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“Technology Alliance”: A Strategic Path for New Technological Hegemony

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Abstract: Science and technology (sci-tech) is becoming the primary battlefield of strategic competition among major countries as the new round of technological revolution and industrial transformation gain momentum worldwide. The competitions on the rules, criteria, and system of sci-tech development and applications will directly impact the reshaping of the power structure of international strategy and the international system. On the basis of the techno-multilateralism strategy, the United States, along with its partners, sets up a “technology alliance” in the high technological field. It aims to hold the power of new technology by jointly formulating new rules and criteria for global technological development and governance. The framework of “technology alliance” taking shape influences profoundly global power structure, international pattern, and the international system.

Keywords: technology alliance, techno-multilateralism, power structure, international system

Presently, we are in the period in which a new round of science and technology (sci-tech) revolution and significant changes unseen in a century converge. The sci-tech revolution is bringing international politics from the era of geopolitics to the era of technopolitik.¹ The center of international strategic competition in such an era is innovation competition in

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¹ Hal Brands, “America Enters the Era of Technopolitik,” accessed November 6, 2020, <https://www.bloomberg.com/opinion/articles/2020-11-06/u-s-needs-australia-sweden-south-korea-to-beat-china-in-ai-battle>.

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high technology and struggle for new power shaped by a new technological revolution. The struggle is reflected in the two aspects: innovative capability in frontier sciences and the ability to shape international systems. Hegemony countries will seek technological leadership by setting up technical regulations against the backdrop of diminishing comparative advantage in innovative technological capability. The Western countries, including the United States, believe that this will be realized through setting up a “technology alliance.” This means that the most technologically advanced democracies should take the lead in setting up new “multilateralism” for global technology policy.¹ This “technology alliance” is inclusive. The new US administration will attach more importance to building a “technology alliance” based on regulation setting as it takes office. It aims to build sci-tech hegemony in the technopolitik era.

Expansion and Overall Arrangement

The focus of “technology alliance” is highly compatible with the frontier fields of the new sci-tech revolution. It significantly expands in 5G, 6G, artificial intellect, quantum technology, semiconductor, space technology, green innovation, and new types of infrastructure.

I. “Technology alliance” expanding from 5G to the whole digital field

The US government and think tanks believe that the establishment of a “technology alliance” starts with 5G.² In May 2019, the US government swayed 32 countries into attending the Prague 5G Security Conference in Czech. Here, the US government issued Prague Proposal, a nonbinding policy suggestion. The Prague 5G Proposal discussed how to remove China’s 5G technology products from the areas of policy, security, technology, and economy. The European Union (EU) published “EU Coordinated Risk Assessment on Cybersecurity in 5G Networks” in October 2019, under the pressure of the

¹ CNAS, “Common Code-An Alliance Framework for Democratic Technology Policy,” accessed October 21, 2020, <https://www.cnas.org/publications/reports/common-code>.

² CNAS, “The US Needs a New Techno Democratic Statecraft Start with 5G,” accessed August, 3, 2020, <https://www.cnas.org/publications/commentary/the-us-needs-a-new-techno-democratic-statecraft-start-with-5g>.

US government. In such publication, the EU identified strategic risks in 5G products. On January 29, 2020, the EU issued the EU Toolbox for 5G,¹ formulating a list of measures to counter the risk of 5G cybersecurity.

On the basis of the Prague 5G Proposal, in July 2020, the US government published the “National Strategy to Secure 5G” for the United States. The US government addressed that together with its closest partners and allies, they will lead the development, deployment, and management of secure and reliable 5G communications infrastructure globally. Influenced by the US government, the United Kingdom changed its attitude toward Huawei, a Chinese tech company. The United Kingdom plans to force a full phase-out of Huawei from Britain’s 5G networks by 2027. It proposes a “Democracy 10” club that includes the G7 nations, Australia, South Korea, and India to reduce dependence on Huawei 5G technology. The ultimate goal of the Prague 5G security mechanism is to set up a “Nato alliance” with 5G security rules and to supply chain security at the core. The former US Secretary of State Mike Pompeo announced the “5G Clean Path” in April 2020, aiming to increase the efficiency of “technology alliance.” It plans to first establish the “technology alliance” in the 5G field with “democracy” as the ideological link and “cybersecurity” as the goal. On August 5, 2020, the United States extended the plan to the whole digital space by issuing the “Clean Network Program.” The program combats China’s technological products, from 5G derivative products to the dimensions of operator, application programs, application store, cloud service, and fiber optic cable, covering digital infrastructure, supply chain, and platform services. Presently, the “technology alliance” in the 5G field is taking shape and the building of the 6G “technology alliance” for the next generation of telecommunication technology is underway. The Alliance for Telecommunications Industry Solutions(ATIS) declared to set up the Next G Alliance on October 13, 2020. It includes members covering chip manufacturers, equipment manufacturers, terminal manufacturers, and software application manufacturers.

II. Setting up “Transatlantic AI Alliance” and Quantum Technology Union

The US Department of Defense (DOD) issued the “US Defense Strategy”

¹ EU, “Cyber Security of 5G Networks—EU Toolbox of Risk Mitigating Measures,” accessed July 24, 2020, <https://ec.europa.eu/digital-single-market/en/news/cybersecurity-5g-networks-eu-toolbox-risk-mitigating-measures>.

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in 2018, saying that artificial intelligence (AI) will be the key for the United States to overtake China, Russia, and its other competitors. The DOD likewise published the “AI Strategy 2018.” It believes that the United States and its allies and partners must use AI to preserve their strategic status and to maintain a free and open international order. The Joint Artificial Intelligence Center (JAIC) coordinated with DOD’s AI work. The JAIC launched a new initiative in November 2020 to set up an alliance in the AI field. It convened a meeting on AI Defense cooperation among 12 countries’ military personnel, including Australia, Canada, Japan, Britain, South Korea, and Israel. It put priorities on bringing China and Russia into the AI framework that was dominated by the Western countries. US think tanks also suggested that the United States and EU discussed setting up a Transatlantic Alliance on AI cooperation.¹ The United States and EU share a similar view on the plan to set up an AI alliance. On December 2, 2020, the European Commission issued A New EU–US Agenda for Global Change.² It proposed the idea to set up a Transatlantic AI Agreement. Additionally, 15 countries, including Canada, France, Germany, Australia, the United States, Japan, and South Korea have officially set up the Global Partnership on AI in August 2020. The Secretariat will be in the International Organization for Economic Cooperation and Development. Two tech centers are located in Paris and Montreal. Canada held the first annual meeting in December 2020. In 2021, the AI alliance will gain more momentum to take shape and will exert a huge impact on global governance rules on AI. Similar to AI, a quantum technology union is in the making. In February 2020, the White House published “A Strategic Vision for America’s Quantum Networks,” proposing to set up the quantum Internet. The US Energy Department announced its plan to build and set up the quantum Internet in July 2020. The quantum Internet is the second Internet parallel to the current Internet. The aim

¹ “The Importance and Opportunities of Transatlantic Cooperation on AI,” accessed June 18, 2020, <https://www.brookings.edu/research/the-importance-and-opportunities-of-transatlantic-cooperation-on-ai/>.

² European Commission, “Joint Communication to The European Parliament: The European Council and The Council—A New EU-US Agenda for Global Change,” accessed December 2, 2020, https://ec.europa.eu/info/sites/info/files/joint-communication- eu-us-agenda_en.pdf.

is to rebuild a “parallel universe” independent of the traditional Internet. The United States signed the “Tokyo Declaration on Quantum Cooperation” with Japan. They agreed to conduct cooperative research on quantum information science and technology and to solve essential international issues and key policy issues through multilateral cooperation.

III. Establishing semiconductor alliance and increasing multilateral export control

Semiconductor is the foundation for modern digital technology. The US government is planning to restrict semiconductor export to China to maintain US supremacy in the semiconductor field.

On February 23, 2020, the Wassenaar Arrangement on Export Controls for Conventional Arms and Dual-Use Good and Technologies stipulated that the member states shall enlarge their scope of export control to prevent technology from spreading to China.¹ Newly restricted products include non civil semiconductor substrate manufacturing technology and noncivilian software that can be used in cyber attacks. The member states agreed to expand control objects at a meeting held in Austria in December 2019.

The United States hopes that none of the fabricators in the world provides products to Huawei. On February 18, 2020, the Trump administration attempted to exert pressure on Taiwan Semiconductor Manufacturing Company into cutting China’s access to key semiconductor technology. Moreover, the US Commerce Department revised the Foreign-produced Direct Product Rule, stipulating that any chip manufacturer in the world using US technology or equipment should obtain permission before providing chips for Huawei.² The US Information Technology and Innovation Foundation issued a report, proposing to increase its leadership by setting up a Global Strategic Supply

¹ Japan Times, “Arms-curbing Wassenaar Arrangement Agrees to Add Military-grade Software, Chip Tech to Export Controllist,” accessed February 23, 2020, <https://www.japantimes.co.jp/news/2020/02/24/business/arms-contro-japan-software-exports/#.XIRtJhMzZKM>.

² Industry and Security Bureau, “Export Administration Regulations: Amendments to General Prohibition Three (Foreign-Produced Direct Product Rule) and the Entity List,” accessed May 19, 2020, <https://www.federalregister.gov/0/documents/2020/05/19/2020-10856/export-administration-regulations-amendments-to-general-prohibition-three-foreign-produced-direct>.

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Chain Alliance (GSSCA). NATO will commence a dialog on export control with EU member states. This shall ensure that export control measures will be applied to semiconductor manufacturing equipment and other basic technologies. The United States is also planning to set up a digital alliance in a digital space similar to that of NATO.

IV. Artemis accords in moon and deep space exploration

Moon and deep space exploration is related to both space and resources for human sustainable development. Such is another battlefield for major space powers. On May 27, 2019, NASA opened the specifications of the Artemismanned moon landing program and prepared to build the gateway—a lunar orbiting platform for the Artemis program.¹ The United States planned to establish a long-term strategic existence in the south pole of the moon through the Artemis Base Camp after returning. The United States persuaded its allies to enter into the Artemis Accord for the early preparation in formulating rules on moon resources development and utilization. On July 10, 2020, NASA signed a Letter of Intent for Joint Exploration with Japan’s Ministry of Education, Education, Science and Technology. The two parties agreed to cooperate intensively in space exploration activities, including fields involving the international space station, moon gateway, and the Artemis program. This Letter of Intent indicated that Japan shall officially participate in NASA’s moon gateway and Artemis program.

As of October 14, 2020, the United States signed Artemis accords with the United Kingdom, Australia, Canada, Japan, Luxembourg, Italy, and the United Arab Emirates. The accord will become the foundation of the alliance framework for the United States to dominate moon and space exploration.

V. Constructing Green Alliance on international climate governance

On December 11, 2019, the new European Commission issued the Europe Green Accord, first stipulating that Europe will go carbon neutral by 2050. The Biden administration likewise promised to go carbon neutral by 2050. The views of the United States and Europe on climate policy are beginning to converge again. Franziska Brantner, a member of the German Bundestag, said

¹ NASA, “Artemis Program Patch,” accessed May 27, 2020, <https://www.nasa.gov/specials/artemis/>.

that the future EU–US relations must set up a new transatlantic green deal. In doing so, in-depth cooperation between the two countries maybe promoted on green financing and fair trade agreement negotiations.¹ According to the leaders of both the Democratic Party and the Republican Party, rebuilding the US–EU cooperation is the pillar that shall lead the global response to climate change. The core of the Europe Green Accord is the “Carbon boundary” regulation mechanism. In such a regulation mechanism, a carbon tariff will be levied on heavy pollution importing countries. American Democrats are in support of implementing a carbon tariff policy with the EU. Additionally, the United States, together with Japan, South Korea, Canada, Mexico, Chile, Brazil, Columbia, Peru, New Zealand, and South Asian countries shall set up the Global Climate Coalition. They aim to secure European energy security and promote transatlantic energy cooperation. The United States established a Clean Energy Partnership with India to push forward the Indo-Pacific strategy. The Green Alliance is gaining momentum and will likely exert a significant impact on both the UN Paris Agreement governance framework and the global pattern of fair, just, and sustainable green development.

VI. Setting up an “Infrastructure Alliance” that dominates the setting of the system of rules and standards in infrastructure construction

In November 2019, the Indo-Pacific Commercial Forum, which was sponsored by the United States, Japan, and Australia, launched the Blue Dot Network. It provides an evaluation system on infrastructure programs in the Indo-Pacific region, with the participation of government departments, social groups, and enterprises. It aims to counter the Belt and Road Initiative by setting up new standards in infrastructure construction programs. The then US Secretary of Commerce Wilbur L. Ross said that the Blue Dot Network would include countries that want “sustainable infrastructure development.” Additionally, the United States planned to establish a global infrastructure connectivity fund, focusing on information and communication

¹ Franziska Brantner, “Toward a New Transatlantic Green Deal,” accessed October 6, 2020, <https://carnegieendowment.org/2020/10/06/toward-new-transatlantic-green-deal-pub-82855>.

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technology (ICT), transportation, and electricity and energy to increase financial support. It likewise planned to bring countries receiving US technological assistance into the system of international norms and governance that already existed. This includes rules for infrastructure investment covering transparency and anticorruption.

The United States and its partners are actively building a system of “technology alliance” in every strategic area. These areas include digital space focusing on 5G, 6G, AI, quantum, and semiconductors; extraterrestrial space focusing on satellite Internet, moon, and deep space and ecological space focusing on climate governance, clean energy, and environmental protection.

Strategic Framework

With the development of the “technology alliance” in every area, the strategic framework and system of the alliance are forming. It features ideology as the starting line and aims to build a system of basic paths including safety and trust standards, building alliance membership, achieving high-tech supply chain stratification, and shaping a global system of rules for technology development and governance.

First, Western “democratic” value is taken as an ideological banner. Western “technology alliance” brings ideological confrontation into a sci-tech strategic competition, launching an extensive public opinion campaign to stigmatize China. Thus, it aggravates ideological confrontation in digital space and destroys the global technological trust system. The US Secretary of State Mike Pompeo said that the infrastructure of the next 100 years must be a communications infrastructure based on a Western ideal of private property and protection of private citizens’ information transparently and not on a Chinese model.¹

The US Senate Committee on Foreign Relations issued a report in

¹ CNBC, “Pompeo Takes Aim at Chinese Tech Firms over Data Theft Concerns,” accessed July 8, 2020, <https://www.cnbc.com/2020/07/08/pompeo-takes-aim-at-chinese-tech-firms-over-data-theft-concerns.html>.

an attempt to launch an attack on China's technological development and application.¹ Additionally, the Center for a New American Security and Australian Strategic Policy Institute jointly conducted special researches on "how to combat high-tech illiberalism and digital threats to the future of democracy," aiming to perfect relative theories. The United States planned to set up a "Techno-Democratic alliance" guided by a national tech strategy to increase efficiency in competition.² The Democrats plotted to strengthen cooperation among Western democratic countries as the new administration took power. Jake Sullivan, appointed by Joseph R. Biden, Jr., as his National Security Advisor, said that "It is time for the United States to truly pull together the like-minded democracies of the world to develop a set of clear priorities" on issues such as the rise of China, climate change, the COVID-19 pandemic, and trade.³ The Biden administration planned to set up a stronger alliance with other "democratic countries" and held the "Global Summit for Democracies." An ideology based on "democracy" will be the political banner for the United States to set up the "technology alliance."

Second, technological trust standards with security as the pointcut must be built. In the case of ideological divergence, security and trust issues are increasingly becoming an important excuse for the United States to crackdown on Chinese tech companies, products, and services. The Prague Proposal raised the curtain for the United States to seek dominance in formulating security principles of the global 5G technology.

In March 2020, President Trump signed the "National Strategy to Secure 5G of the United States of America." It stipulates that the United States shall evaluate cybersecurity risks in the 5G infrastructure, determine its core security

¹ US Senate Committee on Foreign Relations, "The New Big Brother: China and Digital Authoritarianism," accessed July 21, 2020, <https://www.foreign.senate.gov/imo/media/doc/2020%20SFRC%20Minority%20Staff%20Report%20-%20The%20New%20Big%20Brother%20-%20China%20and%20Digital%20Authoritarianism.pdf>.

² The Hill, "The US Needs a New Techno-democratic Statecraft: Start with 5G," accessed November 20, 2020, <https://thehill.com/opinion/technology/510256-the-us-needs-a-new-techno-democratic-statecraft-start-with-5g#.Xyg8m67EvxY.twitter>.

³ Atlantic Council, "Adviser on Biden's Foreign Policy: Start at Home and Repair Alliances," accessed August 21, 2020, <https://www.atlanticcouncil.org/blogs/new-atlanticist/adviser-on-bidens-foreign-policy-start-at-home-and-repair-alliances/>.

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principle, and participate in the formulation of international 5G security principles through the Prague Security Conference. The United States further established and dominated the formulation of 5G security principles in the second Prague Summit held in September 2020. The principle of security standards affecting trust standards, based on different political systems and ideologies, laid a foundation for the United States to set up multiple criteria. The Center for Strategic and International Studies, entrusted by the US State Department, published a report in May 2020 entitled “Criteria for Security and Trust in Telecommunications Networks and Services.” It developed criteria to assess the trustworthiness of telecommunications equipment suppliers. In the political and governance criteria, the report divided the host countries that provide telecommunications equipment suppliers into 10 levels. These were the following: (1) countries with democratically elected government, (2) countries with an independent judiciary, (3) countries where the laws and policies governing networks and connectivity services are guided by demonstrable respect for the rule of law, (4) countries that are security partners with the government of an acquirer or where there are cooperative security arrangements between the government of an acquirer and the government of the supplier, (5) countries with a demonstrable record of protecting personal data, (6) countries with a demonstrable record of observance of their international human rights commitments, (7) suppliers are more trustworthy if they are selected as the result of an acquisition process based on factors other than only cost, taking into account labor conditions, trade practices, human rights, and environmental standards, (8) suppliers are less trustworthy if they exhibit a pattern of behavior and practices outside widely accepted international commercial norms that indicate interdependence between a company and a host government, (9) countries where the national laws of the country mandate cooperation with government or give the government special rights that cannot be challenged in court or the national legislature, and (10) countries with a record of engaging in predatory trade practices. The division of the criteria for security becomes the major criterion for the United States to choose suppliers of high-tech products. More importantly, it constitutes the rating of trustworthiness in a “technology alliance.” The rating of trustworthiness determines the qualifications of a member of the “technology alliance” in which the United States dominates.

Third, membership criteria for a technical alliance must be set up. The “technology alliance” forms a multilayer topology in determining membership qualifications on the basis of different levels of technological trust. The Center for a New American Security published the “Common Code—An Alliance Framework for Democratic Technology Policy.” It pointed out that the alliance is composed of Australia, Canada, the EU, France, Germany, Italy, Japan, Netherlands, South Korea, the United Kingdom, and the United States. Membership criteria are countries with large economies and broad capabilities in technology areas that are crucial to the 21st-century economy. They must be committed to liberal democratic values and the rule of law and have respect for and promotion of human rights.¹ The same is true with the ATIS. The Next G Alliance set up by ATIS stimulates that membership. It is divided into three categories: founding member, contributing member, and strategic member. It also stipulates that those enterprises on US Commerce Department’s blacklist are not qualified to join the alliance.² Hence, Chinese enterprises, such as Huawei and Tze, are not invited to be the founding members of the alliance. As far as the Green Alliance is concerned, the new US administration planned to launch the mode of “climate club” with the framework of a limited number of members on the basis of Western values. Members of the club must agree to adopt a uniform carbon price and put penalty tariffs on imports of nonparticipants.³ In the future, there will be more “technology alliances” in various fields that exclude China and Chinese enterprises. Thus, de facto techno-alliances will be formed that exclude China from their membership.

Fourth, the high-tech supply chain structure shall take on a stratified pyramid. Suppliers of tech products are subject to different political labels and divided into different security trust levels under the structural framework of

¹ CNAS, “Common Code--An Alliance Framework for Democratic Technology Policy,” accessed October 21, 2020, <https://www.cnas.org/publications/reports/common-code>.

² ATIS, “New Founding Members Strengthen ATIS Next G Alliance as It Sets the Course to Advance North American 6G Leadership,” accessed November 12, 2020, <https://www.atis.org/press-releases/new-founding-members-strengthen-atis-next-g-alliance-as-it-sets-the-course-to-advance-north-american-6g-leadership/>.

³ William Nordhaus, “The Climate Club,” accessed May 6, 2020, <https://www.foreignaffairs.com/articles/united-states/2020-04-10/climate-club>.

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political ideology. This results in the fact that the once tightly woven network of global supply chains has been broken and fragmented, and a layered supply chain ladder is formed. These layered supply chains can only flow in the same level network since they are restricted by security rules. Layer-to-layer flow becomes more difficult. Flows across multiple layers are largely isolated. Presently, this trend becomes more obvious. The Cyberspace Solarium Commission proposes a strategy of layered cyber deterrence, aiming to shut Chinese companies out of the supply chain for crucial IT and communications equipment. The Foreign-produced Direct Product Rule formulated by the US Commerce Department stipulated that any chip manufacturer in the world that uses US technology or equipment should obtain permission from the US government before providing chips or sensitive elements for Huawei. The “5G Clean Network Path,” advocated by the US State Department, pointed out that the 5G Clean Path is an end-to-end communication path. It cannot use any transmission, control, computing, or storage device provided by untrusted IT vendors (i.e., Huawei and Tze). US Senator John Thune pointed out that the “Cyber Security Trade Act” will make supply chain “security” a key objective of telecommunications trade negotiations. This shall ensure that the United States is the hub (top) of the global communications infrastructure. The United States planned to form the “Global Strategic Supply Chain Alliance (GSSCA) and Semiconductor Fab Alliance” to restrict China’s export of semiconductor manufacturing equipment and maintain its semiconductor manufacturing technology competitive advantage. This move shall set up international alliances in the fields of semiconductor technology development, property rights protection, and semiconductor ecosystem.¹ To take a comprehensive look, “technology alliance” attempts to build a “hierarchical pyramid” structure of the supply chain system. Such results in the fact that high-tech innovation restraints flow and expansion in the same layer, constituting a hard restrictive condition for the flow of high-tech factors in the supply chain.

Fifth, West-dominated international science and technology development and rule system must be built. On October 21, 2020, the Democratic

¹ “Allied Approach Semiconductor Leadership,” accessed August 27, 2020, <https://itif.org/publications/2020/09/17/allied-approach-semiconductor-leadership>.

Technology Policy Alliance Framework, released by the Center for a New American Security, pointed out that core members of the alliances should coordinate with their partners to determine the norms and principles for the use of technology. They must also jointly oppose China's act of linking technology standardization to mercantilist industrial policies and build uniform standards on the use of surveillance technology to promote technical interoperability among alliances. The Working Group on Science and Technology in the US–China Relations believed that high-level diplomacy must be conducted in key international institutions to strengthen leadership in global technology standard setting.¹ The Cyberspace Solarium Commission planned to send diplomats to participate in setting safety standards in the ICT field.²

Competition is also raging over the dominance of ethical rules in AI. The US DOD has launched an AI ethics code for the future of intelligent warfare. The Transatlantic Alliance for Intelligent Cooperation established a deep strategic relationship between the United States and Europe on AI standard development and application. It instituted global AI standard rules and outpaced China in data procurement, data governance, and values. The United States-led tech alliance will jointly promote the formulation of international high-tech technical norms and principles by sending delegations and reforming the voting mechanism of technical standards organizations. The Artemis Accord, in the space exploration field, requires that all the participants in the Artemis Moon Exploration program follow a series of principles such as interoperability, scientific data release, utilization of space resources, and preservation of space heritage. The formulation of rules in the technical field, on the one hand, enhanced interoperability and upgraded interoperability to further enhance the unimpeded supply chain within the alliance. Hence, a rule-based basis for strengthening common military defense capabilities is established. More importantly, the technological developments involved in the “technology

¹ The Working Group on Science and Technology in US–China Relations, “Meeting the China Challenge: A New American Strategy for Technology Competition,” accessed November 16, 2020, https://asiasociety.org/sites/default/files/inline-files/report_meeting-the-china-challenge_2020.pdf.

² Cyberspace Solarium Commission, accessed March 2020, <https://www.solarium.gov/report>.

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alliance” are in the ascendancy. The technological rules shaped in this stage will provide “soft power” conditions for the United States to establish new scientific and technological hegemony.

Constituting New Hegemony

The gradual formation of the strategic framework system of “technology alliance” will influence the new international power distribution and balance under the new scientific and technological revolution. It will likewise lead to a profound change in the international power structure. The “technology alliance” will build an international power structure on the basis of hegemony by focusing on the power elements such as innovation monopoly, resource control, and space dominance. The alliance will build new strategic deterrence capabilities on this basis.

I. Innovation monopoly

The hierarchical propagation characteristics of scientific and technological innovation determine the gradient of innovation capability. A country or company at the front of the innovation gradient has the comparative advantage of innovation. Innovation elements will spread in the middle of the innovation chain and then spread globally. Under the function of “technology alliance,” the elements of innovation will be constrained by the barriers that the alliance builds, thus constituting new innovation monopoly power without “technology alliance.” It is easy for a country with innovation monopoly power to build technological hegemony. The United States plans to establish an “Alliance Innovation Base” to strengthen innovation cooperation networks. It likewise plans to build a community of technology innovation and protection by adopting the following measures:¹ (1) to incentivize technical protection through mutual benefits, (2) to upgrade information sharing with ally governments, (3) to build ally capacity for the protection of technology and to establish bilateral national security innovation funds, (4) to create positive incentives for technology protection, (5) to invite its allies to join the “ITAR

¹ CNAS, “Sharper: The 5G Future,” accessed April 23, 2020, <https://www.cnas.org/publications/commentary/sharper-5g-future>.

Free Zone,” and (6) to leverage the US–Japan Alliance and to spearhead export controls on semiconductor manufacturing equipment.¹ In the semiconductor field, the United States will invite semiconductor companies from “technology alliance” countries to participate in the American Institute of Manufacturing’s semiconductor industry innovation. This move shall strengthen the coordinated development of technology, reestablish the computing infrastructure to build the semiconductor ecosystem, and achieve technical coordination protection with its allies through export controls, foreign investment reviews, and cracking down on theft of foreign technology and intellectual property. In building the “Alliance Innovation Base,” the United States first focuses on Japan and South Korea. The United States and Japan will strengthen bilateral policy coordination on export controls and investment screening to establish new information sharing and technology security networks. The United States and South Korea will realize the Blueprint for a 21st-Century US-ROK Alliance Strategy in the “new frontier” areas of renewable energy development, civil space dialog, 5G deployment, smart cities, and next-generation telecommunications security.² Hence, the United States aims to promote its global leadership in scientific and technological innovation in the cooperation in scientific and technological research, production, and policy supervision through “technology alliances” with other technologically advanced countries, most of them being Western democracies.

II. Resource control

Another focus of the international power competition is the struggle for the control of resources. A country’s ability to control resources will determine the development space and strength of its science and technology toward industrialization in the development of new technology. “Technology alliance” has more advantages in controlling strategic resources. The new administration

¹ Daniel Kliman, Ben Fitz Gerald, Kristine Lee and Joshua Fitt, “Forging an Alliance Innovation Base,” accessed March 29, 2020, <https://www.cnas.org/publications/reports/forging-an-alliance-innovation-base>.

² CNAS, “Renew, Elevate, Modernize: A Blueprint for a 21st-Century U.S.-ROK Alliance Strategy,” accessed November 16, 2020, <https://www.cnas.org/publications/reports/renew-elevate-modernize-a-blueprint-for-a-21st-century-u-s-rok-alliance-strategy>.

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of President Joe Biden will seek more funding for basic research and more resources to participate in technological and economic competition. The moon’s resources are critical for deep space exploration. The Artemis Accord plays a major role in formulating the rules of extraction and utilization of space resources. The United States, Japan, and the EU plan to contend for marine genetic resources on the high seas with the excuse of “freedom of the high seas” and “common heritage of mankind” in the acquisition of marine biological genetic resources.¹

The United States and the EU are pushing for transatlantic AI cooperation to acquire more AI resources. The NATO plans to create a dedicated NATO Arctic Rapid Reaction Force to compete for polar resources after the arctic ice cap melts.

On December 1, 2020, the US Department of State announced to set up Arctic Education Alliance. It drew up the Common Plan for US–Greenland Cooperation in Support of our Understanding for Pituffik (Thule Air Base). It proposed cooperation plans in areas such as trade and investment, energy and mining, and nature management.² In digital space, cloud computing resources have become the key production resources to drive future digital productivity. It thus raised the curtain of intense geopolitical competition for cloud computing.

III. Spatial dominance

The development of new science and technology has brought new space for human development. The scramble for new space has become an essential manifestation of international strategic competition. Digital space has become an important living space for human beings. Its power is no longer confined to personal information. It also has a strategic influence on the power of the physical entities and the information systems of the physical entities around the world that can access the “Internet of Things.” On July 14, 2020, the European

¹ The Stephenson Ocean Security (SOS), “To Share or Not to Share? Biological Security Risks for Marine Genetic Resources on the High Seas,” accessed April 30, 2020, <https://ocean.csis.org/commentary/to-share-or-not-to-share-biological-security-risks-for-marine-genetic-resources-on-the-high-seas/>.

² US department of States, “Common Plan for US–Greenland Cooperation in Support of Our Understanding for Pituffik (Thule Air Base),” accessed December 1, 2020, <https://dk.usembassy.gov/wp-content/uploads/sites/95/Common-Plan-for-U.S.-Greenland-Cooperation-1.pdf>.

parliament issued “Digital Sovereignty” in Europe. It sought a common data space to create a single digital market. Digital space has extended from terrestrial space to extraterrestrial space. Satellite Internet will become the main form of the next-generation communication network between heaven and earth. The digital space is also extending from the land to the sea. The Defense Advanced Research Projects Agency (DARPA) is pushing for the “Ocean Internet of Things” project. It has deployed thousands of buoy sensors on the ocean, which are sending data through satellites to the cloud for real-time analysis. Consequently, continuous situational awareness on the surface, underwater, and seafloor is achieved. Digital infrastructure accelerates the emergence of digital financial infrastructure. A multidimensional digital financial ecological space based on social payment and the Internet of Things has taken shape. Facebook may restart its revamped Libra cryptocurrency program in 2021. “Artemis Base Camp” will acquire the power to develop and utilize resources in outer space. New strategic space is the basis for the development of new scientific and technological forces. In the future, the strategic competition between digital space and physical space, including sea, land, and space, will intensify.

IV. Strategic deterrence

New technological factors shape new strategic deterrence capabilities. The “National Space Strategy,” released by the United States in March 2018, stressed that the United States regards deterrence and war fighting options as one of its four pillars in “peace through strength” in space. The United States plans to develop a strategy to combine hypersonic weapons with 5G technology to build a “rapid global strike plan.”¹ With the “Blackjack project,” the DARPA has focused on building a space-based “Internet of Things” in the fiscal year 2019. The space-based “Internet of Things” becomes the key infrastructure of “space control power.” In July 2019, the Bipartisan BioDefense Commission in the United States proposed the “BioDefense Manhattan Project” initiative.

¹ Military Aerospace Electronics, “Future Millimeter Wave 5G Wireless Communications Offer Military New Applications to Transform Operations,” accessed October 30, 2020, <https://www.militaryaerospace.com/communications/article/14186438/5g-communications-millimeter-wave>.

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It plans to build a biotech deterrent capability. Artificial intelligence combined with autonomous sensor platforms threatens the viability of mobile ICBM launchers, could “undercut the minimum deterrent strategy” and “blur the line between conventional and nuclear war.” Intelligent decision making is transforming the ability of strategic decision making and military command to respond accurately.¹ The development and application of new technologies are transforming traditional deterrence capabilities. The new deterrent force is being reconstructed at an accelerated pace under the condition of the new scientific and technological revolution.

Influence on the Reform of International System

The “technology alliance” comes into being with the new international power shaped by the new scientific and technological revolution. The emergence of this situation will lead to the accelerated evolution of the international power competition paradigm. It shall then have a significant impact on the reform of the international system.

First, technological hegemony has become a new pillar to support the traditional hegemonic system. The key elements of the traditional great power hegemony system, such as currency, military, and culture, will be highly dependent on science and technology in the era of technopolitik. For instance, digital financial system needs complete digital financial technology support. New military capabilities require the cultivation of new military technologies. Cultural influence likewise must be disseminated and shaped by digital space. Therefore, building technological hegemony has become the core pillar for the United States to support the traditional hegemony system. The manner of accelerating the construction of technological hegemony is an essential reason for the strategic “anxiety” of the United States. This has also become the root cause of the Trump administration’s technological crackdown and containment of China. Moreover, it will be a logical continuation of the new

¹ P. Bracken, “The Intersection of Cyber and Nuclear War,” accessed January 17, 2020, <https://thestrategybridge.org/the-bridge/2017/1/17/the-intersection-of-cyberand-nuclear-war>.

US administration's science and technology strategy toward China. American politicians believe that the quickest and least costly way to build technological hegemony is to form "technology alliances." The alliance could jointly maintain innovative advantages in high-tech fields through joint research and development among technologically advanced allies. "Alliance Innovation Base" is the design to achieve this strategic goal.

The "technology alliance" intensively constructs barriers that prevent advanced science and technology achievement from spreading to their competitors while maintaining the advantages of scientific and technological innovation. These technology barriers are realized through entity list, export control, investment review, supply chain stratification, forced acquisition, forced delisting, talent suppression, and other policy tools. The alliance seeks dominant power of technical standards through reconstructing rules to make up for an inferior position. The strategic direction of "technology alliance" is to realize a new technology hegemony system through the form of "technology multilateralism." Moreover, the alliance seeks to consolidate the cornerstone of the traditional hegemony system.

Second, technical interoperability will strengthen the alliance's common defense system. The joint use of more and more advanced weapons must overcome interoperability problems under the new military revolution. The "technology alliance" emphasizes increasing technological interoperability among allies to build a common defense system. Mark Esper, former US Secretary of Defense, puts forward the Guide for Developing Alliance and Partnership. This is a new strategy to strengthen alliances and partnerships in the era of great power competition.¹ Under this framework, the US DOD launched the Foreign Military Sales Dashboard. The priority is to strengthen the interoperability of military equipment among allies and to build a common defense system to compete in space. Space will be a strategic priority for the next generation of US defense strategies. The nation's core space domain alliance is with Australia, Canada, New Zealand, and the United Kingdom.

¹ Atlantic Council, "Strengthening US Alliances and Partnerships with US Secretary of Defense Mark Esper," accessed October 20, 2020, <https://www.atlanticcouncil.org/commentary/transcript/transcript-strengthening-us-alliances-and-partnerships-with-us-secretary-of-defense-mark-esper/>.

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Such alliance with these countries is known as the Five Eyes partnership. The interoperability of each subsystem of the missile defense system directly determines defense efficiency.¹ The US Navy and the UK Navy have also signed the “Statement of Intent for Future Integrated War Fighting” to strengthen common maritime defense to ensure interoperability and to achieve full coordination of command and control and integrated defense capabilities.² The State Department and the National Institute of Standards and Technology will strengthen standards setting in AI with NATO, the EU, Japan, Australia, and South Korea to enhance the interoperability of AI weapons. It shall also promote the interoperability of intelligent military platforms and decision making procedures. Interoperability is also at the heart of improving joint intelligence and information networks. Alliance members can access each other’s intelligence networks for mutual defense. The United States urged NATO members to prioritize joint research and development at home to ensure system interoperability, as the United States is concerned that differences in technology systems would affect NATO’s defense capabilities.³ At the same time, NATO plans to establish an Indo-Pacific Commission to enhance alliance coordination and interoperability and to maintain the Indo-Pacific defense strategy. Generally, the United States is upgrading its strategic defense architecture from space to sea, from NATO to the Indo-Pacific, through enhanced technological interoperability.

Third, the “technology alliance” creates a new international governance system dominated by the United States and the West through the rules of technological power. The Bretton Woods system built by the United States

¹ CNAS, “Next Generation Defense Strategy: Space,” accessed August 10, 2020, <https://www.cnas.org/publications/commentary/next-generation-defense-strategy-space>.

² U.S. Navy Office of Information, “US, UK Navy Chiefs Conduct Strategic Dialogue, Sign Statement of Intent for Future Integrated War Fighting,” accessed October 21, 2020, <https://www.navy.mil/Press-Office/Press-Releases/display-pressreleases/Article/2390155/us-uk-navy-chiefs-conduct-strategic-dialogue-sign-statement-of-intent-for-future/>.

³ CNAS, “Enlisting NATO to Address the China Challenge,” accessed October 5, 2020, <https://www.cnas.org/publications/commentary/enlisting-nato-to-address-the-china-challenge>.

greatly maintained the post-war American economic and financial hegemony system in the world in the wake of World War II. Under the new round of scientific and technological revolution, the connotation, structure, and system of power will undergo great changes. The United States is planning to devise a system of technological governance like the Bretton Woods paradigm to compete for hegemony under the new power system. The new power rule system is centered on the “technology security trust system,” which is manifested as the “digital trust system” in the digital space. The role of the “technology security trust system” is the same as the dollar trust system, which becomes the core pillar of technology security and application rules. With “Technology Security Trust System” as the center, “technology alliance” aims to (1) reconstruct a new generation of infrastructure by shaping a rule system (5G, 6G, or quantum Internet); (2) monopolize innovation advantage, constraining the flow of innovative elements with supply chain stratified structure; (3) restrict countries outside the alliance from developing and utilizing new strategic space; and (4) reconstruct a new international trade system by embedding digital tax and carbon tax regulation mechanism. The alliance also aims to develop the framework for a digital currency that preserves the central role of the US dollar in the global financial system.¹

Fourth, the “technology alliance” is closely driving the Transatlantic Alliance and the “Indo-Pacific strategic alliance” together. Through the establishment of the Transatlantic Coordination Committee, the Transatlantic Alliance realizes the strategic compatibility and coordination among countries.² A New EU–US Agenda under Global Change, issued by the European Commission on December 2, 2020, proposed the establishment of a new EU–US Trade and Technology Council. Its purpose is to systematically coordinate alliance positions in international standard setting bodies, such as the

¹ Jared Cohen and Richard Fontaine, “Uniting the Techno-Democracies: How to Build Digital Cooperation,” accessed October 13, 2020, <https://www.foreignaffairs.com/articles/united-states/2020-10-13/uniting-techno-democracies>.

² Atlantic Council, “Priorities for a Transatlantic China Strategy,” accessed November 30, 2020, <https://www.atlanticcouncil.org/in-depth-research-reports/issue-brief/priorities-for-a-transatlantic-china-strategy/>.

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Transatlantic Agreement on Artificial Intelligence, to establish blueprints for regional and global technical standards.¹

Michel von der Leyen, the European Commission President, said that the EU is putting forward a proposal for a new, forward-looking transatlantic agenda under new circumstances based on the foundation of “technology alliance.”² The integration of “technology alliance” with countries related to the United States’ “Indo-Pacific Strategy” is also accelerating. For instance, India launched a major ban on Chinese technological products in 2020, with a comprehensive review of Chinese apps and tech companies. Australia and India will form a “key technology partnership.” America’s new alliance system is taking shape at an accelerating pace as the two alliances accelerate their connection in the digital space.

Fifth, “technology alliance” has widened globally the “technology gap” and accelerated the imbalance of the international balance of power. “Technology alliance” builds the barrier of technology diffusion, and the technology gap will emerge in the world with technology barriers. The strength of scientific and technological innovation and the comprehensive national strength display exponential features since the strength of scientific and technological innovation affects comprehensive national strength. As a result, the technology gap will lead to a gap in global innovation and development. Countries with strong scientific and technological innovation abilities will rise rapidly. Conversely, countries that lag behind in scientific and technological innovations will decline fast. This will lead to an unbridgeable development gap in global development. The development barriers of countries at both ends of the development gap will be difficult to penetrate because of the existence of technological barriers built by “technology alliances.” The exponential effect will accelerate the expansion of the development gap, resulting in an accelerated imbalance in international

¹ European Commission, “Joint Communication to the European Parliament: The European Council and the Council--A New EU-US Agenda for Global Change,” accessed December 2, 2020, https://ec.europa.eu/info/sites/info/files/joint-communication- eu-us-agenda_en.pdf.

² “EU-US: A New Transatlantic Agenda for Global Change,” accessed December 2, 2020, <http://www.diplomaticintelligence.eu/international-news/3396-eu-us-a-new-transatlantic-agenda-for-global-change>.

power and will have a huge impact on global security and stability. Such will in turn have profound implications on the global order.

Conclusion

“Technology alliance” is essentially a new form of an international alliance for the United States and its partners to compete for new scientific and technological hegemony, under the condition of new scientific and technological revolution. The “technology alliance,” guided by Western “democracy,” aims to achieve the construction of an alliance in several technical fields through the so-called “technological multilateralism” framework. It is, in fact, an exclusive, narrow sense “club” model targeted against China. It is likewise a mechanism to build a hegemonic system. There remain some differences and obstacles on whether “technology alliance” can become a system and be implemented. The EU tends to realize technological autonomy in the process of new technology development. Seventeen countries in the EU have agreed to the European Processor and Semiconductor Technology Initiative, aiming to reduce their dependence on the United States for semiconductor technology. Distrust of data is another obstacle to the US–EU “technology alliance.” The European Court of Justice ruled that the privacy shield agreement between the United States and EU was invalid in July 2020. The negotiations on a new privacy shield framework between the United States and the EU are deeply divided. Data distrust will directly affect the interoperability and connectivity of Western “technology alliances.” These divisions and digital mistrust will, to some extent, hamper the depth of connectivity of the “technology alliance.” “Technology alliance” will evolve rapidly with the development of the international strategic situation and will take on new characteristics with the development of new technology.

The new scientific and technological revolution is becoming a key variable in the significant changes of the world as a new round of scientific and technological revolution pushes human society into a new stage of development. This process will reshape the international power system and promote an in-depth adjustment of the international power structure. The competition for new power through the form of “technology alliance” will only exacerbate

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the technology gap and development gap, accelerating the imbalance of international power balance and disorder of order. Scientific and technological civilization is the commonwealth of all mankind, as seen from the history of human development and world science and technology. Every scientific and technological revolution in human development has created advanced scientific and technological achievements that will eventually benefit all humankind. The international community should abandon the zero-sum game mentality and adopt the concept of openness, inclusiveness, reciprocity, and shared benefits as the world reaches a critical juncture of major changes. This move shall advance international scientific and technological cooperation.¹ The world community should promote global security, peace, and sustainable development using new technologies to address major global challenges such as climate change and public health. Such promotion is based on a global security concept featuring common, comprehensive, cooperative, and sustainable development. The international community should uphold the vision of a community with a shared future for humankind. Additionally, it should genuinely enable the new scientific and technological revolution to promote new prosperity for human civilization.

(edited by Zhao Linfu)

¹ “Xi Jinping’s Speech at a Symposium of Scientists (in Chinese),” accessed November 11, 2020, http://www.xinhuanet.com/politics/leaders/2020-09/11/c_1126483997.htm.