech: The Beginning of the U.S.-China Cold War? [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/27009>

¹⁹¹ Cold War 2.0? But is the first one over? [Electronic resource] // Nezavisimaya. URL: https://www.ng.ru/ideas/2020-10-22/6_7997_coldwar.html

¹⁹² China-US Conflict: A Second Cold War Threat? [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/26601>

some Russian scholars who believe that the essence of this round of Sino-US conflict is that the United States is trying to maintain its hegemony by suppressing China, which is exactly the same as the practice of suppressing the Soviet Union. Thus, the U.S. policy of "comprehensive containment" toward China is a symbol of the new Cold War.

3.2.2. Russia's position in the Sino-US conflict

On the one side, due to the deep-rooted structural contradictions in Russia-US relations, some Russian scholars believe that cooperation with China should be strengthened and should fight against the United States together with China. This is also the theme of China-Russia relations. A. Maslov argues that, in this situation, the role of Russia is very important, because, it would seem, it makes no sense for Russia to be drawn into the confrontation between China and the United States. But at least two camps are forming. The United States is building its own globalisation to the exclusion of a range of countries such as China and Russia. Therefore, Russia must not only side with China against the U.S., but also come up with its own concept, global vision and enlist the support of many countries.¹⁹³ The Russian politician also believes that Sino-US technological confrontation can bring opportunities for Sino-Russian technological cooperation.¹⁹⁴ According to V. Petrovsky, 2022 will be a particularly difficult and important year for Russian diplomacy, which has shown that China is one of Russia's most reliable partners. The leaders of the two countries also stated that China-Russia relations are at the best level in history and are a model of cooperation between major countries in the 21st century. Of course, Sino-Russian relations still need to bear external

¹⁹³ Alexey Maslov: The U.S. will create a new concept of globalization. [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/27022>

¹⁹⁴ The specter of Chinese Communism has reached America. [Electronic resource] // Nezavisimaya. URL: https://www.ng.ru/economics/2020-07-20/4_7915_china.html

pressure. But the Sino-Russian strategic partnership is able to meet any challenge, mutually strengthen our countries, ensure the protection and promotion of our national interests.¹⁹⁵ Y. Tavrovsky pointed out that both Russia and China are major powers with global influence and strengthening strategic coordination and mutually beneficial cooperation between the two countries is not only of great significance to the development of bilateral relations, but also will strengthen global and regional peace and stability.¹⁹⁶

On the other side, some Russian scholars also believe that Russia should adopt a more flexible policy in the Sino-US conflict and keep a distance from China on some issues in order to maximize its own interests. In 2019, at the St. Petersburg International Economic Forum, Russian President V. Putin cited the Chinese proverb "When tigers fight in a valley, a smart monkey sits and watches how it ends" in response to a question about Russia's place in the trade war between China and the United States.¹⁹⁷ Similarly, I. Danilin argues that the contest for scientific and technological leadership between China and the United States has already begun. Russia should not be drawn into this economic and technological confrontation but take sides when the outcome is decided.¹⁹⁸ A. Selenko also supports this view, arguing that Russia should not be a party

¹⁹⁵ Russian-Chinese Relations in the world context 2022-2023. [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/38470>

¹⁹⁶ Russian Scholar: Russian-Chinese Cooperation Brings More Stability to the World. [Electronic resource] // China daily. URL: <https://cn.chinadaily.com.cn/a/202303/20/WS641821a1a3102ada8b234659.html>

¹⁹⁷ Putin responded with Chinese wisdom to the US-China trade wars. [Electronic resource] // RG.RU. URL: <https://rg.ru/2019/06/07/putin-otvetil-kitajskoj-mudrostiu-na-torgovye-vojny-ssha-i-kitaia.html>

¹⁹⁸ The U.S. and China: War for Technological Leadership. [Electronic resource] // RIAC. URL: https://russiancouncil.ru/analytics-and-comments/interview/ssha-i-kitay-voyna-za-status-tekhnologicheskogo-lidera/?sphrase_id=97346284.

to the conflict, but needs the most elegant and flexible foreign policy course. Moreover, the conflict has opened up new strategic opportunities for Russia. In some cases, Russia would act as an ideal mediator.¹⁹⁹ In addition, according to A. Torkunov, the relationship between the United States and China is currently extremely ideological. Russia needs to keep a distance from China and take a restrained stance on some policy issues, because Chinese and Russian interests have not always aligned.²⁰⁰ A. Arbatov also held a similar view, believing that in view of the history of two countries, Russia should grasp the distance from China and cannot rush from one extreme to another — from the biggest threat in the world to a strategic alliance. Besides, Russia should develop relations with all parties in a balanced manner.²⁰¹

3.3.Sino-Russian technological cooperation

Global technological competition is now becoming increasingly fierce, and competition between countries around technological power has become an important manifestation of the competition of comprehensive national strength. China and Russia have great scientific and technological potential. They have a rich history of technological cooperation and a high level of political mutual trust. In 2019, the China-Russia Comprehensive Strategic Coordination Partnership has entered a new era. Scientific and

¹⁹⁹ "The Role of the Wise Monkey. Political scientist Serenko on Russia's position in the confrontation between the U.S. and China. [Electronic resource] // Rambler. URL: <https://news.rambler.ru/other/44114330-rol-mudroy-obezyany-politolog-serenko-o-pozitsii-rossii-v-protivostoyanii-ssha-i-kitaya/>

²⁰⁰ China-US Conflict: A Second Cold War Threat? [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/26601>

²⁰¹ The emergence of a new bipolarity promises a threat to Russia, Moscow must be an independent center of power - experts. [Electronic resource] // Interfax. URL: <https://www.interfax.ru/presscenter/710923>

technological cooperation is seen as a key pillar of this partnership and one of the most promising areas of cooperation.

3.3.1. History of Sino-Russian technological cooperation

Sino-Russian cooperation in technological innovation has a long history and rich content and has made great contributions to the economic construction and the improvement of technological level of the two countries. Sino-Russian technological cooperation can be divided into the following periods:

1. "Honeymoon" period (1949–1960). The intergovernmental technological innovation cooperation between China and Russia can be traced back to the beginning of the founding of the People's Republic of China. The Soviet Union provided substantial assistance in the early stages of the development of Chinese science and technology, including the provision of equipment, technology, and expertise to Chinese enterprises. At the same time, thousands of Chinese undergraduate and graduate students were studying in Soviet universities, and many highly qualified Soviet specialists were also working in China. In October 1954, *The Convention on Science and Technology Cooperation* was signed, which provided for the exchange of experience between the two countries in all sectors of the economy and the gratuitous transfer of scientific and technical documentation.²⁰² Based on the agreement, a Sino-Soviet commission on scientific and technical cooperation was established. In 1957, the PRC and the USSR formally signed *The Agreement on New Technologies for National Defense*, in which the USSR pledged to help China create an integrated nuclear industry, as well as assist in the

²⁰² B. N. Kuzyk, M. L. Titarenko. *China - Russia 2050. Co-Development Strategy*. – Moscow: Institute for Economic Strategies, 2006. – 442 p.

production of an atomic bomb.²⁰³ Therefore, in the 1950s, the USSR provided enormous assistance to the PRC in terms of technology, equipment, materials, training, and funds.

2. "Rupture" period (1960–1982). At the end of the 1950s, China and the Soviet Union began to have principled differences in national interests, principles, policies and other aspects, and gradually moved towards confrontation. In July 1960, the Soviet government unilaterally recalled all experts in China and stopped the supply of equipment and materials. The technological cooperation between the two sides contracted sharply. In the following years, technological cooperation between the two countries was completely interrupted. China had to redouble its efforts to strengthen China's economic, military, and technological strength by adopting an autarkic development strategy. However, the "Cultural Revolution" that took place from 1966 to 1976 has brought serious damage to China's economic construction and technological development.

3. Period of "perestroika" (1982–1991). In the 1980s, with the warming of Sino-Soviet relations, technological exchanges between the two countries also recovered. In December 1984, China and the Soviet Union signed *The Agreement on Economic and Technological Cooperation*. In 1988 and 1989, the two countries respectively held "Days of Science and Technology" in Beijing and Moscow. Sino-Soviet scientific and technological cooperation shows a clear upward trend.²⁰⁴ From May 15 to 18, 1989, General Secretary of the Central Committee of the Communist Party of the Soviet Union M. Gorbachev visited China and held talks with Deng Xiaoping and other Chinese leaders. After the talks, the two countries issued *The Sino-Soviet Joint Communiqué*, which

²⁰³ Li G., Fan T. Soviet Assistance to China in the Development of nuclear weapons in the 1950s // *Voprosy of History*. – 2012. – No. 11. – pp. 132–136.

²⁰⁴ Li Ziguo, Li Yan. China-Russia Science and Technology Diplomacy and Practice // *Academic Journal of Russian Studies*. – 2021. – No. 4. – pp. 53–74.

marked the normalization of Sino-Soviet relations. China and the Soviet Union decided to develop relations actively and systematically in the fields of economy, trade, science and technology, and culture.

4. "Rapid development" period (1992-2018). After the collapse of the Soviet Union, the Sino-Soviet technological cooperation relationship was replaced by the Sino-Russian technological cooperation relationship. Sino-Russian technological cooperation has entered the track of rapid development. In 1992, the two countries signed *The Sino-Russian Agreement on Science and Technology Cooperation*. In 1996, with the establishment of the Sino-Russian strategic partnership of cooperation, the two sides began to build a safeguard mechanism. In order to better play the role of scientific and technological cooperation in promoting the Sino-Russian strategic partnership, in June 1997, China and Russia formally decided to establish a subcommittee on scientific and technological cooperation within the Committee of Regular Meetings of Sino-Russian Prime Ministers, which is responsible for unified coordination and management of scientific and technical cooperation between China and Russia.²⁰⁵ In the following years, China and Russia have successively signed a series of cooperation documents, such as *The Memorandum of Understanding on Cooperation in the Field of Innovation* in 2000 and 2016, *The Treaty of Good-Neighborliness and Friendly Cooperation Between the People's Republic of China and the Russian Federation* in 2001, *The Memorandum of Understanding on Digital Development* in 2019, etc. forming some key cooperation directions in the field of technological innovation. First, in Sino-Russian technological cooperation, some large-scale cooperation projects led and participated by the state play

²⁰⁵ Sun Wanhu. Sino-Russian Scientific and Technical Cooperation on the Threshold of a New Century and a New Era // Russia, Eastern European & Central Asia Studies. – 2005. – No. 1. – pp. 85–87.

the most important role, such as successful cooperation in the nuclear and aerospace fields. Second, technology parks are important carriers of technological cooperation. Since 1998, China and Russia have established about ten technology parks. Third, universities and scientific research institutions play an important role in Sino-Russian technological cooperation, including cooperation in running schools, establishing joint laboratories and technological centers, and establishing scientific dialogue platforms. It can be said that Sino-Russian technological cooperation has achieved rich results during this period.

5. "Innovation and development" period in the new era (from 2019). In June 2019, Russian President V. Putin and Chinese President Xi Jinping in Moscow signed *The Joint Statement between the People's Republic of China and the Russian Federation on the Development of Comprehensive Partnership and Strategic Cooperation, entering a New Era*, which declared 2020-2021 the Year of Russian-Chinese Science, Technology and Innovation Cooperation.²⁰⁶ China and Russia also decided to jointly establish a technological innovation fund with the amount of US \$1 billion to promote the transformation of joint technological solutions and innovation achievements. The high level of political mutual trust between China and Russia has pushed the technological cooperation to a new level. During this period, Sino-Russian scientific and technological cooperation, in addition to being carried out in traditional fields, also emerged new features. On the one hand, this is reflected in the emphasis on emerging technologies, including the fifth generation of telecommunications, artificial intelligence, biotechnology, and the digital economy. On the other hand, it shows the active

²⁰⁶ Russia and China Opened the Years of Scientific, Technical and Innovative Cooperation (2020-2021). [Electronic resource] // Ministry of Science and Higher Education of the Russian Federation. URL: <https://minobrnauki.gov.ru/press-center/news/novosti-ministerstva/21430/>.

participation of private enterprises, such as Alibaba and Huawei. Technological cooperation has always been an important part of bilateral exchanges between China and Russia. During this period, Sino-Russian technological cooperation has increased significantly, and both sides regard this interaction as the core content of the current and future strategic partnership development.²⁰⁷ Moreover, as China's scientific and technological power has grown, the complementarity of Sino-Russian cooperation has begun to be reflected, and the proximity of scientific and technological power is an important prerequisite for continuously deepening cooperation.

3.3.2. Current situation of Sino-Russian technological cooperation

In the context of the fourth industrial revolution, both China and Russia attach great importance to the role of technological innovation and have formulated important strategic agreements. At the same time, the direction of scientific and technological cooperation between China and Russia is spreading into advanced technological areas.

After the 18th CPC National Congress, China's science and technology industry entered a period of rapid development, and some important science and technology policies and strategies were introduced.²⁰⁸ The 18th CPC National Congress put forward the *innovation-driven development strategy*, placing technological innovation at the core of the national development strategy. China has been implementing the *Made in China 2025* strategy since 2015. In 2016, the Chinese government also issued

²⁰⁷ Christopher W.H. China's Technology Cooperation with Russia: Geopolitics, Economics, and Regime Security // *The Chinese Journal of International Politics*. – 2021. – No. 3. – pp. 447–479.

²⁰⁸ Yuan Zhibin. Review and outlook of major science and technology policies since the 18th CPC National Congress // *Science & Technology Review*. – 2022. – No. 20. – pp. 13–19.

the Outline of the *National Innovation-driven Development Strategy* and the *National 13th Five Year Plan Scientific and Technological Innovation* to clarify the ideas, objectives, tasks, and measures of technological innovation in the new era.²⁰⁹ In 2017, China released *New Generation Artificial Intelligence Development Plan*, which articulates an ambitious agenda for China to lead the world in AI.²¹⁰ The 19th CPC National Congress proposed to accelerate the construction of an innovative country. The 20th CPC National Congress proposed to achieve self-reliance and self-improvement in science and technology at a high level and build a powerful country in science and technology.

Similarly, in recent years, Russia has also taken technological breakthroughs as the main goal and priority of its national development. In 2016, the Russian government issued the *Strategy for the Scientific and Technological Development of the Russian Federation*, which ensures that science and technology are key factors in Russia's development. In July 2017, the Russian government formulated the state program *Digital Economy of the Russian Federation*, which aims to vigorously promote the use of modern digital technology. In April 2019, the Russian government approved the state program for the scientific and technological development of the country until 2030. To support the implementation of the state program, more than 1 trillion rubles of the federal budget will be invested per year by 2030.²¹¹ In October 2019, Russian President V. Putin approved

²⁰⁹ Li Ziguo, Li Yan. China-Russia Science and Technology Diplomacy and Practice // *Academic Journal of Russian Studies*. – 2021. – No. 4. – pp. 53–74.

²¹⁰ China's Artificial Intelligence Revolution. [Electronic resource] // *The diplomat*. URL: <https://thediplomat.com/2017/07/chinas-artificial-intelligence-revolution/>

²¹¹ Jiang Jing. Construction and Development of Russian Scientific and Technological Innovation System // *Russia, Eastern European & Central Asia Studies*. – 2021. – No. 5. – pp. 76–96.

the *National Strategy for the Development of Artificial Intelligence for the period until 2030*. The document stresses that the implementation of the strategy is a prerequisite for Russia to join the group of world leaders in the development and implementation of AI technologies.²¹² In April 2022, Putin signed an order declaring 2022-2031 as the "Decade of Science and Technology".

In addition to implementing a number of technology policies and documents, China and Russia are also actively exploring cooperation in emerging technology areas. The successful holding of the "Sino-Russian Years of Scientific and Technical Cooperation" in 2020–2021 gave a new impetus to scientific and technical cooperation between the two countries. In February 2022, when meeting with President of Russian Federation V. Putin, President of the PRC Xi Jinping stressed the need to promote cooperation in technological innovation between China and Russia, and promote cooperation in advanced fields such as artificial intelligence, the Internet of Things, and the International Lunar Science Station, etc. This indicates the direction for improving the quality and upgrading of cooperation in technological innovation between the two countries.

Huawei has played a very important role in Sino-Russian emerging technological cooperation. Since 2014, China's industry leader Huawei has occupied a leading position in the Russian telecommunications infrastructure market. Huawei benefits from the 5G telecommunication frequency range designated by the Russian government and becomes the only available equipment supplier in this frequency range.²¹³

²¹² Putin approved the National Strategy for the Development of Artificial Intelligence until 2030. [Electronic resource] // TASS. URL: <https://tass.ru/ekonomika/6988396>.

²¹³ China-Russia Cooperation in advanced technologies: The future global balance of power and the limits of "unlimited" partnership. [Electronic resource] // University of Technology Sydney. URL:

Russian mobile operators "MTS" and "Vimpelcom" reached an agreement with Huawei to build a 5G network in Russia. This is the most important technological innovation project for China to enter the Russian market. On the other hand, Huawei has actively expanded its cooperation with Russia and hopes to learn from its STEM professional advantages through contacts with the Russian academic community. At present, Huawei has established partnerships with many Russian universities, providing employment opportunities and student funding, as well as joint research centers and educational projects. Since 2018, Huawei has successively opened research centers in Moscow, St. Petersburg, Kazan, Novosibirsk and Nizhnovgorod.²¹⁴ In addition, Huawei is actively cooperating in the field of artificial intelligence and cloud services with Russian enterprises such as Russian cybersecurity service provider "Kaspersky", Russia's largest state-owned bank "Sberbank", and Russian search giant "Yandex".²¹⁵ There is no doubt that Huawei is the most visible and committed foreign investor in Russia's emerging technology fields.

Another company that plays an important role is Alibaba. In July 2019, the Chinese Alibaba Group, Mail.Ru Group, "MegaFon" and the Russian Direct Investment Fund (RDIF) signed a final agreement to establish a joint venture company called

<https://www.uts.edu.au/acri/research-and-opinion/research-reports/china-russia-cooperation-advanced-technologies-future-global-balance-power-and-limits-unlimited-partnership>.

²¹⁴ Chinese counterrevolution: Huawei activates ties with Russia. [Electronic resource] // Izvestia iz. URL: <https://iz.ru/880890/anna-urmantceva/kitaiskaia-kontrevoliutciia-huawei-aktiviziruet-sviasi-s-rossiei>.

²¹⁵ China-Russia Cooperation in advanced technologies: The future global balance of power and the limits of "unlimited" partnership. [Electronic resource] // University of Technology Sydney. URL: <https://www.uts.edu.au/acri/research-and-opinion/research-reports/china-russia-cooperation-advanced-technologies-future-global-balance-power-and-limits-unlimited-partnership>.

"Aliexpress Russia". This strategic cooperation will accelerate the development of Russia's digital economy.

Sino-Russian scientific and technical cooperation has extended to many industries. As Sino-Russian relations enter a "new era", sectors that are given top priority include, but are not limited to, telecommunications, robotics, artificial intelligence, biotechnology, new media, digital economy, etc.

From the perspective of the international environment, we are currently facing "Great changes unseen in a century". The international political and economic system is undergoing profound evolution. Technology has become the focus of the game of major powers. In particular, the United States and its allies used their technological advantages to carry out technical blockade and technical "decoupling" against China and Russia. Both China and Russia are major countries in technology in the world. Deepening cooperation in technological innovation serves the interests of both countries.

After the international financial crisis in 2008, the gap between China and the United States in terms of economic aggregate and comprehensive strength has accelerated to narrow, and the strategic competition between China and the United States has intensified. Since the Trump government took office in 2017, the United States has taken a series of policies and measures to curb the sustainable development of China's technological strength. Besides, the United States plans to form a technical alliance with "the camp of democratic countries" to try to compete or even confront China in the field of science and technology. One of the inevitable consequences of this is that China seeks scientific and technological independence, and then forms the other technological camp.²¹⁶ According to A. Maslov, head of the School of Oriental Studies at the Higher

²¹⁶ Wang Congyue. The technological confrontation between China and the United States: the front and

School of Economics, the chances of activating Russian-Chinese cooperation are growing as China realizes that American pressure is a long-term thing.²¹⁷ Other experts believe that the Sino-US technological war will accelerate the cooperation between Chinese technological companies and Russian universities, and more Chinese companies will enter the Russian market and begin to develop more actively in Russia and purchase high-tech assets.²¹⁸ Therefore, Sino-US technological confrontation brings opportunities for Sino-Russian technological cooperation.

After the Crimean Crisis in 2014, western countries have taken a series of sanctions against Russia. After launching a special military operation in Ukraine in 2022, Russia is still facing the combined impact of sanctions, broken international partnerships and a brain drain.²¹⁹ In addition, the United States and 37 other countries have implemented a new and complex export control against Russia.²²⁰ According to Castellum. AI, Russia is now the most sanctioned country in the world, and currently has 14081

core of the Sino-US strategic game // World Politics. – 2023. – No. 1. – pp. 1–12. DOI: 10.25136/2409–8671.2023.1.39781

²¹⁷ The specter of Chinese Communism has reached America. [Electronic resource] // Nezavisimaya. Access mode: https://www.ng.ru/economics/2020-07-20/4_7915_china.html

²¹⁸ What opportunities are opening up for Russia in the face of technological confrontation between the U.S. and China? [Electronic resource] // RIAC. URL: <https://russiancouncil.ru/analytics-and-comments/interview/kakie-vozmozhnosti-otkryvayutsya-dlya-rossii-v-usloviyakh-tekhnologicheskogo-protivostoyaniya-ssha-i/>.

²¹⁹ China-Russia Cooperation in advanced technologies: The future global balance of power and the limits of "unlimited" partnership. [Electronic resource] // University of Technology Sydney. URL: <https://www.uts.edu.au/acri/research-and-opinion/research-reports/china-russia-cooperation-advanced-technologies-future-global-balance-power-and-limits-unlimited-partnership>.

²²⁰ Technology Controls Can Strangle Russia—Just Like the Soviet Union. [Electronic resource] // Foreign Policy. URL: <https://foreignpolicy.com/2022/08/22/russia-ukraine-war-sanctions-export-controls-technology-transfer-semiconductors-defense-industry-military-espionage/>.

sanctions against Russian individuals and entities.²²¹ Some experts believe that China may be the key for Russia to survive the technical sanctions.²²²

The Sino-Russian strategic partnership has been deepened due to the convergence of interests and security concerns. Technological cooperation and innovation are regarded as one of the main pillars of this relationship.²²³ Both the Chinese and Russian governments believe that technological strength is critical to their competitiveness, especially when competing with the United States, and their skills and resources are complementary.²²⁴ China's market and resources have surpassed Russia's, while Russia has some technical expertise that China still lacks.²²⁵ It can be predicted that in the future, the amount of technology that China and Russia can obtain from the West will be significantly reduced and deepening technological cooperation between the two countries is an inevitable choice.

3.3.3. Problems of Sino-Russian technological cooperation

In the context of the continuous development of Sino-Russian comprehensive strategic partnership of cooperation, despite the fruitful achievements in technological cooperation between the two countries, there are still some contradictions

²²¹ The World's Most-Sanctioned Countries. [Electronic resource] // Statista. URL: <https://www.statista.com/chart/27015/number-of-currently-active-sanctions-by-target-country/>.

²²² China could be Russia's key to surviving tech sanctions. [Electronic resource] // POLITICO. URL: <https://www.politico.com/newsletters/morning-tech/2022/02/25/china-could-be-russias-key-to-surviving-tech-sanctions-00011702>.

²²³ The Resilience of Sino-Russian High-Tech Cooperation. [Electronic resource] // War on the Rocks. URL: <https://warontherocks.com/2020/08/the-resilience-of-sino-russian-high-tech-cooperation/>.

²²⁴ The China Factor in Tech Export Controls Against Russia. [Electronic resource] // The Diplomat. URL: <https://thediplomat.com/2022/03/the-china-factor-in-tech-export-controls-against-russia/>.

²²⁵ The Resilience of Sino-Russian High-Tech Cooperation. [Electronic resource] // War on the Rocks. URL: <https://warontherocks.com/2020/08/the-resilience-of-sino-russian-high-tech-cooperation/>.

and problems that need to be solved due to the differences in technological level, market environment, legal protection, and way of thinking between the two countries.

First, Sino-Russian relations have always been complex and controversial in history. According to A. Valery and L. Sergei, "since the people of the two countries do not always have complete and objective information about each other, mutual distrust may also occur. There is prejudice against the Russian Federation in China. Chinese media continue to present negative reports on the history of bilateral relations".²²⁶ In Russia, the misunderstanding of China has also led to the growth of rumors about the "China threat theory". Some Russian scholars believe that Russia should keep a distance from China because the interests of the two countries are not always consistent. Technology and investment contacts (with China) should not be regarded by Russian politicians and businessmen as "nectar from heaven".²²⁷ A. Dynkin, Director of the Institute of World Economy and International Relations (IMEMO) at the Russian Academy of Science, describes Sino-Russian relations as "never being enemies, but not standing together forever".²²⁸

Second, the scale of trade and technological cooperation between the two countries lags far behind high-level political relations. The cooperation between China and Russia in many fields is not as deep as the official description. Due to practical

²²⁶ Achkasov V.A., Lantsov S.A. World Politics and International Relations. – Moscow: Aspect-Press, 2011. – p. 412.

²²⁷ China-US Conflict: A Second Cold War Threat? [Electronic resource] // The International Affairs. URL: <https://interaffairs.ru/news/show/26601>

²²⁸ Alexander Dynkin. The confrontation between the United States and China will become the main one in the post-pandemic world. [Electronic resource] // RIAC. – 2020. URL: <https://russiancouncil.ru/analytics-and-comments/comments/protivostoyanie-ssha-i-kitaya-stanet-glavnym-v-postpandemicheskom-mire/>

obstacles, the joint research and co-authorship between China and Russia will take time to mature. In contrast, there has been greater integration and wider cooperation between the technological ecosystems of China and western developed countries.²²⁹ Therefore, the governments of China and Russia are seeking to expand Sino-Russian commercial and scientific and technical exchanges beyond state projects, thus changing the so-called "hot politics, cold economy, cold science and technology" situation.²³⁰

Third, China and Russia have errors in understanding each other. In recent years, with the improvement of its technological level, there has been a voice in China that the benefits of technological cooperation with Russia have decreased. Some Chinese departments lack sufficient understanding and proper evaluation of Russia's technological level, and there is a tendency to belittle Russia's technological strength and blindly praise the West. In fact, despite the devastating impact of the collapse of the Soviet Union on Russia's technological development, Russia still has strong technological strength and has made remarkable achievements in basic research, nuclear technology, space science, biotechnology and other fields.²³¹ On the other hand, Russia also has misunderstandings about China's business environment, intellectual property protection and asymmetrical benefit. To some extent, this hinders the in-depth cooperation in technological innovation

²²⁹ The Resilience of Sino-Russian High-Tech Cooperation. [Electronic resource] // War on the Rocks. URL: <https://warontherocks.com/2020/08/the-resilience-of-sino-russian-high-tech-cooperation/>.

²³⁰ China-Russia Cooperation in advanced technologies: The future global balance of power and the limits of "unlimited" partnership. [Electronic resource] // University of Technology Sydney. URL: <https://www.uts.edu.au/acri/research-and-opinion/research-reports/china-russia-cooperation-advanced-technologies-future-global-balance-power-and-limits-unlimited-partnership>.

²³¹ Zheng Shimin. Analysis of Risks and Challenges of Sino-Russian Scientific and Technological Innovation Cooperation. // Global Review of Science, Technology and Economics. – 2021. –No. 10. – pp. 8–12.

between the two sides.

Fourth, geopolitical and other traditional security threats affect Sino-Russian technological cooperation. From the sanctions against Russia to the trade war and technological war with China, the containment policy of the United States, as well as technical barriers, including export control, have all brought restrictions to the expansion of cooperation between China and Russia. Especially after Russia launched a special military operation against Ukraine in 2022, the impact was particularly obvious. China may worry that if it supports Russia in the high-tech field, it will make Chinese companies the target of the second sanctions.²³² It is reported that Huawei stopped accepting new orders from Russia in March 2022 and stopped delivering equipment according to existing contracts.

Fifth, China and Russia's gains from technological cooperation are impacted by non-traditional security threats such as the COVID-19. 2020 and 2021 were designated as the years of Sino-Russian technological innovation cooperation. The two countries initially planned to jointly hold the large-scale opening ceremony of the technological innovation year. However, due to the complex epidemic situation, the final opening ceremony was held online. The epidemic also affected the implementation of the activity plan of the Year of Technological Innovation. At first, the two sides planned to hold nearly 1000 activities. Finally, most of the activities were held online, with 170 Russian plans cancelled or postponed to 2021 due to the epidemic. At the same time, the COVID-19 has also restricted the exchange of technological talents and experts between the two countries, which has greatly affected the efficiency of Sino-Russian technological

²³² The China Factor in Tech Export Controls Against Russia. [Electronic resource] // The Diplomat. URL: <https://thediplomat.com/2022/03/the-china-factor-in-tech-export-controls-against-russia/>.

cooperation.

Sixth, language barriers affect the in-depth technological exchanges between China and Russia. At present, there is a large gap in the reserve of talents who both know Russian and have certain technological literacy in China, which is far from meeting the rapidly developing demand of Sino-Russian technological innovation cooperation. This problem exists in Russia as well. Moreover, the accurate translation of technological parameters is very important for the smooth development of technological cooperation. Once a certain place is not translated properly, it may lead to the failure of the entire scientific research project.

3.3.4. Policy suggestions on Sino-Russian science and technology cooperation

Although there are many advantages in technological innovation cooperation between China and Russia, it is undeniable that there are also many problems in the Sino-Russian technological cooperation. In order to promote the high-quality development of Sino-Russian technological cooperation, these problems need to be explored and solved by both sides. First, enhancing strategic mutual trust is the basis for deepening technological cooperation, and is also the top priority of technological diplomacy. Second, China and Russia should give full play to their "complementary" advantages. In 2014, Former Prime minister Li Keqiang proposed at the Third Moscow International Forum for Innovative Development "Open Innovations" that "if we combine the advantages of the Russian side in natural resources, scientific, technical and intellectual potential and the advantages of the Chinese side in production, financial resources and the vast market, add Chinese and Russian production wings of innovation, we will get a double powerful

effect, far beyond our countries".²³³ Third, Chinese and Russian universities should strengthen cooperation and contribute wisely to Sino-Russian scientific and technological cooperation by creating a system for training diverse technological personnel (professional knowledge + language) and promoting the exchange of technological personnel. Finally, China and Russia also need to expand the areas of cooperation and increase the level and scope of cooperation, relying on platforms and mechanisms such as the Shanghai Cooperation Organization (SCO), BRICS, and the Belt and Road to enhance the scientific and technological strength of China and Russia in the world.

Conclusions of the third chapter

In international relations, there is a phenomenon of interaction of three actors, which is usually called the triangle relationship. L. Dittmer developed the "strategic triangle" theory and proposed four possible models. According to the analysis, the current Sino-US-Russia triangle is more like a "stable marriage" model, in which the US confronts both China and Russia, while China and Russia maintain a close relationship.

In the context of Sino-US science and technology confrontation, Russia will achieve greater diplomatic flexibility to balance China and the US and become a stabilizer in the new bipolar structure. Sino-Russian technological cooperation has a long history. Despite the bumps in the road, it has also achieved remarkable accomplishments. At present, driven by the deepening bilateral relations between China and Russia, the scope and quality of Sino-Russian technological cooperation are expanding. On the one hand, with the advent of the 4IR, emerging technologies will greatly affect the international configuration and distribution of international power. China and Russia continue to

²³³ III Moscow International Forum for Innovative Development "Open Innovations". [Electronic resource] // Government of Russia. URL: <http://government.ru/news/15217/>.

deepen cooperation and exchanges in emerging technological fields based on independence. On the other hand, at present, we are in a "Great changes unseen in a century ", and the international environment is complex and changeable. The western countries led by the United States "politicize" technology and take a series of sanctions and export control measures against China and Russia, trying to suppress the technological progress and economic development of China and Russia. Therefore, Sino-Russian technological cooperation is of great urgency and fits the national interests of both countries.

CONCLUSION

The question of the international system has been widely discussed in international relations. According to realism, the international system is a power politics in which countries are the main actors in anarchy. Power politics mainly appears in two aspects: the distribution of global power and the strategic relations between these major actors. The structure of international relations is determined by the distribution of power in international politics. "Polarity" is considered the most important player in the international system and the most important variable in the analysis of the international structure. The concept of "polarity" implies that a country or a coalition of countries has a powerful comprehensive strength and a significant influence on world affairs. According to the concept of "polarity" there are several basic forms of the international system: unipolar, bipolar, multipolar, non-polar, asymmetric multipolarity, etc. After the financial crisis of 2008, with the decline of the United States and the rapid rise of other great powers, especially China, there is much debate among scholars as to whether the modern international system is a multipolar structure or a bipolar one. To study this question, it is necessary to understand the variables affecting the international system. The structure of the international system refers to the distribution of power among states, and "polarity" refers to superpowers, whose power and influence is much higher than that of other actors. Therefore, when discussing the factors determining the international system, it is necessary to return to the power factors. In addition, the selected arguments should fully reflect changes in relative power between countries. Consequently, comprehensive national strength and strategic relations can be regarded as scientific objective variables determining the international system.

Traditional studies of the international system have largely focused on the three main areas of economics, politics, and the military, and have neglected the role of science and technology. Nevertheless, human historical experience tells us that the emergence of any scientific and technological revolution will further widen the power gap between countries that are the first to embrace new technologies and other countries. Since the 16th century, there have been many scientific and technological revolutions around the world, each of which has had a profound effect on the international system. Thus, this study focuses on the impact of technology, especially the 4IR, on the international system. After analysis and comparison, this paper concludes that the 4IR accelerated the formation of a bipolar structure between the United States and China. In the future, the 4IR will also stabilize the bipolar structure and prolong the duration of the bipolar system.

Our world is facing "major changes unseen in a century. After the 2008 global financial crisis, the concept of the "Thucydides Trap" was applied to an analysis of Sino-American relations as the comprehensive national strength of the United States was relatively weakened, while that of China was steadily improving. According to G. Allison, "there is a serious structural stress caused by the fact that rising power threatens the position of the ruling power. Under such conditions, not only extraordinary, unexpected events, but even commonplace difficulties in international relations can provoke widespread conflict". Scholars are divided as to whether current Sino-US relations have fallen into the "Thucydides Trap". Since the current Sino-US strategic rivalry meets the three conditions proposed by Allison, this paper concludes that Sino-US relations have fallen into the "Thucydides Trap". Strategic rivalry between the two countries has become increasingly fierce. Technological rivalry has become the front and center of the strategic rivalry between China and the United States.

Since the end of the Cold War, the United States has maintained an absolute leadership position in global science and technology. However, China's scientific and technological power has increased significantly in recent years, narrowing the gap with the United States. In particular, during the 4IR, China maintained its world leadership in areas such as 5G and AI. In order to curb China's continued development of scientific and technological power, the United States has intensified its repression of Chinese technology companies in all areas. The U.S. government has adopted a series of containment measures that essentially suppress China's scientific and technological progress and economic development in order to maintain its scientific and technological advantage and, consequently, its global hegemony. The Sino-US rivalry in science and technology is a comprehensive confrontation in which both China and the US have advantages and disadvantages. Given the breadth and depth of the technological confrontation between China and the United States, this confrontation will not only affect relations between the two countries but will also bring profound changes to the entire world.

In recent years, with the restoration of Russia's power and the accelerated rise of China, discussions about the "strategic triangle" between China, the United States, and Russia have once again intensified. Moreover, as a traditional scientific and technological power and a participant in the Cold War, Russia's role in the scientific and technological confrontation between China and the United States cannot be ignored. Given the current international situation and trilateral relations, the article argues that the current trilateral relationship between China, the United States and Russia is more like the "stable marriage" relationship in the "strategic triangle" theory, that is, the United States confronts China and Russia at the same time, while China and Russia maintain a close relationship.

In 2019, the Sino-Russian relations of comprehensive partnership and strategic interaction have entered a new era. Scientific and technological cooperation is seen as a key pillar of this partnership and one of the most promising areas of cooperation. China and Russia have great scientific and technological potential. They have a rich history of technological cooperation and a high level of political mutual trust. At present, due to the deepening of bilateral relations between China and Russia, the scale and quality of Sino-Russian scientific and technological cooperation is expanding. On the one hand, with the advent of the 4IR, advanced technology will have a significant impact on the international configuration and distribution of international power. China and Russia continue to deepen cooperation and exchanges in advanced technological fields based on independence. On the other hand, we are currently facing "major changes unseen in a century" and the international environment is complex and volatile. Western countries, led by the United States, are "politicizing" science and technology and adopting a series of sanctions and export controls against China and Russia in an attempt to stifle technological progress and economic development in China and Russia. Although there are many advantages in technological innovation cooperation between China and Russia, it cannot be denied that there are also many problems in Sino-Russian scientific and technological cooperation. In order to promote the qualitative development of Sino-Russian scientific and technological cooperation, these problems must be studied and solved by both sides. This dissertation states that the most important for Sino-Russian scientific and technological cooperation is to strengthen strategic mutual trust, to take advantage of "complementarity" between China and Russia, and to create a training system for diverse personnel. In addition, China and Russia also need to expand the areas of cooperation and increase the level and scope of cooperation, relying on platforms and mechanisms such as the Shanghai Cooperation Organization (SCO), BRICS, and the Belt

and Road, to enhance the scientific and technological power of China and Russia in the world, promote the common prosperity and development of world science and technology, and enable science and technology to play a new and more constructive role in world politics.

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