2021.12.31.

NAFI I Research Report I 21-17

The Future of US-China Tech Competition

Global Perceptions, Prospects, and Strategies

Edited by **Jungmi Cha**

National Assembly Futures Institute

Research Report 21-17

The Future of US-China Tech Competition

Global Perceptions, Prospects, and Strategies

NATIONAL ASSEMBLY
FUTURES INSTITUTE

Editor and Contributors

Project Manager and Editor

Jungmi Cha (Director of Center for International Strategies at NAFI)

Research Partners

Chung Min Lee (Carnegie Endowment for International Peace)
Zike Qi (Peking University)
Kazuto Suzuki (University of Tokyo)
Ivan V. Danilin (IMEMO, Russian Academy of Sciences)
Markus Jaeger (German Council on Foreign Relations)
Jingdong Yuan (University of Sydney)
Selina Ho (National University of Singapore)
Csaba Moldicz (John von Neumann University, Hungary)
Oliver Stuenkel (Fundação Getulio Vargas)
Svetlana Kozhirova (International Science Complex "Astana")
Kairat Maratovich Batyrbayev (Eurasian International Studies Association)
Joseph A. Kéchichian (King Faisal Center for Research and Islamic Studies)
Rahmane Idrissa (Leiden University's African Studies Centre)

PREFACE

One of the characteristics of the recent changes in the international order is that various issues such as technology, economy, climate environment, and health are emerging as major elements of diplomatic and security strategies. Amid such transitions where these issues and values and norms are becoming more closely linked to the changing international order, the National Assembly Futures Institute of South Korea has established the Center for International Strategy (CIS) to anticipate and respond to the rapidly changing international order. National Assembly Futures Institute's CIS aims to comprehensively analyze the complex diplomatic and security environment and establish a response strategy from mid-to-long-term perspectives. To achieve this goal, CIS is constructing various global research networks.

The CIS of National Assembly Futures Institute set 〈The Future of the US-China Technology Competition〉 as the core global agenda for 2021 and conducted a global research collaboration project. We invited 13 international scholars from different countries in order to collect research papers on their views and strategies towards the US-China technology competition. Conducting these research projects provided a platform for a comparative analysis to discuss the various perceptions, prospects, and strategies of different countries concerning the future of the US-China technological hegemony. Furthermore, it promoted cooperative measures for a better future by discussing various alternative ideas and international cooperative strategies.

I would like to express my gratitude to the outstanding scholars

from 12 countries around the world and to Jungmi Cha, director of the CIS at the National Assembly Futures Institute, who planned and conducted the entire process of this global research. This study, based on the outstanding expertise and insight of the participating scholars, played a major role in showing the landscape of various global perceptions about the future of the US-China technological competition.

The continued interest and participation of scholars from all parts of the world will make a great contribution to the development of our global collaborative research for a better future for all. I hope that the results of this study will be a useful reference for overcoming the negative impacts of the US-China competition for technological hegemony and for searching for the alternative solutions of global cooperation.

We look forward to your continued interest and participation in the global collaborative research of the National Assembly Futures Institute's CIS.

Thank you.

December 2021
President of the National Assembly Futures Institute,
Hyeon Kon Kim

Biography of Editor and Contributors

Research Organizer and Editor

Jungmi Cha

Jungmi Cha is the director of the Center for International Strategies at National Assembly Futures Institute (NAFI). She is the chair of the Chinese Politics Study Committee at the Korean Association of International Studies. She was a research professor at Yonsei Institute for North Korean Studies. She was formerly a visiting scholar of the Chinese Academy of Social Science, and a research fellow at the Institute for National Security Strategy. She has been researching Chinese politics and foreign policy, and Sino-ROK relations and recently focusing on China's national strategy in technology innovation and military modernization. She has published numerous articles on the issues regarding China, such as "Analysis on China's 4th Industrial Revolution: Discourse, Strategy, and Promotion System." (2018); "China's RMA in 4th Industrial Revolution Era" (2020); "China's Digital Silk Road" (2020).

International Participants

Chung Min Lee

Chung Min Lee is a senior fellow in the Asia Program at the Carnegie Endowment for International Peace. Before joining Carnegie, he taught for twenty years at the Graduate School of International Studies (GSIS) in Yonsei University in Seoul. He has worked at leading research institutes including the RAND Corporation and served as the ROK's Ambassador for International Affairs and Ambassador for National Security Affairs. Chung Min is Chairman of the International Advisory Council of the International Institute for Strategic Studies (IISS). He is an expert on Korean and Asian security, defense, intelligence, and crisis management. He is the author of *Fault Lines in a Rising Asia* (2016) and *The Hermit King: The Dangerous Game of Kim Jong Un* (2019) and his most recent report includes "Is South Korea Going Global? New Possibilities Together with the Biden Administration" (Carnegie, 2021) and "A Peninsula of Paradoxes: South Korean Public Opinion on Unification and Outside Powers" (Carnegie, 2020).

Zike Qi

Zike Qi is an associate professor at Peking University, Department of International Economy and Trade, and former Senior Associate member at St. Anthony's College, Oxford University.

Her main research interests are in Comparative Economic Mechanisms (types of Market Economies), International Monetary System and Global Value Chain, Computable General Equilibrium, and GTAP models. Some of her most recent works include "Comparison Between Inside and Outside Markets Concerning Contributions to China TFP Within a Dual-cycle Economic Framework", 2021 Sept. and "Empirical Study on Explanations of Contemporary International Trade Theories," *in Journal of Economics World (One of the Core Economics Journals in China),* 2011 March.

Kazuto Suzuki

Kazuto Suzuki is a professor of science and technology policy at the Graduate School of Public Policy at the University of Tokyo and senior fellow of the Asia Pacific Initiative (API), an independent policy think tank. He also currently serves as president of the Japan Association of International Security and Trade.

Some of his recent works include "U.S.-China technological hegemony and Japan's economic security," *Policy Briefs,* 2021 of European University Institute and "UN sanctions on Iran and their financial elements" in Sachiko Yoshimura (eds.) United Nations Financial Sanctions (Routledge, 2021).

Ivan V. Danilin

Dr. Danilin is the Head of the Science and Innovation Department at Primakov National Research Institute of World Economy and International Relations (IMEMO), Russian Academy of Sciences. He is also the Associate Professor at MGIMO University and a member of different corporate and federal expert committees.

His primary area of specialization is innovation policies and digital economy of the U.S.A., China, and Russia; analysis of long-term social and economic implications of emerging technologies.

Markus Jaeger

Markus Jaeger is a fellow at German Council on Foreign Relations (DGAP) and an adjunct professor at Columbia University.

Prior to joining DGAP, Markus was a director at Deutsche Bank Research in New York, where he was responsible for US economic and financial markets research.

Previously, he held a variety of research and advisory roles with Deutsche Bank in London, covering the global economy and emerging markets as well as country risk and geopolitics.

Jingdong Yuan

Jingdong Yuan, Ph.D., is Associate Professor of International Security at the Centre for International Security Studies, University of Sydney, and Associate Senior Fellow at the Stockholm International Peace Research Institute. Dr. Yuan's research focuses on Indo-Pacific security, Chinese foreign policy, Sino-Indian relations, and nuclear arms control and nonproliferation. He is the co-author of *Chinese Cruise Missiles: A Quiet Force-Multiplier* (2014) and *China and India: Cooperation or Conflict?* (2003), and co-editor of *Australia and China at 40* (2012) and *Trump's America and International Relations in the Indo-Pacific* (2021).

Selina Ho

Selina Ho is Assistant Professor in International Affairs at the Lee Kuan Yew School of Public Policy, National University of Singapore. She specializes in Chinese politics and foreign policy, with a focus on infrastructure politics and water disputes. She has written and edited several books as well as peer-reviewed journal articles.

Selina is currently a non-resident senior fellow with the Asia and Latin America Program at the Inter-American Dialogue and a non-resident senior fellow of the Singapore Institute of International Affairs. She was appointed a Global Futures Council Fellow with the World Economic Forum from September 2017-September 2018.

Csaba Moldicz

Csaba Moldicz, Ph.D., is Associate Professor at John von Neumann University, Hungary. His main research area is the economic integration process of the European Union and China, with a special focus on the Central and Eastern European region. Currently, he is also the Head of Research at Oriental Business and Innovation Centre, which was established in 2016 by the Budapest Business School and the Central Bank of Hungary. In addition, he is also an Associate Research Fellow of the Institute for Foreign Affairs and Trade (Hungary) and the China-CEE Institute.

Oliver Stuenkel

Oliver Stuenkel is an Associate Professor at the School of International Relations at Fundação Getulio Vargas (FGV) in São Paulo. He is also a non-resident scholar at the Carnegie Endowment for International Peace in Washington DC, a non-resident Fellow at the Global Public Policy Institute (GPPi) in Berlin, and a columnist for EL PAÍS and Americas Quarterly. His research focuses on rising powers, global order, and Brazilian foreign policy. He is the author of IBSA: *The rise of the Global South?* (Routledge Global Institutions, 2014), *BRICS and the Future of Global Order* (Lexington, 2015) and *Post-Western World* (Polity, 2016).

Svetlana Kozhirova

Svetlana Kozhirova is the head of the Center for Chinese and Asian Studies at the International Science Complex "Astana." Her main area of expertise is in regional security and history and has numerous publications on these topics.

Kairat Maratovich Batyrbayev

Kairat Batyrbayev is the Executive Director of the Eurasian International Studies Association. His area of interest includes the geopolitical issues regarding Central Asia and has numerous experiences working in these areas. He was also an expert on the committee on migration in the Kazakhstan Ministry of Labor and Social Protection of Population.

Joseph A. Kéchichian

Joseph A. Kéchichian is a senior fellow at the King Faisal Center for Research and Islamic Studies in Riyadh, Saudi Arabia. He is also the CEO of Kéchichian & Associates, LLC. He has written several books, including *Legal and Political Reforms in Saudi Arabia* (Routledge, 2013), *Power and Succession in the Arab Monarchies* (Lynne Rienner, 2008), *Faysal: Saudi Arabia's King for All Seasons* (University Press of Florida, 2008), and *Succession in Saudi Arabia* (Palgrave, 2001). Some of his latest works are *The Arab Nationalist Advisor: Yusuf Yassin of Sa'udi Arabia* (Sussex Academic Press, 2021), and *Sa'udi Policies towards Migrants and Refugees: A Sacred Duty* (The King Faisal Center for Research and Islamic Studies, 2021).

Rahmane Idrissa

Rahmane Idrissa is a political scientist and historian based at Leiden University's African Studies Centre and the LASDEL, in Niamey, where he also heads the Think Tank EPGA. He was trained as a (political) philosopher at Dakar's UCAD and a political scientist in the US. Aside from numerous articles, book chapters and research studies, Idrissa has published in book form *The Politics of Islam in the Sahel: Between Persuasion and Violence* (2017); *the Historical Dictionary of Niger* (2020); and L'*Afrique pour les nuls* (2015), co-authored with J.-J. Boillot. He has co-edited *Democratic Struggle, Institutional Reform, and State Resilience in the Democratic Sahel* (2020). His research interests range from democratization in Africa and the politics of Islam in the Sahel to state-building in African contexts, both contemporary and historical.

List of Tables

Executive Summary

With the rise of emerging technologies such as artificial intelligence and quantum computing, global leadership competition has been deeply related to the competition for leading these emerging technologies. As technological superiority is seen as one of the most important determinants of the rise and fall of great power, emerging technologies are the main arena for hegemonic competitions of the two superpowers, the United States and China. The US and China have been driving the global race for technological supremacy and geopolitical tensions.

The growing bipolarity between the United States and China, and the resulting decoupling efforts, are now felt on every continent and in every country. Most countries are facing significant challenges amid intensifying US-China technology competition. There have been a lot of discussions and reports on the US-China tech war issues. However, the discourse and discussions of US-China technology competition have been dominated by the superpowers. Even though globally many countries have confronted the economic or political issues related to this US-China Tech Competition, there has been little attention paid to the middle and small states' perceptions and strategies on this issue.

Therefore, this project is designed to share the different perspectives, ideas, and strategies of different states and continents. It also aims to facilitate the global discussion on the economic and political impacts of the US-China Tech Competition and communicate diverse ideas for resolving the problem and building a better future.

With this background and purpose, the Center for International Strategies at the National Assembly Futures Institute invited 13 distinguished and excellent scholars from different countries to engage in proceed with the global collaborative research on the US-China Tech Competition issue.

The main finding of this collaborative research is that there are common global strategy keywords amidst the different perceptions and prospects of the countries analyzed. The common keywords are technological sovereignty, digital development, and diversification. With these keywords, the democratic countries are adding democratic norms and values as well as technological security and leadership as strategies towards the US-China tech competition. On the other hand, most developing countries have relatively lower threat perceptions and security concerns regarding Chinese technology than the Western and developed countries.

Despite their different perceptions and strategies, most countries are worried about the rise of decoupled technological and economic world. They are concerned that the continuing technological competition between the two great powers can generate a divided ecosystem in the digital era and will deteriorate trade liberalization and global openness for innovation. The geopolitics of technology between the two superpowers and competitive race towards technological self-reliance of the advanced countries may lead to the end of 'End of History.' The ideology conflicts and alliance strategies are becoming the important factors to the technology competition of the superpowers.

However, the strategies of the other parts of the world towards the two superpowers' tech competition are focusing on openness and autonomy, and vice versa, these strategies of the other parts of the

world may also affect the future of US-China tech competition. Most countries pursue openness even with more security screening of foreign technologies and they do not pursue economic decoupling even with more cooperation with the allies. Most countries are concerned about the coming tech-divide and the current rise of techno-nationalism will most likely accelerate and deepen the overall trend of decoupling and the decline of the global economy.

With this global collaborative research, we found that there are great spaces where we can facilitate global cooperation. Most countries want to search for resolutions and answers to overcome the challenges we can face in the future stemming from today's power struggles for technological hegemony. We want to navigate the best way to find the answers and alternatives for a better future. We hope that this global collaborative research is the starting point to share the different views and diverse ideas on the very timely global issues which need global cooperation for that better future.

* *The above executive summary does not contain the summaries of each article of the respective countries and continents. We recommend you to read the articles of the distinguished scholars from the different countries. We believe that reading all the precious opinions of the 13 distinguished scholars will greatly enhance the readers' understanding of the global views on the technological hegemonic competition issue.*

국 문 요 약

❑ 연구 배경 및 목적: 미중 기술패권경쟁의 미래와 세계의 전략

- 미중 기술패권경쟁 심화와 미중 디커플링 가능성이 부상하는 환경에서 이는 단순히 미중 양국 뿐만 아니라 전세계 국가들에게 영향을 미칠 수 있는 이슈
- 미중 기술패권경쟁 이슈의 중요성과 전세계적 영향에도 불구하고 미중 양대 강국 중심의 전략이 주목받아왔을 뿐 G2 이외 국가들의 인식과 전략에 대한 관심과 연구가 취약
- 세계 국가들은 각자의 외교안보 환경과 기술수준에 따라 서로 다른 위협인식과 역량을 가지고 있으며, 이는 미중 기술패권경쟁에 대한 인식과 전망, 전략의 차이로 나타날 수 있음
- 미중 기술패권경쟁의 심화로 외교적 경제적 난제들에 대한 토론과 고민이 깊어지는 상황에서 세계의 인식과 동향을 파악하는 것은 미중기술패권경쟁의 미래를 전망하고 전략을 수립하는 데 있어 중요한 출발점임
- 이에 국회미래연구원 국제전략연구센터는 해외 12개국의 학자들을 초청하여, 미중기술패권경쟁의 미래에 대한 세계 각국, 각 대륙의 인식과 전략을 비교연구하는 〈글로벌 공동연구 프로젝트〉 기획 추진
- 미중기술패권경쟁의 미래는 단순히 패권경쟁의 축인 미중 양국 뿐 아니라 세계 국가들이 이를 어떻게 인식하고 대응하느냐가 주요한 영향변수라는 인식 하에 세계 다양한 국가들의 서로 다른 인식과 전략 비교 분석할 필요
- 미중 기술패권경쟁은 단순히 미중 양국 뿐만 아니라 세계 국가들의 미래에 영향을 미칠 수 있는 이슈라는 점에서 세계 각국의 인식과 전략을 공유하고, 이를 토대로 글로벌 협력의 필요성과 한국의 역할을 모색함

- 글로벌 공동연구 참여국은 △기술패권경쟁의 핵심 축인 미국과 중국 △한국에 전략적 참고가 될 수 있는 주요국(일본, 러시아, 독일, 호주, 싱가폴) △전세계의 인식과 전략을 파악하는 데 주요한 분석대상인 개발도상국 그룹(아프리카, 중앙아시아, 중남미, 중동, 중부유럽) 등 12개국으로 선정. 12개국 학자들이 각국 혹은 각 대륙 현지에서 바라보는 미중 기술패권경쟁의 미래에 대한 인식과 전략 연구

- 2021년 11월 19일 연구에 참여한 세계 학자들이 함께 미중기술패권경쟁의 미래에 대한 세계 각국의 인식과 전략을 공유하는 웨비나 개최

❑ 세계 주요국 인식 비교연구와 국제협력의 필요성

- 미중 양대강국의 기술패권경쟁에 대한 세계 주요국과 대륙의 인식의 비교연구 결과 각국의 경제적 상황과 외교안보 환경에 따라 서로 다른 인식과 전략을 가지고 있음을 확인

- 미국동맹국이면서 기술력을 갖춘 선진국들은 미국과의 연대를 중시하면서도 미중 양국으로부터 오는 경제적 외교적 압력을 완화하기 위한 대안으로 기술주권(technological sovereignty)와 경제안보를 강화하고자 하고 있음. 특히 신흥기술분야의 글로벌 경쟁력과 특정국가에 대한 경제적 기술적 의존을 탈피하는 데 중점을 두고 있음. 또한 민주주의와 자유, 규범에 근거한 국제질서를 강조하면서 디지털 시대 규범 협력을 강조하고 있음

  - 중국과의 기술협력을 확대하는 러시아 또한 중국에 대한 의존도를 경계하면서 기술주권과 제3국과의 협력 필요성 인식

- 상대적으로 낮은 기술력을 가지고 디지털화 발전전략을 핵심과제로 안고 있는 개발도상국들은 경제적 실리에 중점을 두고 중국과의 교류를 확대하면서 대중국 의존도를 상쇄하기 위한 서구와의 협력에도 개방적 접근. 다만 서구 선진국들에 비교하여 중국기술에 대한 위협인식이 낮은 상황에서 가격경쟁력을 가진 중국 기술에 대한 의존도는 계속 확대되는 양상

- 다양한 서로 다른 인식과 전략에도 불구하고 세계 각국 인식의 공통점은 1) 디지털 발전전략 중시 2) 기술주권 강조(기술의존과 종속 경계) 3) 협력 다변화, 제3파트너십 모색이라고 할 수 있음

- 미중 기술패권경쟁에 따른 부정적 영향을 최소화하고 자국의 디지털발전에 필요한 실리적 접근을 강조하고 있음

❑ 결론: 글로벌 소통과 협력을 통한 더 나은 미래 창조와 한국의 역할

- 최근 미중기술패권경쟁의 심화는 글로벌 기술혁신 생태계와 세계화 자체에 주요한 변화를 초래하고 있음. 기술민족주의의 부상과 기술지정학의 심화는 기존의 개방된 자유시장과 기술교류의 생태계를 위축시켜 세계의 혁신과 지속발전에 중대한 위험과 도전을 제기할 수 있음
- 세계 각국은 미중 기술패권경쟁이 초래할 수 있는 도전과 부정적 영향들을 극복하고, 디지털 발전을 추구하면서 규범과 자유에 기반한 세계질서 확립의 필요성을 강조하고 있음
- 미중 기술패권경쟁의 심화에 따른 세계질서의 양극화와 디커플링의 가능성에도 불구하고 세계 경제의 상호의존성과 개방성이 이를 제약할 수 있다는 점에서 글로벌 협력의 필요성과 외교의 다변화를 강조하고 있음
- 한국은 기술력을 갖춘 중견국으로서, 기술혁신을 통해 신흥기술분야의 리더십을 제고하고 기술안보의 강화를 위한 글로벌 협력을 확대하면서 세계 디지털발전에 기여하는 '개방형 기술주권(open technological sovereignty)'와 '글로벌 혁신리더십(global innovation leadership)'추구할 필요 있음
  - 세계국가들과의 협력외교를 통해 세계의 디지털화 발전에 기여하면서 디지털 시대 규범과 표준을 선도하는 데 역할할 필요
- 본 글로벌 공동연구 프로젝트의 목표는 미중기술패권경쟁 시대의 도전과 위기를 극복하고 더 나은 미래를 위한 혁신을 함께해 가는 데 필요한 글로벌 토론과 협력을 촉진하는 것임
- 국회미래연구원 국제전략연구센터는 전 세계 학자들과 전문가들이 함께 글로벌 아젠더에 대한 인식과 전략을 공유하고 함께 대안을 만들어가기 위한 글로벌 공동연구 프로젝트를 지속하면서 협력의 공간들을 확대하고자 함.

1. Introduction: Navigating the Future of US-China Tech Competition

Jungmi Cha
Director, Center for International Strategies
National Assembly Futures Institute

Research Background and Significance

With the Chinese technological rise and the US' threat perception towards it, the geopolitical and geo-economic competition between the US and China has been intensified. Especially the emerging technologies such as artificial intelligence and space technologies have been the critical arena for the great power competition. The US and China are perceiving these emerging technologies as the defining factors for obtaining the global hegemony and global leadership and both countries are driving the global race for technological supremacy. The technological hegemony competition and political tensions between the United States and China are now felt on every continent and in every country. Economic and diplomatic pressures stemming from the great power strategic competition have had impacts on the other parts of the world. Hence, most countries are concerned about the negative impacts and significant challenges amid intensifying US-China technology competition.

There have been a lot of discussions and reports on the US-China technological competition. However, the discourses and discussions on US-China technology competition have been dominated by a few great powers. Even though many countries have confronted the economic or political challenges related to this US-China Tech Competition, there has

been little attention to the middle and small states' perceptions and strategies on the US-China tech competition issue. Despite the lack of study on the middle and small states' strategies on the US-China tech competition, the perceptions and strategies of these countries are very important factors to influence the future of the US-China tech competition. Therefore, this project is designed to share the diverse perspectives, ideas, and strategies of different states and continents. It also aims to facilitate the global discussion on the economic and political impacts of the US-China tech competition. We believe that using collective wisdom based on open discussions can be the best way to solve problems and pave a better future. These are the base motives for starting this global collaborative research.

This global research project was made possible with the great dedication of 13 distinguished and excellent scholars from all over the world. We believe that this report can be the starting point to share the different views and communicate the diverse ideas on very timely global issues, which call for global cooperation. Recently the deepening competition between the US and China is a main global issue which most countries are observing with great concern for their national economic and security interests. Most countries' diplomatic strategies have focused on how to minimize the negative impacts and maximize their national interests. They want to search for resolutions and answers to overcome the challenges we can face in the future stemming from today's technological hegemonic power struggles. We all want to navigate the best way to find the answers and alternatives for a better future.

"*The Best Way to Predict Your Future is to Create It!*" This quote from Abraham Lincoln, the former president of the United States, gives inspiration to the study on the future of US-China tech competition. The

world is facing an unprecedented, unpredictable, and uncertain global environment with rapid changes in technologies and global order. The best way to predict the future is to find out the global states' perceptions, preferences, and strategies and to lead the global cooperation to build a better world. We hope this global collaborative research can make meaningful advances for navigating the global influence of the US-China tech competition and searching for solutions to build a better future.

The Rise of New World Order and the Intensifying US-China Competition for Technological Supremacy

Globalization has been stimulated and economic interdependence has rapidly expanded since the end of the Cold War. In the post-Cold War era, free market capitalism and liberal international order have been led by liberal Western leadership. China became integrated into this global system and world economy which has facilitated China's continued economic growth, which made China the second-largest economy in 2010. With the rise of China, the global system has entered a new transitional period and the Western-led liberal international order is now in crisis. Given China's economic rise and political ambition for rejuvenation, there are heightened expectations and tensions around its continued power projection in the global arena. The economic growth under nondemocracy in China has let down the Western expectation of Chinese democratization followed by economic growth. In particular, the US began to perceive the challenges from the Chinese rise as threats to its primacy and liberal order. The US has discussed the failure of its engagement policy towards China that has continued since the 1970s. The world which has been dominated by the Western liberal order is facing fundamental changes in the aspects of the power configuration and the global norms.

In addition to the rise of China, the technological revolution has been the defining factor for the change of global order. With the rise of new technologies such as artificial intelligence, most developed countries are perceiving that those emerging technologies will be the game changers for the future economic power and future leadership roles. The great power competition has been deeply related to the competition for the technological superiority. The US emphasizes technological innovation and technological superiority as the key foundations that have supported its global dominance. The US has viewed China as the strategic competitor and has launched diverse balancing acts against it. The emerging technologies are the critical arenas for the strategic competition between the US and China. The US national security strategy and defense strategy announced during the Trump administration all emphasized the rise of China, especially in the emerging technologies, as a serious threat to maintaining US hegemony. The 2017 U.S. National Security Strategy report emphasized that the US advantages are shrinking as rival states modernize and build up their conventional and nuclear forces and that access to technology empowers and emboldens otherwise weak states. The US has perceived that the Chinese technological rise threatens the US' primacy which has been maintained since the end of the Cold War.

China has emphasized that technological breakthroughs will be the key driving force for realizing the 'Chinese Dream(*zhongguomeng*)' - great rejuvenation of the Chinese nation. Since China emerged as the world's second-largest economy in 2011, it continues to rapidly rise in high-tech fields such as artificial intelligence and blockchain in the era of the 4th industrial revolution, which further pushes China towards global leadership in the digital era. With the massive investment, China has continued to reduce the technological gap with the US, and has aimed to become the world leader in artificial intelligence by 2030. China has stressed that

today's world is confronting the changes unseen in a century (*世界百年未有之大变局. shijiebainianweiyouzhidabianju*). China emphasizes that the continuous development of emerging technologies such as artificial intelligence is a key driving force that will enable China's global leadership in the future order. At the 19th Party Congress in 2017, President Xi Jinping emphasized that connecting the internet, artificial intelligence, and big data with existing economic fields such as manufacturing and service industries will make it possible for China to become the biggest economic power in the world. China's ambition of becoming the world-class science and technology power presents a 'three-step' strategic goal, which is to enter the ranks of innovative countries by 2020; to become a leading country among innovative countries by 2030; to become a world-class science and technology power in 2049.

Recognizing that the rise of China's competitiveness in the high-tech sector is a key challenge to the US primacy and liberal international order, the US began to restrain China's technological rise in various ways. These included limiting investment by Chinese companies in core technology fields, M&A restrictions, import and export controls, and sanctions against Chinese high-tech companies. In particular, artificial intelligence technology can be said to be a key field in the competition for technological hegemony between the US and China. In the United States, the 116th Congress was the most AI-focused congressional session in history. The number of times AI was mentioned by this Congress in legislation, committee reports, and Congressional Research Service (CRS) reports is more than triple that of the 115th Congress.[1)]

The US currently is criticizing the Chinese technological expansion

1) Stanford University's Human-Centered Artificial Intelligence Institute (HAI). 2021. "Artificial Intelligence Index Report 2021." p.13.

towards the developing countries as the expansion of 'the authoritarian technology.' The US refers to China's export and expansion of digital technology as the export of non-liberal and undemocratic technologies of control and censorship. As a response to the current situation in which China's low-cost technology is infiltrating many developing countries, the US Congress has created a digital technology infrastructure fund, including matching funds such as the International Development Finance Corporation (DFC), and low-interest loans to increase the price competitiveness for US companies' technology. Additionally, by increasing the scale of aid to developing countries that do not use the Chinese network technology and by building up digital partnerships with the developing countries, the US has tried to restrain the expansion of Chinese digital influence. The Central Asia Investment Partnership was launched in collaboration with Kazakhstan and Uzbekistan in 2021 can be held as an example of the US strategy to restrain the expansion of Chinese technology.

The U.S. has also expanded various multilateral cooperation efforts with allied and like-minded countries, a so-called 'democratic technology alliance.' The Quad science and technology ministerial meeting and B3W (Build Back Better) strategy are the best examples of the US tech alliances. The B3W recently agreed upon by the G7 includes the expansion of infrastructure support in developing countries, particularly large-scale financial support in the digital sector.

China has become a serious competitor in the emerging technologies to the US. Given the rise of Chinese capacity in emerging technologies, the US has gained the threat perception that it can lose the technological edge over China. These two differing perceptions – the US' perception of threats and China's perception of opportunities, surrounding the high-tech competition are hence creating two different directions: the US' decoupling

strategy and techno-alliance strategy against China; and China's pursuing technological independence, and strengthening technological connectivity with the developing countries. This competition for technological hegemony between the US and China has led to the emergence of the 'Tech Cold War' and 'Tech Divide' discourses, as well as the analogy of the 'New Cold War.' Regarding this analogy, both the US and Chinese governments have officially expressed negative opinions recently and emphasized that it is different from the US-Soviet Cold War period due to the economic interdependence. In addition, both countries stressed the need to open the possibility of cooperation on issues that require bilateral cooperation, such as climate change to minimize the economic and strategic costs.

However, despite these official denials by the US and Chinese governments, the policy stance of the two governments and the world's perceptions all seem to recognize that a new Cold War structure between the two countries is emerging. A recent poll of 12 European countries found that 62% of respondents thought a new Cold War was unfolding between the two.[2] This new Cold War discourse is deeply related to the technological hegemony competition. The US has been trying to cooperate with allied and like-minded countries to respond to the rise of Chinese technology, while China has been expanding China-led science and technology networks. The other countries, therefore, may have great impact from this great power competition for technological hegemony.

2) *The Guardian*. "Most Europeans believe US in new cold war with China and Russia – poll." 2021.09.22. https://www.theguardian.com/world/2021/sep/22/most-europeans-believe-us-in-new-cold-war-with-china-and-russia-poll

The Future of US-China Tech Competition; Other Countries' Views and Strategies

What could be the implications and impacts of this great power competition in the technology space for other countries and regions? What would be the views and strategies of the other countries on this great power competition? How will different nations react to US-China tech competition? These are the questions this study wants to explore and discuss together. While competition between the United States and China is likely to continue, other countries are trying to navigate the impact of this competition in terms of the economic and strategic aspects. Other countries' views and strategies will take on increased importance in shaping the future of the technological hegemony competition between the United States and China.

In order to discuss the future of the US-China technological competition, this study tries to compare and analyze the perceptions, prospects, and strategies of various countries in the world towards US-China tech competition. Despite the great importance and impact of technological competition between the US and China on the other parts of the world, the majority of research and discussion has been dominated by the two great powers. This study is focusing on the perceptions and strategies of other parts of the world in the US-China tech competition. The main purpose of this study is to collect diverse perceptions from different countries towards the G2 tech competition and search for better alternatives to overcome the negative impacts of the US-China tech competition.

What will the future of the US-China tech competition be, and what will the future international order be like? This study focused on the perceptions of countries around the world, not just the US and China, to find the answer to this question. The competition for technological

hegemony between the US and China not only has economic and security impact on both countries involved, but also has profound economic and security impact on every country in the world. Countries around the world are responding to the impact of the US-China technological competition and establishing strategic directions based on their respective diplomatic and economic environments as well as interests. The future of the competition for technological hegemony between the US and China can be affected in various ways depending on how countries around the world perceive and respond to the competition. Former US Secretary of State Hillary Clinton recently said that the future of the US-China strategic competition depends on how other countries in the world, including Asia, Europe, Latin America, and Africa perceive and respond to the strategic competition between the two countries.[3] It can be said that it is the perceptions and responses of not only the US and China, but also the world's response, that constitutes the future of the US-China technological hegemony competition.

This study explores the global perceptions and strategies towards the US-China tech competition. This study also searches for the potential ways for global cooperation in order to manage and mitigate the impacts of this tech-decoupling led by the two great powers. The technological hegemony competition between the US and China will continue to expand into digital networks and digital influence. This competition is also expected to expand into the realm of values and norms. In response to intensifying competitions between the US and China, countries around the world are facing various challenges from the great power competitions on a range of security and economic issues. Most countries are likely to prioritize the

3) Remarks by former Secretary of State Hillary at the Bloomberg New Economy forum 〈Great Power Competition: The Emerging World Order〉. 2021.11.19.

economic and strategic interests of their own country and adopt various strategies to overcome the negative impacts stemming from the US-China Tech Competition.

Thus, the goal of this study is to expand the landscape of discussion on the US-China tech competition issue. This study shows the global perceptions and strategies on the US-China tech competition. Implications and suggestions for global cooperation were derived based on the comparative analysis of the perceptions and strategies of countries around the world. Not only global cooperation but also the role of middle powers like South Korea can be explored based on the global perceptions and strategies towards the US-China tech competition.

PART I

US-China Technological Hegemonic Competition

2. American Perceptions and Strategies on Rising US-China Tech Competition

Chung Min Lee
Senior Fellow, Asia Program
Carnegie Endowment for International Peace

Why China is determined to catch up with the United States

For the first time since its rise as a superpower after World War II, the United States faces an ascendant great power—China—that is poised to compete with the United States on virtually every dimension of hard power, global economic prowess, and even international legitimacy. Many Americans are surprised that China is acting increasingly like a great power with imperialistic undertones, unabashed nationalism, and aggressive propagation and protection of its core strategic interests. While the United States has consistently stressed its own exceptionalism following its rise as a superpower, the fact that China also emphasizes its own version of exceptionalism comes as a surprise to the United States.

However, unless the United States accepts the fundamental fact that Chinese behavior is a historical aberration, i.e., that great powers have always acted imperiously regardless of their political systems, Washington's countervailing strategies are not likely to succeed. Of course, this does not mean that the United States or its closest allies should agree with China's world views or how the Chinese Communist Party's (CCP) leadership seeks to reimagine regional and global order.

On the contrary, China's determination to strengthen its already authoritarian one-party rule fueled by xenophobic pressure on its

neighbors, for instance, hardly coincides with democratic values and norms. From a Chinese perspective, however, the notion that China should abide by an American led international liberal order is akin to asking the United States to live within the boundaries of a Chinese-led world order. More than any other factor, however, the United States must overcome deep political cleavages at home in order to mount a successful counterbalancing strategy vis-à-vis China. Absent political consensus at home, repairing the damage wrought on American democracy during the Trump administration, as well as putting together a much more effective and robust Asia strategy by the Biden administration, American victory in the so-called New Cold War between the United States is hardly guaranteed.

It should come as no surprise that China's foremost strategic goal is to acquire enough national power to push back American hegemony in the Western Pacific. Once it reaches that objective—economically, militarily, and technologically—its secondary goal is to prevent global and subregional encirclements. Since the collapse of the Soviet Union, Sino-Russian ties have improved to the point where they see common ground in countering American influence and simultaneously weakening NATO and U.S.-led alliances in Asia. For now, the Moscow-Beijing entente serves both powers' interests but as the power gap continues to grow between the PRC and Russia, Moscow will feel increasingly uncomfortable as a perennial junior partner.

The emergence of geo-technology at the core of Great Power competition

China, however, is reaching parity with the United States, or even surpassing it in key emerging areas such as AI and quantum computing. In turn, they lie at the heart of China's ambition to regain its historical status as a commanding great power. And while Chinese President Xi Jinping's

concentration of power and cult of personality is unprecedented since the Mao era, China's fundamental strategic goals are unlikely to change so long as the CCP remains in power. Importantly, the tool by which China seeks to reach parity with the United States is state-driven technological innovation fueled by the Fourth Industrial Revolution (FIR). Geopolitics remains a major template in understanding great power relations, but the global balance of power is going to be increasingly shaped and affected by the ascendance of geo-technology or the makeup, projection, and sustainability of national power-driven by FIR technologies and platforms. How China intends to weave the dividends flowing from the FIR can be seen in the following contexts.

First, unlike the former Soviet Union during the Cold War, China today is an all-hands competitor spurred by Deng Xiaoping's groundbreaking economic reforms from the late 1970s. While Chinese President Xi Jinping is cracking down on China's tech giants such as Alibaba and Tencent whose growing power alarmed the CCP, both state-owned enterprises (SOEs) and market-based conglomerates are central to China's technology supremacy strategy. The United States isn't just competing with the Chinese state, armed forces, and intelligence agencies. It is also competing with Chinese firms, entrepreneurs, and innovators throughout critical supply chains.

Second, China seeks to expand Chinese networks such as BeiDou (rival to America's GPS) and maintain a leading edge not only on 5G networks driven by Huawei but to surpass the United States in 6G technologies. Beijing is determined to break away or sharply reduce its dependence on U.S. or Western-driven technologies, standards, and products. The July 2021 unveiling of the C919 commercial jet is a primary example of China's techno-nationalism. "The C919's development also coincides with China's objective of cutting its reliance on foreign technology and increasing

investment to achieve indigenous innovation."[4]

But commercial avionics isn't what China is really after. The big prize is pushing back American space supremacy. China has made it very clear that it intends to become a major space player by the end of the 2020s. Key firms such as China Satellite Network Group that is responsible for launching low earth orbit (LEO) satellites in order to transmit internet services worldwide.[5] "At the strategic level, China is blending civil, defense, and commercial segments to advance its access to and capabilities in space. While other countries, including the U.S., talk about blurring these lines, China is already doing so, enabled by its command economy."[6]

Third, while it is true that Xi Jinping is the strongest communist leader since Mao and most likely poised to enter into an unprecedented third term in 2022, U.S.-China relations aren't likely to improve even if a less authoritarian leader succeeds him. In a widely reported article published in the Atlantic Council in January 2021 entitled "The Longer Telegram," an anonymous former U.S. official wrote, in part, that:

> *China under Xi, unlike under Deng Xiaoping, Jiang Zemin, and Hu Jintao is no longer a status quo power.* It has become a revisionist power. *For the United States, its allies, and the US-led liberal international order, this represents a fundamental shift in the strategic environment. Ignoring this profound change courts peril. Xi is no longer just a problem for US primacy. He now presents*

4) Amanda Lee, "C919: what is China's home-grown alternative to Airbus, Boeing duopoly, and why is it important?", *South China Morning Post,* January 1, 2021, https://www.scmp.com/economy/china-economy/article/3115793/c919-what-chinas-home-grown-alternative-airbus-boeing-duopoly

5) Tracy Qu, "China's new bid to take on Elon Musk's Starlink: a state-owned satellite enterprise," *South China Morning Post,* May 9, 2021, https://www.scmp.com/tech/policy/article/3132709/chinas-new-bid-take-elon-musks-starlink-state-owned-satellite?utm_source=pocket_mylist

6) Blaine Pellicore and Nicholas Nelson, "America needs new mechanisms to compete with China in space," *Defense News,* March 16, 2021, https://www.defensenews.com/opinion/commentary/2021/03/16/america-needs-new-mechanisms-to-compete-with-china-in-space/

a serious problem for the whole of the democratic world.[7]

As noted above, the fact that American analysts, including former officials, are aghast that China is contesting American hegemony is nothing short of strategic naivete. Indeed, it's critical to recall that in October 1950 *—just one year after the founding of the PRC in October 1949—* Mao Zedong decided to unleash hundreds of thousands of so-called People's Volunteers in support of North Korea. Mao didn't care about China's casualties (especially since many Chinese forces were former KMT troops who fought against the communists during China's long civil war). What he was aiming for was to show the United States (and the Western world in general) that regardless of the power gap between the United States and China, China was determined to contest American military supremacy. Of the many contrarian voices, a *Foreign Policy* contributor stressed that key assumptions made by the author of "The Longer Telegram" were faulty.

> The Chinese cannot be hemmed in or waited out. Containment is not a realistic solution. *The goal of American grand strategy, then, should not be the overthrow of the Chinese Communist Party (CCP) or the disintegration of the People's Republic of China government, but convincing Chinese elites to accept a second-place station in an American-led liberal international order. Our would-be Kennan believes this is a feasible goal: After all, previous leaders of China, despite their CCP membership, were content to accept such a role for their country just a decade ago. With the right combination of carrots and sticks, the Communist leadership might gladly embrace such a role again.*[8]

7) Anonymous, "The Longer Telegram: Towards a new American Strategy," The Atlantic Council, January 2021, https://www.atlanticcouncil.org/content-series/atlantic-council-strategy-paper-series/the-longer-telegram/

8) Ibid.

There is no indication that any serious contender for Xi's position has any desire to accept China's secondary position in a liberal international order run by the United States. Indeed, the Chinese are convinced that American technological and economic superiority that enabled the United States' rise as a superpower *is not exceptional* since China is determined to catch up, and if possible, surpass the United States. FIR platforms and technologies are central to China's ambition of attaining, at a minimum, technological parity with the United States. Among the many factors that led to the Soviet Union's demise, its inability to compete technologically with the United States across all areas and not just in nuclear weapons, armaments, and the space sector served as a nail in the coffin. Beijing is absolutely determined not to repeat that fate.

Fourth, as much as the U.S.-China rivalry receives the spotlight, much less attention is paid to political constraints in these two giants. While contrasting approaches to East-West relations during the Cold War existed as evinced by the heated debate on the merits and demerits of détente, bitterly partisan politics and the rise to the fore of extremism is virtually without parallel. In a Pew Global poll published in July 2021, only 33 percent of American adults expressed "a great deal" or "quite a lot" of confidence in 14 institutions.[9] What is arguably more relevant is the unparalleled toxicity of American politics and polarized view of key institutions as illustrated in Table 1 below.

9) Megan Brenan, "Americans' Confidence in Major U.S. Institutions Dips," Gallup, July 14, 2021, https://news.gallup.com/poll/352316/americans-confidence-major-institutions-dips.aspx

Table 2-1. Polarized view of American institutions

Institutions	Republicans/Leaners%	Democrats/Leaners%	Rep-Dem difference
Police	75%	31%	+45
Church/org. religion	51%	26%	+25
Military	78%	62%	+16
Small business	76%	64%	+12
US Supreme Court	39%	35%	+4
Big business	19%	17%	+2
Banks	35%	33%	+2
Criminal Justice System	20%	19%	+1
Congress	7%	17%	-10
Big Tech	22%	34%	-12
Medical system	36%	50%	-14
TV news	6%	25%	-19
Organized labor	16%	39%	-23
Public schools	20%	43%	-23
Newspapers	8%	35%	-27
Presidency	13%	62%	-49

Source: Gallup Poll, June 1-July 5, 2021, https://news.gallup.com/poll/352316/americans-confidence-major-institutions-dips.aspx

America's ability to forge, implement, and sustain a comprehensive China policy that will enable the United States to maintain its technological and economic edge throughout the 21st century is going to depend critically on overcoming deep political divisions. As evinced by the January 6, 2021, mob attacks on the U.S. Capitol and how most Republican lawmakers stayed silent, statecraft cannot but suffer. Indeed, if Donald Trump mounts a comeback in the 2024 presidential election and pulls out a victory over Joe Biden, American democracy is going to be irrevocably tarnished and damaged. While a broad bipartisan consensus exists on countering Chinese influence and power, a domestically hobbled America will not be able to compete effectively against China.

Chinese hubris and glimpses of the emerging U.S.-China technology wars

Writing in 1999, two well-known American defense analysts argued that "the PRC's power projection capabilities, too, are constrained by huge weaknesses—especially in areas such as aerial refueling, electronic warfare, command and control, and amphibious and air assault assets."[10] They suggested that it may well take at least twenty years before China could pose a significant threat to the United States but that "why it would wish to do so, even with a strong military, remains an open question."[11] But once again, it should come as no surprise that China wanted to build a formidable military not only to more effectively counter American military supremacy but to bolster contingency operational capabilities in its near-abroad such as Taiwan, constraining and countering growing South Korean and Japanese military capabilities, and thwarting maritime challenges in the South China Sea.

Today, the PLA is no longer a backwater military infused with Maoist doctrine and delipidated weapons. The PLA is directly challenging American strategic supremacy in the Western Pacific. More importantly, Beijing's leadership is determined to reach de facto military parity with the United States when the PRC celebrates its 100th anniversary in 2049.

Retired Colonel Liu Mingfu of the People's Liberation Army's 2010 book entitled *The China Dream* received wider attention in the West with the publication of an English version in 2015. In it, Liu asserted that "the goal of China's military rise is to make the United States unable to afford to contain China" and furthermore, "China's military strength has to be more powerful than any rivals in the world to the degree and level that no nation

10) Bates Gill and Michael E. O'Hanlon, "China's Hollow Military," Brookings Institution, June 1, 1999, https://www.brookings.edu/articles/chinas-hollow-military/

11) Ibid.

can contain China's rise. *No country shall set a ceiling for China's power.*"[12] Such bold assertions have become increasingly commonplace by Chinese strategic thinkers but as Beijing has become increasingly vocal and aggressive in staking out its international positions and across-the-board attacks against countries that are deemed unfriendly, China has awakened Asia and the world to earnestly push counterbalancing strategies. In more ways than one, China is its own worst enemy.

Yet what makes the U.S.-China technology wars so significant is China's rapid advances in critical technological sectors. American firms, for example, continue to remain dominant in space. Alarmed by China's accelerated technological catchup, the Biden administration announced a near $110 billion research budget to enable the United States to continue to lead in AI, quantum computing, semiconductors, advanced communications, biotechnology, and advanced energy.[13]

According to a recent report in the *Washington Post,* Chinese companies sold 58 percent of the world's smartphones compared to 15% by the United States and cornered 36 percent of the world market in telecom network equipment while America's market share was only 9 percent.[14] Given the growing dual-use of drones, the fact that Chinese companies dominate the drone market with 80 percent of sales compared with just 4 percent by U.S. companies should be seen as an early warning indicator of the depth of

12) Liu Mingfu, "The World is Too Important to Be Left to America," *The Atlantic,* June 5, 2015, https://www.theatlantic.com/international/archive/2015/06/china-dream-liu-mingfu-power/394748/

13) Masha Borak, "US-China tech war: basic research in AI, semiconductors and biotech gets closer to $110 million boost in US," *South China Morning Post,* May 14, 2021, https://www.scmp.com/tech/tech-war/article/3133554/us-china-tech-war-basic-research-ai-semiconductors-and-biotech-gets?utm_source=pocket_mylist

14) Jeanne Whalen and Chris Alcantara, "Nine charts that show who's winning the U.S.-China tech race," The Washington Post, September 21, 2021, https://www.washingtonpost.com/technology/2021/09/21/us-china-tech-competition/

determination by Chinese firms to maintain global competitiveness.[15] The days of cheap Chinese knock-off goods made sense until the late 1990s or even early 2000s but this is certainly no longer the case. As Michael Brown, director of the Defense Innovation Unit in the Department of Defense, warned in a March 2021 conference, unless the United States sharply increased investments in high technologies while taking full advantage of private-sector breakthroughs, "then China will overtake the U.S. technologically."[16]

Slowly, but surely, the United States is finally putting some muscle into its pivot to Asia strategy that began during the Obama administration. Notwithstanding the botched withdrawal of American forces from Afghanistan, Iran's growing nuclear ambitions, and North Korea's recent missile tests, America's major contest and competition is against China. On September 16, 2021, U.S. President Biden, British Prime Minister Boris Johnson, and Australian Prime Minister Scott Morrison announced an unprecedented American deal to provide Australia with knowhow to jointly build nuclear-powered submarines. U.K. Defense Secretary Ben Wallace stated that "China was embarking on one of the biggest military spends in history" and that "it is growing its navy [and air] force at a huge rate. Obviously, it is engaged in some disputed areas."[17] One American analyst noted that "AUKUS [Australia-U.K.-United States] is a deep but flexible partnership between leading tech powers that could shape the 21st century and serve as the model for U.S. alliances in the Indo-Pacific" and a "bloc that shares technology and coordinates defense policies that include Japan,

15) Ibid.

16) Andrew Eversden, "Defense official: US must invest more in innovation to compete with China," *C3ISRNet*, March 24, 2021, https://www.c4isrnet.com/artificial-intelligence/2021/03/23/defense-official-us-must-invest-more-in-innovation-to-compete-with-china/?utm_source=pocket_mylist

17) "Aukus: UK, US and Australia launch pact to counter China," BBC *News,* September 16, 2021, https://www.bbc.com/news/world-58564837

India, Taiwan and the AUKUS countries would be a formidable force."[18)]

It is far too early to herald AUKUS as the model for future technology and defense cooperation across Asia given divergences of perceptions on the urgency and depth of the China threat, significant differences in national capabilities, and contrasting levels of security and technology connectivity amongst Asian states and with the United States. What is clearer, however, is that China's hubris has not only reawakened the American Giant, but in the process, triggered a fundamental rethinking of Chinese designs and goals across the Indo-Pacific. It is important to note that China is not as powerful as it markets itself nor is the United States as weak as the world increasingly perceives an America in phased decline. As noted above, however, while geo-technology lies at the fulcrum of the U.S-China rivalry that will shape geopolitics well into mid-century and beyond, it is the resilience, strength, and attractiveness of American democracy that is going to fundamentally tip the balance in the technology wars between the United States and China.

18) Walter Russell Mead, "Aukus Is the Indo-Pacific Pact of the Future," *Wall Street Journal,* September 27, 2021, https://www.wsj.com/articles/aukus-indo-pacific-pact-china-australia-11632775481

3. China's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Zike Qi
Associate Professor, School of Economics
Peking University

Introduction

US-China tech competition has consumed much of the world's attention since April of 2018. In 2018, the Trump Administration has imposed duties under Section 301 of the Trade Act of 1974 to counter what the Administration claimed are China's forced technology transfer rules and other industrial policies that are designed to give Chinese companies access to the R&D and business know-how of U.S. companies that operate in China. Duties have been imposed to date on $34 billion of Chinese imports at the rate of 25% of the ad valorem value of the imported merchandise (with the U.S. Trade Representative being in the process of choosing the goods for an additional $16 billion in tariffed goods). Following delivery of the results of the Section 301 investigation, President Trump signed a Presidential Memorandum on Actions by the United States on March of 2018. With this memorandum, massive tariffs were to be imposed on Chinese high-tech imports and restricted Chinese companies from investing in mergers and acquisitions in the United States. US trade representatives stated clearly that the US would levy systematic punitive tariffs on Chinese high-tech areas especially related to exportations to the US including AI, ICT, high - performance medical devices, biomedicine, etc., products prioritized on the list of "Made in China 2025". This may have come to

many people's surprise if they had not noticed connected actions undertaken by the United States earlier in 2018, and because the items concerned have apparently little to do with the US/China trade deficit at all.

The China's blueprint for becoming the digital and hi-tech power and the United States' balacing act against Chinese technology made the tech competition between two giants open and exposed to the public attentions for almost the first time in our contemporary history.

China's growth

Facts shown to the world make it seem as if China has developed the ability to compete with the United States all of a sudden, but to the political elites of the United States, the fact has simply become public knowledge. In congressional testimony in 2019, US trade representative Robert Lighthizer said it could be a disaster if China 'conquered' the world with a high percentage of (such as 70% as stated in the document of 2025 plan) domestic-made parts in these high-tech industries. From the US perspective, China has the ability to develop such industries only because of intellectual property theft acquired from US FDI to China and thus gains international competitiveness through unfair competition.

Obviously, negotiations discussed the main form of tech competition in the phase above. However, since the beginning of 2020, such competition between G2 has fostered two new characteristics:

First of all, China made its own tech guidelines as part of an even bigger social and economic plan for the country and made these analogous guidelines more unique and focused as well. Though "Made in China 2025" has not been officially abandoned, this document has rarely been referred

to in the news since the Sino-American tech relationship turned around its direction. Instead, we saw some specific policies made by the Chinese government in terms of particular industries, such as in August 2020, when the State Council issued "Policies for Promoting the High-quality Development of the Integrated Circuit Industry and the Software Industry in the New Era", which was believed to be a strategic file confronting the challenge posed by the United States after its business ban on HUAWEI. Under that framework, "Several policies" were put forward in order to further optimize the integrated circuit industry and software industry development environment, deepen industrial international cooperation, improve industrial innovation ability and quality of development, formulate fiscal policy, investment and financing, research, and development, import and export, talent, intellectual property, market application, international cooperation, and eight other policies and measures. Additionally, in October 2020, "The Outline of the 14th Five-Year Plan for National Economic and Social Development of the People's Republic of China and the Outline of the Long-term Objective for 2035" was launched, within which the NINE strategic emerging industries for China in the next 5-15 years were designated to replace the ten areas stressed in "Made in China 2025". The contents of the former and latter policies are highly duplicated: information technology, biotechnology, new energy, new materials, high-end equipment, new energy vehicles, green and environmental protection, aerospace, and marine equipment. This plan also included an additional goal of strategic emerging industries accounting for more than 17% of China's GDP. With The Outline of the 14th Five-Year Plan written in twenty thousand Chinese words, the above-mentioned Chapter was only 500 words, almost invisible if one does not pay special effort in searching for it.

However, on the United States' side, and to the contrary, the attitude towards tech competition has been more observant, compared to the last century when there were no such policies. On October 5 of 2018, the White House released the US Advanced Manufacturing Leadership Strategy, prepared by the National Committee of Science and Technology (NCST), announcing for the first time in the Trump administration the strategic plan to ensure US leadership of advanced manufacturing in the future. This plan was launched on October 21 of 2015 when the US Office of Science and Technology Policy (OSTP) website announced the new version of the US National Innovation Strategy.

The National Innovation Strategy is an important scientific research guidance policy created by the US Economic Commission (NEC) and the White House Office of Science and Technology Policy (OSTP) in September 2009. It is the national strategic basis for the development and adjustment of the direction of scientific research in the new century and was supplemented in accordance with current affairs in February 2011. The strategy aims to illustrate how the US government, citizens, and enterprises should work together to make comprehensive innovation, maintain, and strengthen the long-term growth momentum of the economy, and based on this, identify technical areas of priority for the US industrial development. The framework is divided into three parts: the cornerstone of investment innovation; promoting the innovation development of the private sector; creating an innovation country. In 2016, the National Committee of Science and Technology (NCST) released a more accurate National AI Research and Development Strategic Plan for the AI field.

In recent years, the pace of US acts for tech competition has sped up. In December 2020, the US passed the fiscal 2021 Defense Authorization Act, and the US will invest over $100 billion in AI weapons, hypersonic missiles,

and military 5G technology, an unprecedented investment in military technology research. The Senate passed the US Innovation and Competition Act in June 2021, which will provide more than $250 billion to help the U. S. maintain a competitive edge over China in areas from artificial intelligence and quantum computing to semiconductors. Part of the bill, the so-called Endless Frontier Act (Endless Frontier Act), will invest about $120 billion in technology areas such as artificial intelligence and quantum computing, which also are highlighted in China's industrial policy dedicated to developing high-end technologies.

Secondly, China's tech competition goes inward compared to that of the United States which goes outward. Lately, relevant finance news out of China refers to concerning behavior, often referred to as "techbash" as a whole, whereby the Chinese central government sanctioning many domestic market superpowers, such as Tencent, Alibaba, DiDi, and some education giants, etc. In Beijing's view, technology is divided into two types: the icing on the cake and the other is core. The strength of a country does not depend on having the world's best group chat app or ride-hailing service. "Hard technology" determines the strength of a country.

An analysis article in The Economist from August also argues the science and technology war between China and the United States makes China more confident about the need of being more independent in key semiconductor areas, which requires putting more resources, talent into "hard technology". Through private tutoring industry restructuring, restrictions on large technology companies, the rectification of fan culture, China is now putting regulatory focus on young people viewed as too addicted to video games and social media in order to help engineers and programmers be more focused on "hard technology". The fifth plenary session of the 19th session of the communist party of China, adhered to the

idea that innovation is the core driving force of global modernization. The goal is solving the "fist in the neck" problem, especially since science and technology self-reliance in circuit industry is a national development strategy, planning tasks, special deployment, for communist China for the first time in its history.

Meanwhile, on the US side, after President Joe Biden entered the White House, he and his senior team members frequently conducted telephone calls and interactive exchanges with ally and partners in Europe, India, and the Pacific, demonstrating his willingness to repair their relationships, strengthen international cooperation and reshape international influence. The United States has been intending to put multilateral pressure on China through the Asia-Pacific rebalancing strategy and the Trans-Pacific Partnership (TPP) since the Obama era, and Biden is likely to follow many Obama era policies. Biden repeatedly said that he would eschew Trump's unilateralism and work with allies to meet the challenge from China. The Democratic Party even said bluntly that "Democrats will work with their Allies to launch more than half of the world's economies against China and negotiate from the strongest position possible". While strengthening foreign ties and cooperation, the United States is also paying attention to escape its dependence on special exclusive regions: in March 2021, the National Artificial Intelligence Security Council (NSCAI) warned that China may surpass the United States as the world's AI superpower in 10 years. Committee chairman and former Google chief executive Eric Schmidt said the US is "close" to losing its lead in microelectronics due to overreliance on Taiwan.

In terms of ideology, the Biden administration has gone further or done more than the Trump administration. Biden has repeatedly made it clear that he puts values diplomacy at the core of US policy towards China. For

example, cooperating with Europe to continue to put pressure on China on issues such as industrial espionage and forced technology transfer; imposing sanctions on Chinese technology companies on human rights issues such as Hong Kong and Xinjiang, and crack downing on specific Chinese technology companies for violations of digital security and data privacy protection.

Similarities between the two countries

Even if US and China have different perceptions on the technological competition of G2, they still have some points in commone.

First of all, there is a similar foundation of widespread public opinion brought on by the gap between the rich and the poor in two societies, which makes both governments agree that the management of science and technology is necessary. While seeing the government as a key partner in actively supporting corporate innovation, both also see the government as a strict regulator of the tech industry. In the US, President Biden and Vice President Kamala Harris have publicly criticized tech companies, calling for more efforts to strengthen regulation, especially for social media giants. In China, on April 10th of 2021, Chinese authorities fined Alibaba 18.2bn yuan ($2.8bn) following an antitrust investigation. The firm is accused of pressuring retailers into offering their goods exclusively on its online store. It is the largest penalty ever handed down by the country's regulators.

The second point, although China has repeatedly emphasized the "Dual Circulation Strategy", there are indications that China wants to manage relations between China and the United States, rather than simply pursue an antagonistic confrontation. Biden and his team have also repeatedly declared that they are seeking a "competition and cooperation" relationship

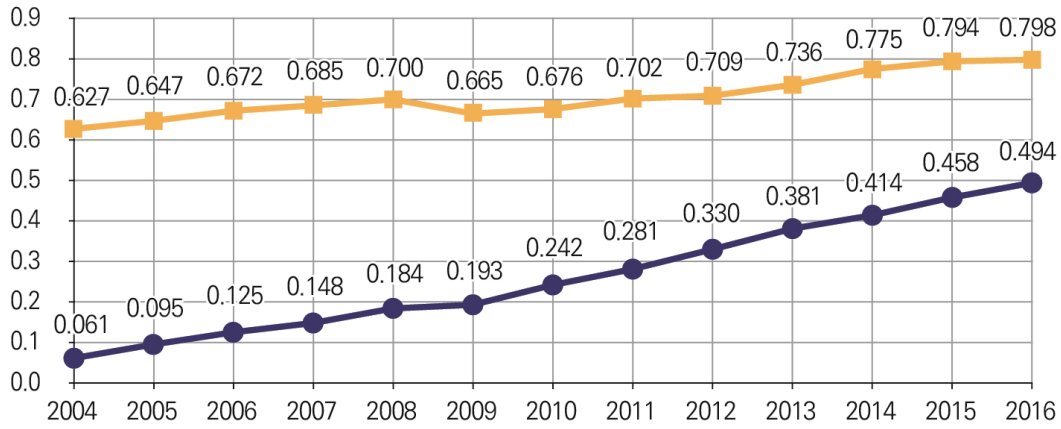
with China. In order to make competition with China "positive" and "controlled", it does not rule out the possibility of easing or even cooperation in relevant fields. The Democratic party generally believes that the benefits of Trump's crazy policy crackdown on Chinese Technology outweighs the loss, so it does not advocate giving up "limited contact" with China and hopes to maintain a pragmatic relationship. Biden's national security assistant Sullivan wrote as early as 2019 that the American contact policy has ended, but the US should not go into "Cold War" mode, China and the US can coexist because if the US loses the world's population, most active, and unlimited future potential market, it will greatly weaken its global competitiveness. For example, in the area of AI, the rapid development of artificial intelligence also hides complex risks and problems. In the current situation, global AI governance without China-US cooperation is inevitably incapable of defusing possible international security risks. The crackdown by the United States on Chinese high-tech enterprises will also bring about the segmentation of global markets and the division of technical standards, leaving other countries facing the problem of choosing the side, which is bound to hinder global scientific and technological innovation.

Finally, both share the worries regarding national security. Emphasizing the value factors of technology is a common tendency in both of their politics. In the US, the Democratic platform made it clear to reset values at the center of foreign policy, repairing alliances and addressing common challenges through allies and international agencies, unlike Trump's use of ideological issues as a tool, Biden is more about defending democratic values as a policy goal. The November 2020 policy proposal for the new Biden administration from the Brookings Society proposed that the interdependence between the Chinese and US data fields poses a series of challenges to cross-border data flow, data privacy, and data security. In

China, a new cyber-security law, which came into force on June 1st of 2017, required that companies in industries deemed to be critical must now ensure their technology systems are "secure and controllable." They must store important data locally and will be subject to audits by official inspectors.

Outlook for the future and conclusion

For the prospect of future, data on tech strengths comparison between two countries still show that there are some disparities between them. According to DU Debin, et al., 2019, in terms of comprehensive science and technology competitiveness, from 2004 to 2016, the US Index rose from 0.627 to 0.798, with slight fluctuations, but overall showed a slow-grow trend. During the same period, Chinas science and technology competitiveness index grew rapidly, from 0.061 to 0.494, with the gap with the United States narrowing year by year. In terms of the ratio of China and the US technology in competitiveness index, it was 61.9% that of the United States in 2016. It can be seen that the gap of the technological competitiveness between China and the US is still very obvious.



Graph 3-1. Comparison of science and technology competitiveness index between China and the United States in 2004-2016(yellow: the United States blue: China)

In a nutshell, marching towards 2035~2040, Chinese strategy on G2 tech competition can be concluded as: closely interactive with the United States, non-attacking, pragmatic and plan-forward. For China, to be tech-independent is a matter of national rejuvenation which China places greater importance on than any other country. But as is evident from their substantial strength level, the road forward could be rough, uneven and perceptibly long.

PART Ⅱ

Global Views and Strategies towards the US-China Tech Competition

4. Japan's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Kazuto Suzuki
Professor, Graduate School of Public Policy
University of Tokyo

Introduction

The US and China are in confrontation in all aspects. Ideologically, President Biden claimed that this is a confrontation between "Democracy against Autocracy." Both countries are in confrontation for the nuclear arms race whereas China is gearing up for building up a larger nuclear arsenal while the US is trying to meet the challenges of new technologies such as hypersonic gliding vehicles. They are also in confrontation with regard to the legitimacy of the regime in Taiwan and the stability of the Taiwan Straits.

From these aspects, it looks similar to the Cold War confrontation between the US and the Soviet Union. However, one thing is quite different. That is the economic interdependence between these two superpowers, and both are holding each other's choke points. China cannot expect economic growth if the US market is closed for China, and the US cannot produce its high-tech products such as iPhone if China rejects to export certain products and materials. Both countries depend on each other while confronting in other domains. In this circumstance, the level of technological superiority became a central issue for strategic competition.

China's actions in pursuit of what is called 'technological hegemony' in

recent years are expected to significantly alter the international order. This paper attempts to analyze trends in the world order brought about by the confrontational relationship between the United States and China. Conflict over technological hegemony in midst of the integration of the global market and the establishment of global supply chains—an environment very different from that of the Cold War era—has not only led to friction and military action, but also has taken on an aspect of competition over superiority in the economic field. Because this conflict revolves around a complex relationship that is neither simply hostile nor simply cooperative[19] and exists in the context of deepening economic interdependence, it is poised to profoundly affect the world order.

What is 'technological hegemony'?

Before further discussion, the term technological hegemony needs to be defined. It is defined herein as the ability to have the power to overwhelm other countries and shape the international order. Extending this concept, technological hegemony may be viewed as 'the ability to possess a specific technology, creating a state in which other countries cannot acquire said technology for a long period of time, and to use that technology to shape the international order.' Such technological hegemony cannot be achieved simply by means of scientific and technological innovation and technological development capabilities. To achieve such hegemony, a country must protect developed technology as intellectual property in order to limit access by other countries. What is of prime importance is to create and implement those technologies into society - social systems, weapons

19) Ashley J. Tellis, Alison Szalwinski, and Michael Wills (eds.) *U.S.-China Competition for Global Influence,* The National Bureau of Asian Research, 2019. https://carnegieendowment.org/files/SA_20_Tellis.pdf.

systems, etc. - and to ascertain whether such technology ultimately has the ability to shape the international order.

From this point of view, it becomes doubtful whether the U.S. can achieve technological hegemony. Although America certainly has the ability to develop new technologies and to put them to practical use, it cannot be said with certainty that they could be socially implemented to shape the international order. The country is already deeply incorporated into the global economy; its resources are focused on high value-added R&D and service industries while its manufacturing industry, which enables mass production for social implementation, is in decline. Even if the U.S. was able to find a breakthrough in new technology, it would be difficult to introduce it to the social system on its own, due to the weakness of mass-production capabilities. To establish technological hegemony in certain domains and to sustain it overall, the country would require a network of free trade agreements for securing the supply chain. In this regard, the decision by former President Donald Trump to leave the TPP (Trans-Pacific Partnership) was inconsistent with the U.S. desire for technological hegemony.

Conversely, China has expanded its share in the global market through its own production capacity. It is now becoming possible for China to influence the international order with new technologies. Although the country is also incorporated into the global supply chain - it cannot domestically produce semiconductors and advanced materials - the Chinese have a sufficient industrial base capable of developing new technologies, and of mass-producing and disseminating them as part of a social system. The debate over modern technological hegemony is strongly linked, not only to simple technological development capabilities, but also to the associated industrial base, industrial productivity, and the ability to gain global market share.

Is 5G the main U.S.-China battleground over technological hegemony?

The rollout of the 5G network is often cited as an issue surrounding technological hegemony between the U.S. and China. We would argue it is also not the subject of a technological hegemony race.[20] From a technological point of view, 5G is already an established technology for Chinese corporations, for Nokia and Ericsson in Europe, as well as NEC and Fujitsu in Japan, companies capable of providing products similar to those of Huawei. There is no U.S.-based company that is competitive in the commercial market for 5G equipment. In this sense, the US decision on 5G is not denying access of its product to foreign countries for the sake of protecting US technology or companies with 5G technologies, nor is 5G monopolizing the technology to use it for hegemonic power.

So how should we view the race to roll out 5G? This is a technological area in which Chinese corporations are rapidly expanding their presence in the global market. Huawei alone is investing in 5G and beyond-5G technologies more than all Western companies combined. The strength of Chinese products is that they invest in low added value mass production, while Western, especially U.S. companies, hesitate to do so because they focus on high added value activities such as designing or developing software. Therefore, Chinese competitiveness now surpasses that of the West. If left up to market forces, Chinese products might acquire a dominant position and drive foreign corporations out.

In that case, a situation will arise in which the 5G communication infrastructure is dependent on Chinese corporations, raising the concern that information exchanged via this communication infrastructure may be easily leaked to the Chinese government. In the event of an intensification

20) Nicol Turner Lee, *Navigating the US-China 5G competition,* Brookings Institution, April 2020. https://www.brookings.edu/research/navigating-the-us-china-5g-competition/

of classic hegemonic rivalry between the U.S. and China, there is also the fear that, in retaliation for a perceived Western offense, Chinese companies might stop providing products, or that codes embedded in Chinese products would be used to launch attacks on socio-economically essential infrastructure in the West.[21] Furthermore, if the 5G infrastructure is monopolized by Chinese corporations, there is the risk of needing to rely on telecommunication technology produced by opaque, and potentially intrusive, high-risk vendors. In other words, issues surrounding 5G create unprecedented problems of increased security due to Chinese corporations being in a superior position through the international competitiveness of their products.

In sum, national economic security may be jeopardized as vulnerability due to dependence on foreign products increases.

Competition over emerging technologies

The competition over technological hegemony is taking place in new fields created by emerging technologies that will greatly influence future socio-economic activities and that can also contribute to military capabilities.[22] These technologies can be categorized into fourteen fields specified by the United States in the Export Control Reform Act (ECRA), i.e.: (1) biotechnology, (2) artificial intelligence and machine learning technology, (3) navigation and positioning, (4) microprocessor technology,

---

21) *Huawei Cyber Security Evaluation Centre Oversight Board Annual Report 2019: A report to the National Security Adviser of the United Kingdom,* United Kingdom, March 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/790270/HCSEC_OversightBoardReport-2019.pdf

22) Xiangning Wu, "Technology, power, and uncontrolled great power strategic competition between China and the United States." *China International Strategy Review,* no.2, pp.99-119, June 2020. https://link.springer.com/article/10.1007/s42533-020-00040-0

(5) advanced computing technology, (6) data analysis technology, (7) quantum information and sensing technology, (8) logistics technology, (9) 3D printing, (10) robotics, (11) brain-computer interfaces, (12) supersonic speeds, (13) advanced materials and (14) advanced surveillance technologies.

The U.S. and its allies have technological superiority in some of these fields. China is rapidly developing its own technological capabilities, and there are several fields in which the country has gained the upper hand (e.g., quantum technologies and advanced surveillance technologies such as facial recognition). These fields of emerging technologies will undoubtedly have a great influence on socio-economic activities, and if they are applied militarily, they would alter China's military capabilities, which could also impact the order of international security.

Of course, technological hegemony cannot be determined simply by the presence or absence of technology. Even if a new technology is developed through R&D, there is a gap (called the 'valley of death') before it can be put to practical use, and even after that, there are several more hurdles before it can be incorporated as a part of a social or military system. Emerging technologies are called 'emerging' because they have not yet reached the stage of practical application and social implementation. The salient question is which country can gain the upper hand technologically and then apply the technologies to social and military systems. There is no doubt that this is where the competition for technological hegemony is taking place.

Changes in policy brought about by emerging technologies

As emerging technologies are socially implemented and established as parts of the social system, it is likely that major changes would also take place in the military and security fields. They may not necessarily become 'game changers' akin to the threat of developing nuclear weapons that could then be deployed, but it is likely that the presence or absence of such technologies would bring about changes in the methods of combat and means for gaining the military advantage, such as the ability to accelerate the decision-making speed by dramatically improving information gathering and processing capabilities.[23)]

Therefore, what becomes an issue is how to control the technologies and restrict knowledge of how they are created, in order to establish technological hegemony. From the point of view of the non-proliferation of weapons of mass destruction, technology transfer has been regulated through export control regimes. Sensitive technologies in specific have been monitored through frameworks such as COCOM and the Wassenaar Arrangement. Such technology has been controlled based on the specifications. High-spec dual-use products and technologies that can be directly applied to weapons manufacture are the subject of control, while those with lower specifications have been, in principle, marketed as general-purpose products to enable both global business and security goals.

On the other hand, emerging technologies are developed in the private sector as versatile technologies in the first instance. It is, therefore, difficult to clearly separate military and civilian applications based on specifications, as has been done in the past. In addition, there are technologies developed and evolved as civilian technologies that have much higher specifications

23) Kelley M. Sayler, *Emerging Military Technologies: Background and Issues for Congress*, Congressional Research Service Report, November 10, 2020. https://fas.org/sgp/crs/natsec/R46458.pdf

than those developed for the military. Thus, civilian knowledge and practice are incorporated into military technologies. For companies seeking to invest, the commercial market is much bigger than the military market, and the proceeds they can obtain from the financial market are much greater than what strictly military investments offer. Certain technologies such as artificial intelligence and the machine learning process require big data, which commercial and civilian activities provide more than military activities. Furthermore, the development of such emerging technologies is not achieved by researchers in a single country but is often created through joint research with international students and researchers from abroad. In addition, these technologies are positioned within the global supply chain and are developed and manufactured using parts and components produced in various countries. In sum, the control of products distributed through the global market, via a global supply chain, not to mention the need for control of research development from various countries calls for a complex system.

We must also consider that it is not yet clear in what way these technologies will contribute to national security. There is no clear distinction between sensitive technologies like weapons of mass destruction and general-purpose products, as we have noted. It is also difficult to properly control technology for the purpose of national security without hindering businesses.

It was once possible to clearly distinguish between military and civilian technologies. The state could develop high-spec technology and control it under the rubric of 'military technology.' This applied to technologies related to weapons of mass destruction. Today it has become difficult to do this in countries with democratic and open economic systems, such as the United States and allies, because it is certain that private industry would

resist complying with additional regulations. In China, which has a state-led economic system, controlling technology is relatively easy.

Will China attain technological hegemony?

China has been playing technological catchup with the West and has operated its economy following a model of importing foreign capital and know-how to achieve this economic development. It is, however, becoming difficult for China to achieve economic development utilizing its low production cost, which is referred to as the 'middle-income trap.'[24] Instead, the Chinese are focusing on technological development in a situation in which there is a call for a shift to high value-added industries.[25] Moreover, in order to solve the increasingly more serious problem of declining birth rates and an aging society, the country has focused on fields such as robotics and AI to promote full automation and labor-saving. In short, as the working population decreases, the Chinese are promoting R&D centered on technological development to augment total factor productivity through machines rather than exploiting labor or capital.

With the advent of competing for technological hegemony it is becoming difficult for China to continue to reap the benefits of the global supply chain, that is, to depend on the U.S. and Western countries for cutting-edge technology, know-how, and materials, in particular, semiconductor manufacturing equipment. As a result, the Chinese confront a situation in which they need to promote the development and manufacture of high

24) Antonio Andreoni, Fiona Tregenna, "Escaping the middle-income technology trap: A comparative analysis of industrial policies in China, Brazil and South Africa", Structural Change and Economic Dynamics, Volume 54, 2020, Pages 324-340.

25) Linda Glawe and Helmut Wagner, *The People's Republic of China in the Middle-Income Trap?,* ADBI Working Paper, No. 749, June 2017. https://www.adb.org/sites/default/files/publication/322961/adbi-wp749.pdf

value-added products, which are in the upstream of the production process.

Under these circumstances, China has begun to recognize the importance of economic security and to cultivate an awareness that its technology is positioning the country as a world leader. This was reflected in President Xi Jinping's speech delivered in April 2020, in which he spoke of goals to foster 'killer technologies' and thereby create a situation in which other countries would become 'dependent on Chinese technology.'[26] Furthermore, it is thought that China has now enacted the National Intelligence Law and the Export Control Law to address the risk of its technologies being transferred to foreign countries. At the same time, this law enables China to take countermeasures if the U.S. and other Western countries end up restricting exports by means of some kind of technology control. In addition, China has amended its national defense law to define cyberspace and outer space as war zones, with the aim of enhancing military capabilities in these areas. The country is ready to mobilize the People's Liberation Army (PLA) against cyber-attacks and attacks on space infrastructure.[27]

In this manner, China is shifting its position to establish economic security by advancing its own technology control and seizing technological hegemony. Moreover, China is considered to have stepped up competition for technological hegemony with the U.S., by making it clear that offensive measures may be taken against countries using, and possibly appropriating, the said technologies.

Traditionally, China's strength lies in the downstream of the production

26) "China must develop 'killer technologies' to survive foreign blockades: Xi," *Apple Daily*, November 1, 2020. https://hk.appledaily.com/news/20201101/ZXKTHTLO4RAPPPFCBH3KN7UVFI/

27) "China's military takes charge of war powers with new defence law," *South China Morning Post,* 3 January, 2021. https://www.scmp.com/news/china/military/article/3115988/chinas-military-takes-charge-war-powers-new-defence-law

process, i.e., in producing mass-produced products. High value-added sectors in upstream of that process, such as semiconductor manufacturing equipment are not yet competitive in strategically important technological fields: China is still in the stage of playing catchup. As a result of the U.S. initiating a competition for technological hegemony and restricting technology transfer, China is being forced into a situation where it needs to enhance its autonomous technological capabilities. Under these circumstances, China will rapidly catch up by means of state-led mobilization of resources. In the case of such a 'sanctions dilemma,'[28] China would be forced to enhance capabilities through indigenous innovation.

So long as technological hegemony is a 'hegemony,' China's present technological capability is insufficient to put the country at the top. The Chinese model requires certain attractiveness to encourage other countries to use such technology. Unless China implements this technology in its socio-economic system in a manner that appeals to other countries, there will be little incentive to adopt it. This has happened before. France once developed a value-added information service called Minitel, which many feel could have been the predecessor to the Internet. The lack of a user-friendly interface and unattractive content (not to mention technical problems) deterred international investment and led to collapse. Furthermore, Japanese feature phones met with a similar fate. Condemned as 'Galapagos mobile phones,' they were highly advanced and among the first to introduce internet surfing and email messaging, however, they were tailored for only the Japanese socio-economic environment. In fact, the Japanese phones that did become internationally popular were the simpler mobile

28) John Patterson "The Sanctions Dilemma," *Middle East Report* no.187-188, March/April 1994. https://merip.org/1994/03/the-sanctions-dilemma/

phones produced by Nokia, and the like. By the same token, in order for Chinese technology to gain international support, it must appeal to the society that uses it. If China employs the technology to monitor and manipulate the activities of its citizens or to suppress criticism of the government, it may be attractive to some dictatorships, but would be less likely to be adopted in many democratic countries.

Japan's Strategy

Finally, let us consider Japan's position in the competition over technological hegemony between the United States and China. Japan is simultaneously in a confrontational relationship with China and in cooperation with the U.S. At the same time, Japan has a profound economic relationship with China; it is not desirable to hinder business with China, or for that matter, for China to strengthen its technology control would make it difficult for the two countries to continue benefitting from this rapport.

Japan should focus on becoming more autonomous in response to the U.S.-China technological hegemony race, thereby gaining capabilities that can be leveraged against both the U.S. and China. This is exactly why new Kishida Administration has set up a new ministerial post for "economic security." The missions of new minister are, first, to improve Japan's "autonomy" in the global supply chain and, second, to develop Japan's "indispensability" to make other countries depend on Japan.

Specifically, Japan should concentrate on refining technologies on the upstream side of the production process, such as cutting-edge materials, robotics, and machining equipment, technology in which the country already excels. As stated, technologies related to the upstream of the

production process tend to be oligopolized and to increase the degree to which other countries rely on Japan.

In any case, Japan could have an influence over other countries through refining technologies, upstream of the production process; by leveraging this position, Japan could avoid being caught up in the intensifying competition over technological hegemony between the U.S. and China. At the same time, it will become important for Japan to reduce dependence on China, thus decreasing its vulnerability. It might shift the current "subsidy for supply chain diversification" valued at 2.3 billion US dollars by de-investing in China and transferring the production site to a third country, a move currently promoted by the Ministry of Economy, Trade and Industry.

Furthermore, in order to avoid being embroiled in the competition over technological hegemony between the U.S. and China, Japan must enhance economic security on its own, and work with other countries. Cooperation with Europe and in U.S.-Europe relations, which cooled during the Trump administration, should recover under the Biden administration. However, as the confrontation between the U.S. and China continues to intensify, Europe will not be able to fully realign with the U.S. China is an important trading partner; the EU and China reached an agreement on Comprehensive Agreement on Investment in December 2020. Europe already maintains an alliance with the United States while honoring an economic relationship with China. Thus, it is in a similar position to that of Japan.

Of particular importance in any cooperative relationship with Europe is sensitivity when taking a lead role in competition for technological standardization so as to avoid being entangled in the competition over technological hegemony between the U.S. and China. European countries

have established a large presence in the setting of product standards and processes, through organizations such as the International Organization for Standardization (ISO), well-versed in this practice in the global market. Because they are new, emerging technologies often present opportunities to set technological standards. If Europe could set standards that can be globally applied, it would conceivably render Chinese and American technologies less internationally viable, before these countries become too dominant in the arena. It is extremely important for Japan and Europe to work together to create a situation favourable to Japanese products, by leading discussions on the development of technological standards, with the common goal of preventing China's technological hegemony and, in some cases, by winning over the United States.

The competition over technological hegemony between the U.S. and China has only recently begun. Japan's future economic security will be determined by its position and behaviour in that protracted competition. Needless to say, cooperation with the United States, Japan's ally, as well as with Europe, which shares the same values and has achieved a similar technological level, offer effective ways to leverage Japanese technologies and to use them as a form of geopolitical power. Wisdom, together with such a broad strategic perspective, is needed to negotiate the era of the U.S.-China technological hegemony race.

5. Russia's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Ivan V. Danilin
Head of Science and Innovation Department
Primakov National Research Institute of World Economy
and International Relations (IMEMO), Russian Academy of Sciences

Introduction

Since 2018, relations between the U.S.A. and P.R.C. entered a new era. Contradictions between the two powers rose steadily through the 2010s as China emerged as a potential regional and then global opponent to the United States. However, it was Donald Trump who finally translated the "selective containment" lexicon into almost a Cold War-style conflict.

The most intense part of it originally was the trade war. However, in the second half of 2019 digital technologies became almost central not only to the economy but (to some extent) also to the political dimension of the conflict. This process was labeled by some observers and the analytic community as "Technology War" – or shortly the "Tech War."[29]

Since 2018, U.S. officials focused on Chinese 5G standards developed by electronic giants Huawei and ZTE.[30] Among other accusations, the White

29) Gordon G. Chang, "The Great U.S.-China Tech War", Encounter Books, 2020; Noah Barkin, "Export controls and the US-China tech war", *MERICS China Monitor,* March 18, 2020, https://merics.org/en/report/export-controls-and-us-china-tech-war; Ivan V. Danilin, "The U.S.-China Technology War: Risks and Opportunities for P.R.C. and Global Tech Sector", *Comparative Politics Russia,* Vol. 11, No 4 (2020), 160-176, https://doi.org/10.24411/2221-3279-2020-10056 (In Russ.); Junfu Zhao, "The Political Economy of the U.S.-China Technology War", *Monthly Review,* Volume 73, Number 3 (July-August 2021), https://monthlyreview.org/2021/07/01/the-political-economy-of-the-u-s-china-technology-war/

House stated that Chinese 5G technologies support Beijing's digital espionage and other functionalities threatening national security.[31] In 2019, first important sanctions were imposed on both companies. Considering the interests of American suppliers Huawei got temporary waivers for the import of some U.S.-produced components (e.g. in August 2021 – for auto chips) but overall pressure on the company and its partners in China and abroad was steadily rising. The White House initiated an international campaign to force its allies and other nations to abandon 5G contracts with both Chinese behemoths. In parallel, efforts to "clean" U.S. telecommunication networks of Chinese equipment started.

But 5G appeared to be just the first victim of the Tech War. In 2019, new U.S. sanctions followed, as well as activities of the Committee on Foreign Investment in the United States (CFIUS) and other bodies to stop Chinese access to the technologically sensitive American assets and competencies. Best Chinese startups in Artificial Intelligence (AI) and cloud computing, companies developing and producing supercomputers, advanced microelectronics,[32] and other digital high-tech actors found themselves under sanctions. More strict control was imposed on the Chinese venture investments in the U.S.A.: from really advanced areas and up to sensitive data assets such as gay dating app Grindr (acquired by Beijing Kunlun Tech

30) Bruno Mascitelli, Mona Chung, "Hue and cry over Huawei: Cold war tensions, security threats or anti-competitive behaviour?", *Research in Globalization,* Vol. 1, 2019, doi: 10.1016/j.resglo.2019.100002.

31) Zach Dorfman, "Tech giants are giving China a vital edge in espionage", *Foreign Policy,* December 23, 2020, https://foreignpolicy.com/2020/12/23/china-tech-giants-process-stolen-data-spy-agencies/

32) "U.S. Expands Blacklist to Include China's Top AI Startups ahead of Trade Talks", *Reuters*, October 7, 2019, https://www.reuters.com/article/ususa-trade-china-exclusive/us-expands-blacklistto-include-chinas-top-ai-startups-ahead-of-tradetalks-idUSKBN1WM25M; "US Adds 33 Chinese Companies, Institutions to Economic Blacklist", *Reuters,* May 22, 2020, https://www.voanews.com/usa/us-adds-33-chinesecompanies-institutions-economic-blacklist

Co).[33] This trend resulted in degradation of Chinese venture presence in the Silicon Valley and other innovative U.S. clusters and a visible drop of P.R.C. venture market after several years of strong growth.[34] In 2020-2021, the White House decided to cut access of Chinese companies — high-tech in the first place — to the American investment capital (an important source of both growth and global expansion). The New York Stock Exchange and the Securities Exchange Commission discussed new requirements for Chinese IPOs and already listed companies with a focus on larger access to the information important for investors[35]—in a clear contradiction with Chinese regulations forbidding some corporate and personal data transfers to foreign entities. Since the Spring of 2021, some new restrictions are discussed by the U.S. Treasury related to so-called Variable Interest Entities (VIE).[36] Since the late 1990s, VIEs were used as a "backdoor" for the international investors to highly protected Chinese internet markets (without real control over mainland companies!) and as an important source of growth for the P.R.C. internet giants like Alibaba. Now VIE as a unique instrument seems to be close to falling under the joint attack of U.S. regulators and P.R.C. officials suspicious of this semi-legal "evasion" of laws by Internet monopolies — with

33) Carl O'Donnell, Liana B. Baker, Echo Wang, "Told U.S. security at risk, Chinese firm seeks to sell Grindr dating app", *Reuters,* March 27, 2019, https://www.reuters.com/article/us-grindr-m-a-exclusive-idUSKCN1R809L

34) "How the US-China Trade War Has Starved Some Silicon Valley Start-ups", *CNBC,* February 1, 2020, https://www.cnbc.com/2020/01/31/chinese-venture-capitalists-draw-back-siliconvalley-investments.html

35) "Chinese Firms That Fail U.S. Accounting Standards to Be Delisted as of 2022: Mnuchin", *Reuters,* August 11, 2020, https://www.reuters.com/article/us-usa-tradechina-companies/chinese-firms-that-fail-usaccounting-standards-to-be-delisted-as-of-2022-mnuchin-idUSKCN2562QX; Echo Wang, "SEC gives Chinese companies new requirements for U.S. IPO disclosures", Reuters, August 24, 2021, https://www.reuters.com/business/finance/exclusive-sec-gives-chinese-companies-new-requirements-us-ipo-disclosures-2021-08-23/

36) Echo Wang, "SEC gives Chinese companies new requirements for U.S. IPO disclosures", *Reuters,* August 24, 2021, https://www.reuters.com/business/finance/exclusive-sec-gives-chinese-companies-new-requirements-us-ipo-disclosures-2021-08-23/

still unknown results for the Chinese internet economy.

Finally, since 2019, restrictions were imposed also on the academic dialogue between the U.S.A. and P.R.C. scholars, on Chinese funding for American higher education institutions, as well as on some education services to the Chinese undergraduates and PhD students allegedly linked to the People's Liberation Army.[37]

These efforts didn't halt but significantly restricted cooperation and business interactions between the two economies in different high-tech areas, especially in the emerging digital technologies. This outcome that was unexpected if not impossible just several years ago, had several important reasons affecting also international dimension of the conflict.

Technology conflict: Between Cold and Trade War

Officially, the rationale for the Tech War was linked to national security issues (also its economic implications) and, to a lesser extent, to the problems of liberal democratic values.

On the national security side, one of the most important arguments supporting the Tech War was possible technology transfers from Chinese commercial high-tech companies to the defense sector in a much-debated Beijing's "military-civilian integration" policy.[38] The other was traditional

37) Andrew Silver, Jeff Tollefson, Elizabeth Gibney, "How US-China Political Tensions Are Affecting Science", *Nature,* April 18, 2019, https://www.nature. com/articles/d41586-019-01270-y; Beryl Lieff Benderly, "U.S. Academics, Make Sure You Know the Rules about Foreign Funding and Affiliations", *Science,* September 11, https://www.sciencemag.org/careers/2019/09/us-academicsmake-sure-you-know-rules-about-foreignfunding-and-affiliations; Paul Evans, "Technonationalism in China-US Relations: Implications for Universities", *East Asian Policy,* Vol. 12, No. 02, 80-92, doi: 10.1142/S1793930520000161; Frank Chen "US blocking more Chinese students from its universities", *Asia Times,* July 20, 2021, https://asiatimes.com/2021/07/us-blocking-more-chinese-students-from-its-universities/

38) Brian Lafferty, Civil-Military Integration and PLA Reforms, In: Phillip C. Saunders, Arthur S. Ding,

cyber-espionage, cybotage, and associated security risks related to possible access of the Chinese government to sensitive information about the U.S.A. and personal data of the Americans.[39] Finally, traditional issues of intellectual property theft, forced technology transfer, unfair competition, and other accusations of P.R.C.'s industrial policy threatening U.S. competitiveness formed a separate economic security rationale for America's "counterstrike".[40]

The value-based rationale was linked in the first place to the alleged oppression of the Uygur minorities by what was presented as the Chinese digital Big Brother. Internet surveillance, repressions against the opposition, and other similar accusations were also used as a basis for sanctions against both startups and established companies.

However real, these rationales were just part of the picture and mask some more strategic goals of the Tech War. Using the framework elaborated by Michael Mastanduno to the U.S. sanctions against the Soviet Union[41] —and relevant to classic models of sanctioning policy[42] —the Tech

Andrew Scobell, Andrew N.D. Yang, and Joel Wuthnow (Eds.), *Chairman Xi Remakes the PLA,* National Defense University Press, 2019, 627-660, https://ndupress.ndu.edu/Portals/68/Documents/Books/Chairman-Xi/Chairman-Xi.pdf

39) Zach Dorfman, "Tech giants are giving China a vital edge in espionage", *Foreign Policy,* December 23, 2020, https://foreignpolicy.com/2020/12/23/china-tech-giants-process-stolen-data-spy-agencies/

40) Robert D. Atkinson, Stephen J. Ezell, *"Innovation Economics: The Race for Global Advantage",* Yale University Press, 2012; Julian Baird Gewirtz, "China's Long March to Technological Supremacy", Foreign Affairs, 27 August, 2019, https://www.foreignaffairs.com/articles/china/2019-08-27/chinas-long-march-technological-supremacy; Lingling Wei and Bob Davis, "How China Systematically Pries Technology From U.S. Companies", *The Wall Street Journal,* September 26, 2018, https://www.wsj.com/articles/how-china-systematically-pries-technology-from-u-s-companies-1537972066

41) Michael Mastanduno, "Strategies of Economic Containment: U.S. Trade Relations with the Soviet Union", *World Politics,* Vol. 37, No. 4 (July 1985), 503-531

42) Gary Clyde Hufbauer, Jeffrey J. Schott, Kimberly Ann Elliott, Barbara Oegg, *"Economic Sanctions Reconsidered",* 3rd Edition, Peterson Institute for International Economics, 2008; William H. Kaempfer, Anton D. Lowenberg, "The Political Economy of Economic Sanctions". In: Todd Sandler, Keith Hartley (Eds.) *Handbook of Defense Economics,* Vol. 2, Elsevier, 2007, 867-911, doi: 10.1016/S1574-0013(06)02027-8

War was a new-era version of the Economic War. The latter one is a group of activities focused on the deceleration of P.R.C. growth, rising costs of development, curtailing resource base, and thus reducing the total Chinese capacity — in a complex of economic, political and military containment efforts. From this point of view, the Tech War was a double-bladed sword forged according to the best practices of economic sanctions. Cutting P.R.C. profits from digital exports (almost 30% of the total)[43] and undermining most innovative and tech-advanced Chinese companies, also significantly raised the costs of further P.R.C. advancements in science, technology, and innovations (also considering "smart" capital) since the nation is still dependent on the West in all these areas. Thus, the White House hoped to prevent the rise of China to a level dangerous to the U.S. economy (also technology and innovation) and military superiority — a motive very similar to some Cold War practices or technology Thucydides trap. And it is important to mention that this "geopolitical rationale" is viewed by at least part of the Chinese elites as the only real reason for the Tech War.[44]

But whatever is similar to the Cold War, the Tech War bears its own specifics due to a new realm of the global economy and digital revolution.

Global digital economy size by different calculations ranges from 4-5%

43) *"Digital Economy Report 2019"*, UNCTAD, United Nations Publications, 2019, 62-64, https://unctad.org/system/files/official-document/der2019_en.pdf; National Science Board, "Production and Trade of Knowledge- and Technology Intensive Industries", *Science & Engineering Indicators,* NSB-2020-5, 2020, https://ncses.nsf.gov/pubs/nsb20205/global-trade-in-high-and-medium-high-r-d-intensive-products; The World Bank, *"ICT goods exports (% of total goods exports)",* 2021, https://data.worldbank.org/indicator/TX.VAL.ICTG.ZS.UN

44) Adam Segal, "Seizing Core Technologies: China Responds to U.S. Technology Competition", *China Leadership Monitor,* The Washington International Trade Association (WITA), 2019, https://www.wita.org/nextgentrade/china-responds-u-s-tech-competition/; Torsten Riecke, "Resilience and Decoupling in the Era of Great Power Competition", *MERICS China Monitor,* 2020, https://merics.org/sites/default/files/2020-08/Merics_ChinaMonitor_PowerCompetition.pdf

(Internet markets and associated services like online payments and supporting electronic solutions) up to 25-30% (including also all electronic and software solutions, telecommunications, and economic effects of their use in other industries) of global GDP.[45] Amid important effects for the national economies—including employment and externalities—at stake are trillion-dollar markets. And fast digitalization of the global economy based on emerging technologies promises to enlarge existing and create brand new markets of key importance for both business entities and national competitiveness. Control (at best) or strong presence (at least) in these new domains means not only super profits, other business, and economic benefits, but are — or seem to be — also critical for the XXI-century economic power, security, and total national capacity. It may be stated that even in the situation of neutral political relationships between the two superpowers, their rising competition for the future digital markets would have been enough to force them to enter some form of conflict — possibly, provoking also geopolitical tensions.

The mix of economic, technological, and geopolitical issues makes the current U.S.-China conflict unique, placing it somewhere in between the Cold War and U.S.-Japan conflict over booming semiconductor and electronics markets in the late 1970-s — early 1990s.[46] This phenomenon is not surprising given the realm of a highly globalized economy with borderless trade and investment flows, highly internationalized value chains, and the rising importance of digital technologies from finance to

45) Kevin Barefoot, Dave Curtis, William A. Jolliff, Jessica R. Omohundro, "Defining and Measuring the Digital Economy", The Bureau of Economic Analysis, U.S. Department of Commerce, Working Paper, 2018, https://www.bea.gov/system/files/ papers/WP2018-4.pdf; *"Measuring the Digital Transformation: A Roadmap for the Future"*, OECD, 2019. doi: 10.1787/9789264311992-en; "Digital Economy Report 2019"

46) Alan W. Cafruny, "Can the United States Contain China?", *Russia In Global Affairs,* Vol. 17, No. 1 (January – March 2019), 100-122, DOI: 10.31278/1810-6374-2019-17-1-100-122

governance, and from production to personal life. The same maybe said about the focus on commercial high-tech corporations and startups rather than on military-industrial capabilities or other traditional targets: knowledgeable economy and the digital revolution are pushing to the top of innovation heights not traditional defense contractors, but commercial private tech-savvy corporations. It will be relevant to mention here that overall R&D expenditures of the American and Chinese Big Tech (Facebook — now known as Meta, Amazon, Microsoft, Alphabet/Google, Apple, Alibaba, Tencent, Baidu) was more than $120 bln in 2020—almost 10% of the R&D budgets of the biggest 2500 global corporations which, in turn, support around 90% of global research and development.[47)]

It is important to note that these real rationales and reasons of the Tech War were enhanced and reshaped by two subjective forces—explaining the high level of War's intensity and its influence on traditionally de-politicized digital markets and on the third parties.

One—as in all cases of emerging technologies—is securitization. Using Gartner's curve as a model we may say that in the minds of the elites emerging digital technologies like AI are at the peak of expectations. So, in their eyes, the conflict over digital technology leadership looks like a zero-sum game, while control over some key technological domains and markets are treated almost in terms of H. Mackinder's classic geopolitics ("who controls x, controls the world"). Considering the Tech War, this is especially well seen in the case of 5G. But in a most pronounced way, it was formulated by the Russian President Vladimir Putin, who—in a speech full of veiled criticism of the U.S. digital

47) Ivan V. Danilin, "Innovative Transformation of Superplatforms', *International Trends,* Volume 18, No. 4 (63). (October–December 2020), doi: 10.17994/IT.2020.18.4.63.2; Data on R&D obtained from annual reports and from: "2019 Global R&D Funding Forecast", *A Supplement to the R&D Magazine,* 2019, https://issuu.com/wtwhmedia/docs/190101-2019_global_funding_forecast; *"The 2020 EU Industrial R&D Investment Scoreboard",* European Commission – Joint Research Centre, Publications Office of the European Union, 2020, doi:10.2760/203793

"monopolistic" ambitions—said: "The one who will become a leader in this [AI] area will be the master of the world".[48]

The securitization is paralleled and enhanced by the neo-techno nationalistic sentiments (using global trade and investment regimes and processes to enhance tech sovereignty). Originally, it was more typical for the P.R.C. (as for all catching-up economies) resulting in some practices highly criticized in the U.S. and Europe, like forced technology transfer. However, since the global financial crisis of 2008-2009 and the rise of China's economic power, protectionist and neo-techno nationalist ideas are gaining much more popularity also in the most developed states.[49] Amid the current U.S. policies to subsidize the "return" of some semiconductor or pharmaceutical industries back to America, it is best revealed by the Digital Sovereignty policy of the E.U.[50] Originally it was aimed at the American Big Tech but now has more global and techno nationalistic focus. The problem is that in the realm of the Tech War these de-jure and de-facto "tech sovereignty" concepts seem to lose gradually original economic sense in favor of a more traditional, political understanding of "sovereignty."

The dangerous mix of tech securitization and politicization of neo-techno nationalism results in the geopolitization of emerging digital technologies—matching the other trend of economization of geopolitics. Digital economy

48) "Putin: lider v sfere iskusstvennogo intellekta stanet vlastelinom mira [Putin: the leader in the field of artificial intelligence will become the master of the world]", *RIA Novosti,* September 1, 2017, https://ria.ru/20170901/1501566046.html [In Russ.]

49) Simon J. Evenett, "Protectionism, state discrimination, and international business since the onset of the Global Financial Crisis', *Journal of International Business Policy,* Vol. 2. (2019), 9-36

50) Carla Hobbs (ed.), *"Europe's digital sovereignty: from rulemaker to superpower in the age of U.S.-China rivalry",* The European Council on Foreign Relations, 2020, https://ecfr.eu/publication/europe_digital_sovereignty_rulemaker_superpower_age_us_china_rivalry/; Tambiama Madiega, *"Digital sovereignty for Europe",* European Parliamentary Research Service, EPRS Ideas Paper, 2020, https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS_BRI(2020)651992_EN.pdf

and emerging technologies are now viewed almost as a classic "strategic asset" in the game of superpowers,[51] and as a factor shaping global and regional alliances, international trade and investment regimes, economic and political cooperation.

These considerations along with other factors play a role in Russia's response to the Tech War—including cooperation with China, its closest partner nation.

Russia and China in the tech war realm: Technology alliance or failed response?

Throughout the 2000-2010s, Chinese interest in high-tech or scientific cooperation with Russia was very limited.[52] Among the reasons were budget restraints of the Russian S&T sector and its very humble commercial high-tech successes, as well as structure of competencies, not matching Chinese economic interests. Language barriers, regulatory and institutional differences further restricted possible areas of cooperation. Some advanced big projects existed, like the construction of the Tianwan Nuclear Power Plant (NPP) and transfers of human space exploration technologies in the late 1990s. But they were not decisive in the general framework of bilateral economic relations. 2014 and Russian "Turn to the East" strategy didn't change the situation dramatically, also because many potential Chinese partners and financial institutions were very cautious about the U.S. sanctions.

---

51) Jeffrey Ding, Allan Dafoe, "The Logic of Strategic Assets: From Oil to AI", *Security Studies,* Volume 30, Issue 2 (2021), 182-212, doi: 10.1080/09636412.2021.1915583

52) More review of state and history of Russian-Chinese S&T relations is presented in: Ivan V. Danilin, "State and Challenges for the Development of Cooperation in Science and Technology between Russia and China" *MIR (Modernization. Innovation. Research),* Vol. 11, no 4 (2020), 384-397, doi: 10.18184/2079-4665.2020.11.4.384-397 [In Russ.]

The start of the Tech War in 2018 corrected the strategy of Chinese elites and business entities. Beijing suddenly found that it is still very dependent on the Western economies in different technological areas and, what is not less important, in science and education. From this point of view, Russia still with potential due to size in some dual-use technologies, software and Internet solutions, physical sciences, and some other areas appeared to be a prospective partner.

Most visible was the activation of dialogues in already established areas of cooperation: defense, nuclear, and aerospace. In the former case, new big deals advanced, including joint development of the Chinese Ballistic Missile Early Warning System (BMEWS).[53] Nuclear cooperation resulted in contracts for the new blocks of Tianwan NPP and the construction of Xudapu NPP.[54] In the aeronautic domain, several projects are on track. After almost a decade of negotiations and preparatory works, long-range wide-body airliner CR929 is finally advancing to the prototype stage.[55] Space cooperation is deepening fast too with joint lunar missions and stations on the moon being discussed.[56]

Chinese businesses also considered new initiatives in Russia. The most important actions were taken by Huawei. The corporation was hit hard but the sanctions and look for different options to advance its tech potential.

53) Alexander Korolev, "China-Russia cooperation on missile attack early warning systems", *East Asia Forum,* November 20, 2020, https://www.eastasiaforum.org/2020/11/20/china-russia-cooperation-on-missile-attack-early-warning-systems/

54) "Start of new unit construction at China's Tianwan and Xudapu nuclear power plants", *Rosatom,* May 19, 2021, https://www.rosatom.ru/en/press-centre/news/start-of-new-unit-construction-at-china-s-tianwan-and-xudapu-nuclear-power-plants/

55) "Construction of the first Russian-Chinese airliner CR929 has begun", *Novosti VPK,* September 03, 2021, https://vpk.name/en/538582_construction-of-the-first-russian-chinese-airliner-cr929-has-begun.html

56) Andrew Jones, "China, Russia enter MoU on international lunar research station", *Space News,* March 9, 2021, https://spacenews.com/china-russia-enter-mou-on-international-lunar-research-station/

Since 2019, Huawei has intensified dialogue with the biggest Russian universities and some research institutions, created an advanced AI R&D center in Moscow, and initiated new research and education projects all over Russia.[57] Some other business entities (with Alibaba among the biggest) also revealed interest in developing Russian innovation and product ecosystems. Chinese R&D venture investments rose dramatically despite the annual current total is still less than $100 million.[58]

A separate important area was 5G. In 2019, during St. Petersburg International Economic Forum (key Russian annual economic and political event), Huawei signed an agreement with the largest Russian mobile network operator MTS in the presence of Vladimir Putin and Xi Jinping.[59] The second biggest Russian telecommunication giant, VimpelCom (Beeline network) also contracted Huawei's 5G equipment.[60] Some other projects in building Russian digital infrastructure followed.

Still, in general, bilateral cooperation didn't change dramatically—amid political declarations, much-lauded but very few big S&T projects, and important but limited corporate initiatives. At least some of the initiatives just get some additional impetus (like nuclear cooperation or CR929). The others would have happened even without the Tech War. 5G is the best

57) See general overview of Huawei activities in Russia in: Huawei Rossiya; Huawei Russia], *tadviser,* https://www.tadviser.ru/index.php/%D0%9A%D0%BE%D0%BC%D0%BF%D0%B0%D0%BD%D0%B8%D1%8F:Huawei_%D0%A0%D0%BE%D1%81%D1%81%D0%B8%D1%8F_(%D0%A5%D1%83%D0%B0%D0%B2%D1%8D%D0%B9) [In Russ.]

58) Data acquired from a set of interviews conducted by the author in 2020 with experts and practitioners engaged in Russia-China venture business activities, including employees of Russian state-owned venture funds with divisions in China.

59) "MTS i Huawei dogovorilis'o razvitii 5G v Rossii [MTS and Huawei agreed to develop 5G in Russia]", *RIA Novosti,* June 5, 2019, https://ria.ru/20190605/1555295921.html [In Russ.]

60) "«Bilajn» menjaet Ericsson na Huawei radi 5G [Beeline changes Ericsson to Huawei for 5G]", *CNews,* May 17, 2019, https://www.cnews.ru/news/top/2019-05-17_bilajn_menyaet_ericsson_na_huawei_radi_5g [In Russ.]

example of the latter case. Huawei already was an important supplier of telecommunication equipment to Russia and had ready-to-install and relatively cheap solutions. So, its role in the Russian 5G as a key vendor was almost predefined. It should be also mentioned that Huawei is not a 5G monopolist on the Russian market. Setting aside Rostec (Russian state-owned dual-use technology behemoth) ambitions to create "Russian 5G,"[61] some acquisitions of Ericsson solutions were also made.[62] The only "strategic" dimensions in the 5G deal with Huawei were a clear political signal to Washington and Brussels and further re-orientation of Russian technology imports towards friendly Chinese suppliers—both mostly related to the post-2014 crisis in Russia-West relations, rather than with the Tech War.[63]

Cooperation between Russia and China in the emerging technologies is also very limited despite some Western analytic reports proclaimed almost an alliance between the "two autocracies."[64] A very illustrative case is the AI. Some security- and public safety-related technology dialogue in this area seems to be real. But there is no indication that any deep and/or large-scale cooperation in building digital Big Brothers or joint

61) "Pravitel'stvo RF i Rosteh dali start razrabotke kompleksnogo reshenija dlja setej 5G [The Russian government and Rostec launched the development of a comprehensive solution for 5G networks]" *Rostec (Official Web Site),* June 30, 2021, https://rostec.ru/news/pravitelstvo-rf-i-rostekh-dali-start-razrabotke-kompleksnogo-resheniya-dlya-setey-5g/ [In Russ.]

62) "Ready for 5G: kak Ericsson pomogayet stroit' osnovu dlya setey svyazi pyatogo pokoleniya v RF [Ready for 5G: how Ericsson helps build the foundation for fifth generation networks in Russia]", *TASS,* December 8, 2020, https://tass.ru/obschestvo/10129665 [In Russ.]; "MTS i Ericsson razognali set' 5G v Innopolise do 3,5 Gbit/c [MTS and Ericsson overclock the 5G network in Innopolis to 3.5 Gbps]", *cnews,* June 9, 2021, https://www.cnews.ru/news/line/2021-06-09_mts_i_ericsson_razognali_set [In Russ.]

63) "Na vysokih skorostjah. Kak razvivaetsja 5G-sotrudnichestvo Rossii i Kitaja [At high speeds. How the 5G cooperation between Russia and China is developing]", *RIA Novosti,* July 12, 2021, https://ria.ru/20210712/sotrudnichestvo-1740943472.html [In Russ.]

64) Samuel Bendett, Elsa B. Kania, "A new Sino-Russian high-tech partnership", *The Australian Strategic Policy Institute,* Policy brief, Report No. 22/2019, https://s3-ap-southeast-2.amazonaws.com/ad-aspi/2019-10/A%20new%20Sino-Russian%20high-tech%20partnership_0.pdf?VersionId=xAs9Tv5F.GwoKPiV9QpQ4H8uCOet6Lvh

cyber-weapons is in place or even possible. The same may be said about the general S&T cooperative framework: outside of Huawei efforts, important but not all-embracing, joint research and development efforts on AI or other advanced emerging technologies is still an idea, rather than reality.

But despite Russia-China's uneven technological cooperation seems to indicate the unimportance of the Tech War for Russian decision-making and policy, in reality, it is proof of the opposite.

The Russian view of the tech war: Techno-sovereignty response to the techno-nationalist challenge

Russian reaction to the Tech War seems to be paradoxical. Moscow views U.S technology sanctions as a "containment of China" — an idea clearly but very shortly articulated by Vladimir Putin in his "Direct Line" interview in 2019,[65] and almost similar to what is said about Western sanctions against Russia. But despite this obviously geopolitical interpretation, Russia's response to the Tech War was very limited. Top officials—including Vladimir Putin and Russian Foreign Minister Sergey Lavrov[66]—didn't make any important policy statements, just criticizing U.S. sanctions in general. No new special high-level documents—including strategies, concepts, or programs—appeared outside of what was already expected. The international reaction, especially cooperation with "Chinese friends and partners," as was shown earlier, was also very limited.

65) "Prjamaja linija s Vladimirom Putinym [Direct Line with Vladimir Putin]", *President of Russia (Official Web Site),* June 20, 2019, http://kremlin.ru/events/president/news/60795 [In Russ.]

66) "Lavrov nazval situaciju s Huawei primerom jeksterritorial'nogo primenenija zakonov SShA [Lavrov called the situation with Huawei an example of the extraterritorial application of US laws]", *Kommersant,* December 17, 2018, https://www.kommersant.ru/doc/3825526 [In Russ.]

The answer for this enigma of the Tech War is that the U.S.-China tech conflict didn't change, but rather supported already existing Russian policies and ideologies.

Since the late 2000s, Russian technology policy has presented a mix of techno-globalist and techno-nationalist rationales. Escalation of the conflict with the West changed this balance in favor of the more traditional techno-sovereignty views with an accent on the defense and other "strategic" areas and import substitution that became a buzzword since the middle of 2010s. These sentiments perfectly matched with political sovereignty and geopolitical independence narratives, which are very popular among Russian elites. Among supporting factors were lobbying of interest groups and interpretations of Chinese successes as a result of state-led industrial buildup resting on import substitution. And it is important to note that Russian techno-sovereignty ideologies evolved if not in parallel (since they appear for different reasons and were realized differently), but in a similar trend with protectionist and techno-nationalistic sentiments in the U.S. and the E.U., steadily rising since 2008-2009 crisis.

From this respect, the Tech War reinforced the kremlin's belief in the relevance of techno-sovereignty.[67] And further geopolitization of technologies (e.g., race for AI supremacy or fears of the technology "dependence" from the adversary nations) and economization of geopolitics (preparing for the "war" for the future markets) supported encapsulation of this ideology among the Russian elites.

67) "Putin prizval garantirovat' tehnologicheskij suverenitet Rossii [Putin urged to guarantee Russia's technological sovereignty]", *RIA Novosti,* July 10, 2019, https://ria.ru/20190710/1556384522.html [In Russ.]; Andrei A. Sushentsov, Andrey Bezrukov, Mikhail Mamonov, Maxim Suchkov, "Mezhdunarodnaja konkurencija i liderstvo v cifrovoj srede [International competition and leadership in a digital environment]", *Report of the Valdai International Discussion Club,* 2021, https://ru.valdaiclub.com/files/36581/ [In Russ.]

This makes the unsurprising fact that Russia-China's tech alliance to confront the U.S. policies didn't come into existence. Russia is thriving to re-build its defense and powerful IT sector for the challenges of the new decade seen as a battle of powers for the tech superiority. Beijing's belief in neo-technology nationalism also seems to be enhanced (at least temporary) by the Tech War. Both nations are willing to be contractors and suppliers in the areas of their expertise and may form limited partnerships even in very sensitive areas (as in the BMEWS case—where Russia rationally decided that otherwise, it will simply lose profits to Chinese competitors and influence over P.R.C. partners). But neither side is ready to cooperate deeply and extensively over really advanced emerging technology areas—especially digital, highly securitized, and seen by both nations as the centerpiece of their future might and independence. As (presumably) most other nations are—in their search of leadership in a new brave digital world.

The tech war and post-war dynamics: Options for the U.S., China, Russia, and the third parties

Despite Biden's Administration differs from its predecessor, the Tech War, securitization, and geopolitization of digital and other emerging technologies survived being a reflection of more important changes in the mindsets of American elites. Both China and Russia are also following the same course as a result of a complex mix of economic, geopolitical, and ideological reasons. Efforts to split digital markets into different "zones of influence," conflicts over the markets of the future, a further rise of protectionism and technological sovereignty, as well as political conflicts over real or alleged digital aggression will still be in place in the near future.

These trends pose significant risks and challenges including impediments on the way of a new Digital Revolution.

Past spectacular successes of the ICT industry rested not only on the technological breakthroughs but also on the highly internationalized nature of the markets and value chains—from Indian IT services to S. Korean micro- and personal electronic competencies, and from U.S. design, Internet, and software brilliance to Chinese production and (now) Internet innovations. Despite investing in the new national digital capabilities in a race for AI and other emerging technologies, it will spur some high-tech advancements (as were seen during the peak of the Cold War). In the long run, balkanization of the digital industry and its securitization and geopolitization may lead to economic, technology, and innovation losses. The digital economy may not be American, Chinese, or Russian—not even speaking about implications for the global inclusive growth, sustainability, and human capital.

So, some form of compromise between different actors in the Tech War seems to be inevitable. This is especially true since advancements in the development and scaling up of emerging technologies will help to overcome the peak of expectations—and fears as well. But the problem is that ideologies, securitization, and geopolitization of technologies will hinder the dialogue. And even after some agreements will appear, the consequences of the Tech War in the form of techno-nationalism and securitization of emerging technologies will remain in the mindsets of the elites. This is especially true for Russia and China that view themselves as unjustly attacked nations, and still have to learn how to cooperate and rely on foreign partners in the S&T. But for the U.S. and the E.U., this challenge will also be important as an accommodation for new roles in a Global Innovation System, where new digital powers exist, which will be very

painful. The generational change of the elites will help to solve this problem, but it will take too much time.

In this situation, third parties like the Republic of Korea face serious challenges. Aligning with any side of the conflict in the short-to-medium term may result in some benefits (like retaking market shares), but also in significant economic and political risks (disruption of value chains, restrictions on trade, rising international tensions, etc.). However, in the long run, these nations may be the biggest winners of the conflict. All parties of the technology confrontation—including Russia—view them as almost neutral actors and relatively "safe" partners. New investments in human capital, R&D, digital infrastructure, and international initiatives may lead to important successes of RoK and other nations in the digital sphere. Which, in turn, may play a role in the rationalization of policies and dialogue between the great powers. If this scenario prevails, it is not impossible that these small, but advanced countries with high digital competencies may become new Digital Geneva on the way to re-establishing open trade, investment, and innovations in the digital area.

6. Germany's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Markus Jaeger
Fellow, America's Program
German Council on Foreign Relations

Introduction

Technology is the application of scientific knowledge for practical purposes. National technology policy involves or affects a wide range of issues, including innovation, application, commercialization, standards, rules, and regulations, intellectual property rights as well as trade and investment, and so on. Today's debate about technology in the context of intensifying US-Chinese geostrategic competition is largely focused on so-called critical and emerging technologies, such as quantum computing, artificial intelligence, nanotechnology, robotics, semi-conductors, gene-editing, cloud computing, 5G networks, to name only the most important technologies.

Technological competition has always been a salient feature of international politics. Technological superiority can have dramatic effects. New technologies like gunpowder, tanks, and nuclear weapons often proved decisive in military confrontations that shaped and reordered international politics. A small group of Spanish adventurers carrying "guns, germs, and steel" was able to destroy the mighty Inca Empire.[68] Gunboats forced Japan to open up economically. Meanwhile, the ready adoption of foreign technologies allowed relatively backward economies to catch up rapidly

68) Jared Diamond, Guns, germs, and steel, London: Cape, 1997

and also wield international influence. Technology is a (or rather the) major source of economic prosperity and international political-military power.[69]

Technological competition arguably matters even more today. If today's emerging technologies turn out to be "winner-take-all" technologies, that is, provide the first adaptor with an unassailable advantage, future technological breakthroughs will have dramatic effects. And even if most technologies, in the end, prove to be buy-able, license-able, reverse-engineerable, or steal-able, even a temporary technological advantage might have far-reaching economic and political consequences as far as the economic and security relations between states are concerned. With the accelerating, and exponential rate of technological progress, the importance of technology is likely to be enhanced further.[70]

Technology matters. In strategic terms: to the extent that it provides a country with a temporary or permanent edge, it has the potential to quickly alter the dynamics of political-military competition by providing a party with a decisive military advantage (e.g., nuclear bomb). In economic terms: a technological monopoly generates economic rents; it can help enhance "comprehensive national competitiveness" by putting an economy on an accelerated development path; and it can provide a state with leverage by affording it to offer or restrict other states' access to its indigenous, monopolistic technology. In short, technology has the potential to create a decisive strategic advantage or, on the receiving end, decisive disadvantage, in addition to creating geoeconomic leverage or, on the receiving end, geo-economic vulnerabilities. It should therefore not come as a surprise that geopolitical competition almost inevitably engenders technological competition, as is the case today with respect to US-Chinese relations.

69) Paul Kennedy, Engineers of victory, Toronto: HarperCollins Publishers, 2013
70) Geoffrey West, Scale, London: Penguin, 2017

Economics and politics of technology diffusion and competition

Liberal economics posits that technological advancement occurs thanks to market competition. In reality, technological development is often furthered by government policies and frequently occurs in the context of geopolitical competition (e.g., space race, nuclear weapons, radar, sonar). Liberal economics assumes that technology will be diffused on the basis of the market mechanism and the decisions of individual economic agents. In reality, governments often prevent technological diffusion and/ or restrict access to indigenous technology on national security grounds, particularly with respect to "dual-use" technologies. But even if technology can be acquired by another state, it frequently gives rise to dependencies and hence political-economic vulnerabilities. For example, a country can purchase advanced fighter planes or super-fast computers. But not being able to produce the technology itself and/ or being reliant on seller-controlled supply chains, spare parts, or maintenance, technology acquisition can lead to dependence and vulnerabilities that can potentially be exploited by the seller.[71)]

It is in this context that US-Chinese technological competition needs to be analyzed. Technology interdependence may help generate efficiency and economies of scale, while technology autarky does not. But autarky limits or eliminates actual or potential vulnerabilities and security vulnerabilities. The trade-off between efficiency and vulnerability becomes more acute in the context of intensifying security competition. In the context of geopolitical competition, it also becomes imperative to retain technological superiority for economic and political-military reasons. In a world with

71) Henry Farrell & Abraham Newman, How global economic networks shape state coercion, International Security, Vol. 44, No. 1, 2019; also, Daniel Drezner, The uses and abuses of weaponized interdependence, Washington: Brookings, 2021

only two technological superpowers also puts other countries, such as Germany and Korea, in a very difficult and delicate position. Not only do they find it difficult to compete with the superpowers technologically, they may also end up in a firing line of geo-economic and geo-tech conflict between the superpowers. This has forced, and will continue to force, Germany to adjust its technology-related policies.

Germany in the face of Chinese, US, and Sino-US technology competition and geo-economic pressure

Traditionally, Germany has been adherent of so-called ordo-liberalism. Ordo-liberalism is committed to creating a stable macroeconomic environment as well as institutions geared towards safeguarding competition. It is generally skeptical with respect to, even opposed to, industrial policy or heavy-handed government intervention.[72] German economic and technology policies have been characterized by openness and competition rather than government intervention and protectionism. By and large, Germany pursued a hands-off policy towards technological development, including technology transfer, foreign investment, and trade. At least, this has been true within its security alliance, less so vis-à-vis members of an opposing alliance. As a technological leader and due to the limited national security implications of within-alliance technological diffusion, the German government had little reason to intervene in private markets. In fact, Germany has been among the most open economies in terms of inward FDI and trade.[73]

72) Jeromin Zettelmeyer, The return of economic nationalism in Germany, Peterson Institute, Policy Brief 4, 2019

73) OECD FDI Regulatory Restrictiveness index: https://www.oecd.org/daf/inv/investment-policy/FDIRRIndexPPT.pdf

Ostensibly triggered by the acquisition of a German robotics firm by a Chinese company in 2017 and underpinned by increasing concerns about an uneven level playing field with respect to China, Germany began to modify its approach to technology-related foreign competition and investment. Today China's economic behavior is increasingly seen as driven by "unfair competition" violating the principles of German ordo-liberalism. Whether in the form of government subsidies, non-reciprocal access to the Chinese markets in terms of trade and investment, intellectual property rights violations, or informal regulatory discrimination in the Chinese market,[74] the German government and corporate German have become concerned about an uneven international playing field and its consequences for German industrial and technological leadership.

Meanwhile, Germany is also facing increased pressure from Washington to align itself with US geo-economic and geo-tech policies vis-à-vis China (e.g., 5G network build-out).[75] There is also tension with respect to competition and taxation issues related to US tech giants. Intensifying US-Chinese tensions and the prospect of increased US pressure has also raised concern in Berlin about being squeezed by both US and Chinese geo-economic pressure. Given Germany's significant economic dependence, particularly in terms of trade and employment, on both the US and China, having to pick a side – economically or technologically – would be very costly.

74) European Chamber of Commerce China, Business Confidence Survey, 2021: https://www.europeanchamber.com.cn/en/publications-business-confidence-survey

75) NPR, Despite US pressure, Germany Refuses to Exclude Huawei's 5G Technology, March 20, 2019: https://www.npr.org/2019/03/20/704818011/despite-u-s-pressure-germany-refuses-to-exclude-huaweis-5g-technology

Germany's response thus far

In light of concerns about uneven level playing and unfair competition, Germany has adopted a range of policies. First, Germany has reformed and tightened inward FDI regulations by broadening the national security review process, now including investment in "critical infrastructure".[76] The regime remains fairly open and largely non-discriminatory. It does provide the authorities with greater legal authority (and political discretion) to scrutinize foreign direct investment by extra-EU companies in sensitive sectors and companies. Second, Germany has also been a strong supporter of the EU-level FDI screening mechanism.[77] Third, Germany has supported EU initiatives to exclude non-EU companies from bidding for government procurement in case these companies benefit from "unfair" government support.[78] This to a large extent simply extends EU competition rules to extra-EU companies. This would offer a further tool to keep Chinese companies from gaining an unfair advantage.

Fourth, and relatedly, so-called trade defense measures and anti-coercion tools are being readied to be deployed by the European Commission, and generally supported by the German government.[79] This also provides authorities with an additional reason to intervene where certain technology sectors risk going belly up due to ("unfair") Chinese competition. Fifth,

76) Gibson & Dunn, Germany Further Strengthens Foreign Direct Investment Regime, May 13, 2021: https://www.gibsondunn.com/germany-further-strengthens-foreign-direct-investment-fdi-regime/

77) European Commission, Foreign Direct Investment EU Screening Framework. February 2019: https://trade.ec.europa.eu/doclib/docs/2019/february/tradoc_157683.pdf

78) Skadden, EU Proposes New M&A and Procurement Control Legislation to Combat Foreign Subsidies, May 19, 2021: https://www.jdsupra.com/legalnews/eu-proposes-new-m-a-and-procurement-1745602/

79) European Commission, Trade Defence, April 17, 2020: https://ec.europa.eu/trade/policy/accessing-markets/trade-defence/

Germany interestingly has put forward an industrial policy, so-called Germany 2030.[80] Semantically, this would seem to be a direct response to "Made in China 2025".[81] Last but not least, at the bureaucratic level the German government has created federal innovation agencies in both the civilian and military realm modeled on the Pentagon's DARPA. Taken together, all these measures and initiatives should largely be seen as a response to Chinese competition and "unfair competition," a defense of a level playing field, but also as a way to shield indigenous technologies from "unfair" (Chinese) competition (The trade defense measures were perhaps more of a direct response to US protectionist policies under the Trump presidency).

These policies and initiatives appear consistent with the strategic guidance issued by the European Commission that considers China both an "economic competitor" and a "ssystemic rival."[82] Germany and Europe are also talking about "strategic autonomy" (or so-called Europäische Handlungsfähigkeit), digital sovereignty, and so on. This type of thinking is new and seeks to generate policies that can help reduce the EU's economic and technological dependence and vulnerabilities vis-à-vis both the US and China. In view of the intensifying geopolitical rivalry between Washington and Beijing, the EU, and especially Germany, is bound to experience intensifying diplomatic and geo-economic pressure to align or not to align itself with one side or the other.

80) Federal Ministry of Economic Affairs, Made in Germany: Industrial Strategy 2030, November 29, 2019: https://www.bmwi.de/Redaktion/EN/Dossier/industrial-strategy-2030.html

81) CSIS, Made in China, Made in China 2025, June 1, 2015: https://www.csis.org/analysis/made-china-2025

82) European Commission, EU-China Strategic Outlook: March 12, 2019: https://ec.europa.eu/info/sites/default/files/communication-eu-china-a-strategic-outlook.pdf

Germany supports this concept and thinking in principle. After all, geo-economically Germany finds itself in a sticky situation.[83] The US and China are Germany's most important economic partners and German companies have become particularly dependent on the fast-growing Chinese market. For example, the Comprehensive Agreement on Investment (CAI)[84] largely reflects Germany's priorities and preferences as well as its concerns about market access. At the same, the US is as important trade-wise as China, and it remains much more important in terms of German overseas FDI. This makes Germany vulnerable to both Washington and Beijing, economically. And this is precisely why intensifying US-Chinese technology competition and likely decoupling would force Germany to choose sides and upset its most or second most important economic partner.

Most likely scenario – geo-tech alliance and intra-alliance tech cooperation

From a political-economic point of view, national tech policy ought to strike an acceptable balance between vulnerability, on the one hand, and reap the economic benefits from economic cooperation, on the other hand. This is where geopolitical rivalry tilts the balance in favor of limiting vulnerability and technological cooperation within rather than across security alliances. Moreover, technological cooperation, broadly defined, generates favorable security externalities, while technological cooperation between rivals is seen as creating undesirable vulnerabilities prone to exploitation by the other party. Not only does providing access to

83) Markus Jaeger, Germany between a rock and a hard place in China-US competition, Commentary, March 17, 2021; see also Markus Jaeger, The Logic (and Grammar) of US Grand Strategy, DGAP, 2021: https://dgap.org/en/research/publications/logic-and-grammar-us-grand-strategy

84) European Commission, EU-China Comprehensive Agreement on Investment, February 23, 2021: https://trade.ec.europa.eu/doclib/press/index.cfm?id=2115

technology enhance the relative position of the competitor but relying on the technology of a competitor also creates vulnerabilities.

Allies are less likely to abuse their technological superiority and even if they do, the harm to national security is typically limited given shared security interests. And often there is (some) diplomatic or even legal recourse, at least within the reasonably rules-based US-led alliance. This also suggests that as US-Chinese geopolitical and geo-economic competition intensifies, with-alliance cooperation on technology becomes more desirable, while across-alliance dependencies are likely to experience decoupling (absent geopolitical and geo-technological rivalry, China might well become keener on technological cooperation). Present geopolitical competition, concerns about vulnerabilities trump concerns of efficiency (of course, this does not mean that in selected areas, cooperative relations are impossible. But this is unlikely to happen with respect to critical and emerging technologies. And even ostensibly non-sensitive technologies may come to be viewed as security risks e.g., US policy towards TikTok).

This is why the envisioned Trade and Technology Council[85] stands a good chance of success. It foresees the coordination of 5G, semiconductors, supply chains, exports controls and technology rules and standards. Such a cooperative agreement offers rules for access, monitoring and credible safeguards. It lays the foundation for intra-alliance coordination. But it also creates the foundation for Sino-US and Sino-US alliance technological decoupling. Long-standing security relationships and, most of all, common security interests should help facilitate a cooperative solution. Once again, the security externalities of cooperation facilitate such a solution (it is no coincidence that trade cooperation as envisioned by the Bretton Woods

85) European Commission, EU – US: A New Transatlantic Agenda for Global Change, December 20, 2020: https://ec.europa.eu/commission/presscorner/detail/en/IP_20_2279

agreement ended up not including US rivals). Again, within-alliance cooperation is more likely to succeed than across-alliance cooperation due to security externalities and vulnerabilities.

Korea and Germany – between a rock and a hard place

Germany and Korea find themselves in broadly similar positions. Undoubtedly, Korea's challenges are far greater than Germany's with respect to US-Chinese competition. Both countries are sensitive to Chinese economic geo-economic measures due to their extensive trade and investment relationships. Both countries are sensitive to US geo-economic pressure, too. This sensitivity is further enhanced by both countries' security dependence. Both countries also face increased economic competition from China, including in the technological realm, and both countries face an uneven level playing field. Economically, Korea naturally is much more dependent on China than Germany. And Korea is more dependent on Washington for its security than Germany. The extensive and intensive geo-political, geo-economic, and geo-tech rivalry will therefore have more far-reaching consequences for Seoul than Berlin.

Moreover, Germany is in a better position due to it being an EU member. EU-level coordination and responses to both US-Chinese competition and the US and Chinese geo-economic policies targeting Germany are more easily deflected given the cover and clout the EU-27 provides. This provides Germany with greater flexibility and room for maneuver than Korea. Washington will be more cautious about driving Germany and Europe into the arms of their geopolitical rival. The risk of driving Korea into the arms of China is far less significant. However, if push comes to shove, Washington is unlikely to shy away from exerting its geopolitical and geoeconomics influence on Germany.

Korea and Germany find themselves in a sticky situation given their dependence on both the US and China. However, in the end, security trumps economics. Security dependence overrides economic interests. Both Korea and Germany will largely end up siding the US security and technology. If both countries can avoid or deflect Chinese geo-economic countermeasures, they will not necessarily suffer Chinese economic retaliation. But here too, Korea is in a stickier position than Germany given its greater economic dependence on China and the greater concomitant vulnerability vis-à-vis China.

7. Australia's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Jingdong Yuan

Associate Professor, Centre for International Security Studies
University of Sydney

Introduction

US-China relations have significantly deteriorated over the past few years. In its 2017 National Security Strategy, the Trump administration for the first time openly labeled China as its "strategic competitor."[86] This hawkish and adversarial approach replaced America's long-held policy of engagement of 45 years and has since intensified a strategic rivalry between a rising power seeking its rightful place in the world and a reigning power having presided over a liberal international order of seven decades. In its first year in office, the Biden administration has so far shown every sign of continuing Trump's hardline policy. The only differences have been a decidedly greater emphasis by Washington on working with allies and partners in building multilateral alignments to manage the Chinese challenges across the Atlantic and in the Indo-Pacific region.[87]

America's awareness of China as a strategic competitor in fact dates back two decades when the incoming George W. Bush administration began a major shift from the Clinton administration's engagement policy of building a

86) The White House, *The National Security Strategy of the United States of America.* Washington, DC. December 2017. https://trumpwhitehouse.archives.gov/wp-content/uploads/2017/12/NSS-Final-12-18-2017-0905.pdf

87) Anne Thurston, *Engaging China: Fifty Years of Sino-American Relations.* New York: Columbia University Press, 2021).

strategic partnership with Beijing. Instead, Bush and his top national security advisers termed China as a strategic competitor. The September-11 terrorist attacks on the US made it imperative to work with China and other major powers in the global war on terror and subsequently, joint efforts in dealing with the North Korean nuclear proliferation issue. The Obama administration sought to develop a stable relationship with Beijing while indicating a pivot to Asia in anticipation to future competition with a rising China that had emerged from the 2008-09 global financial crisis not only largely intact but also much stronger and more assertive in its foreign policy.

However, it was not until the Trump administration that Washington began a more comprehensive reevaluation of America's China policy and sought to redress what it considered to be inept and ineffective approaches to handling its emerging peer competitor. It began with demands on rectifying some of the structural problems of the bilateral trade ties in that the US had accumulated ever growing deficits while access to China's market remained limited, conditional and, for some businesses, denied altogether. The administration's heavy-handed use of tariffs on imported Chinese goods triggered escalation to a trade war. At the same time, the Trump administration promulgated the so-called Free and Open Indo-Pacific strategy, strengthened its defense ties with its allies and engaged other regional security partners, and actively promoted the Quadrilateral Security Dialogue (Quad) between Australia, India, Japan and the US. Both the administration and the Congress also expanded and elevated ties with Taiwan, including relevant legislation, high-level exchanges, and arms sales to the island democracy.[88]

88) Ryan Hass, "Lessons from the Trump Administration's Policy Experiment on China." Working Paper for the Penn Project on the Future of U.S.-China Relations. September 2020. https://www.brookings.edu/wp-content/uploads/2020/09/Ryan-Hass_Lessons-from-the-Trump-Administrations-Policy-Experiment-on-China_Final.pdf

Out of this wide spectrum of contestation from trade to security, a key aspect of the five-decade bilateral relationship—engagement in science and technology cooperation—has undergone a fundamental re-evaluation. For both Beijing and Washington, technology competition has been recognized as crucial in determining who will come out on top in the commanding heights of military, economics, innovation, and industry.[89] The intensifying competition is in sharp contrast in the more engaging and cooperative characteristics that have marked the bilateral technology relationship in the past. In fact, among the first areas of cooperation in the early days of US-China relations was the Carter administration's decision to establish science and technology cooperation with China in 1979 with an official bilateral agreement, which in turn has facilitated and encouraged across the board cooperation and collaboration between American and Chinese scientists and Chinese students admitted to US institutions of higher education over four decades.[90]

This paper provides an overview of the current US-China technology competition, in particular where Washington views China's growing technology challenges to its erstwhile dominant position both globally and in critical areas, and US policies that aim to preserve its leading position, prevent and slow down Chinese advances in science and technology, especially where such advances contribute significantly to China's defense modernization programs, and enlist the support and cooperation of allies

89) Elsa B. Kania and Adam Segal, "Globalized Innovation and Great Power Competition: The US-China Tech Clash," in Jacques deLisel and Avery Goldstein, eds., *After Engagement: Dilemmas in U.S.-China Security Relations.* Washington, DC: The Brookings Institution Press, 2021, pp. 298-329; Paul Evans, "Techno-nationalism in China-US Relations: Implications for Universities," *East Asian Policy* 12:1 (April 2020), pp. 80-92.

90) Department of State, United States-China Science and Technology Cooperation: Biennial Report to the U.S.-China Economic & Security Review Commission, December 2006. https://2001-2009.state.gov/documents/organization/96437.pdf.

and partners to achieve these goals. The paper will also discuss Australia's perspectives on the emerging US-China technology competition and Canberra's policy responses to an ever-changing technological landscape in order to protect its own interests.

Science and technology in US-China relations

Over the past decades, while science and technology ties have evolved along with the deepening of bilateral economic interdependence, a number of issues have also emerged. One relates to technology transfers. Washington has become increasingly aware of and concerned over the means and manners through which some transfers have taken place—what the US administrations term as forced technology transfers from American firms in China. Other concerns include intellectual property thefts, state subsidies in Chinese tech companies, and procurement of technologies through acquisitions and mergers. Washington has approached Beijing in seeking solutions to the former issues while strengthening its foreign investment review processes regarding the latter.[91] Overtime, the US technology policies that are de-centralized, that favor the market for resource allocation and encourage industry-led innovation rather than direct government intervention to pick "winners" stand in contrast to Beijing's long-term planning, state support, and whole-of-government

91) Office of the United States Trade Representative, *Findings of the Investigation into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974.* March 22, 2018. https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF; Forum Staff, "Intellectual Pursuits: The People's Republic China Uses Buying Power, Theft, Spying to Gain Technological Edge," Indo-Pacific Defense Forum 44:2 (July 2019), pp. 19-23; Michael Brown and Pavneet Singh, *China's Technology Transfer Strategy: How Chinese Investments in Emerging Technology Enable a Strategic Competitor to Access the Crown Jewels of U.S. Innovation.* Defense Innovation Unit Experimental, February 2017. https://admin.govexec.com/media/diux_chinatechnologytransferstudy_jan_2018_(1).pdf.

approaches to research development and innovation that give Chinese tech companies distinct advantages. The "Made in China 2025" strategy has been viewed as Beijing's approach to setting standards and achieving dominance in the high-tech sectors.[92] Indeed, China has been actively pursuing greater integration of emerging dual-use technologies into its defense industry. Its whole-of-government approach aims at closing the gap with the West, and its "Made in China 2025" strategy, specifically targets such critical areas as artificial intelligence (AI), quantum computing, robotics, big data, advanced materials, automation, among others.[93]

US-China technology competition extends to a number of tech sectors. Some of them are primarily about who will gain commercial advantages, for instance electronic vehicles; others, such as quantum computing, artificial intelligence (AI), machine learning, robotics, 5G technologies and Internet of Things (IoT), are emerging technologies, dual-use, and have significant potentials for military applications.[94] China has invested heavily in quantum science and in recent years have made remarkable progress in quantum technologies such as quantum cryptography, communications,

92) Hilary McGeachy, US-China Technology Competition: Impacting a Rules-based Order. Sydney: United States Studies Centre, May 2019. file:///Users/jdyuan/Downloads/US-China-technology-competition-impacting-a-rules-based-order.pdf; Jost Wübbeke, Mirjam Meissner, Max J. Zenglein, Jaqueline Ives, and Björn Conrad, "Made in China 2025: The Making of a High-Tech Superpower and Consequences for Industrial Countries." MERICS *Papers on China*. No. 2. Berlin: Mercator Institute for China Studies, December 2016. https://merics.org/sites/default/files/2020-04/Made%20in%20China%202025.pdf

93) "Commercialized Militarization: China's Military-Civil Fusion Strategy," interview with Greg Levesque. Seattle: The National Bureau of Asian Research, June 30, 2021. https://www.nbr.org/publication/commercialized-militarization-chinas-military-civil-fusion-strategy/; US-China Economic and Security Review Commission, "Emerging Technologies and Military-Civil Fusion—Artificial Intelligence, New Materials, and New Energy," Chapter 3, Section 2, *2019 Annual Report to Congress*. Washington, DC: USCC, November 2019, https://www.uscc.gov/annual-report/2019-annual-report-congress

94) Satoru Mori, "US Technological Competition with China: The Military, Industrial and Digital Network Dimensions," *Asia-Pacific Review* 26:1 ((2019), pp. 77-120.

computing, among others. China successfully launched the world's first quantum satellite, Micius (or Mozi, 墨子), in 2016.[95] The quantum cryptography and quantum communications would, as described in one recent report, "create new networks that will be, at least in theory, 'unhackable'" while quantum computing "will create unparalleled computing capabilities, with impactful applications that include cracking prevalent types of encryptions."[96]

Washington's approaches to US-China technology competition have increasingly shifted from the earlier focus on dealing with unfair Chinese policies and practices to gain commercial advantage and set technology standards to regaining the commanding heights in key emerging and foundational technologies in its strategic rivalry with China. Other Chinese methods of obtaining foreign civilian and military technologies have included direct investments, research collaboration, mergers and acquisitions of firms that manufacture dual-use products with military applications, as well as cyber espionage.[97] Indeed, the national security implications of US-China technology competition are not lost for US and, not surprisingly, Australian

95) Daniel Garisto, "China Is Pulling Ahead in Global Quantum Race, New Studies Suggest," *Scientific American,* July 15, 2021, https://www.scientificamerican.com/article/china-is-pulling-ahead-in-global-quantum-race-new-studies-suggest/; Ling Xin, "China launches world's first quantum science satellite," Physics World, August 16, 2016. https://physicsworld.com/a/china-launches-worlds-first-quantum-science-satellite/

96) Elsa B. Kania and John K. Costello, *Quantum Hegemony? China's Ambitions and the Challenge to U.S. Innovation Leadership.* Washington, DC: Center for a New American Security. September 12, 2018. https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/CNASReport-Quantum-Tech_FINAL.pdf?mtime=20180912133406&focal=none. See also, Munish Sharma, "Decrypting China's Quantum Leap," *The China Journal,* no. 80 (July 2018), pp. 24-45.

97) de la Beaumelle, M.A., B. Spevack, and D. Thorne, *Open Arms: Evaluating Global Exposure to China's Defence-Industrial Base.* Washington, DC: Center for Advanced Defense, 2019, https://www.c4reports.org/open-arms; Meia M. Nouwens and Helena Legarda, "Emerging Technology Dominance: What China's Pursuit of Advanced Dual-Use Technologies Mean for the Future of Europe's Economy and Defence Innovation." London and Berlin: International Institute for Strategic Studies/Mercator Institute for China Studies, December. https://www.merics.org/sites/default/files/2018-12/181218_Emerging_technology_dominance_MERICS_IISS.pdf

policy makers as they grapple with the significance of how emerging and foundational technologies provide a critical edge to the next generation of industrial and military power, a phenomenal long game that Beijing has been preparing for decades while Washington is only now awakened to the seriousness of these challenges, in particular "a revolution in technology that poses both perils and promises."[98]

Indeed, the growing recognition of the nature of US-China technology competition and its fundamental impact on national security has become an important factor informing Washington's policies towards China in general and regarding technologies, innovation, and America's investment in its future prospects of contesting and winning this competition in particular.[99] This competition now spans from 5G technologies, AI, semi-conductor, to robotics, hypersonics, advanced materials, and data analytics.[100] Six out of the ten priority areas as stipulated in "Made in China 2025"—new advanced information technology, machine tools and robotics, aerospace and aeronautics,

98) The White House, Interim National Security Strategic Guidance. March 2021, p. 8., at: https://www.whitehouse.gov/wp-content/uploads/2021/03/NSC-1v2.pdf. Regarding Beijing's approaches towards US- China strategic rivalry, see Michael Pillsbury, Hundred Year Marathon: China's Secret Strategy to Replace America as the Global Superpower. New York: Henry Holt and Company, 2016; Rush Doshi, The Long Game: China's Grand Strategy and the Displacement of American Power. New York: Oxford University Press, 2021.

99) Tai Ming Cheung and Thomas G. Mahnken, eds., *The Gathering Pacific Storm: Emerging US-China Strategic Competition in Defense Technological and Industrial Development.* Amherst, NY: Cambria Press, 2018.

100) Elsa B. Kania, "Artificial Intelligence in China's Revolution in Military Affairs," *Journal of Strategic Studies* 44:4 (2021), pp. 515-542; Kathryn Waldron, "Huawei and National Security: Lessons for 6G," *R Street Policy Study,* no. 204 (October 2020), https://www.jstor.org/stable/resrep27015; James L. Schoff and Asei Ito, *Competing with China on Technology and Innovation.* Washington, DC: Carnegie Endowment for International Peace, October 2019, https://carnegieendowment.org/files/ChinaRiskOpportunity-China_Tech.pdf; Michaela D. Platzer et al., *Semiconductors: U.S. Industry, Global Competition, and Federal Policy.* Washington, DC: Congressional Research Service, October 26, 2020. https://crsreports.congress.gov/product/pdf/R/R46581; Lindsay Gorman, "China's Data Ambitions Strategy, Emerging Technologies, and Implications for Democracies." The National Bureau of Asian Research, August 14, 2021, https://www.nbr.org/publication/chinas-data-ambitions-strategy-emerging-technologies-and-implications-for-democracies/

maritime equipment and high-tech shipping, new energy vehicles and new materials, are dual-use technologies with military applications.[101] The military significance of technology competition has been further amplified by China's military-civil fusion (MCF) [*junmin ronghe* 军民融合] that has been adopted by Beijing as a whole-of-government strategy towards building China's technology, innovation, industry, and military prowess.[102]

MCF has evolved from the earlier civil-military integration (CMI) that was introduced in the late 1990s and early 2000s, with a view to encouraging a more integrative approach to civilian and military production in that the emphasis was placed on "spin-on" whereby civilian technology could be applied in defense uses. CMI emphasized combining both defense and civilian industrial bases as well as tapping into emerging commercial technologies for military applications.[103] The Xi administration has relabeled CMI as MCF and designated it as a national priority to facilitate resources and technology sharing between the civilian and the military spheres to enable the development of a modern defense industrial complex at home. Xi himself has on many occasions emphasized the importance of implementing the MCF strategy as the all-important and necessary choice for building the country's national strategic system and capabilities and a strong military in the new era.[104]

---

101) Zoe Stanley-Lockman, "Triangular Industrial Trajectories," in Richard A. Bitzinger and Nicu Popscue, eds., *Defence Industries in Russia and China: Players and Strategies*. Report No. 36. Paris: European Union Institute for Security Studies, December 2017, pp. 65-75.

102) Richard A. Bitzinger, "China's Shift from Civil-Military Integration to Military-Civil Fusion," *Asia Policy* 16:1 (January 2021), pp. 5-24; Alex Stone and Peter Wood, China's Military-Civil Fusion Strategy: *A View from Chinese Strategists*. Montgomery, AL.: China Aerospace Studies Institute, Air University, June 15, 2020, https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/

103) Tai Ming Cheung, *Fortifying China: The Struggle to Build a Modern Defense Economy.* Ithaca and London: Cornell University Press, 2009.

104) Xinhua, "Xi Jinping: Unwaveringly Promoting the Deepening of MCF to Provide Strategic Support for the Chinese Dream and the Dream of a Strong Military," March 12, 2018; Tai Ming Cheung,

MCF represents concerted efforts in aligning civil and defense technology developments in that both the commercial and military potentials can be exploited to the maximum extent, and in careful, targeted, and medium- to long-term planning to achieve optimal outcomes. The 2013 edition of *Science of Military Strategy* emphasizes "[e]xpand[ing] Military-Civilian Fusion from its concentration in the realm of the defense science and technology industry, and broaden it into every area of the economy, science and technology, education, and personnel, etc., raising it from an industry and department-level issue to national strategic standing."[105] The success of this strategy has depended on both determined leadership support and dedicated resources in key areas, including domestic R&D in high-tech sectors, academic exchanges with foreign institutions, mergers and acquisitions through foreign direct investments overseas, and talent recruitment programs.[106]

Beijing has developed the organizational structure to oversee, coordinate and give direct guidance to building China into a technologically strong power. In 2015, a Strategic Committee of Science, Technology, and Industry Development for National Defense was established. The following year, the Central Military Commission (CMC) set up its Science & Technology

---

"Keeping Up with the *Jundui:* Reforming the Chinese Defense Acquisition, Technology, and Industrial System,' in Saunders, P.C. et al., eds., *Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms,* pp. 585-625. Washington, DC: National Defense University Press. https://ndupress.ndu.edu/Portals/68/Documents/Books/Chairman-Xi/Chairman-Xi_Chapter-15.pdf?ver=2019-02-08-112005-803

105) Cited in Daniel Alderman, "An Introduction to China's Strategic Military-Civilian Fusion," in Joe McReynolds, ed., *China's Evolving Military Strategy*, p. 397. Washington, DC: Brookings Institution Press for Jamestown Foundation.

106) Tai Ming Cheung, "Introduction," in Cheung, ed., *Forging China's Military Might: A New Framework for Assessing Innovation.* Baltimore, MD: John Hopkins University Press, 2014, pp. 1-14; Daniel Alderman and Jonathan Ray, "Artificial Intelligence, Emerging Technologies, and China-US Strategic Competition," in Cheung and Mahnken, eds., *The Gathering Pacific Storm,* pp. 179-210; George M. Dougherty, "Accelerating Military Innovation: Lessons from China and Israel," *Joint Forces Quarterly* 98:3 (October 2020), pp. 10-19.

Commission. In 2017, a Scientific Research Steering Committee was set up under the CMC.[107] In January 2017, a Central Commission for Integrated Military and Civilian Development [*Zhongyang Jun-Min Ronghe Fazhan Weiyuanhui* 中央军民融合发展委员会] was established, chaired by Xi Jinping himself. The Commission has already held a couple of meetings deliberating on important issues and issuing guidelines and directives.[108] Beijing issued its 13th Five-Year Plan for National Defense Science and Technology Industry Development (2016-20), which set out six key tasks through 2020 aimed at breakthroughs in core technological capabilities:

- Facilitating leapfrog development of weapons and military equipment
- Enhancing innovation capabilities in turnkey areas
- Improving overall quality and efficiency
- Optimizing the structure of the defense industry and vigorously promoting civil-military integration (CMI) and subsequently military-civil fusion (MCF)
- Accelerating the export of armaments and military equipment supporting national economic and social construction
- Supporting national economic and social construction.[109]

The Plan sets out an indigenous innovation strategy and aims to

107) Department of Defense. *Military and Security Developments Involving the People's Republic of China 2020: Annual Report to Congress*. Washington, DC: Office of the Secretary of Defense, September 2020. https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD-CHINA-MILITARY-POWER-REPORT-FINAL.PDF

108) Elsa B. Kania, "In Military-Civil Fusion, China Is Learning Lessons from the United States and Starting to Innovate," RealClear Defense, August 27 2019, https://www.realcleardefense.com/articles/2019/08/27/in_military-civil_fusion_china_is_learning_lessons_from_the_united_states_and_starting_to_innovate_114699.html

109) "2016 National Defence Science, Technology and Industry Working Conference Was Held in Beijing," State Council, People's Republic of China, Janury 9, 2016, available at: www.gov.cn/xinwen/2016-01/09/content_5031770.htm.

"circumvent the costs of research, overcome international political constraints and technological disadvantages, and 'leapfrog' China's defense industry by leveraging the creativity of other nations. This includes exploitation of open sources, technology transfer and joint research, the return of Western-trained Chinese students and, of course, industrial espionage, both in its traditional form (human intelligence) and, increasingly, cyber-espionage."[110] At the same time, an IDAR (introduce, digest, absorb, and re-innovate) approach has been adopted to import advanced technologies, namely:

- Introduce foreign technologies to China's market
- Digest and study them via reverse engineering
- Absorb then into domestic workflows
- Re-innovate them for domestic needs[111]

This leadership support has translated into steady growth in defense spending and continued focus on the improvements in China's defense-technological and industrial base (DTIB). China has sustained substantive increases in defense spending over the past three decades, reaching $252 billion in 2020, with growing expenditure in defense R&D.[112] China has procured from, licensed-manufactured, and gained access to foreign weapons systems and military technologies, predominantly from

110) Michael Raska, "Strategy and Challenges," in Richard A. Bitzinger and Nicu Popscue, eds., *Defence Industries in Russia and China: Players and Strategies.* Paris: EU Institute for Security Studies, p. 58. https://www.iss.europa.eu/sites/default/files/EUISSFiles/Report_38_Defence-industries-in-Russia-and-China.pdf

111) de la Beaumelle, *et al., Open Arms,* p. 14.

112) Diego Lopes da Silva, Nan Tian, and Alexandra Marksteiner, "Trends in World Military Expenditure, 2020." *SIPRI Fact Sheet,* Stockholm: Stockholm International Peace Research Institute, April 2021. https://www.sipri.org/publications/2021/sipri-fact-sheets/trends-world-military-expenditure-2020

Russia. Sino-Russian defense cooperation has extended from Chinese procurement of Russian weapons systems in the 1990s, licensed production, to Russian assistance in Chinese development of a missile defense warning system, and technological collaboration in fifth-generation telecommunication, artificial intelligence, biotechnology and digital economy.[113]

US strategy towards technology competition has by and large focused on measures to restrict Chinese abilities to acquiring US/Western technologies and lately also involved identifying emerging and foundational technologies for state support. However, the general approach remains encouraging the private sector to take initiatives in innovations and technological developments, especially in semiconductor, AI, quantum computing, 5G, among others.[114] The restrictive measures adopted so far include greater scrutiny of Chinese investments in the US; expansion of the Commerce Department's entity list of Chinese companies and individuals; denial of visas to Chinese scholars and students for exchanges and studies in STEM (science, technology, engineering, mathematics) subjects in US research institutes and universities, among others. These have been facilitated through the passage of the 2018 Export Control Reform Act (ECRA) and the Foreign Investment Risk Review Modernization Act (FIRRMA), with the latter giving enhanced authority to the Committee on Foreign Investment in the United States (CFIUS), and the launch of the "China Initiative" at the Justice Department to prosecute technology thefts and other criminal activities. All

113) Samuel S. Bendett and Elsa B. Kania, "A New Sino-Russian High-Tech Partnership: Authoritarian Innovation in An Era of Great-Power Rivalry." *Policy Brief,* Report No. 22/2019. Barton, ACT: Australian Strategic Policy Institute, October 2019, https://www.aspi.org.au/report/new-sino-russian-high-tech-partnership.

114) Ryan Hass, "America's Sharpening Focus on Technology Competition with China," The Jerusalem Strategic Tribune, August 2021, https://jstribune.com/ryan-hass-china-technology-race/; Alex Capri, *Quantum Computing: A New Frontier in Techno-nationalism.* Hinrich Foundation, August 17, 2021.

of these are meant to protect US National Security Innovation Base.[115] Washington has also sought cooperation with allies, including forging common front on technology competition and developing and strengthening multilateral export controls vis-à-vis China.[116]

Indeed, despite its MCF strategy, M&A (merge and acquisition) activities in Europe and the United States, and Beijing's support through investment and subsidies, significant technological bottlenecks exist, which means that foreign technology acquisitions remain critical to closing the gap between China's defense technologies and those of the leading Western powers, especially the United States. Fundamentally, the increasing complexity of military technology has rendered it much harder for "imitation and replication of state-of-the-art weapon systems" to succeed.[117] Clearly, export controls remain critical in stalling, preventing, and delaying Chinese developments in military technologies and hence advancement in its defense modernization efforts. Given the wide availability of advanced dual-use technologies and strong commercial interests in their exports as

115) Brendan Thomas-Noone, *Tech Wars: US-China Technology Competition and What It Means for Australia.* Sydney. United States Studies Centre, June 2020. https://united-states-studies-centre.s3.amazonaws.com/uploads/a88/1fb/d77/a881fbd77c65a94e7f29e956fc16be5e1f19e11f/Tech-wars-US-China-technology-competition-and-what-it-means-for-Australia.pdf

116) Mark Scott and Jacopo Barigazzi, "US and Europe to forge tech alliance amid China's rise," Politico, June 9, 2021, https://www.politico.eu/article/eu-us-trade-tech-council-joe-biden-china/#; Transatlantic Strategy Group, Stronger Together: A Strategy to Revitalize Transatlantic Power. December 2020. https://www.belfercenter.org/sites/default/files/2020-12/Transatlantic/StrongerTogether.pdf; Julie Smith et al., Charting a Transatlantic Course to Address China. Washington, DC: Center for a New American Security and the German Marshall Fund of the United States. October 2020. https://www.gmfus.org/sites/default/files/CNAS-Report-Transatlantic-August-2020-final.pdf

117) Mark Ashby et al., *Defense Acquisition in Russia and China* (Santa Monica: RAND, 2021). file:///Users/jdyuan/Downloads/RAND_RRA113-1.pdf; Andrea Gilli and Mauro Gilli, "Why China Has Not Caught Up Yet: Military-Technological Superiority and the Limits of Imitation, Reverse Engineering, and Cyber Espionage," *International Security* 43:3 (Winter 2018/19): 141-189; Elsa B. Kania and Lorand Laskai, *Myths and Realities of China's Military-Civil Fusion Strategy.* Washington, DC: Center for a New American Security. January 2021. https://www.cnas.org/publications/reports/myths-and-realities-of-chinas-military-civil-fusion-strategy

the revenues generated enable continuing R&D and innovation, export controls are essential but can only be effective with carefully selected and regularly updated lists of controlled items and a broad consensus between the US and its allies on the adopted strategies and approaches that are enforceable and effective.[118]

As a result of the intensifying US-China strategic rivalry, export controls on sensitive technologies and strategic commodities are increasingly being deployed by Washington to retain America's edge in the high-tech sector as well as its dominance in military power.[119] In recent years, both the Trump and Biden administrations have instituted and strengthened domestic export control regulations, placed leading Chinese tech companies such as Huawei and ZTE on the Commerce Department's entity list, and pressured its European allies to tighten reviews and restrictions on technology transfers to China. The latest example includes the US pressure on the Dutch company ASML to not export its advanced chip making machinery to China.[120]

---

118) Hugo Meijer, *Trading with the Enemy: The Making of US Export Control Policy towards the People's Republic of China* (Oxford: Oxford University Press, 2016); Brigitte Dekker & Maaike Okano-Heijmans, eds., *Dealing with China on High-Tech Issues Views from the US, EU and Like-Minded Countries in a Changing Geopolitical Landscape* (The Hague: The Clingendael Institute, December 2020). https://www.clingendael.org/sites/default/files/2020-12/Report_Dealing_with_China_December_2020_0.pdf

119) Nigel Inkster, *The Great Decoupling: China, America and the Struggle for Technological Supremacy.* London: Hurst Publishers, 2021.

120) Fergus Ryan, Audrey Fritz and Daria Impiombato, "Reining in China's technology giants." *Issues Paper.* Report No. 46/2021. Barton, ACT: Australian Strategic Policy Institute, June 2021. https://www.aspi.org.au/report/mapping-chinas-technology-giants-reining-chinas-technology-giants; David Shepardson, "U.S. tightens restrictions on Huawei access to technology, chips," Reuters, August 17, 2020, https://www.reuters.com/article/us-usa-huawei-tech/u-s-tightening-restrictions-on-huawei-access-to-technology-chips-idUKKCN25D1CC; Stu Woo and Yang Jie, "China Wants a Chip Machine from the Dutch. The U.S. Said No," *Wall Street Journal,* July 17, 2021. https://www.wsj.com/articles/china-wants-a-chip-machine-from-the-dutch-the-u-s-said-no-11626514513?page=1

Australian perspectives and policy responses

Canberra's views on the emerging US-China technology competition and its policy responses have been informed by several key factors. The first and foremost is the enduring alliance relationship between Australia and the US, which has recently marked the 70th anniversary of the ANZUS Treaty. This alliance has been the anchor of Australian security and it has taken even greater significance given the rise of China and Beijing's challenges to the rules-based order in the Indo-Pacific.[121] Second, Australia's defense depends on reliable access to America's advanced weapons systems and military technologies. Given its relatively small market and limited defense industrial base, and its deep enmeshment with America's scientific infrastructure, Australia must maintain close collaboration with the US in emerging technologies.[122] Third, Australia has developed close economic interdependence with China over the past two decades, including extensive bilateral cooperation in science and technology.[123]

The past decade has witnessed growing convergence of interests between Australia and the US, which in turn has led Canberra and Washington to strengthen the alliance to make it more adaptive to the changing

121) Patrick Walters, ed., *ANZUS at 70: The Past, Present and Future of the Alliance.* Barton, ACT: Australian Strategic Policy Institute, August 2021. https://www.aspi.org.au/report/anzus-70-past-present-and-future-alliance

122) Brendan Thomas-Noone, *Ebbing Opportunity: Australia and the US National Technology and Industrial Base.* Sydney: United States Studies Centre, November 2019, https://www.ussc.edu.au/analysis/australia-and-the-us-national-technology-and-industrial-base; Thomas-Noone, Tech Wars; Darren J. Lim, Zack Cooper, and Ashley Feng, *Trust and Diversify: A Geoeconomic Strategy for the Australia-US Alliance.* Sydney: United States Studies Centre, September 2021. https://www.ussc.edu.au/analysis/trust-and-diversify-a-geoeconomic-strategy-for-the-australia-us-alliance

123) James Laurenceson and Michael Zhou, *Small Grey Rhinos: Understanding Australia's Economic Dependence on China.* Sydney: Australia-China Relations Institute, May 22, 2019. https://www.australiachinarelations.org/content/small-grey-rhinos-understanding-australia%E2%80%99s-economic-dependence-china; Laurenceson and Zhou, *The Australia-China Science Boom.* July 22, 2020. https://www.australiachinarelations.org/content/australia-china-science-boom

geostrategic environment in the region. Australia has responded to the Obama administration's "Pivot to Asia" and the Trump administration's "Free and Open Indo-Pacific" strategies by expanding areas of security cooperation and increasing military interoperability with the US within the alliance framework. In September 2021, Australia, the United Kingdom and the United States announced the AUKUS, which involves the supply of nuclear-powered submarines to Australia and extensive trilateral defense cooperation. At the same time, Canberra has also been engaged in minilateral security alignments with the like-minded powers in the region, such as the Quad, and has sought to enhance its own defense capabilities through significant budget increases.[124] Australia has been one of the major destinations of US arms exports, accounting for 9.4% in 2016-20, second to Saudi Arabia. Since 2004, 67% of all Australian arms purchases have come from the US. Between 2013 and 2017, Australia spent A$10 billion on American weapons systems and military equipment through the US Department of Defense Foreign Military Sales (FMS) programs.[125]

What is equally, if not more important, is the extensive economic enmeshment between Australia and the US, especially in the two allies' investments in each other. As of 2019, American investments in Australia were at A$984 billion, 40 percent more than its total investments in China and directly responsible for 7 percent of Australia's GDP in that year, with 320,000 people employed in US majority-owned companies. Meanwhile, towards the end of 2019, Australian investments in the U.S. totalled nearly

124) Department of Defense. *2020 Defence Strategic Update.* Canberra: Australian Government, July 2020. file:///Users/jdyuan/Downloads/2020_Defence_Strategic_Update.pdf

125) Pieter D. Wezeman, Alexandra Kuimova, and Siemon T. Wezeman, "Trends in International Arms Transfers, 2020." *SIPRI Fact Sheet.* Stockholm: Stockholm International Peace Research Institute, March 2021. https://www.sipri.org/sites/default/files/2021-03/fs_2103_at_2020_v2.pdf

A$837 billion.[126] Since 1989, Australia has been designated as a "major non-NATO ally" by the US Congress and as a result it enjoys close cooperation in defense research and development with America and is given the same level of exemption from US Arms Export Control Act as other NATO member states. This enables Canberra to both be in possession of advanced platforms and enhance interoperability with the US forces. The US-Australia Defense Trade Cooperation Treaty allows Canberra greater access to advanced American defense systems and technologies.[127]

US-China technology competition poses significant challenges to Australia's technological and industrial base. Given the tightening US defense export control regime, Australian companies and research institutions may face growing barriers to American technologies while Australia's ongoing science and technology collaboration with China also risks US secondary sanctions and loss of access to US technologies and research opportunities due to Washington's concerns over re-transfers of US-origin technologies or those that contain US components. At the same time, severing S&T collaboration or joint basic research with Chinese counterparts would mean higher costs in R&D and loss of revenues, not to mention potential sanctions from Beijing. While US Congress in 2017 extended the National Technology and Industrial Base (NTIB) to include both the United Kingdom and Australia in addition to Canada, which joined in 1993 when the policy framework was adopted. NTIB would foster a defense free trade area between the US and its key allies to leverage their joint resources to develop and "maintain a military-technological edge

126) Deliotte Australia. *Building Prosperity: The Importance of the United States to the Australian Economy.* Canberra, ACT: Deliotte, 2020. https://au.usembassy.gov/building-prosperity-the-importance-of-the-united-states-to-the-australian-economy/

127) Australian Embassy. "Australia-US Defence Relationship." Undated. https://usa.embassy.gov.au/defence-cooperation

vis-à-vis great power adversaries," including China.[128] However, progress in implementation has been slow and the full potential of allied cooperation in defense technological research and development has yet to take place, partly as a result of bureaucratic fragmentation and the lack of sufficient political attention at the highest level.

Just as Australia's science and technology ecosystem is facing mounting challenges in navigating the US-China technology competition, where Washington's increasingly more restrictive measures have extended from traditional areas of export controls to new areas such as universities, academics and students who contribute to the development of science and technology critical for national security, Australia is also becoming aware of risks of foreign attempts in intellectual property theft, espionage (human or cyber), and M&As that may result in exportation or transfers of critical technologies, either indigenous Australian or developed with the US and other allied partners.[129] As a result, Canberra has in recent years introduced tighter legislation aimed to protecting its technological and industrial base.[130]

Clearly, the US-China technology competition poses significant dilemmas for Australia's science and technology ecosystem that has historically relied on collaboration with key technological leaders in order to gain benefits for the Australian economy at relatively affordable and sustainable cost levels. Given tightening US restrictions on emerging technologies and securitization of science and technological collaboration, slow implementation of the NTIB, and growing

128) Thomas-Noone, *Ebbing Opportunity,* p. 3.

129) Alex Joske, "Picking flowers, making honey: The Chinese military's collaboration with foreign universities." *Policy Brief.* Report No. 10/2018. Barton, ACT: Australian Strategic Policy Institute, October 2018. https://www.aspi.org.au/report/picking-flowers-making-honey

130) Stephen Dziedzic, "The federal government's new foreign relations laws passed parliament. Here's what that means." ABC net, December 8, 2020, https://www.abc.net.au/news/2020-12-08/what-are-the-governments-new-foreign-relations-laws-about/12947590

Chinese economic coercion against Australian industries and companies, a radical re-think of Australia's science and technological ecosystem is on the agenda. There is clearly a need to significantly raise the level of government investment in research and development, which has been in decline in recent years. Second, fostering and supporting selected areas either because these are where Australian entities hold significant niche, or those emerging technologies that are critical for Australia's economy and wellbeing, should also be considered.[131] Building Australia's technological "weight" and forging non-US and non-Chinese scientific partnerships could foster "a more self-sufficient and dynamic R&D base" that will "allow Australia to better weather the growing fragmentation of the technological world" as a result of the US-China strategic rivalry.[132]

Conclusion

US-China technology competition has intensified in recent years, a reflection of the two powers' growing strategic rivalry, where emerging and foundational technologies are increasingly perceived as the *sine qua non* of national industrial base and military power. Washington has responded to Beijing's military-civil fusion strategy and its aggressive pursuit of foreign technologies with a series of counter-measures, including greater scrutiny of Chinese investments in the US, export controls on and expanded entity list related to China especially its leading tech companies, and better coordination with allies. Australia is facing significant challenges amid intensifying US-China technology competition that also threatens its

131) Gavin Brennen, Simon Devitt, Tara Roberson and Peter Rohde, "An Australian strategy for the quantum revolution." *Policy Brief.* Report No. 43/2021. Barton, ACT: Australian Strategic Policy Institute, May 2021. https://www.aspi.org.au/report/australian-strategy-quantum-revolution

132) Thomas-Noone, *Tech Wars,* p. 19.

science and technology ecosystem that has historically depended on collaboration with foreign partnerships for its scientific R&D. Given the growing uncertainties and an increasingly fragmented technological world, Canberra has had to review its options, including whether and to what extent developing Australia's own technological weight is the way to go and at a cost it can afford and must accept.

8. Singapore's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Selina Ho

Assistant Professor, Lee Kuan Yew School of Public Policy
National University of Singapore

Introduction

Technology stands at the heart of the strategic competition between the United States and China. Since the Trump administration's identification of China as a strategic competitor in 2017, the US-China trade war has evolved into a tech war. The United States' 2021 Annual Threat Assessment declared that China is a "near-peer competitor, challenging the United States in multiple arenas - especially economically, militarily, and technologically – and is pushing to change global norms."[133] It also identified China as "the top threat to US technological competitiveness."[134]

The technology competition has four main components: 5G, artificial intelligence (AI), technology standards, and biotechnology. There are spillover effects for countries not directly involved in the competition between the two great powers. Decoupling efforts by both sides have downstream impact for countries around the world. The threat of bifurcation of technological systems and networks into two different spheres, one dominated by the United States and the other by China, is real. This article explores Singapore's perception of the competition and its

133) Office of the Director National Intelligence, *Annual Threat Assessment of the US Intelligence Community,* April 9, 2021, p. 4.

134) Ibid., p. 7.

strategies for managing the impact of the competition on Singapore. In order to minimize the negative spillovers, Singapore has struck a balance between the United States and China by welcoming technology companies from both sides to invest in Singapore. Although it has chosen Nokia and Ericsson to build its main 5G networks, Huawei and ZTE continue to be involved in its 5G ecosystem. By engaging multiple players in its technological sector, Singapore is seeking to diversify so as to reduce reliance on one particular supplier. Singapore is also playing an active role in setting standards and ethical principles in the new digital economy in order to ensure that systems remain open, interoperable, and rules based.

US-China technology competition

Fundamental to the US-China technological competition is the different approaches the two countries have taken to 5G, artificial intelligence, biotechnology, and standard-setting. In the United States, the private sector drives the market for new and emerging technologies while in China, a "whole-of-state" approach is used, with both the commercial sector and the state, particularly the security and defense realms, involved in a series of interlocking plans that guide the entire nation's R&D activities.[135)]

Great powers arise as a result of their domination of the leading sectors of the global economy[136)] and it is thus not surprising that China's drive for technological dominance is central to its global ambitions. In a rallying call

135) Daniel Alderman and Jonathan Ray, "Artificial Intelligence, Emerging Technologies, and China-US Strategic Competition," in Tai Ming Cheung and Thomas G. Mahnken, eds., *The Gathering Pacific Storm: Emerging US-China Strategic Competition in Defense Technological and Industrial Development* (Amherst, New York: Cambria Press, 2018), p. 180.

136) Ashley J. Tellis, "Overview: The Return of US-China Strategic Competition," in Ashley J. Tellis, Alison Szalwinski, and Michael Wills, eds., *Strategic Asia 2020: US-China Competition for Global Influence* (Seattle and Washington, DC: The National Bureau of Asian Research, January 2020), p. 29.

to the Chinese people, President Xi Jinping launched the "Made in China 2025" initiative in 2015. It is aimed at "innovation-driven development," which will not only allow China to reduce its reliance on foreign technology and semi-conductors but also to move up the value chain and transform its economy. The initiative highlighted 10 priority areas, the most significant of which are information and communication technology; advanced numerical control machine tools and robotics; aerospace technology; and biopharmaceuticals and high-performance medical equipment.[137] China's 14th Five-Year Plan, unveiled in March 2021, for the first time, described technological innovation as a matter of national security, and not just economic development.

The United States has passed several legislations in response to Chinese growing technological dominance. The Trump administration's Clean Network Initiative is one such initiative for safeguarding American assets from aggressive intrusion by malign actors. It addresses the threats to "data privacy, security, human rights and principled collaboration posed to the free world from authoritarian malign actors."[138] As of late 2020, more than 30 mobile operators from 20 countries have joined the United States in excluding components produced by Chinese government affiliates in 5G networks.[139] The Biden administration's US Innovation and Competition Act may be even more far-reaching than the Clean Network Initiative. It commits $250 billion to funding research and subsidizing chip and robot makers in order to counter China's technological ambitions. President Joe

137) Elsa B. Kania, "Made in China 2025, Explained," *The Diplomat,* February 1, 2019. https://thediplomat.com/2019/02/made-in-china-2025-explained/

138) US Department of State, "The Clean Network." https://2017-2021.state.gov/the-clean-network/index.html

139) Roslyn Layton, "State Department's 5G Clean Network Club Gains Members Quickly," *Forbes,* September 4, 2020. https://www.forbes.com/sites/roslynlayton/2020/09/04/state-departments-5g-clean-network-club-gains-members-quickly/?sh=1fcc10ac7536

Biden has cast technological competition with China as the most important front in the struggle between democracy and autocracy, pledging to ramp up investments in science and technology, particularly in AI and quantum computing.

At the center of the technology race is the competition in 5G mobile broadband telecommunications. 5G is set to become a fundamental component of the world's communication and information technology infrastructure. Chinese firm, Huawei, is a major player in 5G. China is advancing its Digital Silk Road (DSR) in developing countries, and Huawei and ZTE are selling Radio Access Network (RAN) equipment that is a critical component of the 5G network. The United States worries over how China might use Huawei, ZTE, and its telecommunication companies to build electronic infrastructure networks that either shut out the West or which contain vulnerabilities that the Chinese government can exploit. The United States' sense of vulnerability is further heightened when China passed a National Intelligence Law in 2017 requiring all Chinese entities, including companies like Huawei, to share technology and information with its military, intelligence, and security agencies.

Setting global standards in technology is also at the forefront of the competition between the United States and China. The United States has lagged behind China as its approach to standard-setting has been industry-led compared to China's state-led approach. The new "China Standards 2035" plan uses large government subsidies to promote Chinese indigenous development of technologies and then employs strategies to enhance China's influence over the international bodies that set the crucial standards and norms for emerging technologies. China has also placed its officials at international standard-setting bodies. China's growing influence in this area not only provides opportunities for its firms but also gives it a

strong voice in setting digital standards and norms that impact the competitiveness of firms and the security of new technologies.[140]

AI is critical for future technological leadership as it can be used in most sectors of the economy, including healthcare, energy, and transportation. At present, the United States is the global leader as the most widely used AI platforms are developed by American companies. China is however rapidly catching up with its "data advantage" due to its large population and lax data regulations.[141] Semi-conductors are critical to AI. Even though the United States has forbidden the sale of US-manufactured semi-conductors to China and pressured its allies such as Taiwan to do the same, this has had a salubrious effect on China's domestic semi-conductor industry, spurring it to make major advancements. China has also aggressively sought to drive the development of global standards for AI; among other initiatives, it drafted a white paper on AI standards in 2018.

Biotechnology is another area of competition between the two countries. This is most prominently seen in the race to develop vaccines, treatment, and testing capabilities for the SARS-CoV-2 virus. The United States dominates the biotechnology industry, but China has identified biotechnology as top priority for future development and has pumped in massive investments to boost R&D and STEM education.

Risk of bifurcation

US-China technological decoupling carries significant risks of a bifurcation of the Internet, with China on one side and the United States

140) *American Strategy for Technology Competition,* November 16, 2020, p. 4. https://asiasociety.org/center-us-china-relations/meeting-china-challenge-new-american-strategy-technology-competition.
141) Ibid., p. 43.

on the other side. As the United States took action against Huawei, it has actively pressured other countries, particularly its allies, to adopt similar policies and ban Huawei equipment. For countries like Australia, which is deeply enmeshed with the US scientific infrastructure, the path is particularly tricky.[142] After much hand-wringing, Australia finally chose to side with the United States and has banned Huawei from its 5G networks. Japan, Canada, India, Sweden, Taiwan, Vietnam, and New Zealand have taken more nuanced steps but the bottom-line is that Huawei will not be part of the core infrastructure of these countries. France, Germany, Italy, and the Netherlands are moving forward with their deployments with some restrictions. The United Kingdom banned mobile providers from purchasing Huawei 5G equipment and mandated that providers must remove all Huawei 5G equipment from their networks by 2027. Although it has not formally blocked Huawei, it has delayed its decision long enough to force its telecom companies to exclude Huawei from their 5G networks.[143]

While most Western countries and developed countries in East Asia have excluded Huawei from their 5G networks, Huawei has made significant inroads in the developing parts of the world, specifically Southeast Asia and Africa. With the exception of Singapore and Vietnam, other Southeast Asian countries have signed on or is in the process of signing on with Huawei.[144] Furthermore through the Belt and Road Initiative, many of these countries are part of China's Digital Silkroad (DSR). Laos, Malaysia, and Myanmar for

142) Brendan Thomas-Noone, *Tech Wars: US-China Technology Competition and What It Means for Australia* (United States Studies Centre, June 2020). https://www.ussc.edu.au/analysis/us-china-technology-competition-and-what-it-means-for-australia.

143) Fergus Ryan, Audrey Fritz, and Daria Impiombato, "Mapping China's Technology Giants: Reining in China's technology giants," *Issues Paper Report* No. 46/2021 (Australian Strategic Policy Institute, June 2021), p. 13.

144) See Figure 2 in Hilary McGeachy, U*S-China Technology Competition: Impacting A Rules-based Order* (United States Studies Centre, June 2020). https://www.ussc.edu.au/analysis/us-china-technology-competition-impacting-a-rules-based-order.

instance have signed DSR agreements with China.[145] In Africa, a Center for Strategic and International Studies report identified 71 deals in 41 countries between Huawei and these countries for cloud infrastructure and e-government services.[146]

The risk of bifurcation in Internet and 5G networks into two hardware and software zones is real, potentially creating a situation where the rich and developed Western nations run systems and networks that are incompatible with those of poor and developing non-Western nations using Chinese 5G equipment and technology. Furthermore, as countries adopt different 5G networks, their systems and networks may not be interoperable. Incompatible regulatory settings on the treatment of data and other standards may also result.

Singapore's view

Singapore sees the escalating conflict between the United States and China as extremely dangerous for not just the two parties involved but also the rest of the world. The possibility of war cannot be ruled out; war will be disastrous and "everything is to be lost."[147] However, cooperation is still possible, and the Singapore government has urged both sides to work together to resolve their conflict and compete in a healthy manner. During the Shangri-La Dialogue in 2019, Singapore's Prime Minister Lee Hsien

145) Manoj Harjani, "Is Southeast Asia ready for a US-China tech decoupling," *The Interpreter,* May 31, 2021.

146) Jevans Nyabiage, "African nations continue to put trust in Huawei for data management," *South China Morning Post,* June 28, 2021. https://www.scmp.com/news/china/diplomacy/article/3138917/african-nations-continue-put-trust-huawei-data-management.

147) Grace Ho, "Everything is at stake with US-China tensions: PM Lee," *The Straits Times,* May 19, 2021. https://www.straitstimes.com/singapore/politics/everything-is-at-stake-with-us-china-tensions-pm-lee.

Loong called on the United States and China to reach a "strategic accommodation" despite their dispute over trade and technology.[148] In a *Foreign Affairs* article slightly more than a year later, Lee pointed out that the United States is not a declining power as the Chinese believe and neither is China likely to collapse like the Soviet Union as the Americans believe, and countries in the Asia-Pacific do not wish to be forced to choose between them.[149] At the Aspen Security Forum in August 2021, Lee urged the two countries to develop an "overall constructive relationship" that would allow the two countries to develop areas of common interest and "constrain the areas of disagreement."[150] Areas of cooperation include setting norms and standards in digital economy such as data transfer, data transparency and accountability, and where data has to be hosted. These issues are deemed less contentious and important to the new economy.

Singapore's Foreign Minister Vivian Balakrishnan has also expressed Singapore's view that "avoiding an all-out, high tech catastrophic conflict is necessary and attainable, but it is not automatic."[151] According to Balakrishnan, the challenge for the rest of the world, in the meantime, is to find ways to navigate the complexities of the fast evolving US-China relationship with the prospects of bifurcated supply chains and technological

148) Prime Minister's Office, "PM Lee Hsien Loong at the IISS Shangri-La Dialogue 2019," May 31, 2019. https://www.pmo.gov.sg/Newsroom/PM-Lee-Hsien-Loong-at-the-IISS-Shangri-La-Dialogue-2019.

149) Lee Hsien Loong, "The Endangered Asian Century: America, China, and the Perils of Confrontation," *Foreign Affairs,* July/August 2020. https://www.foreignaffairs.com/articles/asia/2020-06-04/lee-hsien-loong-endangered-asian-century.

150) Philip Heijmans, "Singapore's Lee urges China to, U.S. to stem deteriorating ties," *Bloomberg,* August 3, 2021. https://www.bloomberg.com/news/articles/2021-08-03/singapore-s-lee-urges-china-u-s-to-stem-deterioration-in-ties.

151) Transcript of Minister for Foreign Affairs Dr Vivian Balakrishnan's participation at the Asia Society Dialogue on "Southeast Asia in 2021 and the crisis in Myanmar" held via Zoom on May 20, 2021 at 2000hrs. https://www.mfa.gov.sg/Newsroom/Press-Statements-Transcripts-and-Photos/2021/05/transcript-of-minister-participation-at-Asia-society-dialogue.

decoupling occurring in the short term.[152] Singapore, like other middle powers and smaller states, hopes that hostility between the two sides can be checked and a stable order can ensue in the region and globally. A common refrain from countries is that they want to avoid choosing sides. The United States is Singapore's largest investor as about 85 percent of US foreign investment in Southeast Asia is in Singapore, while China is Singapore's largest trading partner and Singapore is China's largest investor.[153] Given Singapore's deep and extensive ties with both countries, PM Lee made it clear that "Singapore could not afford to take sides."[154] Exclusive spheres of influence and moves to create digital technology trade alliance or an alliance of "Techno Democracies" will be rejected by the region.

Singapore's strategy for managing US-China technology competition

Singapore has undertaken a multi-pronged strategy to deal with the fallout from the US-China tech war:

- maintain balance between the United States and China;
- ensure a fair and transparent process in business dealings without caving into pressures from either side;
- diversify reliance and collaborate with multiple players and sources;
- work with third countries that share its interest in maintaining an open

152) Ibid.

153) Justin Ong, "Singapore must make own decisions amid US-China rivalry: Vivian," *The Straits Times*, March 2, 2021. https://www.straitstimes.com/singapore/politics/spore-must-make-own-decisions-amid-us-china-rivalry-vivian

154) Karishma Vaswani, "Singapore PM: 'Considerable risk" of severe US-China tensions," *BBC*, March 11, 2021. https://www.bbc.com/news/business-56318576.

and rules-based technological order; and

- actively participate in the international effort to develop legal standards, ethical principles, and rules for the digital economy.

On the international stage, Singapore's foreign policy has always been to play the role of the honest broker and maintain neutrality in the face of great power competition. During a parliamentary session in March last year, Balakrishnan underscored the point that Singapore must maintain a "consistent, principled foreign policy with both superpowers."[155] He explained that "that's how we maintain our relevance, and our strategic autonomy ... by being relevant to both and, at the same time, making it very clear to both of them that we will never be a stalking horse or a Trojan horse for the other."[156]

To maintain this balance in the technology competition between the United States and China, Singapore has welcomed both countries' technology companies to its shores. Singapore is an attractive destination for technology companies because it has the necessary infrastructure and regulatory framework that provide a conducive business environment for foreign investment and trade. With Chinese tech companies expanding their operations in Singapore, Singapore has become the hub for Chinese tech companies.[157] Both Tencent and Alibaba have increased their presence in Singapore while TikTok owner ByteDance is reported to have made substantial investments. Although Huawei lost out to Nokia and Ericsson in building Singapore's main 5G network, it continues to play an

155) Justin Ong, "Singapore must make own decisions amid US-China rivalry: Vivian," *The Straits Times,* March 2, 2021. https://www.straitstimes.com/singapore/politics/spore-must-make-own-decisions-amid-us-china-rivalry-vivian

156) Ibid.

157) Justin Harper, "Singapore becomes hub for Chinese tech amid US tensions," *BBC,* September 16, 2020. https://www.bbc.com/news/business-54172703.

active role in Singapore's plans to build a smart nation. It established its flagship data center in Singapore in 2020 to help Singapore's enterprise market cope with the huge increase in data flows and Internet traffic. In February 2021, Huawei established a $40 million lab in Singapore that allows developers to test apps and services for its mobile devices. In addition, despite the pandemic, Huawei has expanded the size of its mobile services team in Singapore by three times.[158] While maintaining a welcoming environment for Chinese companies, Singapore is also the regional headquarters for many US technology companies, such as Google, Facebook - now known as Meta, and LinkedIn. In June 2021, the US-based semiconductor manufacturer GlobalFoundries announced that it would invest $4 billion to expand its chipmaking facilities in Singapore.

Singapore has also ensured that its business processes are fair and transparent, without yielding to political pressures from either side. For instance, its choice of vendors for building its 5G network is based on a clear set of criteria, namely performance, security, and resilience. Nokia and Ericsson were chosen by Singapore telecommunication companies in June 2020 to build their main 5G networks based on these criteria. Singapore's Minister for Communications and Information S. Iswaran made it clear that no vendor, including Huawei, was excluded from the selection process; the selection process was rigorous and competitive; and the outcome is an ecosystem where there are diverse players.[159] Moreover, Huawei and ZTE continue to be involved in the non-core aspects of the broader 5G ecosystem; Singapore telecommunication companies are

158) Kenny Chee, "Huawei opens $53 million regional centre in Singapore," *The Straits Times,* February 24, 2021. https://www.straitstimes.com/tech/tech-news/huawei-opens-53-million-regional-centre-in-singapore.

159) Saheli Roy Choudhury, "Huawei loses out to Nokia, Ericsson in building Singapore's main 5G networks," *CNBC,* June 25, 2020. https://www.cnbc.com/2020/06/25/huawei-loses-out-to-nokia-ericsson-in-building-singapores-main-5g-networks.html

looking at working with Huawei and ZTE on some parts of the networks. By engaging multiple players, Singapore has sought to diversify its 5G network providers to minimize the cybersecurity risks arising from over-reliance on one single provider.[160]

Singapore is collaborating with other countries similarly concerned with the possibility of bifurcation of the world into two zones with interoperability issues. It is working with these countries to ensure that there are more interoperable systems and standards to promote cross-border data flows and digital trade. Singapore has also sought to create a harmonized legal and regulatory environment for the digital economy with other countries. Despite being a small country, Singapore has been actively shaping rules on the digital economy.[161] In the World Trade Organization, for instance, Singapore has been working with Australia and Japan to push forward consensus on e-commerce regulations. It has also pursued Digital Economy Agreements (DEA), which is a treaty that establishes digital trade rules and digital economy collaborations between two or more economies. Through DEAs with key partners, Singapore hopes to enhance cooperation in setting ethical principles for emerging technologies like AI and to develop international frameworks to foster interoperability of standards and systems so as to better support Singapore businesses, especially SMEs, engaged in the digital economy.[162] Thus far, Singapore has concluded negotiations on two DEAs, the first with

160) Muhammad Faizal Abdul Rahman, "Singapore Decides on 5G Networks: Is Huawei banned?" *The Diplomat,* July 20, 2020. https://thediplomat.com/2020/07/singapore-decides-on-5g-networks-is-huawei-banned/.

161) Linh Tong, "Vietnam, Singapore Begin Negotiations on Digital Trade Agreement," *The Diplomat,* June 30, 2021. https://thediplomat.com/2021/06/vietnam-singapore-begin-negotiations-on-digital-trade-agreement/.

162) Website of the Singapore Ministry of Trade and Industry. https://www.mti.gov.sg/Improving-Trade/Digital-Economy-Agreements.

Chile and New Zealand, and the second with Australia. It has also begun separate negotiations with South Korea and the United Kingdom. In June 2021, Singapore and Vietnam agreed to set up a joint technical working group on Digital Partnership.

Conclusion

By treading a fine balance between the United States and China, diversifying its 5G network, ensuring fair and transparent business processes, and taking a leading role in setting standards for digital economy, Singapore aims to minimize the damage from the US-China tech war and at the same time, build the foundations of its future economy. Singapore's neutrality and business-friendly environment helps put it in a good position to mitigate the impact of the tech war. Nevertheless, the challenges to its ability to steer a middle course between the two great powers and to manage the fallout from their conflict are significant. As Singapore leaders and officials have noted, the escalation of the conflict between the United States and China, and the misperceptions they have of each other will ultimately be costly for the two countries as well as countries around the world. Both countries are unlikely to successfully decouple itself from the other without inflicting significant damage on itself and others. One former Singapore diplomat noted that there may be no "sweet spot" for Singapore between the Americans and the Chinese.[163] As US-China competition will be prolonged, managing it requires "continuous vigilance and periodic decisive action."[164]

163) Bilahari Kausikan, "No sweet spot for Singapore in US-China tensions," *The Straits Times,* May 30, 2019. https://www.straitstimes.com/opinion/no-sweet-spot-for-spore-in-us-china-tensions.

164) Ibid.

9. Visegrád Countries' Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Csaba Moldicz
Associate Professor
John von Neumann University

Introduction

Economic opportunities and geopolitical imperatives collide in the Visegrád countries' policies towards China; this clash of interests is evident when it comes to their interpretations of China's role in their technological catch-up process. To varying degrees, the Central European countries can be characterized by a lack of capital and the need for technology transfer. Although substantial funds are available from the EU budget,[165] both R&D spending and other indicators of technological development in these countries lag behind the EU average. Therefore, the need for technology transfer is not a novelty in the Central European region. Rather, looking back in history, it is one of the most enduring features of the region's economic development over centuries.

The reason why these countries seemed to cooperate enthusiastically with China after Global Financial Crisis (2008-2009) can be explained by the asymmetric nature of their economic relations with Western European countries and the US. Theoretically, China offers a diversification of technology transfer channels as it has been a rising technology power in the last two decades. Although at this point it should be inserted that the media image of China

165) The EU's budget official name is multiannual financial framework, the recent budget' started in 2021 and finishes in 2026.

in this area is somehow misleading, as the country only does better than the US in certain areas (5G technology and, artificial intelligence) and obviously has better indicators when it comes to the size of the market.[166]

The Belt and Road Initiative (launched in 2013) and the 17+1 cooperation framework (established in 2012) implied greater cooperation with Central European countries in this area. At the same time, we can mention three main reasons why this cooperation had a different outcome for the members of the Visegrád Group (Poland, the Czech Republic, Slovakia, and Hungary).

First, fault lines emerged in the Visegrád Group over China's policy when geopolitical tensions between China and the US became more intense and required a reorientation of foreign policy in the Visegrád countries. We can add that the global pandemic in 2020 and 2021 exacerbated the already existing geopolitical tensions in the Visegrád countries, which reacted differently to the changing environment.

Second, economic cooperation with China led to growing trade imbalances in Poland, and the Czech Republic, while Hungary was able to contain the trade deficit and attracted significantly more investment from China than other Visegrád countries. Although it would be simplistic to explain foreign policy orientations in terms of economic data, we cannot but point out their relevance for policy making.

Third, the US, which wants to forge a global alliance against China, is better off in Poland, where it can easily appeal to Polish concerns about a more assertive Russia and offer military protection in the context of NATO, while the foreign policy interpretation of Russia in Hungary is much less

166) Csaba Moldicz, China, the USA, and Technological Supremacy in Europe (Rethinking Asia and International Relations) 1st Edition, Routledge.

negative. In this environment, Poland is easily persuaded to jump on the bandwagon and join the global coalition against China.

This paper is divided into three sections. The first section looks at the technical indicators and overall economic performance of the Visegrád countries and places their performance in a European and global perspective. The next part examines the results of economic cooperation with China with a special focus on technology transfer and policies related to technology transfer from China. The third section broadens the view and contextualizes the country-specific results when it comes to Chinese cooperation and seeks to draw conclusions regarding the role of China in the catching-up process of these countries.

Economic and technology performance of Visegrád countries

The Czech Republic is an outlier in the group, as its relative performance in terms of GDP per capita is closest to the EU average. Czech GDP per capita (measured in purchasing power parity) was 94 percent of the EU-27 average, while Poland (76 percent), Hungary (74 percent), and Slovakia (71 percent) lagged behind. However, the outstanding performance of the Czech Republic could not be repeated in innovation, where various indicators show performance in research, innovation, and digitalization.

Gross domestic expenditure on research and development (R&D) is significantly lower in the Visegrád countries than in the western part of the continent. In 2019, R&D spending as a percentage of GDP in the Czech Republic was 1.94 percent, while the EU average was 2.19 percent. Performance was worse in other countries. (Hungary: 1.48%, Poland: 1.32%, Slovakia: 0.83%.) Neither the Digitization Index nor the Innovation Scoreboard rankings - both indicators produced annually by European

Commission - show the need for technological upgrading in these economies.

The catching-up process of these countries since joining the European Union has been largely based on imported knowledge, technology, and capital. Most of these imported "goods" came from Germany after the economic and political transformation of these countries in the 1990s. While these countries benefited from this process, on the one hand, it brought them into an increasingly asymmetric dependence on Germany and other Western investors. Myant summarizes this way:

> *"The kind of capitalism that has been established in CEECs, it is argued above, can reasonably be characterized as dependent. Key domestic actors have proved incapable of providing economic dynamism, leaving that role to incoming MNCs for which CEECs are but a small part of global operations. Without a substantial change from the established variety of capitalism, economic prospects for the foreseeable future will depend on how these MNCs choose to use their CEEC operations."*[167]

167) Martin Myant, The Limits to Dependent Growth in East-Central Europe, October 2018, Revue de la Régulation, p. 24.

Table 9-1. Basic innovation indicators of Visegrád Four Countries

	Research and development expenditure in terms of GDP (2019, %)[168]	Digital Economy and Society Index ranking[169]	Innovation Scoreboard 2020 ranking[170]
EU-27	2.19	-	-
Czech Republic	1.94	17	16
Hungary	1.48	21	22
Poland	1.32	23	24
Slovakia	0.83	22	21

The opportunity to cooperate with China came at the right time for the Visegrád countries: disappointment with the EU, weaker growth impulses from the West, and a growing awareness of asymmetrical dependence on the West coincided with the rise of China, whose initiatives promoted economic and technological cooperation with China.

Economy and technology cooperation with China

Trade with China has been growing in the region over the last two decades, however, just a glance at trade data shows that the China relationship is far from being the most important, and at the same time trade with China is unbalanced. Table 2 shows that, except for Hungary, trade deficits with China are huge and even growing when looking at long-term data. In 2019, Poland has a trade deficit with China accounting

168) Eurostat database

169) European Commission, The Digital Economy and Society Index (DESI). Retrieved from: https://ec..europaeu/digital-single-market/en/digital-economy-and-society-index-desi accessed on: Country Report Hungary, p. 3.; Country Report Poland p. 3.; Country Report Czech Republic p. 3.; Country Report Slovakia p. 3.

170) European Commission, European Innovation Scoreboard 2020. Retrieved from: https://ec.europa.eu/commission/presscorner/detail/en/QANDA_20_1150 accessed on: page 2.

for 2.7 billion USD while its overall trade surplus was 5.2 billion USD. This comparison tells us why Poland is more cautious with deepening China's trade. At the same time, we must add that these data are somewhat misleading as they don't report much of the Chinese goods re-exported to other EU member states.

Table 9-2. Merchandise trade with China in 1999 and 2019 (%, Billion USD)

	Export to China (%)		Export to China (1999, Billion USD)		Import from China (%)		Import from China (Billion USD)	
Year	1999	2019	1999	2019	1999	2019	1999	2019
Hungary	0.28	1.36	0.07	1.6	2.18	6.1	0.61	7.1
Czech Republic	0.21	1.24	0.06	2.5	1.96	15.8	0.56	28.3
Poland	0.49	1.0	0.1	2.7	2.66	12.3	1.2	30.4
Slovakia	0.06	2.1	0.006	1.9	1.28	6.4	0.14	5.8

Source: World Bank WITS database

Looking at Chinese FDI in the region, Hungary seems to be much more successful than other Visegrád countries. The table shows the actual size of Chinese FDI and its importance in terms of GDP. However, what we cannot see from the table is that the combined FDI value is insignificant to the attractiveness of the Western European countries. Germany alone attracted USD 48 billion between 2005 and 2020, while the Visegrád countries had an FDI stock of USD 9.12 billion at the end of 2020.

Table 9-3. Chinese FDI as % of GDP, ranking based on the relative size of Chinese FDI to GDP

	Chinese FDI stock between 2005 and 2020 (Billion $)	*GDP (Billion$,2020)*	*Chinese FDI as of GDP (%)*
Hungary	5.88	155	3.79
Czech Republic	0.96	241	0.40
Poland	2.28	594	0.38

Source: own calculation based on World Bank data and American Enterprise Institute's dataset "The China Global Investment Tracker"[171] The data set was updated in early 2020.

Technological cooperation seems to be a particularly sensitive issue, as the new Biden administration sees certain areas such as 5G networks, 5G devices, and artificial intelligence (AI) as strategically important to the geopolitical contest with China and discourages its regional allies from using critical Chinese technology. The irony of the situation is that if there is one area where the Visegrád countries could benefit significantly from relations with China, it is 5G and AI.

In support of the so-called Prague proposals,[172] Poland signed a joint declaration with the US on cybersecurity in September 2019,[173] Czech

171) China Global Investment Tracker compiled by the American Enterprise Institute uses a different approach to collect data on Chinese FDI in Europe and other regions. The AEI traces the investment back to the owner and do not include returns to China, these combined annual values of transactions are usually much higher than the data sets with the BOP approach.

172) The Prague Proposals are basically a collection of recommendations announced at the Prague 5G Security Conference in 2019. The thirty-two countries participating included the Visegrád countries too.

173) Donald J. Trump, Press Release - U.S.-Poland Joint Declaration on 5G Online by Gerhard Peters and John T. Woolley, The American Presidency Project. Retrieved from: https://www.presidency.ucsb.edu/node/333992

Republic is among the early skeptics of 5G cooperation with China, but the joint declaration on 5G was not signed until May 2020.[174] Slovakia also signed this declaration with the US in October 2020.[175] However, this does not mean that Huawei would be completely ousted from the region. The core of the joint declarations is the assessment of:

> *"1) Whether the supplier is subject, without independent judicial review, to control by a foreign government; 2) Whether the supplier has a transparent ownership structure; and 3) Whether the supplier has a record of ethical corporate behavior and is subject to a legal regime that enforces transparent corporate practices."*[176]

Hungary is the only country in the group that has not signed this cooperation, ruling out cooperation with China in this area. Moreover, Huawei is one of the main Chinese investors in Hungary, and the company established its European logistics and production center in Hungary in 2005. Over a period of more than 15 years, the company has invested around USD 1.2 billion in Hungary, employs 2,000 people, and cooperates with around 600 Hungarian companies. The company estimates that the economic impact of Huawei's investment in Hungary is 0.39 percent of GDP.

Obviously, there are many layers to this story that have implications for technological cooperation with China, but they can only be briefly touched upon here:

---

174) Reuters, Czechs sign joint 5G security declaration with United States. May 6, 2020. Retrieved from: https://www.reuters.com/article/us-czech-usa-5g-idUSKBN22I33O

175) United States – Slovak Republic Joint Declaration on 5G Security. Media Note, Office of the Spokesperson, October 23, 2020.

176) See footnote 172).

- FDI screening. Although regulation of 5G and AI is the responsibility of member states, EU guidance is crucial. The result of EU activities was the publication of the so-called 5G toolbox.[177] In addition to the document's main conclusion that adequate progress has been made in strengthening the powers of national authorities, the report highlights the importance of FDI screening. The Czech Republic[178] and Slovakia[179] introduced a new foreign investment screening system in February and March 2021, respectively. Poland[180] did the same in July 2020, while Hungary adopted its own version of the FDI screening law as early as 2019. All the legislative changes reflect a changing economic environment, in sharp contrast to the pre-crisis period (2008-2009), which was friendlier to foreign investment. Concerns are raised about so-called critical investments.
- BRI and 17+1 cooperation. Both initiatives contain elements and references to cooperation in technology transfer, see the term "Digital Silk Road", however not too much has been achieved in these years. Digital cooperation between China and the Visegrád four countries is, if at all, bilateral.

177) European Commission, Cybersecurity of 5G networks. EU Toolbox of risk mitigating measures. 2020. Retrieved from: https://ec.europa.eu/digital-single-market/en/news/cybersecurity-5g-networks-eu-toolbox-risk-mitigating-measures

178) Baker Mackenzie, Czech Republic introduces new foreign investment screening regime. 2021. Retrieved from: https://foreigninvestment.bakermckenzie.com/2021/03/03/czech-republic-introduces-new-foreign-investment-screening-regime/

179) Baker Mackenzie, Slovakia introduces new foreign investment screening regime. 2021. Retrieved from: https://foreigninvestment.bakermckenzie.com/2021/04/13/slovakia-introduces-new-foreign-investment-screening-regime/

180) Arkadiusz Rumiński & Łukasz Karpiesiuk & Iwona Domańska, New Foreign Direct Investment screening rules in Poland, 2020. Retrieved from: https://ssw.solutions/en/new-foreign-direct-investment-screening-rules-in-poland/

Balancing and hedging – Foreign policy strategies

Hungary seems to be the outlier in the Visegrád countries' China policy at the moment. The sharpest contrast between foreign policy towards China can be seen in the case of Hungary and the Czech Republic. For this reason, we take a look at these two countries and draw a comparison in this context. In this context, the question arises of how the difference emerged.

The reason behind the difference is that the Czech Republic has almost average development in the EU, while Hungary, despite the significant steps it has taken in recent years, still has work to do, and the need to catch up is more urgent in Hungary's case. In other words, foreign policy is less motivated by the immediate development needs of the economy of the Czech Republic and the price the country would pay for deeper cooperation with China seems too high, especially considering the international environment and the growing tensions between the US and China. At this point, it should be added that the Czech view carries two major risks: (a) the catching-up process seems to be completed, but it still relies on asymmetric trade and investment relations; (b) relations with China are easily damaged by inappropriate policies, but it takes a considerable period of time to repair them. The possibility of a change of course in foreign policy can never be ruled out, but the price offered by Americans for an anti-China foreign policy seems low, as American direct investment would flow into the country even if the Czech Republic adopts a more China-friendly tone, as the case of Hungary shows. In addition, military and security threats also appear to be extremely low.

In characterizing the two foreign policies, one must resort to the foreign policy terms bandwagoning, balancing, and hedging. The spectrum of states' behavior is usually classified between "bandwagoning" and

"balancing," where "balancing" means using political, economic, and military means to try to prevent a rising power from becoming a hegemon, and "bandwagoning" means entering into an alliance with the rising power. Somewhere in between is the concept of hedging, a mix of cooperative and confrontational elements.[181] Placing the two countries on this spectrum reveals clear differences. The Czech Republic is very sure which side it is on and pursues a balancing strategy towards China and a strategy of bandwagoning towards the US, while Hungary is close to hedging in both cases (See Table 4).

Hungary – which pursues a classic balance-of-power strategy – can also be described as a "swing state." The term "global swing state" became more popular in the early 2010s when essentially four emerging countries were characterized in this way. Fontaine and Kliman formulate this as:

> *"These four rising democracies might be termed "global swing states." In the American political context, swing states are those whose mixed political orientation gives them a greater impact than their population or economic output might warrant. This applies to Brazil, India, Indonesia, and Turkey"*[182]

In the case of Hungary, this term simply means that the country is balancing between the two superpowers. And it is quite clear that the country cannot be placed in the group of Brazil, India, Indonesia, and Turkey, but the worldwide media attention that Hungarian foreign policy

181) John D Ciorciari, Jürgen Haacke, Hedging in international relations: an introduction. International Relations of the Asia-Pacific, Volume 19, Issue 3, September 2019, Pages 367–374.

182) Richard Fontaine & Daniel M. Kliman (2013). International Order and Global Swing States. Center for Strategic and International Studies. The Washington Quarterly 36:1 pp. 93–109. Retrieved from: https://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/publication/TWQ_13Winter_FontaineKliman.pdf

moves receive shows that Hungarian foreign policy has a greater influence than its population and economic power would suggest.

Table 9-4. Foreign policy strategies of the Czech Republic and Hungary

The chosen strategy	Czech Republic	Hungary
vis-à-vis China	Balancing	Hedging (closer to bandwagoning)
vis-à-vis the United States	Bandwagoning	Hedging

Source: own compilation

To sum up, we can conclude that Hungary will adopt an "open for business" attitude towards investment and technology transfers from China, which is in line with the country's economic interests, while other Visegrád countries will pursue a strategy more influenced by American and German geopolitical interests. Hungary's attitude towards other Asian nations is the same as we can see in the case of China because it is mainly motivated by diversification efforts rather than geopolitical considerations. Obviously, cooperation with China in the automotive industry is the next logical step. In this case, Korean and Chinese investors can complement each other's investments in Hungary and in certain cases compete with each other.

Conclusion

The Visegrád countries have very similar motivations to cooperate with China, but the slight differences in economic development and geostrategic location lead to very different outcomes in their China policies. With the exception of Hungary, the Visegrád countries seem to adopt a hawkish stance on China and take their cue from the US in China affairs. At the same time, all four countries were enthusiastic about the economic opportunities of cooperation with China. Kavalski explains there are four

different reasons for this turnaround in policy: unfulfilled promises of China, the pressure of the US and the EU, the negative perception of the protests in Hong Kong, and the internal fatigue caused by the expansive project of the BRI and the 17+1 cooperation in China.[183)]

We could also see that Hungary's policy towards China in general and 5G security is much friendlier than Polish, Czech, and Slovak stances towards China. At the same time Hungary's position on trade is more balanced, the country also benefits more from Chinese FDI, but this is only one reason for a different policy in Hungary.

The other reason is more complex but helps to understand the possible outcome of the competition. The US and China have very different approaches to economic development. Chinese interventions, particularly direct or indirect steering of Chinese business investment and technological cooperation, make good political relations between China and the country in question more important to the outcome of economic cooperation, while US foreign policy does not directly influence these business decisions, so ironically Hungary can afford a hedging strategy against both China and the United States. The realization that Hungary can have the best of both worlds has been incorporated into Hungarian foreign policy and has put the Hungarian economy in a happy position in the long run.

183) Emilian, Kavalski, How China lost Central and Eastern Europe. The Conversation, 2020. Retrieved from: https://theconversation.com/how-china-lost-central-and-eastern-europe-142416

10. Latin America's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Oliver Stuenkel
Associate Professor, School of International Relations
Fundação Getulio Vargas (FGV)

Introduction

On September 24th 2019, in his annual report prior to the opening of the United Nations General Assembly's 74th General Debate, UN Secretary-General António Guterres wrote that he feared "the possibility of a great fracture: the world splitting in two, with the two largest economies on earth creating two separate and competing worlds, each with their own dominant currency, trade and financial rules, their own Internet and artificial intelligence capacities, and their own zero sum geopolitical and military strategies".[184] Indeed, while the trade war has been the defining element of the bilateral relationship between China and the United States over the past years, it is the incipient Tech War between the two and the likely emergence of separate geopolitical tech spheres of influence that will have far broader consequences for the future of global order. Rapid technological change, symbolized by the arrival of 5G mobile technology, artificial intelligence, and quantum computing will be the defining element in the emerging great-power standoff, marked by the battle for supremacy in cyberspace between the United States and China.[185] Our era will most likely be shaped

184) 'In "World of Disquiet", UN Must Deliver for the People, Guterres Tells General Assembly', 24 September, 2019, https://news.un.org/en/story/2019/09/1047172. In: Yan Xuetong, Bipolar Rivalry in the Early Digital Age, The Chinese Journal of International Politics, Volume 13, Issue 3, Autumn 2020, Pages 313–341, https://doi.org/10.1093/cjip/poaa007

no longer by trade liberalization and open competition, but by the 'geopoliticization' of the world economy and the two superpowers' race towards technological self-reliance. While the coming Tech War will differ in many ways from the Cold War, there are many reasons to believe that it will be at least as all-encompassing as the great power competition between Washington and Moscow that shaped the latter half of the 20th century.[186]

Political decision-makers and commentators in Latin America have, until recently, ignored Guterres's warning. After all, the region has long been able to stay away from global conflicts, being only tangentially involved in major geopolitical events such as World War I, World War II and the so-called War on Terror that shaped global affairs over the past decades. Yet the emerging tech competition between the United States and China is already shaping contemporary politics in Latin America, where governments were subject to US pressure to refrain from embracing the Chinese telecommunications giant Huawei as the provider of 5G technology — a step that policy makers in Washington regard as the first, and almost irreversible step in Beijing's efforts to establish unprecedented political influence around the world.[187] In response, Chinese diplomats lashed out at US attempts to convince Latin American governments to exclude Huawei, raising concerns in capitals across the region that maintaining productive ties with both Washington and Beijing would be increasingly difficult.[188]

185) Graham Allison. Is China Beating America to AI Supremacy? National Interest. December 22, 2019. Available at: https://nationalinterest.org/feature/china-beating-america-ai-supremacy-106861

186) Fareed Zakaria. The New China Scare. Foreign Affairs. January/February 2020. Available at: https://www.foreignaffairs.com/articles/china/2019-12-06/new-china-scare

187) Oliver Stuenkel. Huawei Heads South. Foreign Affairs. May 10, 2019. Available at: https://www.foreignaffairs.com/articles/brazil/2019-05-10/huawei-heads-south

188) Oliver Stuenkel. Latin American Governments Are Caught in the Middle of the U.S.-China Tech War. Foreign Policy. February 26, 2021. Available at: https://foreignpolicy.com/2021/02/26/latin-america-united-states-china-5g-technology-war/

The rise of the new Tech War will not only be the defining element of the bilateral relationship between the United States and China — which together represent roughly 40% of global GDP —, it will also create complex challenges for third countries such as Brazil, Mexico, Argentina, and Colombia as they seek to articulate their foreign policy strategy over the coming years. While they, naturally, will all seek to maintain strong ties to both Washington and Beijing, the technological split between the two countries (and their respective blocs) will reduce overall interoperability and make maintaining a neutral stance more difficult. For example, when Brazil's president Jair Bolsonaro visited Donald Trump in 2019, the US president made clear that stronger bilateral ties would depend on Brazil's efforts to limit Chinese influence in Latin America, specifically asking the newly elected Brazilian leader not to allow Huawei to be part of the 5G network's rollout.[189] US officials have threatened to suspend intelligence sharing if the Brazilian government would not exclude the Chinese company from the bidding process, even though Washington struggled to present hard evidence of Chinese state cyber activity through Huawei so far.[190] Washington employs a similar strategy when dealing with its key allies around the world. For Latin American governments, navigating this complex new scenario will be among the key foreign policy challenges in the coming years.

Since 2016, Latin America has looked on warily as the Trump and Biden administrations have taken active steps to exclude China from US-American technological know-how, a move that is set to change the basic rules of

189) Oliver Stuenkel Can VP Mourão Fix Brazil-China Ties? Americas Quarterly. May 21, 2019. Available at: https://www.americasquarterly.org/content/can-vp-mourao-fix-brazil-china-ties

190) Patrícia Campos Mello. EUA podem rever parceria de inteligência se Brasil permitir 5G chinês, diz diplomata. Folha de São Paulo. August 31, 2019. Available at: https://www1.folha.uol.com.br/mundo/2019/08/eua-ameacam-rever-parceria-de-inteligencia-se-brasil-permitir-5g-chines-diz-diplomata.shtml See also: Emily Taylor. Who's Afraid of Huawei? Understanding the 5G Security Concerns. Chatham House. September 9, 2019. Available at: https://www.chathamhouse.org/expert/comment/who-s-afraid-huawei-understanding-5g-security-concerns

globalization.[191] After all, a significant part of the global economy will be intimately tied to new technologies — ranging from autonomous cars and drones used for transport and warfare, to communication and global finance — and all of them will be subject to the new geopolitical logic of the emerging Tech War. Whoever controls these new technologies is expected to have a massive strategic advantage in global affairs over the next 10-15 years. 5G technology, as *The Economist* puts it, has "become a proxy for superpowerdom"[192] — as Erdan Arikan, the Turkish engineer who played a key role in developing the next-generation technology, says, "5G is totally different from the internet. It is like a global nervous system."[193] It should thus be no surprise that the battle over who controls this nervous system is the defining element in the global competition between Washington and Beijing.[194] While the Trump years were often seen, from a Latin American perspective, as an unusual period that may go down in history as an outlier, the Biden administration quickly made clear that it did not intend to fundamentally shift its approach vis-à-vis China. The tech war, analysts from Mexico City to São Paulo and Buenos Aires realized, was here to stay.

Latin America would not be spared because, while the global tech industry will be most exposed, it is a mistake to believe that developing

191) Richard Waters, Kathrin Hille and Louise Lucas. Huawei v the US: Trump risks a tech cold war. Financial Times. May 24, 2019. Available at: https://www.ft.com/content/78ffbf36-7e0a-11e9-81d2-f785092ab560

192) Ren Zhengfei may sell Huawei's 5G technology to a Western buyer. The Economist. September 12, 2019. Available at: https://www.economist.com/business/2019/09/12/ren-zhengfei-may-sell-huaweis-5g-technology-to-a-western-buyer

193) Steven Levy. Huawei, 5G, and the Man Who Conquered Noise. Wired. November 16, 2020. Available at: https://www.wired.com/story/huawei-5g-polar-codes-data-breakthrough/

194) Zach Dorfman. China used stolen data to expose CIA operatives in Africa and Europe. Foreign Policy. Available at: https://foreignpolicy.com/2020/12/21/china-stolen-us-data-exposed-cia-operatives-spy-networks/

countries dependent on commodity exports, such as Brazil, would be less affected. The coming tech-split and techno-nationalism will most likely accelerate and deepen the overall trend of 'decoupling,' the declining economic interdependence between the world's two largest economies, and potentially US companies' growing aversion to being exposed to geopolitical risk that operating in China implies. Indeed, growing restrictions and geopolitical concern that affected technological firms quickly seeped into other, related areas, and broader restrictions in banking and venture-capital funding are already emerging, a trend that will inevitably affect all other industries.[195] That includes, among others, Latin American agribusiness, a highly sophisticated industry that relies on drones to monitor crop growth and fertilizer distribution, and which is set to benefit significantly from the arrival of 5G technology.

This development risks the emergence of two separate economic camps, reverting the tremendous economic globalization that has been the hallmark global order over the past decades – and which has tremendously benefited Latin America, a region that depends on both the United States and China. In 2020, Beijing's "dual circulation" policy seemed to be a first step towards adapting to this new reality, placing greater emphasis on the domestic market – a worrisome step for Latin America, a key supplier of commodities to China.[196] Growing decoupling will also deepen a cultural divide, reducing ties between scholars, artists, and societies more generally. While Latin American universities have not yet come under pressure to "take sides" – the region's elite institution maintain diverse ties to institutions in both the United States and China—,

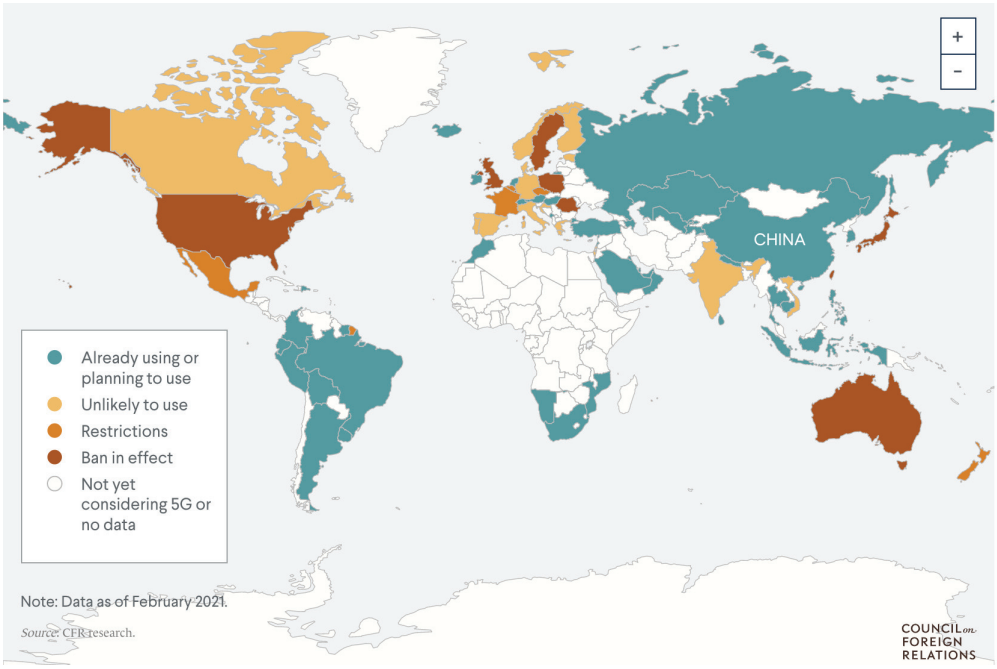
195) Elizabeth Braw. How China Is Buying Up the West's High-Tech Sector. Foreign Policy. December 3, 2020. Available at: https://foreignpolicy.com/2020/12/03/how-china-is-buying-up-the-wests-high-tech-sector/

196) James Kynge and Jonathan Wheatley. China pulls back from the world: rethinking Xi's 'project of the century'. Financial Times. December 11, 2020. Available at: https://www.ft.com/content/d9bd8059-d05c-4e6f-968b-1672241ec1f6

university administrators have begun to closely follow developments in the United States and in Europe, where institutions have struggled to adapt to growing great power tensions – in the US, for example, universities have grown reluctant to accept Chinese graduate scholars for fear that they may work for the Chinese government. From an economic point of view, such a process is set to be costly, considering how deeply intertwined China's and the United States' economy have become — after all, even the 5G networks in China heavily depend on critical components from the United States.[197] In a report published in 2020, Deutsche Bank estimates that the tech war will cost more than $3.5 trillion dollars until 2025.[198] A negative global economic environment often produces devastating consequences in Latin America, a region vulnerable to external shocks and perennially dependent on outside investments.

197) Are China and the United States fighting a "Tech Cold War"?. JP Morgan Securities. May 11, 2019. Available at: https://www.jpmorgan.com/securities/insights/are-china-and-the-us-fighting-a-tech-cold-war

198) Apjit Walia. The coming Tech Wall and the covid dilemma. July 2020. Available at: https://www.dbresearch.com/PROD/RPS_EN-PROD/PROD0000000000507995/The_coming_Tech_Wall_and_the_covid_dilemma.pdf?undefined&realload=Pq/hjNd51B~8jfSVWdofR~1hfDhqMcfCx1R8dtWobLdxoNqwl7EXDltHpiEW2qM1qSrghK4fb2khmAr6Dub~Uw== In: Adam Segal. The Coming Tech Cold War With China. Foreign Affairs. September 9, 2020. Available at: https://www.foreignaffairs.com/articles/north-america/2020-09-09/coming-tech-cold-war-china



Source: Council on Foreign Relations (https://www.cfr.org/blog/china-huawei-5g?utm_source=twtw&utm_medium=email&utm_campaign=TWTW%202021April2&utm_content=Final&utm_term=TWTW%20and%20All%20Staff%20as%20of%207-9-20

Graph 10-1. Huawei's role in 5G networks around the world

In response to Trump's ban, Huawei announced in 2019 that it had built its first 5G mobile network base stations without using any US parts.[199] Perhaps symbolic of this grown schism, US pressure on Huawei led the Chinese technology giant to abandon Android, Google's smartphone operating system, in order to develop a separate platform. Soon later, the Chinese government decided that its entire public administration would

199) Cliff Kupchan and Paulo Triolo. Distrust But Verify: How The U.S. And China Can Work Together On Advanced Technology. Supchina, November 26, 2019. Available at: https://supchina.com/2019/11/26/distrust-but-verify-the-us-china-advanced-technology/

have to remove PCs and Western software within three years.[200] In response to this new reality of "weaponized interdependence," which attempted to force companies from other countries to cut their ties to firms like Huawei, the Chinese government decided that its only way out would be becoming a tech superpower without depending on the United States. Chinese companies that are at risk due to US sanctions began to receive special protection from the government in Beijing.[201] Yet it remains far from certain whether the US approach stands a chance: in a world divided by a virtual Iron Curtain, players from third countries, for example in the semiconductor ecosystem, may end up preferring access to the Chinese market and know-how.[202] Indeed, as the graph above shows, Latin American governments have been deeply reluctant to cede to US pressure so far, and none so far accepted excluding Huawei as a provider of components for its 5G network.

Over the coming years, the Tech War is likely to increasingly hinder the sharing of information, undermine economies of scale — the very principles that have led to technological progress over the past thirty years — and the rise of a digital iron curtain risks massively increasing transaction costs due to interoperability issues and unnecessary duplication.[203] With such a

200) Yuan Yang and Nian Liu. Beijing orders state offices to replace foreign PCs and software. The Financial Times. December 8, 2019. Available at: https://www.ft.com/content/b55fc6ee-1787-11ea-8d73-6303645ac406

201) Adam Segal. The Coming Tech Cold War With China. Foreign Affairs. September 9, 2020. Available at: https://www.foreignaffairs.com/articles/north-america/2020-09-09/coming-tech-cold-war-china

202) John Lee. The Global War for 5G Heats up. The Diplomat. July 31, 2020. Available at: https://thediplomat.com/2020/08/the-global-war-for-5g-heats-up/

203) Cliff Kupchan and Paulo Triolo. Distrust But Verify: How The U.S. And China Can Work Together On Advanced Technology. Supchina, November 26, 2019. Available at: https://supchina.com/2019/11/26/distrust-but-verify-the-us-china-advanced-technology/ Ian Bremmer and Cliff Kupchan have described this phenomenon as a "virtual Berlin Wall." In: Top Risks 2020. January 6, 2020. Available at: https://www.eurasiagroup.net/issues/top-risks-2020 While issues such as 5G and Artificial

zero-sum competition, globalization as we know it from the 1990s and 2000s — largely free from major geopolitical concerns — will be the most prominent victim of the Tech War.[204]

While these developments have just recently started making headlines in Latin American newspapers, what is often overlooked is that key elements of the Tech Cold War have been in place for years. Huawei and ZTE have largely been banned from the US, and China is blocking US tech firms such as Google and Meta from its market, effectively establishing an 'economic Iron Curtain' and creating a separate digital universe. For Chinese strategists, it has long been clear that the only way to assure technological security is to achieve near-total self-reliance, a conviction confirmed by Donald Trump's decision to place Huawei on the so-called entity list in 2019 — a move that posed an existential threat to the Shenzhen-based telecommunications firm. In response, Huawei has doubled down on its efforts to maintain its lead in developing countries, including in Latin America, engaging in an unprecedented public outreach to strengthen its reputation in the region. In Latin America, these developments were in part obscured by the fact that China's rise has produced countless benefits of both economic and geopolitical nature – after all, Beijing's growing presence in the region helped Latin American decision-makers balance the United States' traditionally strong influence.

Intelligence may be regarded, by many, as niche issues, they have long become a key element of the global economy. IA technology provided by Chinese companies such as Dahua, Hikvision, ZTE and Huawei are already used in more than 30 countries, all of whom are part of the Belt and Road Initiative (BRI). Stephen Feldstein. The Global Expansion of AI Surveillance. Working Paper, Carnegie Endowment for International Peace, September 17, 2019. Available at: https://carnegieendowment.org/2019/09/17/global-expansion-of-ai-surveillance-pub-79847

204) This should not be confused with deglobalization or predictions of the "end of globalization", an idea frequently voiced during the pandemic in 2020. See, for example, Douglas Irwin. The pandemic adds momentum to the deglobalization trend. Peterson Institute of International Economics. April 23, 2020. Available at: https://www.piie.com/blogs/realtime-economic-issues-watch/pandemic-adds-momentum-deglobalization-trend

The overarching questions

Several overarching questions have emerged in Latin America with regard to this reality:

First of all, to what extent does technology transform the fundamental dynamics of international politics, which traditionally has been the product of factors such as geography, military might and economic power? From a geopolitical perspective, geography has long been destiny, and geographic aspects have always been crucial to comprehend nations' behavior. It is impossible to understand Latin American foreign policy over the past two centuries without taking its geographic proximity to the United States, the "colossus of the north," into account. In the same way, being landlocked is a key determinant of Bolivia's international role, and the Amazon Forest and the Andean Mountains create formidable physical barriers that limit ties between South American nations until this day.

Yet with a growing part of the global economy moving towards the technological and virtual realm, aspects such as physical proximity or distance may no longer be as relevant as they used to be. Indeed, while traditional spheres of influence depended on a great power's capacity to physically reach and defend a specific territory, placing Latin America firmly into the United States' sphere of influence — technological spheres of influence may be established irrespective of any geographic factors, but rather depend on the technological standards and platforms governments chose to adopt. Contrary to traditional spheres of influence, technological spheres of influence may look like a patchwork from a geographical point of view — after all, the physical location of threats matters little in cyberspace, and the cost of launching a cyberattack two hundred miles away is the same as attacking a target on the other side of the globe. This is not to say, of course, that geography will cease to matter entirely

anytime soon. China's far greater dependence on importing energy from around the world will shape its behavior for decades, and the United States' privilege of being protected by two oceans will continue to make it less vulnerable to foreign attacks than almost any other major power. We are thus unlikely to enter a post-geographic age yet. However, the fact that digital supremacy is today seen as a key element of the new bipolar order suggests dynamics may play out differently than they did during the second half of the 20th century. Could Latin America, then, cease being part of the United States' sphere of influence and start being most strongly influenced by China? Or will the region be exposed to permanent jostling for power, shaped by military dependence on the United States but economic and technological dependence on Beijing? We cannot answer the question in a satisfactory manner without gaining a better understanding of the nature of the US-Chinese tech competition.

These aspects are crucial as Latin American observers seek to comprehend to what extent is the emerging great power contest comparable to and different from the Cold War in the 20th century, and what that means for third countries seeking to navigate this new scenario? Yan Xuetong argues that the United States and China are "competing for digital superiority rather than ideological expansion," suggesting that an ideological clash similar to that in the 20th century is unlikely to occur.[205] Indeed, the author does so far as to make a clear distinction between a "Cold War mentality" and a "digital mentality": According to Yuetong, "Cold War mentality rests on ideological biases and beliefs, while digital mentality rests on the belief in the power of science and technology, especially digital capability."[206] The Chinese government itself frequently points out

205) Yan Xuetong, Bipolar Rivalry in the Early Digital Age, The Chinese Journal of International Politics, Volume 13, Issue 3, Autumn 2020, Pages 314, https://doi.org/10.1093/cjip/poaa007

206) Ibid, p. 317

that it does not seek to export its political ideology. In the same way, Odd Arne Westad points out that US and Chinese society today are far more similar than US and Soviet society were during the Cold War. After all, societies in the two most powerful countries of our time are, despite important political differences, strongly influenced by individualism and capitalism.[207] In the same way, the United States' far less pronounced commitment to economic liberalism and open markets, and China's desire to project itself as a defender of globalization, create a vastly different scenario from that of the 20th century, and may drive Latin America into the arms of China given Beijing's greater willingness to provide access to its domestic market.

What does it mean that Latin America is increasingly economically dependent on an authoritarian power? In 2017, Xi Jinping argued that China's development model represented "a new option" for countries around the world, and that a "Chinese approach" could help solve humanity's problems.[208] The Communist Party's International Department works with young politicians around the world and often refers to China's development model as a "reference" for others.[209] The debate about consequences for Latin America is still incipient but will play a growing role in the coming years.

Finally, what explains Latin American countries' differing approaches to dealing with the emerging Tech War? At first sight, countries in the region have adopted remarkably similar rhetoric vis-à-vis the situation, expressing

207) Odd Arne Westad. The Sources of Chinese Conduct Are Washington and Beijing Fighting a New Cold War? Foreign Affairs, September/October 2019. Available at: https://www.foreignaffairs.com/articles/china/2019-08-12/sources-chinese-conduct

208) How China's Communist Party trains foreign politicians. The Economist. December 10, 2020. Available at: https://www.economist.com/china/2020/12/10/how-chinas-communist-party-trains-foreign-politicians

209) Ibid.

discomfort at being pressured by the two superpowers. Yet at the same time, there is profound disagreement when it comes to the choices available. Latin American policy makers often express the desire to remain "neutral" in the face of growing tensions, yet policy makers privately admit that a choice would ultimately be unavoidable.

Given how fluent, complex, and incipient these developments in Latin America still are, no article is capable of offering a definitive analysis of the many trends described here. Rather, the goal of this analysis is to promote a more global debate about the consequences of the phenomenon that is too often described from either the US or Chinese perspective. More views from the outside can help us identify more general lessons about how the Tech War is set to impact global order.

11. Central Asia's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Svetlana Kozhirova
Head of the Center for Chinese and Asian Studies
International Science Complex "Astana"

Kairat Maratovich Batyrbayev
Executive Director,
Eurasian International Studies Association

Introduction

In the 21st century, the development and promotion of proprietary technologies have become an important element in the struggle for world leadership, which in turn has led to the emergence of two main technological ecosystems - the American and the Chinese.

The American system is considered to be the oldest, largest, and most developed. It relies on its unconditional technological leadership. The key goal of this strategy is to maintain the innovation initiative, prolong its own dominance, and prevent the emergence of serious competitors at the global level. For these needs, active personnel work is being carried out, and preferential conditions are being created for the development of the startup ecosystem. A significant factor is the creation of numerous common goods. All this allows American companies to provide a trial version of their own products to the whole world, which gives the user the opportunity to get access to one of the most advanced technologies at no extra cost. However, it should be borne in mind that if the Americans doubt their own hegemony in the technological environment, the principles can be revised

at their discretion, up to the creation of artificial barriers to deter competitors. Currently, more than 60% of all domains are operated by the American side (Verisign, and Afilias), more than 50% of content delivery networks are also owned by Americans (Amazon, Akamai, and Cloudflare), all the main Tier 1 providers are US residents, ten of thirteen DNS servers are also controlled by the US. Therefore, due to such Internet geography and the awareness of the United States' readiness to take very extreme measures in unilateral sanctions, countries that are not allied with the United States are trying to form their own protected circuit of their sovereign Internet.

The Chinese techno-economic platform is smaller than the American one, but it nevertheless claims to be a technological leader. A significant amount of financial and human resources allows it to be self-contained and administratively reallocate resources to those areas of technological development that seem to be the most promising for the CPC. The Chinese were the first in the world to experiment with the autonomy of a number of services building the Great Digital Wall of China. The competitiveness of the Chinese model is based on the cheapness of their proposals and participation in financing advanced developments in other states (Chinese companies are already participating in the development of 5G networks in more than 50 countries, developing scientific collaborations in 150 countries and introducing urban security systems in about 100 large cities throughout the world). At the same time, China relies on waiting tactics and does not react to US provocations. From the Chinese point of view, America is a more weighty and powerful player in this area. However, the pace of growth in the Chinese technology industry allows Beijing to expect that it will be a matter of time before reaching a market position comparable to that of the United States. It is unlikely that the Americans will be able to stop this process. There is a demand for pragmatism in

world politics. In response to it, an increasing number of American allies (including Europeans) are favorable towards China's proposals for cooperation in the digital sphere (Hungarian authorities are actively inviting Chinese manufacturers to set up 5G networks in Budapest. In Germany, the discussion about China's participation in the development of the national 5G networks has reached the presidential and the chancellor level).

The specific technology goals of the "Made in China 2025" strategy include "70% self-sufficiency in high-tech industries by 2025 and global market dominance by 2049."[210] Bypassing the United States and Europe, China aims to become a "science and technology superpower" and close "the gap with the West in areas such as robotics, artificial intelligence, and fully automated systems. China is focusing its efforts on research and development, especially on new technologies in dual-use areas such as artificial intelligence (AI), robotics, and space, which can also be used for military purposes. Even civilian AI companies (such as Baidu, Alibaba, Tencent, or iFlytek) are directly involved in the development of dual-use technologies and have created special research centers for these purposes.[211]

General characteristics for Central Asia

Transnational giants - Google, Meta, Microsoft, Huawei, TikTok, Alibaba, and YouTube - are already talking on equal terms with national and foreign governments. It is impossible to ignore them as a factor of national security. On one hand, the information accumulated by such ecosystems

210) The European Centre of Excellence for Countering Hybrid Threats. Hybrid CoE Trend Report 5: Trends in China's Power Politics // URL: https://www.hybridcoe.fi/wp-content/uploads/2020/07/20200710_Trend-Report-5-China_Web.pdf

211) Elsa Kania. Cooperation, competition and the dual-use dilemma in artificial intelligence https://www.aspi.org.au/report/technological-entanglement

and the advanced solutions introduced by them is of colossal interest to the competent authorities. On the other hand, their ability as sources of information to broadcast certain information messages to a gigantic audience is becoming a factor in national political life. These properties of such corporations endow them with the "right to vote" in the international arena and at the same time make them subject to strict national regulation.

The information space of Central Asian countries is dominated by America's Google and Meta (including Facebook, Instagram, and WhatsApp), which are significantly ahead of their Russian counterparts (Vkontakte, Yandex, etc.) and Chinese platforms (Baidu, WeChat, etc.) in popularity. These American platforms are actively trying to influence the information field and the political situation in the internal politics of the Central Asian countries through the manipulation of content and restrictions on access to certain resources.

Since 2020, in connection with the introduction of a new procedure for paying VAT for foreign companies that provide services to individuals in electronic form, Netflix, Google, Apple and a number of other US companies have registered in Uzbekistan as taxpayers.[212)]

Later in March 2021, for similar reasons, Google, Meta, and other American companies also registered in Tajikistan as taxpayers.[213)]

In September of 2021, on the initiative of deputies D. Zakieva and A. Sarym, the question of opening representative offices of American messengers and social networks was also initiated in Kazakhstan, but with an emphasis on the need to protect the health and safety of children,

212) Apple and Netflix in Uzbekistan. Should Kazakhstan be afraid of competition // URL: https://tengrinews.kz/kazakhstan_news/apple-netflix-uzbekistane-stoit-kazahstanu-opasatsya-429886/

213) Google and Facebook officially become taxpayers in Tajikistan // URL: https://tengrinews.kz/sng/google-facebook-ofitsialno-stali-nalogoplatelschikami-430822/ accessed on date?

including cyberbullying.[214] At the same time, the Google press service replied that in the near future the opening of the company's office in Kazakhstan and Central Asian countries is not planned,[215] since this region is not a large market for an international corporation.[216]

There is also a US-Chinese confrontation in the area of technology of the financial and banking sector of Central Asia. If earlier this market was dominated by the US payment systems (Visa and Mastercard), then since 2015 there has been an increase in users of the Chinese UnionPay (In May 2015, Union Pay signed an agreement with the Halyk Bank of Kazakhstan on cooperation in issuing bank cards, online payments, express translations and financial support for Kazakh students studying in China[217]). By 2017, UnionPay had already overtaken above American counterparts in terms of the volume of the issue in the global payment card market. By the beginning of 2018, the number of payment cards in circulation in the world reached 15 billion and UnionPay still has the largest share.[218] According to forecasts, in 2022, the volume of available cards worldwide will reach 17 billion, where the share of the Chinese side will also dominate. It should be noted, that the states participating in the Belt and Road Initiative have become the main markets for issuing UnionPay cards over the past few years. Banking institutions of 30 countries of the Belt and Road, including 6 states of Central Asia, have issued over 35 million UnionPay cards, which

214) Aidos Sarym: «Social networks are not freedom of speech. These are the tools of totalitarianism» // URL: https://www.exclusive.kz/expertiza/obshhestvo/125588/ accessed on date?

215) Does Google plan to open an office in Kazakhstan // URL: https://tengrinews.kz/kazakhstan_news/planiruet-li-google-otkryit-ofis-v-kazahstane-430839/ ???

216) When Google comes to Kazakhstan // URL: https://forbes.kz//process/internet/google_mojet_priyti_v_kazahstan_v_blijayshie_dva_goda/

217) UnionPay stakes on cooperation with Kazakhstan // URL: https://kapital.kz/finance/41406/union-pay-delayet-stavku-na-sotrudnichestvo-s-kazakhstanom.html

218) UnionPay remains the largest payment processor in the world // URL: https://plusworld.ru/daily/platezhnyj-biznes/unionpay-ostaetsya-krupnejshej-platezhnoj-sistemoj-v-mire/

is 20 times more than before the introduction of this Chinese initiative.[219]

The smartphone market in Central Asia has also been dominated by American devices over Chinese ones for many years, but the trend has changed significantly in recent years. Thus, according to the results of a study by IDC Worldwide Quarterly Mobile Phone Tracker, the market share of Chinese smartphones (Huawei, Oppo, and Xiaomi) in Kazakhstan amounted to 38.7%, while Apple products, along with other brands, except Samsung, were only 10.8%.[220]

According to the same IDC consulting agency, the share of the Chinese PC and laptop manufacturer Lenovo in the first quarter of 2021 was 24.3%, which allowed it to take the leading position in the ranking. At the same time, the total share of American manufacturers (HP, Dell, and Apple) amounted to 46.3%.[221] According to IT specialists from Central Asian countries, a similar situation is observed in our region.

There is also a dominance of Chinese companies in the deployment of 5G technologies. According to the Dell'Oro Group research company, Huawei takes the leading position with a market share of up to 28.3% in the global ranking of 5G equipment manufacturers in 2020. Sweden's Ericsson is in second place with 13.9%, and Nokia is third with 16.2%. At the same time, the US administration is considering the takeover of Nokia by its Cisco Systems company by stimulating it with various tax incentives and financial support.[222] Directly in Central Asia, the picture is

219) UnionPay cards issued outside China exceed 100 million // URL: https://tass.ru/press-relizy/5718053

220) Results of 2020 in the mobile phone market of Kazakhstan // URL: https://www.idc.com/getdoc.jsp?containerId=prEUR247564121

221) PC Shipments Show Continued Strength in Q1 2021 Despite Component Shortages and Logistics Issues, According to IDC // URL: https://www.idc.com/getdoc.jsp?containerId=prUS47601721

222) How Nokia and Huawei made different 5G. Nokia lost and Huawei took off // URL: https://www.cnews.ru/news/top/2020-07-08_nokia_proigrala_bitvu_za_5gsdelav

heterogeneous. For example, initially in October 2019, Kazakhstan launched the first pilot test project of 5G networks from Beeline in the city of Shymkent, where Nokia was the supplier of equipment.[223] However, later in 2021, Huawei CEO Zhang Qingguo noted that the Chinese side also launched a pilot project jointly with Beeline Kazakhstan (the integration process has been completed, the first phase of the project is underway, and data transmission is being tested[224]).

In general, since 2002, there has been an experience of cooperation between Huawei and Kazakhtelecom in terms of network modernization, transition to digital telephone networks, broadband Internet access, including through wireless communication (launch of a 5G network in the city of Nur-Sultan and by 2023 throughout Kazakhstan).

In 2007, ExIm Bank of China financed a 7-year export credit of US $34 million for Kazakhstan to import telecommunications equipment from Huawei Tech. It is reported to have a very flexible payment schedule, but no details. The main recipient is the Kazakh company Mobile Telecom Service LLP.

In April 2009, Kazakhtelecom JSC, the Bank of China, and Huawei Technologies signed a tripartite memorandum of understanding aimed at implementing telecommunications projects in Kazakhstan. The purpose of the memorandum is to create preconditions for financing telecommunication projects in Kazakhstan by the Bank of China. Kazakhtelecom and Huawei Technologies will take part in such projects.[225]

---

223) 5G in Kazakhstan. Is the market ready to introduce new technology? // URL: https://kursiv.kz/news/kompanii/2020-11/5g-v-kazakhstane-gotov-li-rynok-k-vnedreniyu-novoy-tekhnologii

224) Huawei shares the prospects for the launch of a 5G network in Kazakhstan in 2021 // URL: https://www.huawei.com/kz/news/kz/2021/news-huawei-5g-network-kazakhstan

225) Dreher, A., Fuchs, A., Parks, B.C., Strange, A. M., & Tierney, M. J. (2017). Aid, China, and Growth: Evidence from a New Global Development Finance Dataset. AidData Working Paper #46.

Speaking about technological cooperation between China and the CAR countries in the tourism industry, the role of Tencent Culture & Tourism should be noted, which has developed and actively implements smart tourism projects in a number of cities in the SCO member countries, including within the framework of the Eight Wonders of the SCO project. These initiatives are closely related to other technology projects and in the future are aimed at expanding the Chinese presence in the Central Asian market in such related areas as the digital economy.[226]

China's technological penetration into the Central Asian states began relatively recently and is carried out mainly within the framework of the "Digital Silk Road" doctrine. Since Xi Jinping came to power in 2012, a number of technological breakthroughs have been achieved in such prestigious areas as landing on the moon, docking into space, supercomputers (in February 2020, the Chinese side provided a set of supercomputer systems worth 109.66 million yuan for the operation of KazNU named after Al-Farabi[227]) and quantum computing. In arms innovation, China has developed promising prototypes of aircraft and unmanned aerial and naval systems, building its second in-house-designed aircraft carrier and has achieved astounding modernization of its navy in record time.

In 2013, Chinese President Xi Jinping announced the Belt and Road Initiative in Astana. Since then, there has been an intensification of cooperation between the countries, including the field of technology. To

---

Williamsburg, VA: AidData

226) The SCO Secretary General discussed with the Director General of Tencent Culture & Tourism the issues of cooperation on the development of smart tourism in the SCO // URL: http://rus.sectsco.org/news/20190906/572874.html

227) China will give Kazakhstan a supercomputer worth 5.4 billion tenge // URL: https://inbusiness.kz/ru/last/kitaj-podarit-kazahstanu-superkompyuter-stoimostyu-5-4-mlrd-tenge

satisfy China's interests in transit through the CA countries, the expansion of investments in infrastructure projects and the transport system was used. Another important factor is the financing of projects through tied lending, a feature of which is "the use of Chinese materials, equipment, technologies or labor in the implementation of projects."[228]

In addition, the access of Chinese companies to markets abroad, such as along the BRI, has political support and government export subsidies, while foreign companies do not have mutual access to markets in China. Thus, Western firms operate in an uneven playing field, competing with Chinese technology firms. Coupled with the multitude of illegal methods of acquiring foreign technology, it ranges from traditional espionage to cyber espionage and innocent academic exchanges, poses a serious threat to the long-term security of industrial bases in western high-tech countries.[229]

In August 2015, the President of the Republic of Kazakhstan N. Nazarbayev visited China, where, among other things, a framework agreement on strengthening relations in the field of industrialization and investment, using modern technologies was signed between the two countries.[230]

The signing of this agreement with subsequent adjustments became a trigger for the implementation of 56 joint Kazakh-Chinese projects worth $ 27.6 billion. In the context of the regions of Kazakhstan, projects under the BRI are planned to be implemented in 11 regions and 3 large cities. During

228) Kashin V., Korolev A. China's assistance to the countries of Central Asia // World economy and international relations. T. 62.No. 3, 2018., p. 82

229) Nouvens and Legarda, New Technologies; William S. Hannas and Huey-Mi Chang, "Chinese Technology Transfer: An Introduction" to The Quest for China for Foreign Technology: Beyond Espionage, William K. Hannas and Didi Kirsten Tatlow (London: Routledge, 2020), 3-20.

230) Resolution of the Government of the Republic of Kazakhstan dated January 27, 2016 No. 30 On approval of the Framework Agreement between the Government of the Republic of Kazakhstan and the Government of the PRC on strengthening cooperation in the field of industrialization and investment. // URL: https://adilet.zan.kz/rus/docs/P1600000030

the implementation of the projects, it is expected that the unemployment rate will be reduced by creating about 20 thousand new job opportunities, mainly for Kazakhstani citizens (up to 90%).

Considering the theme of the presence of Chinese technology campaigns in Kazakhstan, it should be noted that in 2015, Hikvision's Representative Office in Kazakhstan was opened. Today the company has offices in Almaty and Nur-Sultan. It is especially notable that, after the state visit of the President of the Republic of Kazakhstan K.Tokayev to China in September 2019, where the head of state showed interest in creating joint innovative enterprises, technoparks and IT centers with Chinese companies, Hikvison attracted the attention of the Kazakh public in the context of plans to implement within the framework of the "Safe City" and traffic monitoring projects.[231]

In May 2016, China Telecom signed a contract with Kazakhtelecom JSC to create a high-speed, high-capacity route from Hong Kong to Europe, called the "Transit Silk Road".

Since 2017, hardware and software systems "Sergek" have been operating in the cities of Kazakhstan. The complexes were first introduced in Nur-Sultan, and then in a number of other cities, including Almaty, Shymkent, Ust-Kamenogorsk, and Semey. These complexes are supplied by Korkem Telecom, whose technical partner is the Chinese Dahua Technology company.[232]

In 2017, Huawei on the basis of the Kazakh-British Technical University (KBTU) opened the first Huawei Authorized Information and Networking

231) The head of state took part in the opening of the 6th meeting of the Kazakhstan-China Business Council // URL: https://www.akorda.kz/ru/events/international_community/foreign_visits/glava-gosudarstva-prinyal-uchastie-v-otkrytii-6-go-zasedaniya-kazahstansko-kitaiskogo-delovogo-soveta

232) Chinese equipment in cities of Kazakhstan raised concerns over possible spy surveillance // URL: https://central.asia-news.com/ru/articles/cnmi_ca/features/2019/12/11/feature-01

Academy (HAINA) in Almaty. Then later in 2019, it included the Kazakh National University named by Al-Farabi (KazNU) in its global network with the prospect of inviting the most successful students for internships at its headquarters in Shenzhen.[233]

Since 2020, a leading construction holding in the real estate market of Kazakhstan BI Group, starting from a pilot project (BI-City Tokyo in Nur-Sultan), began to actively introduce the equipment of the Chinese Dahua company into new residential complexes for the needs of internal monitoring, IP cameras, access ANPR cameras, video intercom and other systems taking into account climatic conditions.[234]

Conclusion

In connection with the introduction of the Belt and Road Initiative, China's relations with the countries along this project have intensified. Traditionally, it was believed that the PRC was engaged exclusively in the economy, and on the other hand, military issues were left within the sphere of interests of the Russian Federation. However, China recently has begun to change its tactics of action in Central Asia from the previously practiced reliance on Russia in favor of solving problems on its own.

The security sector is important and relevant for the PRC for several reasons, including the presence of extremist cells in the Xinjiang Uygur Autonomous Region (XUAR), the withdrawal of American troops from Afghanistan, and the rise to power of the Taliban with radical Islamic views. Therefore, Beijing's preventive measure in 2016 was an agreement

233) Huawei Academy opens in Almaty to support local ICT education // URL: https://astanatimes.com/2017/05/huawei-academy-opens-in-almaty-to-support-local-ict-education/

234) Dahua solution was implemented in an elite residential complex in Nur-Sultan // URL: https://www.dahua-russia.com.ru/news/bi-citytokyo-dahua-solutions2-news

between Tajikistan and China on the modernization of security infrastructure in their border region, which included plans to create 11 "outposts of different sizes" and a training center for border guards,[235] later in February 2019, there was information in the American media about secret Chinese military base in the Gorno-Badakhshan region of Tajikistan.[236] In addition, within the SCO, the emphasis on Chinese cooperation is gradually shifting in the military direction. Joint military exercises are held annually. The security services of the Central Asian countries purchase large amounts of Chinese technological equipment and build their IT infrastructure on its foundation.[237]

Also, in recent years, due to the increased tension in the Asia-Pacific region caused by the Taiwan issue, disputed territories along the Malacca Strait, and the creation of anti-Chinese coalitions like QUAD and AUKUS, China is gradually increasing its own armaments, and exhibitions are held annually. For example, on September 28th, 2021, the 13th China International Aviation and Aerospace Exhibition were launched in Zhuhai (Guangdong Province), which presents the latest Chinese developments in military and aviation technology CH-6 UAVs, CH-817 mini-drone, J- 16D, J-20 fighter, Y-20 military transport aircraft, KJ-500 early warning aircraft, Xian H-6K bomber, and HQ-9B missile system, WZ-7 high-altitude reconnaissance drone, a rocket for a manned flight to the lunar orbit and many other samples.[238] All this may indicate the build-up of Chinese arms and the inevitability of their

235) How Tajikistan is turning into a zone of special interests of China // URL: https://www.caa-network.org/archives/21363

236) Gerry Shea. In the inaccessible highlands of Central Asia, a quiet newcomer: Chinese troops // URL: https://www.washingtonpost.com/world/asia_pacific/in-central-asias-forbidding-highlands-a-quiet-newcomer-chinese-troops/ 18.02. 2019 / 78d4a8d0-1e62-11e9-a759-2b8541bbbe20_story.html

237) Rafaello Pantucci. Not just the economy. How China is increasing its power influence in Central Asia // URL: https://carnegie.ru/commentary/83949

238) The Chinese Air Force presented the best samples of equipment at the 13th China International Aviation and Space Salon // URL: http://russian.people.com.cn/n3/2021/0929/c31521-9902254.html

export. From this perspective, one of the promising areas of Chinese technological influence in Central Asia is seen. But nevertheless, it should be borne in mind that the Central Asian countries are closely linked with Russia by agreements within the framework of the Collective Security Treaty Organization (CSTO), the Commonwealth of Independent States (CIS), the Eurasian Economic Union (EAEU), and other integration structures, including those dealing with security and military cooperation, so it will be rather difficult for China to acquire a share in this area.

However, the US and EU countries are increasingly recognizing the danger that the Digital Silk Road, the Space Information Corridor, the Belt and Road, and other Chinese initiatives will allow China to set technical standards in post-Soviet countries and across the globe.[239]

Nevertheless, the countries of Central Asia are completely unprofitable for the geopolitical rivalry between China and the United States to affect their plans for technological modernization and digitalization based on the fourth technological revolution, which is already being developed in Kazakhstan and Uzbekistan. The rivalry between Washington and Beijing will limit the ability of the countries of the region to freely choose partners, technologies, and investors when creating their technology industries and implementing digitalization programs for the industry and service sectors.

239) Sam Olsen. China is winning the war for global tech dominance // URL: https://thehill.com/opinion/technology/518773-china-is-winning-the-war-for-global-tech-dominance

12. Middle Eastern Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Joseph A. Kéchichian
Senior Fellow, Research and Islamic Studies
King Faisal Center

Introduction

The growing bipolarity between the United States and China is now felt on every continent, in every country, and across various economic interactions. Although tensions were exacerbated under the colorful Donald J. Trump Administration, which espoused a combination of isolationism and jingoism, and notwithstanding a far more internationalist penchant under Joseph L. Biden, Washington is struggling to respect its global commitments and treaties. Like many other countries, including Russia and leading European powers, the United States (US) is seeking direct bilateral accords, asking allies, partners, and foes alike to choose between it and the People's Republic of China (PRC). The latter is fast expanding key economic, military, and even political influence by wielding soft power in what some analysts perceive to be part of a larger and long-term planned strategy. In the first decades of the twenty-first century, what the world is witnessing is sophisticated global competition between relatively democratic free market economies (the United States, most Western European powers, the Republic of Korea, Japan, Australia, and others) and the system of state capitalism in the skewed Chinese Communist Party paradigm. Nowhere is this contest more visible than in the Middle East and North Africa (MENA) region where decision-makers at the junior level—individuals who follow

global developments closely—are impressed by an increasing number of American authorities focused on the consequences of epochal changes that benefit from artificial intelligence (AI).

Importantly, American officials are keen to pass laws that will limit the use of facial recognition in criminal investigations, which surprises many. In fact, officials are following dramatic changes in robotics that are rewriting rules that may well determine how access to fast internet and the availability of 5G wireless technology will forge new business models. In Massachusetts and Oregon (the latter banning facial recognition entirely), for example, such preferences are directly opposite what Chinese regulations allow for, as the collection of biometric data is more or less routinized and accepted in China. Conservative Saudi Arabia and equally traditional Egypt frown on such methods even if available 5G technology in both countries may encourage some to practice versions of AI identification methods. The implications of China's 5G network in the Middle East are especially problematic since 5G's "Authentication and Key Agreement" protocol is "believed to be unsecure, creating potential data theft or sabotage, which could have national security implications." As discussed by two prominent observers, "Americans have good reason to be skeptical of artificial intelligence," which means that Middle Eastern societies will be even more cautious.[240]

Of course, while a company like Huawei, the firm at the forefront of China's 5G services, may be perceived as a possible threat in the United States on account of Chinese laws that impose cooperation with the government in cases of national security, these fears are not well

240) Frank Pasquale and Gianclaudio Malgieri, "If You Don't Trust A.I. Yet, You're Not Wrong," *The New York Times,* 30 July 2021, at https://www.nytimes.com/2021/07/30/opinion/artificial-intelligence-european-union.html.

understood in Arab societies.[241] Still, the security concern over 5G wireless technology cannot be ignored and as the former American Secretary of State Michael Pompeo warned: "If a country adopts this and puts it in some of their critical information systems, we won't be able to share information with them, we won't be able to work alongside them."[242] Remarkably, the issue became critical in May 2019 when President Trump signed an executive order that blocked transactions of technology that "poses an unacceptable risk to the national security of the United States."[243] The United Arab Emirates, Saudi Arabia, Kuwait, Bahrain, and Egypt, all of which have telecommunication firms that have partnered with Huawei, did not and do not see short-term negative consequences. In fact, and as noted by a leading observer, the "Africa Cup of Nations, hosted in Egypt in the summer of 2019," was the "venue where Huawei roll[ed] out its 5G phone network for the first time, introducing the technology at the Cairo International Stadium."[244]

Given that artificial intelligence will certainly become a significant business paradigm this century, perhaps replacing core economic pillars (coal, oil, natural gas, etc., ...) that created the modern world through the

241) Adam Satariano, "U.A.E. to Use Equipment from Huawei Despite American Pressure," *The New York Times*, 26 February 2019, at https://www.nytimes.com/2019/02/26/technology/huawei-uae-5g-network.html.

242) "U.S. Won't Partner with Countries that Use Huawei Systems: Pompeo," *Reuters,* 21 February 2019, at https://www.reuters.com/article/us-huawei-tech-usa-pompeo/us-wont-partner-with-countries-that-use-huawei-systems-pompeo-idUSKCN1QA1O6.

243) Tucker Higgins, "Trump Declares National Emergency Over Threats Against US Technology Amid Campaign Against Huawei," *CNBC,* 15 May 2019, at https://www.cnbc.com/2019/05/15/trump-signs-executive-order-declaring-national-emergency-over-threats-against-us-technology.html.

244) "China's Huawei to Launch 5G at Africa Cup of Nations in Egypt," *Arab News,* 22 April 2019, at http://www.arabnews.com/node/1485906/business-economy, as cited by Jonathan Fulton, *China's Changing Role in the Middle East,* Washington, D.C.: The Atlantic Council, June 2019, p. 17, at https://www.atlanticcouncil.org/wp-content/uploads/2019/06/Chinas_Changing_Role_in_the_Middle_East.pdf.

use of critical energy resources, and since it is now the chief domain of US-Chinese competition and geopolitical superiority—best demonstrated over the ongoing battle over 5G technology, how will this competition affect Arab societies? Will Riyadh and Cairo succeed in advancing long-term interests in this ongoing struggle for global hegemony?

Arab perceptions of China and the United States

According to an authoritative American source, "China increasingly is a near-peer competitor, challenging the United States in multiple arenas—especially economically, militarily, and technologically—and is pushing to change global norms."[245] The assessment concludes that "[t]he Chinese Communist Party (CCP) will continue its whole-of-government efforts to spread China's influence, undercut that of the United States, drive wedges between Washington and its allies and partners, and foster new international norms that favor the authoritarian Chinese system." It concludes: "Chinese leaders probably will, however, seek tactical opportunities to reduce tensions with Washington when such opportunities suit their interests."[246]

For its part, Beijing perceives the competitive US-China relations as a necessary step in ongoing geopolitical shifts. It views Washington's economic policies (not only under the Trump Administration but going back several decades) against Beijing as part of broader US efforts to contain or even prevent China's rise. Moreover, the PRC does not see its growing economic and technological successes as threats to anyone and

245) *Annual Threat Assessment of the US Intelligence Community,* Washington, D.C.: Office of the Director of National Intelligence, 9 April 2021, p. 4, at https://www.dni.gov/files/ODNI/documents/assessments/ATA-2021-Unclassified-Report.pdf

246) Ibid.

insists that it is only preserving its territory and regional preeminence. All international advances, it further posits, are not at Washington's expense, though with India (notwithstanding periodic border clashes), in the South China Sea (where Beijing intimidates rival claimants), Taiwan (where moves towards unification confront increased PRC military activities), Russia (with whom it shares complementary defense and economic interests), and throughout Asia and Africa with the promotion of the Belt and Road Initiative (BRI) to expand core economic, political, and military assets, stand as real challenges.

Over the long-term, Arab countries like Saudi Arabia and Egypt understand that China will remain a top global contender, though how they maneuver between this rising power and the United States is unclear. Of course, Riyadh and Cairo appreciate that Beijing will continue to pursue various goals to actually become a genuine great power and that it might still build a world-class military to secure its global presence, though neither has authorized China to erect military installations on its soil, nor granted Beijing access to enhance intrinsic abilities to project power that, presumably, would protect Chinese interests abroad and defend them from putative foes. To be sure, China has sold certain military equipment to both Saudi Arabia and Egypt, but these pale in comparison with what both countries purchased and continue to acquire from the United States and other Western countries.

Far more important are concerns over China's efforts to invest in cyber-espionage around the world, including throughout the Arab World, as Beijing hones its substantial cyber-attack capabilities especially as the deployment of 5G wireless technology initiatives dramatically improve intrinsic capabilities. Saudi and Egyptian authorities recognize that China's significant attention to cyber-warfare is mostly focused on Westernized

societies, but neither can overlook the spillover effects of this attention elsewhere. For now, China's surveillance systems (and censorship capabilities) that monitor its population and repress dissent, particularly among ethnic minorities like the Uyghurs, has not gathered a great deal of opposition—at least in public—in Saudi Arabia and Egypt. Yet, neither country can long ignore cyber intrusions that may affect Saudi and Egyptian citizens. After the 2020 pandemic, Beijing has used its global assistance programs to combat COVID-19 not only as it rushed sorely needed aid to various countries, but to also export its surveillance tools and technologies that, to put it bluntly, was a grave concern.

Naturally, Saudi and Egyptian officials know that China will continue to expand its global intelligence footprint to better support growing political, economic, and security interests that, left unchallenged, will weaken—perhaps even threaten the United States' existing alliances and partnerships. Saudi and Egyptian leaders may well be happy to have another interested great power investing, building, and trading in the region, though most are wary that China, as the primary global strategic competitor to the United States, will be far less reliable than Washington. In fact, Beijing's focus on critical technologies, including advanced computing and artificial intelligence will advance China's military and economic welfare, not necessarily theirs, something that experts comprehend in full.

Differences between China and the United States

Few doubt China's undeclared ambition to lead the global order or, at the very least, present America's global behavior as an existential threat both to the Chinese system as well as the rest of the world. For over a century, the United States enjoyed significant influence throughout the Middle East, sealed through more or less effective security and military presences. It was a non-colonial entity, which pleased most, and actually expanded

important socio-cultural resources to ingratiate itself with many MENA societies. To a certain extent, China emulates this method via valuable economic megaprojects that reflect its extensive geo-economic clout. MENA views and strategies on the ongoing hi-tech competition between the United States and China are thus directly tied to each country's readiness to provide an alternative security umbrella in the Middle East or, for Beijing, whether it is ready to expand its geographic spheres of rivalry with Washington. Towards that end, China relies on its Belt and Road Initiative (BRI) that, truth be told, is a game-changer.[247]

The Belt and Road Initiative

Suffice it to say, at least for the purposes of this short essay, that by 2035, and through its "Digital Silk Road" and broader BRI, Beijing "is working to spread its model of data governance and expand its access to data by building Internet infrastructure abroad and boosting digital trade."[248] So far, the US has only called on countries to reject the 5G phenomenon, but this has not worked. Calls to focus on privacy, anti-trust issues, and liability are falling on deaf ears. MENA states, like the UK and others, are far more interested in economic benefits, as most are aware that AI drives data in so many fields (health, energy, transportation, etc., ...) that can potentially provide huge benefits because "the quantity of data a country can access may result in a sustainable productivity advantage."[249] In the words of Eric Schmidt, the former CEO of Google, and Robert Work, the former US deputy

247) Much has been written on the Belt and Road Initiative. For two interesting perspectives, see Jeremy Garlick, *The Impact of China's Belt and Road Initiative: From Asia to Europe,* New York: Routledge, 2019; and Bruno Maçães, Belt and Road: A Chinese World Order, London: Hurst, 2020.

248) Matthew J. Slaughter and David H. McCormick, "Data is Power: Washington Needs to Craft New Rules for the Digital Age," *Foreign Affairs* 100:3, May/June 2021, pp. 54-62, the quotation is on page 60.

249) Ibid.

secretary of defense, data-enabled AI will be "the most powerful tool in generations for benefitting humanity," but it will also be "used in the pursuit of power,"[250] which few can overlook.

The BRI, once called "the most significant and far-reaching initiative that China has ever put forward," transformed China' economic interests in the Middle East and North Africa. From Beijing's perspectives, the BRI created significant strategic opportunities, which dismayed Western powers.[251] To be sure, China was a "wary dragon" in the Middle East because its influence was still at an early stage compared with the United Kingdom's and the United States' century-long records, though all Arab countries, along with practically all non-Arab actors with a voice in the area, remained keenly interested in what it proposed to do over the next period in history. Of course, Arab societies that experienced the colonial era and, at least for its elites after the twentieth century, familiarity with Western languages and culture was a tested verity.

Chinese language and Middle Kingdom politics, in contrast, were quite alien even if Beijing, whose leaders are looking decades ahead, opted to invest heavily to improve existing perceptions. As one astute observer noted, "establishing stronger people-to-people bonds is an attempt to address" such shortcomings, was one of the priorities of the BRI. Towards that end, "China has set up Confucius Institutes to teach Chinese language and culture in Bahrain, Egypt, Iran, Israel, Jordan, Lebanon, Turkey, and the UAE." Moreover, and as an interesting outcome of Saudi Heir Apparent Muhammad bin Salman's 2019 trip to China was a commitment to introduce Chinese language instruction at all stages of Saudi school and university education,

250) Ibid., p. 57.

251) Michael Swain, "Chinese Views and Commentary on the 'One Belt, One Road' Initiative," *China Leadership Monitor* 47: 2, 2015, p. 3.

which became a reality.[252] Clearly, while the aim on both sides was to increase cultural awareness and linguistic fluency, China was making progress even if it needed to be more deeply engaged on security issues to become a top-tier player. BRI projects, no matter how one cuts them, may yet provide Beijing with solid first steps towards that goal.

Therefore, how Arab societies perceive China and the United States over the next period can be educational as everyone moves their positions on the checkerboard. According to the Arab Barometer, which conducted surveys in six countries—Algeria, Jordan, Lebanon, Libya, Morocco, and Tunisia—to gauge the attitudes of ordinary citizens towards the two world powers, Arab publics preferred China, ostensibly because most rejected American policies towards the region. China was viewed favorably by half or more of respondents in three countries—Algeria (60 percent), Morocco (52 percent), and Tunisia (50 percent)—while a third or more had a positive view of Beijing in Lebanon (43 percent), Jordan (35 percent) and Libya (34 percent). By comparison, fewer than a third harbored a favorable view of the United States in all six countries, ranging from a high of 28 percent in Morocco to a low of 14 percent in Libya. Yet, despite China's growing economic ties throughout MENA states, relatively few Arabs concluded that the PRC posed an economic threat (26 percent of Lebanese and 21 percent of Tunisians believed that it was), while just 13 percent of Algerians reached the same conclusion.

Given that this survey was conducted at the height of the Trump Administration, the results probably reflected Washington's foreign policy preferences at the time—moving the Embassy from Tel Aviv to Jerusalem, the Abraham Accords, and other such initiatives—even if the United Arab Emirates, Bahrain, Morocco, and Sudan crossed the psychological hurdle to

252) Fulton, *op. cit.,* p. 15.

come to terms with Israel.[253] What this survey highlighted was that indigenous perceptions were changing and that both Washington and Beijing were keenly invested in advancing long-term interests throughout the Middle East.

Moreover, and because nearly half of China's oil imports originate in the MENA region, conservative Arab Gulf monarchies—along with other Arab as well as non-Arab Middle Eastern states—must factor in the Middle Kingdom's various postures. For the Gulf states, this predicament cannot be overlooked, but requires a far better reading of what makes China tick. The most powerful Gulf Cooperation Council (GCC) members—namely Saudi Arabia and the United Arab Emirates—are increasingly frustrated with American policies in the Middle East and continue to see the United States as a far less reliable regional actor in the twenty-first century, especially over the latter's policies towards Iran.

To be sure, the coronavirus fallouts accelerated the debate within GCC societies about potential strategic hedging policies, though the consequences of these shifts were ambiguous. Nevertheless, and because Saudi Arabia and Egypt, to focus just on these two Arab countries, have privileged ties with Washington, leaders in both countries know that hedging their ties in their relations with China can have serious after-effects. Several GCC states, particularly Saudi Arabia and the United Arab Emirates, perceive some American global policies, including its competition with China over global hegemony, as sources of grave concern to their welfare.

Beyond the opportunities that Beijing's rise and its growing economic trade ties with the region could present, forcing Washington's hand to alter its commitment to their security can be very risky. How they maneuver

253) Michael Robbins, "U.S. & China's Competition Extends to MENA," *Arab Barometer,* 12 January 2021, at https://www.arabbarometer.org/2021/01/u-s-chinas-competition-extends-to-mena/.

such troubled waters was extremely difficult to anticipate. For in the end, Saudi Arabia, Egypt, and scores of Arab States know that the United States remains the most important economy in the world and, naturally, still the key country that ensures global security. Of course, American confusion enhances isolationist tendencies in the United States, which resulted in perceived withdrawals from certain parts of the world, though Washington was neither unpredictable nor unreliable. Naturally, any American pull back from any theater might create opportunities for China, though few can bet on such developments.

Middle Eastern perspectives, prospects, and the strategies over 5G

5G, which will have more than 1.7 billion subscribers worldwide by 2025 according to the Global System for Mobile (GSM) communications (originally known as the Groupe Spécial Mobile),[254] is already available in Saudi Arabia and Egypt. Riyadh has concluded that Greater bandwidth will allow higher download speeds, eventually up to 10 gigabits per second for laptops and desktop computers, which will drastically improve all internet services but especially the up-and-coming Internet of Things (IoT) that will add competitiveness and enhance capabilities. Both Saudi Arabia and Egypt are keenly interested in acquiring the necessary infrastructures for IoT so that machine-to-machine features benefit from new technologies and, hence, facilitate global commerce.

According to a reliable source, 5G "enables multiple use cases that were previously impossible within the mobile environment, ... due to its combination of extremely low latency, ability to connect a large number of

254) "Positive 5G Outlook Post COVID-19: What Does It Mean for Avid Gamers?," Forest Interactive, 29 June 2020, at https://www.forest-interactive.com/newsroom/positive-5g-outlook-post-covid-19-what-does-it-mean-for-avid-gamers/.

devices and greater throughput, as well as the fact it can operate on a higher number of spectrum bands."[255] Experts recognize, nevertheless, that fears regarding the potential espionage by Chinese equipment vendors are all too real, which have compelled several countries (including the United States, Australia, and the United Kingdom) to restrict or deny the use of Chinese equipment in their respective 5G networks.

Of course, Chinese vendors and Beijing have repeatedly denied claims of espionage, though few believed them. To be sure, these technologies are still experimental, though 5G is being rolled out in several countries that believe they "must prepare now to realize the future advantages" it could bring. For example, 5G is touted to "enable tangible improvements in competitiveness for multiple industry verticals in the Kingdom of Saudi Arabia [KSA], both by underpinning new use cases and by enhancing the customer experience for existing ones. Responding to this, mobile network operators (MNOs) in KSA have begun early 5G investments, although delivering a country-wide commercial rollout" was easier said than done.[256] Among various hurdles are nationwide rollout infrastructures, "lowering deployment costs, successfully managing cybersecurity threats, building a skilled workforce and developing products that leverage 5G's unique capabilities."[257] How will Riyadh address these challenges are still unclear although authorities perceive the need to boost collaboration between private sector players with the state, which might well deliver tangible dividends. During the fourth quarter of 2020, 5G services in Saudi Arabia increased and now reach across 51 cities and provinces in various regions of the Kingdom. Importantly, a Communications and Information

255) Arthur Little, *Beyond the Buzz: Making 5G a Success in Saudi Arabia,* February 2021, p. 3, at https://www.adlittle.com/en/insights/report/beyond-buzz-making-5g-success-saudi-arabia.

256) Ibid.

257) Ibid.

Technology Commission (CITC) report noted that the average download speed was 315.55 mbps [mega-bytes per-second], compared with less than 150 mbps for the existing 4G system.[258] Remarkably, the results of the Comprehensive Strategic Partnership, which was signed with China in 2016, proved to be a wise step in light of various concrete results that sharply improved communications in Saudi Arabia. In fact, the Kingdom was ranked fifth in the use of "digital government" according to a study by Accenture, directly tied to these first steps. Moreover, and because Riyadh focused on its digital strategy, which was embedded in its epochal Vision 2030 agenda, few were surprised by this high-performance. Accenture surveyed 5,000 people across several countries in its study and concluded that respondents approved additional online services, even to use social media to engage with governments that, without a doubt, promised to raise the proverbial ante.[259]

Likewise, and as stated above, Egypt entered into various accords with China to deploy 5G wireless technology too, although this drew the ire of American officials. As part of the conflict between Washington and Beijing over the phasing in of 5G networks, Beijing's Ambassador to Cairo, Liao Liqiang, launched an attack on Washington on 25 October 2020, as he accused it of "establishing spying platforms and suppressing the Chinese partners wishing to introduce the 5G technology."[260] Earlier, Keith Krach, the US Undersecretary of State for Economic Growth, Energy and the Environment, had spoken at the US Embassy in Cairo, when he warned against using Chinese companies to launch 5G networks: "They [Chinese

258) "Saudi Arabia Extends 5G Deployment to 51 Cities and Provinces," *Arab News,* 10 February 2021, at https://www.arabnews.com/node/1807116/business-economy.

259) "Saudi Arabia ranks 5th in use of 'digital government'," Saudi Press Agency, 18 May 2021, at https://www.arabnews.com/node/1860356/saudi-arabia.

260) "US Warns Egypt to Avoid Chinese Companies on 5G Connections," *The Monitor,* 3 November 2020, at https://www.al-monitor.com/originals/2020/11/egypt-china-us-war-5g-networks-boycott.html.

companies] offer cheap to negligible prices, but in the long run, the cost will be exorbitant because it is a matter of data protection," Krach said on 23 October 2020. He lambasted Egyptian companies that worked with their Chinese counterparts, saying the latter were nothing more than tools used by the Chinese government to steal and employ customer information for the benefit of Chinese security services. Instead, Egyptians were invited to join a "clean network," presumably "a coalition of countries committed to securing their information from 'malign actors' such as the Chinese Communist Party." Liqiang was livid and retorted: "What the US side is calling for under the name of a 'clean network' can safely be called 'a dirty network,' 'an eavesdropping network,' 'a monopoly network' and 'an ideological network'." Adding insult to injury, the Chinese Ambassador affirmed that Washington was playing dirty. "In order to prevent Chinese companies from achieving a leading feature in the field of 5G," he hammered, "US politicians have resorted to every means possible to suppress such companies," before concluding that "Chinese-Egyptian cooperation is a matter restricted to China, and Egypt does not require any US interference." The ambassador underscored how privileged those contacts were, reminding his interlocutors that China was a leading donor to Egypt, to the tune of 100 million Egyptian pounds (US $6.3 million) and stressed that the Chinese government intended to provide another batch of aid to help women and children in Egypt fight the coronavirus. According to the Chinese ambassador, Beijing was also an important investor in Egypt, ostensibly pouring in US $71.68 million in 2019 alone in foreign direct investments (FDI). Notwithstanding these figures, the Chinese ambassador failed to mention that American aid to Egypt was more than $2.1 billion annually, divided into $815 million in economic aid and $1.3 billion in military aid, something that Cairo knew full well. Moreover, American FDI in Egypt stood at $11 billion in 2019, according to data published by the

Office of the United States Trade Representative.[261] In the event, Cairo could not risk its privileged relations with Washington, especially if one considered potential support for Egypt to join a "clean network." Of course, the American-Egyptian relationship was very strong at the political level as well, something that China was still not able to compete with despite gargantuan efforts.

Over the long-term, however, and because China and Egypt signed a Comprehensive Strategic Partnership in 2014 that build on an earlier (1999) accord, Cairo perceived China as a useful alternative to most Western powers and, while it has started purchasing some valuable military-equipment from Beijing, Egypt remained firmly ensconced in the Western camp.

As part of its BRI initiatives, China wished to intensify its trade privileges through the Suez Canal, believing that a sea BRI route would not only run through Egypt but also other Mediterranean countries like Italy and Greece. What Beijing failed to note was that such a scheme was opposed by leading European Union countries, most of which perceived the BRI as a genuine threat to European economies. Cairo's ties with France, Italy, Germany, and others were far too valuable to jeopardize even if China concluded that Egypt was a convenient partner, assuming that few Europeans would rush in to assist the Arab republic to face its difficult socio-economic conditions. In other words, it was China that believed Egypt would be "forced to develop trade and economic relations with the PRC, and thereby voluntarily surrender its market to Chinese entrepreneurs," even if this was a stretch of the imagination.[262] Simply stated, Western cooperation with

261) "U.S.-Egypt Trade Facts," Washington, D.C.: Office of the United States Trade Representative, at https://ustr.gov/countries-regions/europe-middle-east/middle-east/north-africa/egypt.

262) Ivan Bocharov, "Egypt-China Relations at the Present Stage," Russian International Affairs Council, 3 March 2020, at https://russiancouncil.ru/en/analytics-and-comments/columns/middle-east-policy

Egypt was too advanced to forego, though much more was needed to address intrinsic socio-economic challenges.

The battle over technology, which the 5G war with Huawei illustrates well, has become profoundly political since Washington "argues that Huawei's technology provides a back door for Chinese government surveillance and possible manipulation and that the company is covertly connected to the government and the Communist Party." It was for this principal reason that the United States banned Huawei to work with American telecommunications networks and is "trying to persuade other countries to do the same." Indeed, and according to a leading analyst, Washington's behavior was "reminiscent of the British and German battleships before World War I, [since] fifth-generation cellular—5G—along with Huawei has become in this era the embodiment of the new rivalry," which everyone must factor in in their national security calculations.[263]

Conclusion

In 2019, China responded to Trump Administration claims that it "masterminded the wholesale theft of American technology," with a White Paper, China's National Defense in the New Era,[264] in which it perceived America's "growing hegemonism, power politics, [and] unilateralism" as a threat because, it affirmed, Washington pursued "absolute military superiority" and has "undermined global strategic security." It added that the Asia-Pacific became unstable because "countries from outside the region" (clearly meaning

/egypt-china-relations-at-the-present-stage/.

263) Daniel Yergin, *The New Map: Energy, Climate, and the Clash of Nations, New York:* Penguin Press, 2020, p. 175.

264) "Full Text: China's National Defense in the New Era," Xinhua, 24 July 2019, at http://english.www.gov.cn/archive/whitepaper/201907/24/content_WS5d3941ddc6d08408f502283d.html.

the United States), "illegally enter China's territorial waters and the waters and airspace near China's islands and reefs, undermining China's national security."[265]

The United States was still the sole global power in 2021 with limited chances for immediate structural changes in the global order, not only because of Washington's military superiority but because it, more than any other country, created extensive alliances and partnerships throughout the world. With respect to both Saudi Arabia and Egypt, extensive American military deployments, coupled with significant political, diplomatic, and cultural clout, have served Riyadh and Cairo quite well. Notwithstanding periodic skirmishes, Saudi Arabia and Egypt valued their ties with the United States. Of course, this does not mean that China is an intractable power given that it has become a massive economic powerhouse in its own right. Furthermore, both Saudi Arabia and Egypt (and others), appreciate Beijing's ambitious plans to dominate the international scene via its economic superiority though that is not enough. For now, the United States remains the ideal strategic partner and provides an indispensable security umbrella, which is well appreciated by all concerned.

265) Yergin, *op. cit.,* p. 173.

13. Africa's Perceptions, Prospects, and Strategies towards the US-China Tech Competition

Rahmane Idrissa
Senior Researcher, African Studies Centre
Leiden University

Introduction

The Western ideals of democracy and human rights are popular in Africa. Though not necessarily loved by many governments, they are popular enough that they have become a norm to which even rulers who trample them must pay lip service. But there is an idea that is even more popular in a continent that has suffered subservience for centuries, and that is sovereignty. In the contest between the US and China for the shaping of what Africa's tech environment should look like, the US and its Western allies have a few handicaps, among which Africa's aspiration to sovereignty is the most significant. Sovereignty does not mean, for Africa, the same thing as for the US or China. It is not about being the center and focus of the world: it is about survival – in the guise of economic development and transformation. In this struggle for development, it is not the wish of African countries to have to choose between the US/West and China. Western aid, both multilateral and bilateral, is crucial to development in many African countries. But the investment model of Chinese aid is friendlier to development and sovereignty in Africa in a long-term, structural sense, despite the risks, real or imagined, associated with growing Chinese influence. The Information and Communication Technologies (ICT) sector is a good illustration for this argument.

Africa's infrastructure problem

The vital challenge of Africa is its marginalization in the global economy. Historically, Africa has been central for the building of the Western-run economic world system, via its labor and natural resources, but it did not develop into a place attractive for Western capital, especially investment in production. Economists teach that there are three factors of production: land, labor, and capital. Infrastructure must surely be counted a fourth, since it is an indispensable input of growth. And among the parameters that make Africa less attractive than most other world regions, this is very clearly the most important. The continent has no shortage of "land," i.e., natural resources. It has a surfeit of unskilled labor, while skilled labor can be trained and/or imported (rich Arabian Gulf states import most of their skilled labor). And capital follows markets in which production and trade combine into cycles that reward investors with profit. But neither production nor trade can grow in any sustainable, let alone profitable way with unreliable electricity, poor or no roads and rail, and dilapidated wires and mail. Modern infrastructure was built in Africa in the early 20th century to serve colonial enterprise, which orientated it towards extraction, with roads and rail connecting sources of colonial products to ports. After the retreat of colonial empires, this infrastructure mostly decayed, except where enclave economies survived or were installed by international capital (mostly Western).

This history has created a context where use of infrastructure incurs higher cost than elsewhere while taking more time to yield lower returns. According to the African Development Bank (AfDB), Africa loses at least 2 percent of annual growth to poor infrastructure,[266] a huge figure given the

266) African Development Bank Group. "Tracking Africa's Progress in Figures." Report, May 2014. pg48

rate of long-term economic growth it will take to get the continent in a cycle of development (7 percent in the tallies of the UN's Sustainable Development Goals, a rate not reached across the continent[267]). Currently, the African vision for ending the region's marginalization, as propounded at the African Union (AU), is to stimulate rapid growth in intra-African trade. Africa is the world region lagging the most in regional trade, a key launchpad of economic development. In 2018, the AU brokered an agreement for an African Continental Free Trade Area (AfCFTA) that enlisted within months 54 of the 55 member states of the regional organization. The ambitious goal was to boost intra-African trade by 52% in 2022 by removing tariffs on 90% of goods tradable among the countries. But even before the COVID-19 pandemic scrambled forecast on international exchanges, political will was hamstrung by the vast physical infrastructure needs on the continent; and even after the AfCFTA has harmonized legal and regulatory practices between countries, businesses and clients lack credible solutions for payment and communication across borders. Without the logistics that rely on sound infrastructure, free trade is a castle built in the air.

In sum, Africa has a strategic and urgent need for infrastructure development, which is a notoriously capital-intensive undertaking. In 2012 for example, the World Bank estimated the need for the building and maintenance of just physical infrastructure on the continent at $ 93 bn per year, more than double the $ 45 bn per year then available. And in modern economies, most rewarding trade solutions require wired infrastructure, which has very limited coverage in most African countries.

Yet one can be upbeat even about such a dismal situation and stress, as

267) Begashaw, Belay. "African and the Sustainable Development Goals: a Long Way to Go." Brookings, July 2019.

does the AfDB, that Africa's needs are "a unique opportunity to develop … infrastructure in a sustainable manner" by "leapfrogging" into "the best innovations from around the world."[268] In this view, unencumbered by the deadweight of legacy infrastructure – which most African countries lack in any significant amounts – states in Africa can look forward to increasing productivity in novel ways by embracing the future: Internet technologies, broadband connectivity, 5G. But that, too, requires development investment.

And that's where the US-China geopolitical tussle on ICT development becomes important on the African stage.

Western indifference, Chinese solutions

There are two big differences in the relations of China and the US with Africa. First, China has a developmental state, the US does not; and second, China has an African policy, the US does not. A developmental state – such as the ones all African countries had in the 1960s – actively coordinates public economic policy and private economic activity according to a governmental plan and vision. In China, the plan includes a global expansion of trade that aims at guaranteeing long-term access to raw materials and markets, seen as indispensable for China's own continuing development. It also includes, as a means to an end, the construction or acquisition, and at any rate the development of the tools that would facilitate such access: ports, roads, rail, ICTs. This instrumental objective is achieved via "lean and mean" private enterprise consistently supported by public policy, including in terms of finance. Western states, least of all the US, do not operate in this way (although they did in an earlier phase of their economic development).

268) African Development Bank Group. "Tracking Africa's Progress in Figures." Report, May 2014. pg48

In this context, Africa became a favored terrain for the deployment of China's plans largely because the West, in the Afropessimistic mood that dates back to the 1980s, had lost interest in what *The Economist* magazine, in an (in)famous headline of May 2000, called "The Hopeless Continent." Six years after that publication, France's president Nicolas Sarkozy said during a visit to Mali that "economically, France does not need Africa." If the leader of the Western country most entangled with Africa could make such a claim, one can only imagine what others might be thinking. At any rate this was taking stock of the fact that Africa had been virtually excluded from international commerce. In 2003, the World Trade Organization (WTO) recorded that Africa's share of world exports had fallen from 6% in 1980 to 2% in 2002, and its share of world imports from 4.6% in 1980 to 2.1% in 2002. With its vanishing export earnings and high political risk – due to instability – the continent was too much of a tough terrain for a Western capital used to snug and secure business environments in many other parts of the world. On the other hand, just a year after the dispiriting WTO report, Chen Jian, then China's deputy Minister of Commerce, quietly announced that "China will further expand telecom cooperation with African nations in line with mutual benefits and common development. The Chinese government will support its telecom enterprises to run more telecom services in Africa."[269]

And so, it did. Between 2005 – when the plan announced by Chen Jian went into action – and 2020, Chinese tech investments and contracts in sub-Saharan Africa alone totaled $7.19 bn, according to China Global Investment Tracker. Unruffled by Africa's "tough terrain," ZTE built 50% of Africa's 3G networks and Huawei built 70% of its 4G networks, in a context where, by 2019, such broadband connections have outstripped 2G

269) IDE-JETRO. "China in Africa." 2009. Chapter 9: "China's Telecommunication's Footprint in Africa."

connectivity.[270] In term of handsets, which is the prime source of African access to broadband connectivity, the International Data Corporation (IDC) records that Chinese brands, with their cheap and slick products, make up over 64% of Africa's smartphone market (Huawei makes up about 9% of the market).[271] China is also taking the lead in the supply of other critical ICT technology to Africa, including data centers and trunk lines. Thus, in just fifteen years, China has become not just the dominant, but more significantly, the indispensable ICT partner of Africa. In the present international climate, that is a problem.

Elephants' fight

The US' quarrel with China is about world supremacy and political values. The US intends to stay "top nation," to use the phrase from the satirical book *1066 and all that.* And China appears increasingly an existential threat to the West's liberal-democratic ideals, of which the US is the self-proclaimed guardian. The threat is all the more serious because of China's spectacular economic prowess in a system which was presumably tailored to fit only liberal economic policy. In recent years, the flashing point of that new "yellow peril" is 5G technology and the way it is poised to shape the information society crucial to the politics and prosperity of advanced liberal democracies. The US has designed a policy response which, ultimately, risks rending the Internet itself, splitting it into a US-dominated Internet, and a Chinese-dominated one. Voices from the US – such as Google's former CEO Eric Schmidt and State Department advisor

270) Hruby, Aubrey. "The Digital Infrastructure Imperative in African Markets." Atlantic Council, April 2021.

271) Manek, Sheila. "Africa's Smartphone Market Grows in Q3 2020, but Feature Phone Shipments Decline." IDC, December 2020.

Jared Cohen – charge that this may result from China heading a combine of sophisticated autocracies which liberal democracies simply must oppose. In this developing ICT war, the US is already pressuring states and world regions to take its side. Africa, presented in this narrative as prey to a Chinese "charm offensive," is no exception.

At the advancing edge of ICT innovations, China, a latecomer, lags behind in terms of operating systems and control over the kind of software, content and communication tools that are accessible on smartphones outside its domestic market. But it has taken the lead regarding 5G connectivity. The US wants to break that lead, citing the danger that it would be used by the illiberal world power to shape the information society of the future and leverage control to spy on and disrupt the governing centers of democracies. In recent years, China's heightened anti-democratic or anti-liberal domestic policies – including increased censorship and intensive legal surveillance and monitoring of the population via ICTs – serve to justify such fears. As it actively organizes its own 5G development, the US has more or less successfully hampered the deployment of China's 5G solutions in the West, even though they are cheaper and more efficient. It has also exerted pressure in Africa, not always unsuccessfully. At this stage, 5G deployment is still incipient worldwide. There are only 3% of mobile phone connections on 5G in the world, and while Asia, which is in the lead, has 5% of mobile connections on that service, the lead African country, South Africa, has less than 1% of mobile connections on it. Such figures only give to the supply of 5G service the looks of a race, since progress will come swiftly in rich markets. It is expected to be slower in Africa. But even there, the GSMA, the mobile telecommunications industry trade body, estimates that if 5G connections will make up only 3% of total mobile connections in Africa by 2025, there will be commercial 5G services in at least seven national markets in the

region at that date.[272]

Given Africa's urgent need for gains in infrastructure, the US angst about Chinese lead in a "race" over 5G services often appears as political whim from the African vantage point. Regarding Chinese spying, African leaders were unfazed when French newspaper *Le Monde* broke with the story that China had bugged the AU headquarters in Addis Ababa in January 2018 (they already knew). Eric Olander, managing editor of the China Africa Project, points out that, as the revelations of Edward Snowden on the US National Security Agency detailed, collecting massive amounts of information via ICTs is not an exceptionally Chinese behavior, it is common "in international statecraft." On another score, the dual thirst of African countries for sovereignty and for ICT expansion can lead to states replicating Chinese political "characteristics" where sovereignty is equated with authoritarian governance via ICTs. In June 2021, Senegal, inaugurated a data storage center that will store all state data and repatriate all national data, with finance from a Chinese loan and equipment and technical support from Huawei.[273] If, as Senegal's President Macky Sall said, this would protect the country's sovereignty in terms of data storage, it will also provide the government with full access to the information on the servers, and the power to act on that information. In places where authoritarian governance is often a temptation, this is an apparent breach of the "free and open Internet" principles that the US promotes. And since it was accomplished with Chinese help, it seems to confirm the worries about China pushing the spread of technologically sophisticated autocracy. But as Iginio Gagliardone points out in China, *Africa and the Future of the*

272) GSMA. "G5 in Sub-Saharan Africa: Laying the Foundations." 2019.

273) Swinhoe, Dan. "Senegal to migrate all government data and applications to new government data center." DCD, June 2021.

Internet,[274] authoritarians in Africa have much more often exploited US-backed anti-terrorism agenda and securitization of development to legitimize repression of online activity than they have relied on any Chinese approach. And it is "Pegasus," a software provided by a liberal democracy – Israel – that was used, in illiberal states in Africa and elsewhere, to pry on political opponents and civil society activists, not a Chinese instrument.

In fact, in Gagliardone's analysis, given China's need for increased access to resources and markets, and its latecomer status in Africa, it has been keener on market penetration, including by adjusting to the liberal political culture encountered in some of the countries – Ghana or Kenya, e.g. – than on exporting any political model, as Western countries usually seek to do.[275] This points not only to the pragmatism of Chinese engagement with Africa on the tech terrain, but also to the fact that it is shaped by an interaction of broad interests, determined by Africa's quest for sovereignty and economic development on the one hand, and China's vision of global relevance or dominance on the other hand. China's policy is well accepted in Africa because China, despite its greater overall agency, appears to pursue its interests while recognizing those of Africa, in contrast to the West; but the West also has the benefit that its liberal-democratic discourse has strong resonance in Africa, especially in the civil society. In the end, what makes the difference is that China is willing to invest in Africa's needs, and the West does not know if it wants to. And one is reminded of the African proverb that says, "when the elephants fight, it is the grass that suffers." In the ICT clash between the American and Chinese elephants, Africa is looking for ways to get its ride while avoiding being the grass. Any strategic thinking

274) Gagliardone, Iginio. *China, Africa and the Future of the Internet.* London: Zedbooks, 2019.
275) Ibid.

in Africa would depend on changing options in the fast-evolving tech industry, but the rule of thumb is to help companies to reduce or avoid single supplier risk, even among Chinese suppliers. This can be done passively, as when African governments did not ban operators from using Huawei equipment, or actively, when governments look to support domestic operators on their choice of vendor despite outside pressures. Thus, in March 2021, the Kenyan government supported Safaricom, East Africa's biggest telecoms operator in its multivendor strategy – trialing both Huawei and Finnish rival Nokia – *and* in navigating US pushbacks.[276]

276) Mureithi, Carlos. "Kenya becomes the second African country to roll out 5G." Quartz Africa, April 2021.

PART Ⅲ

Comparative Analysis and Suggestions

14. Conclusion: Global Views on the Future of US-China Tech Competition and the Global Cooperation

Jungmi Cha
Director, Center for International Strategies
National Assembly Futures Institute

"The G2 and the Rest": US-China Tech Competition and the reactions of the other parts of the world

The US and China are expanding their national-level technological innovation and technology diplomacy strategies, recognizing that superiority in emerging technologies is a major factor in the competition for influence and hegemony in the future. The emerging technologies in the digital era are now viewed as strategic assets and game-changers for global leaders and influence in the future. With this technological determinism, technological competition has become deeply related to the great powers' geopolitical competition, security matters, and even ideological conflict.

This study examined how countries around the world perceive the rapidly intensifying competition for technological hegemony between the United States and China. The strategic competition between the US and China is now felt on every continent and in every country. Most countries are experiencing diplomatic and economic challenges stemming from intensifying US-China technology competition. Each state and continent have been concerned about the evolving situation of the US-China tech competition and trying to find the best policy direction to safeguard their national security and interests. Intensifying US-Chinese tensions have given a

diplomatic dilemma to a lot of countries who have economic and security dependence on both the US and China. Most countries are concerned that they will be pressured to pick a side and that will be very costly economically or technologically. With these concerns in mind, most countries are pursuing technological autarky or pragmatic approaches to limit potential technological and security vulnerabilities. The US' decoupling policy to exclude China from its high tech supply chain and China's response strategy – focusing on strengthening indigenous technology and expanding their digital network with developing countries have great impacts on other parts of the world. In the era of emerging technology development and changing international order due to the rise of China, most countries are pursuing a national strategy focusing on strengthening their competitiveness and autonomy.

The perceptions and strategies of different countries around the world indeed show that most countries are concerned with the impacts the US-China tech competition can generate and are seeking the appropriate approaches to protect their national interest while minimizing the negative impacts. Based on the comparative analysis of 12 countries for this study, we can argue that most states are perceiving the importance of the US-China tech competition issues and their growing severity. They are pursuing the strategies to maximize their economic and strategic interests on one hand and minimize their burdens or challenges stemming from the US-China tech competition on the other hand.

Comparative analysis of global perception and strategies

With the help of distinguished scholars from 12 different countries, this study analyzed the global perceptions and strategies towards the US-China tech competition. Based on this study, the global perceptions and strategies seem to fit into three categories. The first category is countries pursuing technological sovereignty while aligning with one superpower. These countries have a relatively competitive technological capacity. Germany, Japan, Australia, and Russia can be categorized into this technological sovereignty group. As members of the Quad or the US alliance, Japan, Germany, and Australia are strengthening their solidarity with the US in terms of a wide range of digital infrastructures and norms. Thus, they perceive that China has violated the open and rule-based market competition system with government intervention and protectionism. These countries are concerned that one-sided dependence on China's economy can generate threats to their security and economy. These countries are focusing on securing independent technological capabilities and technological sovereignty through technological innovation in terms of strategic autonomy while reinforcing cooperation with the US and emphasizing norms and values. Whereas these countries maintain cooperation with the US, based on the principles of democracy, human rights, and a norm-based order, they pursue securing their technological sovereignty with diversified partners. Russia can also be categorized into the technological sovereignty group, even though it has been strengthening technological cooperation with China. The second category is countries pursuing a balanced and open stance to both superpowers. Singapore is the representative country for this category. Singapore has struck a balance between the US and China by welcoming technology companies from both sides to invest in Singapore. Although it has chosen Nokia and Ericsson to build its main 5G networks, Huawei and ZTE continue to be involved in its

5G ecosystem. Singapore pursues the role of the honest broker and maintains neutrality in the face of the great power competition. The third category is countries pursuing digitalization with bandwagoning with whoever offers more aid for digital development. They have a pragmatic approach to maximize their economic interest while maintaining their political autonomy. Latin America, which is vulnerable to external shocks, seeks to maintain strong ties with both Washington and Beijing even while the economic influence of China is growing. Visegrád countries are open to cooperation with China to some extent, because of their need for digitalization and technological upgrading. However, there is some fragmentation of policies towards China between the Visegrád countries based on their geopolitical concerns and economic situations. Latin America also has profound disagreement when it comes to the choice between the US and China even if they adopt similar rhetoric for expressing discomfort at being pressured by the two superpowers. Central Asia is also becoming an important arena for the US and China competition. Based on China's Digital Silk Road, Central Asia's technological dependence on China has been rapidly expanding. Big Chinese tech companies like Huawei, Tencent, and Hikvision have invested in Central Asia. China has expanded its technological influence in Africa which also has a strategic and urgent need for infrastructure development. Africa pursues sovereignty for survival and perceives China's aid as friendlier to the development and the sovereignty of African nations in the long term. These developing countries have very pragmatic and economic-oriented strategies. However, they are all concerned about the negative impacts of the strategic competition between the superpowers and pursue a balanced position to avoid the fallout from the superpowers' conflict.

Through the comparative analysis of perceptions, prospects, and strategies of some major countries and continents, two characteristics can be

distinguished.

First is the rise of technology alliances and the bifurcation of technological chains. Western and developed countries' attempts to reduce their economic dependence on China are likely to continue. The EU-US Trade and Technology Council (TTC), which was launched in June 2021 and held its first meeting on September 29 of that year, is the representative case for the Atlantic technology alliance. The second characteristic is the possibility of rapid expansion of China's digital engagement with the developing region.

The Future of US-China tech competition; the Need for Global Cooperation for a Better Future

The common keywords of the global strategies on the rise of technological hegemony competition between the superpowers are 'sovereignty, digital development, and diversification.' In addition to these strategic focuses, developed countries are emphasizing the importance of democratic values. Despite their different perceptions and strategies, most countries are worried about the rise of a decoupled technological and economic world. This is because the continuing technological competition between the two great powers can generate a divided ecosystem in the digital era and will deteriorate trade liberalization and global openness for innovation. The techno-geopolitics of two superpowers and competitive race towards technological self-reliance of the developed countries may lead to market bifurcation and supply chain decoupling.

However, most countries around the world are focusing on economic openness and political autonomy while they prospect the strategic competition between the US and China is likely to last for a long time. They pursue policies that maintain openness even with more security

screening of foreign technologies. They do not pursue economic decoupling even with more cooperation with the allies. Most countries are concerned about the coming tech-divide and the rise of technology nationalism will most likely accelerate and deepen the overall trend of decoupling and eventually the decline of the global economic growth. Growing economic decoupling may also deepen a political divide and heighten the possibility of conflict. The global prospects of the future of US-China tech competition are mostly related to their economic and strategic interests in the long term. However, they do think that the possibility of complete decoupling is very low because of global economic interdependence. Even if the global states do have different approaches based on their economic and diplomatic situations, they do have a common need for diversifying their supply chains and diplomatic cooperation.

South Korea's strategy and its role in global cooperation

In the age of technological hegemony competition between the US and China, the core strategy of most countries is 'innovation.' While enhancing technological innovation competitiveness, South Korea needs to focus on economic security and investment in emerging technologies. Emerging technologies such as artificial intelligence and biotechnology will be the defining space for great power competition. Therefore, South Korea has to build a mid-to-long-term innovation strategy to enhance its own technological competitiveness. First of all, South Korea can pursue the development of technological edge with the cooperation with the US as an ally. Secondly, South Korea also needs to focus on strengthening its economic security by diversifying its supply chain and focus on securing technological competitiveness with great investment in R&D. Thirdly, South

Korea needs to seek global leadership for assisting the digitalization of developing countries, and lead the global cooperation as a middle power with technological capacity.

As for the strategies towards the US-China tech competition, South Korea may have a relatively similar position with Germany and Singapore. The difference is that Germany is a member of the EU and Singapore is a member of ASEAN and thus, can take a joint response and multilateral approach at the regional level. In order to enhance the technological capacity and leadership, South Korea needs to pursue technological sovereignty and competitiveness by strengthening global cooperation. In order to secure global prosperity and peace in the digital era, South Korea needs to clear the strategic direction for 'Open Technology Leadership' and to strengthen the global cooperation and technology alliances with third parties such as Europe and ASEAN who are also endeavoring to have technology sovereignty. South Korea is the first non-EU state to join the EU's 'GAIA-X' projects. This representative event shows South Korea's open technological leadership focusing on networking with credible and norm-based digital partners. As a middle power with technological prowess in the era of technological hegemonic competition, South Korea can broaden the scope of cooperation and solidarity with various partners in the mid-to-long-term perspective. As a democratic middle power, South Korea needs to pay more attention to global governance and norms for a better future for all in the digital era. South Korea also needs to enhance global leadership in the digital era by cooperating with the developing countries in Latin America, Central Asia, the Middle East, and Africa. South Korea needs to play a constructive role in leading global cooperation in the digital era.

Starting the international dialogue for global cooperation towards an open and co-prosperous digital era

The recent trends of techno-nationalism and geo-politicization of technology pose significant risks and challenges, giving impediments to global open innovation which is based on a liberal and rule-based order. Balkanization of the digital industry and its securitization and geo-politicization may lead to economic, technology, and innovation losses.

Digitalization itself needs a very transparent, open, and cross-border innovation-focused trajectory. We need to keep discussing how to solve the problems we are facing in the era of great powers' tech competition. Multilateral and institutional approaches are needed to make breakthroughs for a cooperative and innovative future. This global collaborative research led by NAFI can be one of the foundations for promoting global dialogues and cooperations on the US-China tech competition issues. The focus of this research was to open a diverse discussion on what the global impacts of this tech war are and how to overcome the negative impacts from this great power tech war, in addition to how to cooperate for a better solution. We need more open discussions and multilateral approaches for a better future. We hope this report will be a meaningful start for facilitating global discussions and cooperation on the global challenges of the coming digital era.

Reference

Reference

1. Introduction

Artificial Intelligence Index Report 2021. 2021. Stanford, California.

Fukuyama, Francis. 1989. "The End of History?" The National Interest 16: 3-18.

Harding, Harry. 2015. "Has U.S. China Policy Failed." The Washington Quarterly 38(3): 95-112.

Henley, Jon. 2021. "Most Europeans Believe US in New Cold War with China and Russia - Poll." The Guardian. https://www.theguardian.com/world/2021/sep/22/most-europeans-believe-us-in-new-cold-war-with-china-and-russia-poll

National Security Strategy of the United States of America. 2017.

Stanley, Timothy, and Alexander Lee. 2014. "It's Still Not the End of History." The Atlantic. https://www.theatlantic.com/politics/archive/2014/09/its-still-not-the-end-of-history-francis-fukuyama/379394/

"Great Power Competition: The Emerging World Order." 2021. https://www.bloomberg.com/news/videos/2021-11-19/great-power-competition-the-emerging-world-order-video

2. American Perceptions, Prospects, and Strategies

Anonymous. 2021. "The Longer Telegram: Towards a New American China Strategy." The Atlantic Council. https://www.atlanticcouncil.org/content-series/atlantic-council-strategy-paper-series/the-longer-telegram/

Borak, Masha. 2021. "US-China Tech War: Basic Research in AI, Semiconductors and Biotech Gets Closer to US$110 Billion Boost in US." South China Morning Post. https://www.scmp.com/tech/tech-war/article/3133554/us-china-tech-war-basic-research-ai-semiconductors-and-biotech-gets?utm_source=pocket_mylist

Brenan, Megan. 2021. "Americans' Confidence in Major U.S. Institutions Dips." Gallup. https://news.gallup.com/poll/352316/americansconfidence-major-institutions-dips.aspx

Eversden, Andrew. 2021. "Defense Official: US Must Invest More in Innovation to Compete with China." C4ISRNet. https://www.c4isrnet.com/artificial-intelligence/2021/03/23/defense-official-us-must-invest-more-in-innovation-to-compete-with-china/

Gill, Bates, and Michael E. O'Hanlon. 1999. "China's Hollow Military." Brookings Institution. https://www.brookings.edu/articles/chinas-hollow-military/

Lee, Amanda. 2021. "C919: What Is China's Home-Grown Alternative to Airbus, Boeing Duopoly, and Why Is It Important? | South China Morning Post." South China Morning Post. https://www.scmp.com/economy/china-economy/article/3115793/c919-what-chinas-home-grown-alternative-airbus-boeing-duopoly

Liu, Mingfu. 2015. "The Chinese Dream to Overtake America." The Atlantic. https://www.theatlantic.com/international/archive/2015/06/china-dream-liu-mingfu-power/394748/

Mead, Walter Russell. 2021. “Aukus Is the Indo-Pacific Pact of the Future.” Wall Street Journal. https://www.wsj.com/articles/aukus-indo-pacific-pact-china-australia-11632775481

Pellicore, Blaine, and Nicholas Nelson. 2021. “America Needs New Mechanisms to Compete with China in Space.” Defense News. https://www.defensenews.com/opinion/commentary/2021/03/16/america-needs-new-mechanisms-to-compete-with-china-in-space/

Qu, Tracy. 2021. “China’s New Bid to Take on Elon Musk’s Starlink: A State-Owned Satellite Enterprise.” South China Morning Post. https://www.scmp.com/tech/policy/article/3132709/chinas-new-bid-take-elon-musks-starlink-state-owned-satellite?utm_source=pocket_mylist

“Aukus: UK, US and Australia Launch Pact to Counter China.” 2021. BBC News. https://www.bbc.com/news/world-58564837.

4. Japan’s Perceptions, Prospects, and Strategies

Andreoni, Antonio, and Fiona Tregenna. 2020. “Escaping the Middle-Income Technology Trap: A Comparative Analysis of Industrial Policies in China, Brazil and South Africa.” Structural Change and Economic Dynamics 54: 324-40.

Chan, Minnie. 2021. “China’s Military Takes Charge of War Powers with New Defence Law.” South China Morning Post. https://www.scmp.com/news/china/military/article/3115988/chinas-military-takes-charge-war-powers-new-defence-law

Glawe, Linda, and Helmut Wagner. 2017. The People’s Republic of China in the Middle-Income Trap? https://www.adb.org/sites/default/files/publication/322961/adbi-wp749.pdf

Huawei Cyber Security Evaluation Centre Oversight Board Annual Report

2019: A Report to the National Security Adviser of the United Kingdom. 2019. https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/790270/HCSEC_OversightBoardReport-2019.pdf

Lee, Nicol Turner. 2020. "Navigating the US-China 5G Competition." Brookings Institution. https://www.brookings.edu/research/navigatingthe-us-china-5g-competition/

Patterson, John. 1994. The Sanctions Dilemma. https://merip.org/1994/03/the-sanctions-dilemma/

Sayler, Kelley M. 2020. Emerging Military Technologies: Background and Issues for Congress. https://fas.org/sgp/crs/natsec/R46458.pdf

Tellis, Ashley J., Alison Szalwinski, and Michael Wills. 2019. U.S.-China Competition for Global Influence. Washington, D.C. https://carnegieendowment.org/files/SA_20_Tellis.pdf..

Wu, Xiangning. 2020. "Technology, Power, and Uncontrolled Great Power Strategic Competition between China and the United States." China International Strategy Review 2: 99–119. https://link.springer.com/article/10.1007/s42533-020-00040-0

"China Must Develop 'Killer Technologies' to Survive Foreign Blockades: Xi." 2020. Apple Daily. https://hk.appledaily.com/news/20201101/ZXKTHTLO4RAPPPFCBH3KN7UVFI/ "China's Huawei to Launch 5G at Africa Cup of.

5. Russia's Perceptions, Prospects, and Strategies

Atkinson, Robert D., and Stephen J. Ezell. 2012. Innovation Economics: The Race for Global Advantage. Yale University Press.

Barefoot, Kevin, Dave Curtis, William A. Jolliff, and Jessica R. Omohundro.

2018. Defining and Measuring the Digital Economy.

Benderly, Beryl Lieff. 2019. "U.S. Academics, Make Sure You Know the Rules about Foreign Funding and Affiliations." Science. https://www.science.org/content/article/us-academicsmake-sure-you-know-rules-about-foreignfunding-and-affiliations

Bendett, Samuel S., and Elsa B. Kania. 2019. Australian Strategic Policy Institute A New Sino-Russian High-Tech Partnership: Authoritarian Innovation in An Era of Great-Power Rivalry. Barton, ACT. https://www.aspi.org.au/report/new-sino-russian-high-tech-partnership.

Cafruny, Alan W. 2019. "Can the United States Contain China? Contradictions and Limits of U.S. Power in the Trump Era and Beyond." Russia in Global Affairs 17(1): 100–122.

Chang, Gordon G. 2020. The Great U.S.-China Tech War. Encounter Books.

Chen, Frank. 2021. "US Blocking More Chinese Students from Its Universities - Asia Times." Asia Times. https://asiatimes.com/2021/07/us-blocking-more-chinese-students-from-its-universities/

Danilin, Ivan V. 2020a. "Innovative Transformation of Superplatforms." International Trends 18(4).

_____. 2020b. "State and Challenges for the Development of Cooperation in Science and Technology between Russia and China." Modernization. Innovation. Research (MIR) 11(4).

_____. 2020c. "The U.S.-China Technology War: Risks and Opportunities for P.R.C. and Global Tech Sector." Comparative Politics Russia 11(4): 160–76. https://doi.org/10.24411/2221-3279-2020- 10056

Digital Economy Report 2019. 2019. New York. https://unctad.org/webflyer/digital-economy-report-2019.

Ding, Jeffrey, and Allan Dafoe. 2021. "The Logic of Strategic Assets: From Oil to AI." Security Studies 30(2): 182–212.

Dorfman, Zach. 2020. "Tech Giants Are Giving China a Vital Edge in Espionage." Foreign Policy. https://foreignpolicy.com/2020/12/23/china-tech-giants-process-stolen-data-spy-agencies/

Evans, Paul. 2020. "Techno-Nationalism in China-US Relations: Implications for Universities." East Asian Policy 12(02): 80-92.

Evenett, Simon J. 2019. "Protectionism, State Discrimination, and International Business since the Onset of the Global Financial Crisis." Journal of International Business Policy 2: 9-36.

Gewirtz, Julian Baird. 2019. "China's Long March to Technological Supremacy." Foreign Affairs. https://www.foreignaffairs.com/articles/china/2019-08-27/chinas-longmarch-technological-supremacy

Hill, Derek. 2020. Production and Trade of Knowledge- and Technology-Intensive Industries. Alexandria, VA. https://ncses.nsf.gov/pubs/nsb20205/global-trade-in-high-and-medium-high-r-d-intensive-products.

Hobbs, Carla. 2020. Europe's Digital Sovereignty: From Rulemaker to Superpower in the Age of US-China Rivalry – European Council on Foreign Relations. https://ecfr.eu/publication/europe_digital_sovereignty_rulemaker_superpower_age_us_china_rivalry/

Hufbauer, Gary Clyde, Jeffrey J. Schott, Kimberly Ann Elliott, and Barbara Oegg. 2008. Economic Sanctions Reconsidered. 3rd ed. Peterson Institute for International Economics.

Jones, Andrew. 2021. "China, Russia Enter MoU on International Lunar Research Station." SpaceNews. https://spacenews.com/china-russia-enter-mou-on-international-lunar-research-station/

Kaempfer, William H., and Anton D. Lowenberg. 2007. "The Political Economy of Economic Sanctions." In Handbook of Defense Economics, eds. Todd Sandler and Keith Hartley. Elsevier, 867-911.

Korolev, Alexander. 2020. "China-Russia Cooperation on Missile Attack Early Warning Systems." East Asia Forum. https://www.eastasiaforum.org/2020/11/20/china-russia-cooperation-on-missile-attack-early-warning-systems/

Lafferty, Brian. 2019. "Civil-Military Integration and PLA Reforms." In Chairman Xi Remakes the PLA, eds. Phillip C. Saunders et al. Washington, D.C.: National Defense University Press, 627-60. https://ndupress.ndu.edu/Portals/68/Documents/Books/Chairman-Xi/Chairman-Xi.pdf

Madiega, Tambiama. 2020. Digital Sovereignty for Europe. https://www.europarl.europa.eu/RegData/etudes/BRIE/2020/651992/EPRS_BRI(2020)651992_EN.pdf

Mascitelli, Bruno, and Mona Chung. 2019. "Hue and Cry over Huawei: Cold War Tensions, Security Threats or Anti-Competitive Behaviour?" Research in Globalization.

Mason, Jeff, Andrea Shalal, and Alexandra Alper. 2020. "Chinese Firms That Fail U.S. Accounting Standards to Be Delisted as of 2022: Mnuchin." Reuters. https://www.reuters.com/article/us-usa-trade-china-companies-idUSKCN2562QX.

Mastanduno, Michael. 1985. "Strategies of Economic Containment: U.S. Trade Relations with the Soviet Union." World Politics 37(4): 503-31.

Measuring the Digital Transformation: A Roadmap for the Future. 2019.

O'Donnell, Carl, Liana B. Baker, and Echo Wang. 2019. "Told U.S. Security at Risk, Chinese Firm Seeks to Sell Grindr Dating App." Reuters. https://www.reuters.com/article/us-grindr-m-a-exclusive-idUSKCN1R809L

Riecke, Torsten. 2020. Resilience and Decoupling in the Era of Great Power Competition. https://merics.org/sites/default/files/2020-08/Merics_Chin

aMonitor_PowerCompetition.pdf

Segal, Adam. 2019. "Seizing Core Technologies: China Responds to U.S. Technology Competition." China Leadership Monitor, The Washington International Trade Association (WITA). https://www.wita.org/nextgentrade/china-responds-u-s-tech-competition/

Silver, Andrew, Jeff Tollefson, and Elizabeth Gibney. 2019. "How US-China Political Tensions Are Affecting Science." Nature 568: 443–44.

Sushentsov, Andrei A., Andrey Bezrukov, Mikhail Mamonov, and Maxim Suchkov. 2021. Mezhdunarodnaja Konkurencija i Liderstvo v Cifrovoj Srede [International Competition and Leadership in a Digital Environment]. Moscow. https://ru.valdaiclub.com/files/36581/

The 2020 EU Industrial R&D Investment Scoreboard. 2020. Brussels.

Wang, Echo. 2021. "SEC Gives Chinese Companies New Requirements for U.S. IPO Disclosures | Reuters." Reuters. https://www.reuters.com/business/finance/exclusive-sec-gives-chinese-companies-new-requirements-us-ipo-disclosures-2021-08-23/

Wei, Lingling, and Bob Davis. 2018. "How China Systematically Pries Technology From U.S. Companies." The Wall Street Journal. https://www.wsj.com/articles/how-china-systematically-pries-technology-from-u-s-companies-1537972066

Zhao, Junfu. 2021. "The Political Economy of the U.S.-China Technology War." Monthly Review 73(3). https://monthlyreview.org/2021/07/01/the-political-economy-of-the-u-s -china-technology-war/

"«Bilajn» Menjaet Ericsson Na Huawei Radi 5G [Beeline Changes Ericsson to Huawei for 5G]." 2019. CNews. https://www.cnews.ru/news/top/2019-05-17_bilajn_menyaet_ericsson_na_huawei_radi_5g.

"Construction of the First Russian-Chinese Airliner CR929 Has Begun - ВПК.Name." 2021. VPK. https://vpk.name/en/538582_construction-of-the-

first-russian-chinese-airliner-cr929-has-begun.html

"How the US-China Trade War Has Starved Some Silicon Valley Start-Ups." 2020. https://www.cnbc.com/2020/01/31/chinese-venture-capitalists-draw-back-siliconvalley-investments.html

"Huawei Activities in Russia." TAdviser. https://www.tadviser.ru/index.php/Компания:Huawei_Россия_(Хуавэй)

"ICT Goods Exports (% of Total Goods Exports) ." 2021. The World Bank. https://data.worldbank.org/indicator/TX.VAL.ICTG.ZS.UN

"Lavrov Nazval Situaciju s Huawei Primerom Jeksterritorial'nogo Primenenija Zakonov SShA [Lavrov Called the Situation with Huawei an Example of the Extraterritorial Application of US Laws]." 2018. Kommersant. https://www.kommersant.ru/doc/3825526

"MTS i Ericsson Razognali Set' 5G v Innopolise Do 3,5 Gbit/c [MTS and Ericsson Overclock the 5G Network in Innopolis to 3.5 Gbps]." 2021. CNews. https://www.cnews.ru/news/line/2021-06-09_mts_i_ericsson_razognali_set

"MTS i Huawei Dogovorilis' o Razvitii 5G v Rossii [MTS and Huawei agreedto Develop 5G in Russia]." 2019. RIA Novosti. https://ria.ru/20190605/1555295921.html.

"Na Vysokih Skorostjah. Kak Razvivaetsja 5G-Sotrudnichestvo Rossii i Kitaja [At High Speeds. How the 5G Cooperation between Russia and China Is Developing]." 2021. RIA Novosti. https://ria.ru/20210712/sotrudnichestvo-1740943472.html

"Pravitel'stvo RF i Rosteh Dali Start Razrabotke Kompleksnogo Reshenija Dlja Setej 5G [The Russian Government and Rostec Launched the Development of a Comprehensive Solution for 5G Networks]." 2021. Rostec. https://rostec.ru/news/pravitelstvo-rf

"Prjamaja Linija s Vladimirom Putinym [Direct Line with Vladimir Putin]."

2019. President of Russia. http://kremlin.ru/events/president/news/60795

"Putin: Lider v Sfere Iskusstvennogo Intellekta Stanet Vlastelinom Mira [Putin: The Leader in the Field of Artificial Intelligence Will Become the Master of the World]." 2017. RIA Novosti. https://ria.ru/20170901/1501566046.html

"Putin Prizval Garantirovat' Tehnologicheskij Suverenitet Rossii [Putin Urged to Guarantee Russia's Technological Sovereignty]." 2019. RIA Novosti. https://ria.ru/20190710/1556384522.html

"Ready for 5G: Kak Ericsson Pomogayet Stroit' Osnovu Dlya Setey Svyazi Pyatogo Pokoleniya v RF [Ready for 5G: How Ericsson Helps Build the Foundation for Fifth Generation Networks in Russia]." 2020. TASS. https://tass.ru/obschestvo/10129665

"Start of New Unit Construction at China's Tianwan and Xudapu Nuclear Power Plants." 2021. Rosatom. https://www.rosatom.ru/en/

"U.S. Expands Blacklist to Include China's Top AI Startups Ahead of Trade Talks." 2019. Reuters. https://www.reuters.com/article/ususa

"US Adds 33 Chinese Companies, Institutions to Economic Blacklist." 2020. Voice of America (VOA). https://www.voanews.com/usa/us-adds-33-chinesecompanies-institutions-economic-blacklist.

6. Germany's Perceptions, Prospects, and Strategies

Business Confidence Survey. 2021. Beijing. https://www.europeanchamber.com.cn/en/publications-business-confid ence-survey

Diamond, Jared. 2003. Guns, Germs, and Steel. Spark.

Drezner, Daniel W., Henry Farrell, and Abraham L. Newman. 2021. "The Uses and Abuses of Weaponized Interdependence." Brookings Institution Press. https://www.brookings.edu/book/the-uses-and-abuses-of-weapon

ized-interdependence/

EU-China Comprehensive Agreement on Investment. 2021. Brussels. https://trade.ec.europa.eu/doclib/press/index.cfm?id =2115

EU-China Strategic Outlook. 2019. Brussels. https://ec.europa.eu/info/sites /default/files/communication-eu-china-astrategic- outlook.pdf

EU – US: A New Transatlantic Agenda for Global Change. 2020. Brussels. https://ec.europa.eu/commission/pressco rner/detail/en/IP_20_2279

Farrell, Henry, and Abraham Newman. 2019. "How Global Economic Networks Shape State Coercion." International Security 44(1).

Foreign Direct Investment EU Screening Framework. 2019. Brussels. https: //trade.ec.europa.eu/doclib/docs/2019/february/tradoc_157683.pdf

Germany Further Strengthens Foreign Direct Investment (FDI) Regime. 2021. https://www.gibsondunn.com/germany-further-strengthens-foreign-dire ct-investment-fdi-regime/

Jaeger, Markus. 2021a. Germany Between a Rock and a Hard Place in China-US Competition. https://dgap.org/en/research/publications/germ any-between-rock-and-hard-place-china-us-competition

_____. 2021b. "The Logic (and Grammar) of US Grand Strategy." DGAP. https://dgap.org/en/research/publications/logic-and-grammar-us-grand -strategy

Kakissis, Joanna. 2019. "Despite U.S. Pressure, Germany Refuses To Exclude Huawei's 5G Technology." NPR. https://www.npr.org/2019/03/20/70481 8011/despite-u-s-pressure-germany-refuses-to-exclude-huaweis-5g-tec hnology

Kennedy, Paul. 2013. Engineers of Victory. New York: Random House.

Kennedy, Scott. 2015. "Made in China 2025." Center for Strategic and International Studies. https://www.csis.org/analysis/made-china-2025

OECD FDI Regulatory Restrictiveness Index. https://www.oecd.org/daf/inv/investment-policy/FDIRRIndexPPT.pdf

Trade Defence. 2020. Brussels.

West, Geoffrey. 2017. Scale. London: Penguin Press,.

Zettelmeyer, Jeromin. 2019. The Return of Economic Nationalism in Germany. Washington, D.C.

"EU Proposes New M&A and Procurement Control Legislation To Combat Foreign Subsidies." 2021. Skadden, Arps, Slate, Meagher & Flom LLP. https://www.jdsupra.com/legalnews/eu-proposes-new-m-a-and-procurement-1745602/

"Made in Germany: Industrial Strategy 2030." 2019. Federal Ministry of Economic Affairs. https://www.bmwi.de/Redaktion/EN/Dossier/industrial-strategy-2030.html

7. Australia's Perceptions, Prospects, and Strategies

2019 Annual Report to Congress. 2019. US-China Economic and Security Review Commission Washington, D.C. https://www.uscc.gov/annual-report/2019-annual-report-congress

Alderman, Daniel. 2017. "An Introduction to China's Strategic Military-Civilian Fusion." In China's Evolving Military Strategy, ed. Joe McReynolds. Washington, DC: Brookings Institution Press for Jamestown Foundation.

Alderman, Daniel, and Jonathan Ray. 2018. "Artificial Intelligence, Emerging Technologies, and China-US Strategic Competition." In The Gathering Pacific Storm, eds. Tai Ming Cheung and Thomas G. Mahnken. Cambria Press, 179–210.

Ashby, Mark et al. 2021. Defense Acquisition in Russia and China Defense Acquisition in Russia and China. Santa Monica: RAND Corporation. https://www.rand.org/pubs/research_reports/RRA113-1.html

Bendett, Samuel S., and Elsa B. Kania. 2019. Australian Strategic Policy Institute A New Sino-Russian High-Tech Partnership: Authoritarian Innovation in An Era of Great-Power Rivalry. Barton, ACT. https://www.aspi.org.au/report/new-sino-russian-high-tech-partnership.

Bitzinger, Richard A. 2021. "China's Shift from Civil-Military Integration to Military-Civil Fusion." Asia Policy 16(1): 5-24.

Brennen, Gavin, Simon Devitt, Tara Roberson, and Peter Rohde. 2021. An Australian Strategy for the Quantum Revolution. Barton, ACT. https://www.aspi.org.au/report/australian-strategy-quantum-revolution

Brown, Michael, and Pavneet Singh. 2017. China's Technology Transfer Strategy: How Chinese Investments in Emerging Technology Enable a Strategic Competitor to Access the Crown Jewels of U.S. Innovation. Washington, D.C.

Capri, Alex. 2021. "Quantum Computing: A New Frontier in Techno-Nationalism." Hinrich Foundation. https://www.hinrichfoundation.com/research/wp/tech/quantum-computing-a-new-frontier-in-techno-nationalism/

Cheung, Tai Ming. 2009. Fortifying China: The Struggle to Build a Modern Defense Economy. Ithaca and London: Cornell University Press.

_____. 2014. "Introduction." In Forging China's Military Might: A New Framework for Assessing Innovation, ed. Cheung. Baltimore, MD: John Hopkins University Press, 1-14.

_____. 2019. "Keeping Up with the Jundui: Reforming the Chinese Defense Acquisition, Technology, and Industrial System." In Chairman Xi Remakes the PLA: Assessing Chinese Military Reforms, eds. Phillip C.

Saunders et al. Washington, D.C.: National Defense University Press.

Cheung, Tai Ming, and Thomas G. Mahnken. 2018. The Gathering Pacific Storm: Emerging US-China Strategic Competition in Defense Technological and Industrial Development. Amherst, NY: Cambria Press.

Dekker, Brigitte, and Maaike Okano-Heijmans. 2020. Dealing with China on High-Tech Issues Views from the US, EU and Like-Minded Countries in a Changing Geopolitical Landscape. The Hague. https://www.clingendael.org/sites/default/files/2020-12/Report_Dealing_with_China_December_2020_0.pdf

Department of Defense. 2020a. "2020 Defence Strategic Update." Australian Government. https://www.defence.gov.au/about/publications/2020-defence-strategic-update

_____. 2020b. Military and Security Developments Involving the People's Republic of China 2020: Annual Report to Congress. Washington, DC. https://media.defense.gov/2020/Sep/01/2002488689/-1/-1/1/2020-DOD

Doshi, Rush. 2021. The Long Game: China's Grand Strategy and the Displacement of American Power. New York: Oxford University Press.

Dougherty, George M. 2020. "Accelerating Military Innovation: Lessons from China and Israel." Joint Forces Quarterly 98(3): 10–19.

Dziedzic, Stephen. 2020. "The Federal Government's New Foreign Relations Laws Have Passed Parliament. Here's What That Means." ABC Net. https://www.abc.net.au/news/2020-12-08/what-are-the-governments-new-foreign-relations-laws-about/12947590

Evans, Paul. 2020. "Techno-Nationalism in China–US Relations: Implications for Universities." East Asian Policy 12(02): 80–92.

Forum Staff. 2019. "Intellectual Pursuits: The People's Republic China Uses Buying Power, Theft, Spying to Gain Technological Edge." Indo-Pacific Defense Forum 44(2): 19–23.

Garisto, Daniel. 2021. "China Is Pulling Ahead in Global Quantum Race, New Studies Suggest." Scientific American. https://www.scientificamerican.com/article/china-is-pulling-ahead-in-global-quantum-race-new-studies-suggest/

Gilli, Andrea, and Mauro Gilli. 2019. "Why China Has Not Caught Up Yet: Military-Technological Superiority and the Limits of Imitation, Reverse Engineering, and Cyber Espionage." International Security 43(3): 141–89. http://www.css.ethz.ch/content/dam/ethz/special-interest/gess/cis/center-for-securities-studies/pdfs/Gilli-and-Gilli.pdf,

Gorman, Lindsay. 2021. "China's Data Ambitions: Strategy, Emerging Technologies, and Implications for Democracies." The National Bureau of Asian Research (NBR). https://www.nbr.org/publication/chinas-data-ambitions-strategy-emerging-technologies-and-implications-for-democracies/

Hass, Ryan. 2020. Lessons from the Trump Administration's Policy Experiment on China.

_____. 2021. "America's Sharpening Focus on Technology Competition with China." The Jerusalem Strategic Tribune. https://jstribune.com/ryan-hass-china-technology-race/

Inkster, Nigel. 2021. The Great Decoupling: China, America and the Struggle for Technological Supremacy. London: Hurst Publishers.

Joske, Alex. 2018. Picking Flowers, Making Honey: The Chinese Military's Collaboration with Foreign Universities. https://www.aspi.org.au/report/picking-flowers-making-honey

Kania, Elsa B. 2019. "In Military-Civil Fusion, China Is Learning Lessons From the United States and Starting to Innovate." RealClear Defense. https://www.realcleardefense.com/articles/2019/08/27/in_military-civil_fusion_china_is_learning_lessons_from_the_united_states_and_starting_to_innovate_114699.html

_____. 2021. "Artificial Intelligence in China's Revolution in Military Affairs." Journal of Strategic Studies 44(4): 515–42.

Kania, Elsa B., and John K Costello. 2018. Quantum Hegemony? China's Ambitions and the Challenge to U.S. Innovation Leadership. Washington, D.C. https://s3.us-east-1.amazonaws.com/files.cnas.org/documents/CNASReport-Quantum-Tech_FINAL.pdf?mtime=20180912133406&focal=none

Kania, Elsa B., and Lorand Laskai. 2021. Myths and Realities of China's Military-Civil Fusion Strategy. Washington, D.C. https://www.cnas.org/publications/reports/myths-and-realities-of-chinas-military-civil-fusion-strategy

Kania, Elsa B., and Adam Segal. 2021. "Globalized Innovation and Great Power Competition: The US-China Tech Clash." In After Engagement: Dilemmas in U.S.-China Security Relations, eds. Jacques DeLisel and Avery Goldstein. Washington, DC: Brookings Institution Press, 298–329.

de La Beaumelle, Marcel Angliviel, Benjamin Spevack, and Devin Thorne. 2019. Open Arms: Evaluating Global Exposure to China's Defence-Industrial Base. Washington, DC. ttps://www.c4reports.org/openahrms

Laurenceson, James, and Michael Zhou. 2019. Small Grey Rhinos: Understanding Australia's Economic Dependence on China. Sydney. https://www.australiachinarelations.org/content/small-grey-rhinos-understanding-australia's-economic-dependence-china

_____. 2020. "The Australia-China Science Boom." Australia-China Relations Institute. https://www.australiachinarelations.org/content/australia-china-science-boom

Levesque, Greg. 2021. "Commercialized Militarization: China's Military-Civil Fusion Strategy." The National Bureau of Asian Research (NBR). https://www.nbr.org/publication/commercialized-militarization-chinas-military-

civil-fusion-strategy/

Lim, Darren J., Zack Cooper, and Ashley Feng. 2021. Trust and Diversify: A Geoeconomic Strategy for the Australia-US Alliance. Sydney. https://www.ussc.edu.au/analysis/trustand-diversify-a-geoeconomic-strategy-for-the-australia-us-alliance

McGeachy, Hilary. 2019. United States Studies Centre US-China Technology Competition: Impacting a Rules-Based Order — United States Studies Centre. https://www.ussc.edu.au/analysis/us-china-technology-competition-impacting-a-rules-based-order

Meijer, Hugo. 2016. Trading with the Enemy: The Making of US Export Control Policy towards the People's Republic of China. Oxford: Oxford University Press.

Mori, Satoru. 2019. "US Technological Competition with China: The Military, Industrial and Digital Network Dimensions." Asia-Pacific Review 26(1): 77-120.

National Security Strategy of the United States of America . 2017.

Nouwens, Meia M., and Helen Legarda. 2018. Emerging Technology Dominance: What China's Pursuit of Advanced Dual-Use Technologies Mean for the Future of Europe's Economy and Defence Innovation. London and Berlin.

Office of the United States Trade Representative, Findings of the Investigation into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974. 2018. Washington, D.C.

Pillsbury, Michael. 2016. Hundred Year Marathon: China's Secret Strategy to Replace America as the Global Superpower. New York: Henry Holt and Company.

Platzer, Michaela D., John F. Sargent Jr., and Karen M. Sutter. 2020.

Semiconductors: U.S. Industry, Global Competition, and Federal Policy. Washington, D.C.

Raska, Michael. 2017. "Strategy and Challenges." In Defence Industries in Russia and China: Players and Strategies, eds. Richard A. Bitzinger and Nicu Popscue. Paris: EU Institute for Security Studies.

Ryan, Fergus, Audrey Fritz, and Daria Impiombato. 2021. Australian Strategic Policy Institute Mapping China's Tech Giants: Reining in China's Technology Giants | Australian Strategic Policy Institute | ASPI. Barton, ACT. https://www.aspi.org.au/report/mapping-chinas-technology-giants-reining-chinas-technology-giants

Schoff, James L., and Asei Ito. 2019. Competing with China on Technology and Innovation. Washington, D.C. https://carnegieendowment.org/files/ChinaRiskOpportunity-China_Tech.pdf

Scott, Mark, and Jacopo Barigazzi. 2021. "US and Europe to Forge Tech Alliance amid China's Rise." POLITICO. https://www.politico.eu/article/eu-us-trade-tech-council-joe-biden-china/

Sharma, Munish. 2018. "Decrypting China's Quantum Leap." https://doi.org/10.1086/697232 80: 24-45. https://www.journals.uchicago.edu/doi/abs/10.1086/697232

Shepardson, David. 2020. "U.S. Tightening Restrictions on Huawei Access to Technology, Chips." Reuters. https://www.reuters.com/article/us-usa-huawei-tech/u-s-tightening-restrictions-on-huawei-access-to-technology-chips-idUKKCN25D1CC

da Silva, Diego Lopes, Nan Tian, and Alexandra Marksteiner. 2021. SIPRI Fact Sheet - Trends in World Military Expenditure, 2020. Stockholm. https://www.sipri.org/publications/2021/sipri-fact-sheets/trends-worldmilitary-expenditure-2020

Smith, Julie, Andrea Kendall-Taylor, Carisa Nietsche, and Ellison Laskowski. 2020. Charting a Transatlantic Course to Address China. Washington, D.C.

Stanley-Lockman, Zoe. 2017. "Triangular Industrial Trajectories." In Defence Industries in Russia and China: Players and Strategies, eds. Richard A. Bitzinger and Nicu Popscue. Paris: European Union Institute for Security Studies, 65-67.

Stone, Alex, and Peter Wood. 2020. China's Military-Civil Fusion Strategy: A View from Chinese Strategists. Montgomery, AL. https://www.airuniversity.af.edu/CASI/Display/Article/2217101/chinas-military-civil-fusion-strategy/

The White House. 2021. Interim National Security Strategic Guidance. Washington, D.C.

Thomas-Noone, Brendan. 2019. "Ebbing Opportunity: Australia and the US National Technology and Industrial Base." United States Studies Centre. https://www.ussc.edu.au/analysis/australia-and-the-us-national-technology-and-industrial-base

_____. 2020. "Tech Wars: US-China Technology Competition and What It Means for Australia." United States Studies Centre. https://www.ussc.edu.au/analysis/us-china-technology-competition-and-what-it-means-for-australia.

Thurston, Anne F. 2021. Engaging China : Fifty Years of Sino-American Relations. New York: Columbia University Press.

Transatlantic Strategy Group, Stronger Together: A Strategy to Revitalize Transatlantic Power. 2020. Cambridge, MA. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fwww.belfercenter.org%2Fsites%2Fdefault%2Ffiles%2F2020-12%2FTransatlantic%2FStrongerTogether.pdf&clen=5161554&chunk=true

United States-China Science and Technology Cooperation: Biennial Report to the U.S.-China Economic & Security Review Commission. 2006.

Waldron, Kathryn. 2020. "Huawei and National Security: Lessons for 6G." R

Street Policy Study 204. https://www.jstor.org/stable/resrep27015

Walters, Patrick. 2021. Australian Strategic Policy Institute ANZUS at 70: The Past, Present and Future of the Alliance. Barton, ACT. https://www.aspi.org.au/report/anzus-70-past-present-and-future-allian

Wezeman, Pieter D., Alexandra Kuimova, and Siemon T. Wezeman. 2021. Trends in International Arms Transfers, 2020 - SIPRI Fact Sheet . Stockholm.

Woo, Stu, and Yang Jie. 2021. "China Wants a Chip Machine From the Dutch. The U.S. Said No. ." The Wall Street Journal. https://www.wsj.com/articles/china-wants-a-chip-machine-from-the-dutch-the-u-s-said-no-11626514513?page=1

Wübbeke, Jost et al. 2016. Made in China 2025: The Making of a High-Tech Superpower and Consequences for Industrial Countries. Berlin.

Xin, Ling. 2016. "China Launches World's First Quantum Science Satellite." Physics World. https://physicsworld.com/a/china-launchesworlds-first-quantum-science-satellite/

"2016 National Defence Science, Technology and Industry Working Conference Was Held in Beijing." 2016. State Council, People's Republic of China. www.gov.cn/xinwen/2016-01/09/content_5031770.htm.

"Australia-US Defence Relationship ." Australian Embassy. https://usa.embassy.gov.au/defence-cooperation

"Building Prosperity: The Importance of the United States to the Australian Economy." 2020. U.S. Embassy & Consulates in Australia. https://au.usembassy.gov/building-prosperity-the-importance-of-the-united-states-to-the-australian-economy/

"Xi Jinping: Unwaveringly Promoting the Deepening of MCF to Provide Strategic Support for the Chinese Dream and the Dream of a Strong Military." 2018. Xinhua.

"Infrastructure Development." 2014. In Tracking Africa's Progress in Figures, Tunis: African Development Bank Group.

8. Singapore's Perceptions, Prospects, and Strategies

Alderman, Daniel, and Jonathan Ray. 2018. "Artificial Intelligence, Emerging Technologies, and China-US Strategic Competition." In The Gathering Pacific Storm, eds. Tai Ming Cheung and Thomas G. Mahnken. Cambria Press, 179–210.

Annual Threat Assessment of the US Intelligence Community. 2021. Washington, D.C. https://www.dni.gov/files/ODNI/documents/assessments/ATA-2021-U

Chee, Kenny. 2021. "Huawei Opens $53 Million Regional Centre in Singapore." The Straits Times. https://www.straitstimes.com/tech/tech-news/huawei-opens-53-million-regional-centre-in-singapore

Choudhury, Saheli Roy. 2020. "Huawei Loses out to Nokia, Ericsson in Building Singapore's Main 5G Networks." CNBC. https://www.cnbc.com/2020/06/25/huawei-loses-out-to-nokia-ericsson-in-building-singapores-main-5g-networks.html

Harjani, Manoj. 2021. "Is Southeast Asia Ready for a US-China Tech Decoupling?." The Interpreter. ttps://www.lowyinstitute.org/the-interpreter/southeast-asia-ready-us-china-tech-decoupling

Harper, Justin. 2020. "Singapore Becomes Hub for Chinese Tech amid US Tensions ." BBC News. https://www.bbc.com/news/business-54172703.

Heijmans, Philip. 2021. "Singapore's Lee Urges China to, U.S. to Stem Deteriorating Ties." Bloomberg. https://www.bloomberg.com/news/articles/2021-08-03/singapore-s-lee-urges-china-u-s-to-stem-deterioration-in-ties.

Ho, Grace. 2021. ""Everything Is at Stake with US-China Tensions: PM Lee." The Straits Times. https://www.straitstimes.com/singapore/politics/everything-is-at-stake-with-us-china-tensions-pm-lee.

Kania, Elsa B. 2019. "Made in China 2025, Explained." The Diplomat. https://thediplomat.com/2019/02/made-in-china-2025-explained/

Kausikan, Bilahari. 2019. "No Sweet Spot for Singapore in US-China Tensions." The Straits Times. https://www.straitstimes.com/opinion/no-sweet-spot-for-spore-in-us-china-tensions

Layton, Roslyn. 2020. "State Department's 5G Clean Network Club Gains Members Quickly." Forbes. https://www.forbes.com/sites/roslynlayton/2020/09/04/state-departments-5g-clean-network-club-gains-members-quickly/?sh=37eed5017536

Loong, Lee Hsien. 2020. "The Endangered Asian Century: America, China, and the Perils of Confrontation." Foreign Affairs. https://www.foreignaffairs.com/articles/asia/2020-06-04/lee-hsien-loong-endangered-asian-century.

McGeachy, Hilary. 2019. US-China Technology Competition: Impacting a Rules-Based Order. Sydney.

Nyabiage, Jevans. 2021. "African Nations Continue to Put Trust in Huawei for Data Management." South China Morning Post. https://www.scmp.com/news/china/diplomacy/article/3138917/african-nations-continue-put-trust-huawei-data-management.

Ong, Justin. 2021. "Singapore Must Make Own Decisions amid US-China Rivalry: Vivian." The Straits Times. https://www.straitstimes.com/singapore/politics/spore-must-make-own-decisions-amid-us-china-rivalry-vivian

Rahman, Muhammad Faizal Abdul. 2020. "Singapore Decides on 5G Networks: Is Huawei Banned?" The Diplomat. https://thediplomat.com/

2020/07/singapore-decides-on-5g-networks-is-huawei-banned/

Ryan, Fergus, Audrey Fritz, and Daria Impiombato. 2021. Australian Strategic Policy Institute Mapping China's Tech Giants: Reining in China's Technology Giants | Australian Strategic Policy Institute | ASPI. Barton, ACT. https://www.aspi.org.au/report/mapping-chinas-technology-giants-reining-chinas-technology-giants

Tellis, Ashley J., Alison Szalwinski, and Michael Wills. 2019. U.S.-China Competition for Global Influence. Washington, D.C. https://carnegieendowment.org/files/SA_20_Tellis.pdf..

Thomas-Noone, Brendan. 2020. "Tech Wars: US-China Technology Competition and What It Means for Australia." United States Studies Centre. https://www.ussc.edu.au/analysis/us-china-technology-competition-and-what-it-means-for-australia.

Tong, Linh. 2021. "Vietnam, Singapore Begin Negotiations on Digital Trade Agreement." The Diplomat. https://thediplomat.com/2021/06/vietnam-singapore-begin-negotiations-on-digital-trade-agreement

Vaswani, Karishma. 2021. "Singapore PM: 'Considerable Risk' of Severe US-China Tensions." BBC News. https://www.bbc.com/news/business-56318576

"Digital Economy Agreements." Ministry of Trade and Industry, Singapore . https://www.mti.gov.sg/Improving-Trade/Digital-Economy-Agreements.

"PM Lee Hsien Loong at the IISS Shangri-La Dialogue 2019." 2019. Prime Minister's Office Singapore. https://www.pmo.gov.sg/Newsroom/PM-Lee-Hsien-Loong-at-the-IISS-Shangri-La-Dialogue-2019.

"The Clean Network." 2021. United States Department of State. https://2017-2021.state.gov/the-clean-network/index.html

"Transcript of Minister for Foreign Affairs Dr Vivian Balakrishnan's Participation at the Asia Society Dialogue on 'Southeast Asia in 2021

and the Crisis in Myanmar' Held via Zoom on 20 May 2021 at 2000hrs." 2021. Ministry of Foreign Affairs, Singapore. https://www.mfa.gov.sg/Newsroom/Press-Statements-Transcripts-and-Photos/2021/05/transcript-of-minister-participation-at-Asia-society-dialogue.

"Working Group of Science and Technology in US-China Relations, Meeting the China Challenge: A New American Strategy for Technology Competition." 2020. Asia Society. https://asiasociety.org/center-uschina-relations/meeting-china-challenge-new-american-strategy-technology-competition.

9. Visegrád countries' Perceptions, Prospects, and Strategies

Ciorciari, John D., and Jürgen Haacke. 2019. "Hedging in International Relations: An Introduction." International Relations of the Asia-Pacific 19(3): 367–74.

Cybersecurity of 5G Networks. EU Toolbox of Risk Mitigating Measures. 2020. Brussels. chrome-extension://efaidnbmnnnibpcajpcglclefindmkaj/viewer.html?pdfurl=https%3A%2F%2Fccdcoe.org%2Fuploads%2F2020%2F01%2FEU-200129-Cybersecurity-of-5G-networks-EU-Toolbox-of-risk-mitigating-measures.pdf&clen=6188115&chunk=true

European Innovation Scoreboard 2020. 2020. Brussels. https://ec.europa.eu/growth/industry/policy/innovation/scoreboar ds_en

Fontaine, Richard, and Daniel M. Kliman. 2013. "International Order and Global Swing States." The Washington Quarterly 36(1): 93–109.

Kavalski, Emilian. 2020. "How China Lost Central and Eastern Europe." The Conversation. https://theconversation.com/how-china-lost-central-and-eastern-europe-142416

Mackenzie, Baker. 2021a. "Czech Republic Introduces New Foreign

Investment Screening Regime." Foreign Investment and National Security Blog. https://foreigninvestment.bakermckenzie.com/2021/03/03/czech-republic-introduces-new-foreign-investment-screening-regime/

_____. 2021b. "Slovakia Introduces New Foreign Investment Screening Regime." Foreign Investment and National Security Blog. https://foreigninvestment.bakermckenzie.com/2021/04/13/slovakia-introduces-new-foreign-investment-screening-regime/

Moldicz, Csaba. 2021. China, the United States and the Technological Supremacy in Europe. 1st ed. Routledge.

Myant, Martin. 2018. "The Limits to Dependent Growth in East-Central Europe." OpenEdition Journals 24(2nd Semestre). http://journals.openedition.org/regulation/13351

Peters, Gerhard, and John T. Woolley. 2019. "Donald J. Trump, Press Release - U.S.-Poland Joint Declaration on 5G Online." The American Presidency Project. presidency.ucsb.edu/documents/press-release-us-poland-joint-declaration-5g

Rumiński, Arkadiusz, Łukasz Karpiesiuk, and Iwona Domańska. 2020. "New Foreign Direct Investment Screening Rules in Poland." SSW Pragmatic Solutions. https://ssw.solutions/en/new-foreign-direct-investment-screening-rules-in-poland/

The Digital Economy and Society Index (DESI). 2019. Brussels. https://ec.europa.eu/digital-single-market/en/digitaleconomy-and-society-index-desi

"Czechs Sign Joint 5G Security Declaration with United States." 2020. Reuters. https://www.reuters.com/article/us-czech-usa-5g-idUSKBN22I33O

"United States – Slovak Republic Joint Declaration on 5G Security." 2020. United States Department of State. https://2017-2021.state.gov/united-states-slovak-republic-joint-declaration-on-5g-security/index.html

10. Latin America's Perceptions, Prospects, and Strategies

Braw, Elisabeth. 2020. "How China Is Buying Up the West's High-Tech Sector." Foreign Policy. https://foreignpolicy.com/2020/12/03/how-china-is-buying-up-the-wests-high-tech-sector/

Dorfman, Zach. 2020. "China Used Stolen Data to Expose CIA Operatives in Africa and Europe." Foreign Policy. https://foreignpolicy.com/2020/12/21/china-stolen-us-data-exposed-cia-operatives-spy-networks/

Feldstein, Stephen. 2019. "The Global Expansion of AI Surveillance." Carnegie Endowment for International Peace. https://carnegieendowment.org/2019/09/17/global-expansion-of-ai-surveillance-pub-79847

Graham, Allison. 2019. "Is China Beating America to AI Supremacy?" The National Interest. https://nationalinterest.org/feature/china-beating-america-ai-supremacy-106861

Irwin, Douglas. 2020. "The Pandemic Adds Momentum to the Deglobalization Trend | PIIE." Peterson Institute of International Economics. https://www.piie.com/blogs/realtime-economic-issues-watch/pandemic-adds-momentum-deglobalization-trend

Kupchan, Cliff, and Paulo Triolo. 2019. "Distrust but Verify: How the U.S. and China Can Work Together on Advanced Technology." Supchina. https://supchina.com/2019/11/26/distrust-but-verify-the-us-china-advanced-technology/

Kynge, James, and Jonathan Wheatley. 2020. "China Pulls Back from the World: Rethinking Xi's 'project of the Century''." Financial Times. https://www.ft.com/content/d9bd8059-d05c-4e6f-968b-1672241ec1f6

Lee, John. 2020. "The Global War for 5G Heats Up." The Diplomat. https://thediplomat.com/2020/08/the-global-war-for-5g-heats-up/

Levy, Steven. 2020. "Huawei, 5G, and the Man Who Conquered Noise ."

WIRED. https://www.wired.com/story/huawei-5g-polar-codes-data-breakthrough/

Mello, Patrícia Campos. 2019. "EUA Podem Rever Parceria de Inteligência Se Brasil Permitir 5G Chinês, Diz Diplomata [US May Review Intelligence Partnership If Brazil Allows Chinese 5G, Says Diplomat]." Folha de São Paulo. https://www1.folha.uol.com.br/mundo/2019/08/eua-ameacam-rever-parceria-de-inteligencia-se-brasil-permitir-5g-chines-diz-diplomata.shtml

Segal, Adam. 2020. "The Coming Tech Cold War With China." Foreign Affairs. https://www.foreignaffairs.com/articles/north-america/2020-09-09/coming-tech-cold-war-china

Stuenkel, Oliver. 2019a. "Can VP Mourão Fix Brazil-China Ties?" Americas Quarterly. https://www.americasquarterly.org/article/can-vp-mourao-fix-brazil-china-ties/

_____. 2019b. "Huawei Heads South." Foreign Affairs. https://www.foreignaffairs.com/articles/brazil/2019-05-10/huawei-heads-south

_____. 2021. "Latin American Governments Are Caught in the Middle of the U.S.-China Tech War." Foreign Policy. https://foreignpolicy.com/2021/02/26/latin-america-united-states-china-5g-technology-war/

Taylor, Emily. 2019. "Who's Afraid of Huawei? Understanding the 5G Security Concerns." Chatham House. https://www.chathamhouse.org/2019/09/whos-afraid-huawei-understanding-5g-security-concerns

Walia, Apjit. 2020. The Coming Tech Wall and the Covid Dilemma.

Waters, Richard, Kathrin Hille, and Louise Lucas. 2019. "Huawei v the US: Trump Risks a Tech Cold War." Financial Times. https://www.ft.com/content/78ffbf36-7e0a-11e9-81d2-f785092ab560

Westad, Odd Arne. 2019. "The Sources of Chinese Conduct: Are Washington and Beijing Fighting a New Cold War? | Foreign Affairs." Foreign

Affairs. https://www.foreignaffairs.com/articles/china/2019-08-12/sources-chinese-conduct

Yan, Xuetong. 2020. "Bipolar Rivalry in the Early Digital Age." The Chinese Journal of International Politics 13(3): 313–41. https://academic.oup.com/cjip/article/13/3/313/5854839

Yang, Yuan, and Nian Liu. 2019. "Beijing Orders State Offices to Replace Foreign PCs and Software." Financial Times. https://www.ft.com/content/b55fc6ee-1787-11ea-8d73-6303645ac406

Zakaria, Fareed. 2019. "The New China Scare." Foreign Affairs. https://www.foreignaffairs.com/articles/china/2019-12-06/new-china-scare

"Are China and the United States Fighting a 'Tech Cold War'?" 2019. JP Morgan Securities. https://www.jpmorgan.com/wealth-management/wealth-partners/insights/are-china-and-the-us-fighting-a-tech-cold-war

"How China's Communist Party Trains Foreign Politicians." 2020. The Economist. https://www.economist.com/china/2020/12/10/how-chinas-communist-party-trains-foreign-politicians

"In 'World of Disquiet', UN Must Deliver for the People, Guterres Tells General Assembly | | UN News." 2019. UN News. https://news.un.org/en/story/2019/09/1047172

"Ren Zhengfei May Sell Huawei's 5G Technology to a Western Buyer." 2019. The Economist. https://www.economist.com/business/2019/09/12/ren-zhengfei-may-sell-huaweis-5g-technology-to-a-western-buyer

11. Central Asia's Perceptions, Prospects, and Strategies

Dreher, Axel et al. 2017. Aid, China, and Growth: Evidence from a New Global Development Finance Dataset.

Hannas, William. C., and Didi Kirsten Tatlow. 2020. China's Quest for

Foreign Technology Beyond Espionage. Routledge.

Hybrid CoE Trend Report 5: Trends in China's Power Politics. 2020. https://www.hybridcoe.fi/wp-content/uploads/2020/07/20200710_Trend-Report-5-China_Web.pdf

Kania, Elsa B. 2018. Cooperation, Competition and the Dual-Use Dilemma in Artificial Intelligence. Canberra. https://www.aspi.org.au/report/technological-entanglement

Kashin, V., and A. Korolev. 2018. "China's Assistance to the Countries of Central Asia." World economy and international relations 62(3).

Needham, Mass. 2021. "PC Shipments Show Continued Strength in Q1 2021 Despite Component Shortages and Logistics Issues, According to IDC." IDC. https://www.idc.com/getdoc.jsp?containerId=prUS47601721

Nouwens, Meia M., and Helen Legarda. 2018. Emerging Technology Dominance: What China's Pursuit of Advanced Dual-Use Technologies Mean for the Future of Europe's Economy and Defence Innovation. London and Berlin.

Olsen, Sam. 2020. "China Is Winning the War for Global Tech Dominance." The Hill. https://thehill.com/opinion/technology/518773-china-is-winning-the-war-for-global-tech-dominance

Pantucci, Raffaello. 2021. "Not Just the Economy. How China Is Increasing Its Power Influence in Central Asia." Carnegie Moscow Center. https://carnegiemoscow.org/commentary/83934

Sarym, Aidos. 2021. "[Social Networks Are Not Freedom of Speech. These Are the Tools of Totalitarianism]." Exclusive. https://www.exclusive.kz/expertiza/obshhestvo/125588/

Shea, Gerry. 2019. "In the Inaccessible Highlands of Central Asia, a Quiet Newcomer: Chinese Troops." The Washington Post. https://www.washingtonpost.com/

"5G in Kazakhstan. Is the Market Ready to Introduce New Technology?" 2020. Kursiv. https://kursiv.kz/news/kompanii/2020-11/5g-vkazakhstane-gotovli-rynok-k-vnedreniyu-novoy-tekhnologii

"Apple and Netflix in Uzbekistan. Should Kazakhstan Be Afraid of Competition." 2021. Tengri News. https://tengrinews.kz/kazakhstan_news/apple-netflix-uzbekistane-stoit-kazahstanu-opasatsya-429886/

"China Will Give Kazakhstan a Supercomputer Worth 5.4 Billion Tenge." 2020. InBusiness. https://inbusiness.kz/ru/last/kitaj-podarit-kazahstanu-superkompyuter-stoimostyu-5-4-mlrd-tenge

"Chinese Equipment in Cities of Kazakhstan Raised Concerns over Possible Spy Surveillance." 2019. Central Asia News. https://central.asia-news.com/ru/articles/cnmi_ca/features/2019/12/11/feature-01

"Dahua Solution Was Implemented in an Elite Residential Complex in Nur-Sultan." Dahua Russia. https://www.dahua-russia.com.ru/news/bi-citytokyo-dahua-solutions2-news

"Does Google Plan to Open an Office in Kazakhstan." 2021. Tengri News. https://tengrinews.kz/kazakhstan_news/planiruet-li-google-otkryit-ofis-v-kazahstane-430839/

"Google and Facebook Officially Become Taxpayers in Tajikistan." 2021. Tengri News. https://tengrinews.kz/sng/google-facebook-ofitsialno-stali-nalogoplatelschikami-430822/

"How Nokia and Huawei Made Different 5G. Nokia Lost and Huawei Took Off." 2020. CNews. https://www.cnews.ru/news/top/2020-07-08_nokia_proigrala_bitvu_za_5gsdelav

"How Tajikistan Is Turning into a Zone of Special Interests of China." 2021. Central Asia Analytical Network. https://www.caa-network.org/archives/21363

"Huawei Academy Opens in Almaty to Support Local ICT Education." 2017. The Astana Times. https://astanatimes.com/2017/05/huawei-academy-opens-in-almaty-tosupport-local-ict-education/

"Huawei Shares the Prospects for the Launch of a 5G Network in Kazakhstan in 2021." 2021. Huawei. https://www.huawei.com/kz/news/kz/2021/news-huawei-5g-network-kazakhstan

"On Approval of the Framework Agreement between the Government of the Republic of Kazakhstan and the Government of the PRC on Strengthening Cooperation in the Field of Industrialization and Investment." 2016. Decree of the Government of the Republic of Kazakhstan. https://adilet.zan.kz/rus/docs/P1600000030

"Results of 2020 in the Mobile Phone Market of Kazakhstan." 2021. IDC. https://www.idc.com/getdoc.jsp?containerId=prEUR247564121

"The Chinese Air Force Presented the Best Samples of Equipment at the 13th China International Aviation and Space Salon." 2021. Xinhua. http://russian.people.com.cn/n3/2021/0929/c31521-9902254.html

"The Head of State Took Part in the Opening of the 6th Meeting of the Kazakh-Chinese Business Council." 2019. Official site of the President of the Republic of Kazakhstan. https://www.akorda.kz/ru/events/international_community/foreign_visits/glava-gosudarstva-prinyal-uchastie-v-otkrytii-6-go-zasedaniya-kazahstansko-kitaiskogo-delovogo-soveta

"The SCO Secretary General Discussed with the Director General of Tencent Culture & Tourism the Issues of Cooperation on the Development of Smart Tourism in the SCO." 2019. Secretariat of the Shanghai Cooperation Organization. http://rus.sectsco.org/news/20190906/572874.html

"UnionPay Cards Issued Outside of China Exceed 100 Million." 2018. TASS. https://tass.ru/press-relizy/5718053

"UnionPay Remains the Largest Payment Processor in the World." 2018. PlussWorld. https://plusworld.ru/daily/platezhnyj-biznes/unionpay-ostaetsya-krupnejshej-platezhnoj-sistemoj-v-mire/

"UnionPay Stakes on Cooperation with Kazakhstan." 2015. Freedom Finance. https://kapital.kz/finance/41406/union-pay-delayet-stavku-na-sotrudnichestvo-s-kazakhstanom.html

"When Google Comes to Kazakhstan." 2018. Forbes Kazakhstan. https://forbes.kz//process/internet/google_mojet_priyti_v_kazahstan_v_blijayshie_dva_goda

12. Middle Eastern Perceptions, Prospects, and Strategies

Annual Threat Assessment of the US Intelligence Community. 2021. Washington, D.C. https://www.dni.gov/files/ODNI/documents/assessments/ATA-2021-U

Bocharov, Ivan. 2020. "Egypt-China Relations at the Present Stage." Russian International Affairs Council. https://russiancouncil.ru/en/analytics-and-comments/columns/middle-east-policy/egypt-china-relations-at-the-present-stage/

Fulton, Jonathan. 2019. China's Changing Role in the Middle East. Washington, D.C. https://www.atlanticcouncil.org/wp-content/uploads/2019/06/Chinas_Changing_Role_in_the_Middle_East.pdf.

Garlick, Jeremy. 2021. The Impact of China's Belt and Road Initiative The Impact of China's Belt and Road Initiative : From Asia to Europe. Routledge. https://www.taylorfrancis.com/books/mono/10.4324/9781351182768/impact-china-belt-road-initiative-jeremy-garlick

Hassan, Khalid. 2020. "US Warns Egypt to Avoid Chinese Companies on 5G Connections." The Monitor. https://www.al-monitor.com/originals/2020

/11/egypt-china-us-war-5g-networks-boycott.html

Higgins, Tucker. 2019. "Trump Declares Emergency over Threats to US Tech amid Huawei Concerns." https://www.cnbc.com/2019/05/15/trump-signs-executive-order-declaring-national-emergency-over-threats-against-us-technology.html

Maçães, Bruno. 2020. Belt and Road: A Chinese World Order. London: Hurst.

Pasquale, Frank, and Gianclaudio Malgieri. 2021. "If You Don't Trust A.I. Yet, You're Not Wrong." The New York Times. https://www.nytimes.com/2021/07/30/opinion/artificial-intelligence-european-union.html

Robbins, Michael. 2021. "U.S. & China's Competition Extends to MENA." Arab Barometer. https://www.arabbarometer.org/2021/01/u-s-chinas-competition-extends-to-mena/

Satariano, Adam. 2019. "U.A.E. to Use Equipment From Huawei Despite American Pressure." The New York Times. https://www.nytimes.com/2019/02/26/technology/huawei-uae-5g-network.html

Sethi, Rohit. 2021. "Beyond the Buzz: Making 5G a Success in Saudi Arabia." Arthur D. Little. https://www.adlittle.com/en/beyond-buzz-making-5g-success-saudi-arabia

Slaughter, Matthew J., and David H. McCormick. 2021. "Data Is Power: Washington Needs to Craft New Rules for the Digital Age." Foreign Affairs 100(3). https://go.gale.com/ps/retrieve.do?tabID=T003&resultListType=RESULT_LIST&searchResultsType=SingleTab&hitCount=28&searchType=AdvancedSearchForm&currentPosition=2&docId=GALE%7CA660012365&docType=Article&sort=Relevance&contentSegment=ZEAI-MOD1&prodId=EAIM&pageNum=1&contentSet=GALE%7CA660012365&searchId=R1&userGroupName=anon~questia&inPS=true

Swaine, Michael D. 2015. "Chinese Views and Commentary on the 'One Belt, One Road' Initiative." China Leadership Monitor 47(2).

U.S.-Egypt Trade Facts. Washington, D.C. https://ustr.gov/countries-regions/europe-middle-east/middle-east/north-africa/egypt

Yergin, Daniel. 2020. The New Map: Energy, Climate, and the Clash of Nations. New York: Penguin Press,.

"China's Huawei to Launch 5G at Africa Cup of Nations in Egypt." 2019. Arab News. www.arabnews.com/node/1485906/business-economy.

"Full Text: China's National Defense in the New Era." 2019. Xinhua. http://english.www.gov.cn/archive/whitepaper/201907/24/content_WS5d3941ddc6d08408f502283d.html.

"Positive 5G Outlook Post COVID-19: What Does It Mean for Avid Gamers?" 2020. Forest Interactive.

"Saudi Arabia Extends 5G Deployment to 51 Cities and Provinces." 2021. Arab News. https://www.arabnews.com/node/1807116/business-economy

"Saudi Arabia Ranks 5th in Use of 'Digital Government.'" 2021. Saudi Press Agency, Arab News. https://www.arabnews.com/node/1860356/saudi-arabia.

"U.S. Won't Partner with Countries That Use Huawei Systems: Pompeo." 2019. Reuters. https://www.reuters.com/article/us-hua

13. Africa's Perceptions, Prospects, and Strategies

Begashaw, Belay. 2019. "Africa and the Sustainable Development Goals: A Long Way to Go." Brookings Institution. https://www.brookings.edu/blog/africa-in-focus/2019/07/29/africa-and-the-sustainable-development-goals-a-long-way-to-go/

G5 in Sub-Saharan Africa: Laying the Foundations. 2019. https://data.gsmaintelligence.com/api-web/v2/research-file-download?id=45121572&file=

2796-160719-5G-Africa.pdf

Gagliardone, Iginio. 2019. China, Africa and the Future of the Internet. London: Zedbooks.

Hruby, Aubrey. 2021. "The Digital Infrastructure Imperative in African Markets." Atlantic Council. https://www.atlanticcouncil.org/blogs/africasource/the-digital-infrastructure-imperative-in-african-markets/

Manek, Sheila. 2020. "Africa's Smartphone Market Grows in Q3 2020, but Feature Phone Shipments Decline." IDC. https://www.idc.com/getdoc.jsp?containerId=prMETA47055320

Mureithi, Carlos. 2021. "Kenya Becomes the Second African Country to Launch 5G." Quartz Africa. https://qz.com/africa/1990724/kenya-becomes-the-second-african-country-to-launch-5g/

Swinhoe, Dan. 2021. "Senegal to Migrate All Government Data and Applications to New Government Data Center." DCD. https://www.datacenterdynamics.com/en/news/senegal-to-migrate-all-government-data-and-applications-to-new-government-data-center/

"China's Telecommunication's Footprint in Africa." 2009. In China in Africa, Chiba: Institute of Developing Economies Japan External Trade Organization (IDE-JETRO). https://www.ide.go.jp/English/Data/Africa_file/Manualreport/cia_09.html

The Future of US-China Tech Competition:

Global Perceptions, Prospects, and Strategies

Printed on	December 27, 2021
Published on	December 31, 2021
Publisher	Hyeon Kon Kim
Published by	National Assembly Futures Institute
Address	Room 222 of National Assembly Member's Hall. 1, Uisadang-daero, Yeongdeungpo-gu, Seoul, Republic of Korea
Telephone	+82-2-786-2190
Fax	+82-2-786-3977
Website	www.nafi.re.kr
Printed by	MisaWelfare Co. (+82-2-6948-9650)

ISBN 979-11-90858-71-7 (93300)

NATIONAL ASSEMBLY
FUTURES INSTITUTE