

TOWARD A DEMOCRATIC TECHNOLOGY ALLIANCE: An Innovation Edge that Favors Freedom

Ash Jain and Matthew Kroenig





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This is the fourth report in a five-part series of Atlantic Council publications, as part of a project on revitalizing the rules-based international system and positioning the United States and its allies to succeed in an era of strategic competition.

The first publication, *Present at the Re-Creation: A Global Strategy for Revitalizing, Adapting, and Defending a Rules-Based International System*, sets forth an overarching global strategy for the United States and its allies to uphold the rules-based system by strengthening cooperation among the world's democracies, while seeking to cooperate with other global powers on areas of common concern.

The second report, *From the G7 to a D-10: Strengthening Democratic Cooperation for Today's Challenges*, proposes the creation of a new D-10 core group of influential democracies across North America, Europe, and the Indo-Pacific, aimed at deepening strategic collaboration on the most pressing challenges facing the rules-based order.

The third report, *An Alliance of Democracies: From Concept to Reality in an Era of Strategic Competition*, suggests that an Alliance of Democracies could foster cooperation among a larger group of nations committed to shared values and goals, potentially as a standing body stemming from the Biden administration's series of democracy summits.

This report calls for a *Democratic Technology Alliance* that would ensure that the free world prevails in the race for advanced technologies by jointly investing in innovation, countering unfair practices, and developing rules and norms consistent with democratic values.

This fifth and final report, *A Democratic Trade Partnership: Ally Shoring to Counter Coercion and Secure Supply Chains*, proposes an integrated economic framework for leading democracies and other partners to reduce strategic dependency on revisionist autocracies, coordinate on economic challenges, and foster free, fair, and secure trade.

I. EXECUTIVE SUMMARY

Following World War II, the United States and its democratic allies established and defended a rules-based international system. This system was expanded and deepened after the end of the Cold War. Despite its shortcomings, it has proven unmatched in its ability to deliver peace, prosperity, and freedom to the United States and much of the world. The global order, however, is at an inflection point. It is being confronted by revisionist autocratic powers — China and Russia — and, at the same time, contending with a range of other challenges, from emerging and disruptive technologies to climate change to a lack of confidence in open-market democracy.

The rules-based system has been successful in ways that its founders could not have imagined. But, as the authors of this report have set forth in a series of related publications, this system must be revitalized and adapted for a new era.¹ Inclusive institutions, including the United Nations (UN), have been limited in their effectiveness, in part because

of obstruction by autocracies that systematically violate key tenants of the rules-based system. New institutions are needed that bring together powerful and likeminded democracies — those that are willing to play by certain rules and use their collective influence to positively shape the future of the system.

Such an approach is particularly necessary to address the challenges of emerging technologies. The world is experiencing a Fourth Industrial Revolution (4IR). An array of new technologies are being simultaneously developed and advanced, such as artificial intelligence (AI), quantum computing, synthetic biology, additive manufacturing, fintech, and robotics. As with previous advances, these new technologies offer great promise but also threaten serious downside risks. Fire can fuel stoves and keep people warm, but it can also be used to torch villages. Similarly, AI algorithms can be employed to run efficient smart cities of the future, but can also guide lethal and

¹ Ash Jain and Matthew Kroenig, *Present at the Re-Creation*, Atlantic Council, October 30, 2019, <https://www.atlanticcouncil.org/wp-content/uploads/2019/10/Present-at-the-Recreation.pdf>

destructive autonomous weapons systems. The central question is how can the United States and its allies harness these advanced technologies for good while successfully managing their potential dangers?

Among the greatest challenges in the area of technology are those posed by China. As it acts to challenge the rules-based international system, Beijing is pursuing a systematic effort to win the race for advanced technologies, and it appears to be leading in several key areas. China has invested heavily in research and development in advanced technologies, from AI to quantum computing to hypersonic missiles, while also gaining advantages through unfair practices, including the widespread theft of intellectual property (IP).

China's increasing capabilities in the technology realm pose significant risks for the United States and its democratic allies and partners. These risks are evident across three main areas: defense and national security, economics, and values. Beijing is using its increasingly advanced technological capabilities to develop more sophisticated weapons systems. China's leadership in advanced technologies could help fuel its economic growth and render much of the world dependent on it for critical technologies. Beijing is also employing new technologies in ways that are inconsistent with democratic norms, such as facial recognition technology to assert greater surveillance of its citizens, and is exporting these technologies to other autocracies.

To be sure, not every aspect of China's role in developing advanced technology is cause for concern. Efforts by Chinese scholars to develop AI for medical diagnostics, for example, could constructively advance scientific knowledge and provide health benefits for people around the world. The challenges posed by China and other autocracies, including Russia, stem from their disregard of international norms and systematic attempts to undermine key elements of the rules-based order.

The nation or group of nations that are first to develop and harness the technologies of the 4IR will enjoy a sustained economic, military, and geopolitical advantage. The first three industrial revolutions originated in the West and helped propel democracies to a position of global leadership that has lasted for several centuries. If leading democracies are able to maintain their technological edge, they will be well-positioned to sustain their geopolitical, economic, and military advantages and uphold the rules-based international system. If, on the other hand, the Chinese Communist Party (CCP) succeeds in deploying advanced technologies ahead of the democratic world, it will be in a much stronger position to advance a China-centric system that is more consistent with its autocratic values. Indeed, the strategic competition between democracy and autocracy may ultimately be decided in the technological domain.

For the United States to prevail in this competition, it must successfully harness the technologies of the Fourth Industrial Revolution. But to compete effectively, the United States cannot act alone. It must work closely with democratic allies and partners to leverage shared capabilities and resources, and implement joint strategies and policies that are strategically aligned. Several efforts have been initiated to help strengthen democratic cooperation on the technologies of the 4IR, including through the G7, the Quad, and the US-EU Trade and Technology Council. However, while valuable, these efforts have been limited in geographic and technological scope. What is missing is an integrated framework for technology cooperation that brings together leading democracies to advance a holistic, coherent, and effective set of strategies across a range of domains.

The nation or group of nations that are first to develop and harness the technologies of the Fourth Industrial Revolution will enjoy a sustained economic, military, and geopolitical advantage.

The United States and leading democracies across North America, Europe, and the Indo-Pacific should establish a new Democratic Technology Alliance (DTA). Bringing together the world's most technologically advanced democracies, such an alliance would foster cooperation across a wide range of the most critical and emerging technologies, including AI, quantum, 5G, biotech, semiconductors, nanotechnology, hypersonics, and others.

The DTA should focus on three major lines of effort. First, it should strengthen innovation ecosystems in the free world through joint research and development, increased data sharing, and forging a common approach to technology regulation. Second, it should limit China's unfair technology advantages by developing common approaches to investment screening, IP theft, export controls, outbound investment, and cybersecurity. Third, the DTA should follow a two-track path for establishing global technology norms: seeking agreement on rules and norms among leading democracies, while also seeking to engage autocratic powers from a unified position of strength to negotiate a more inclusive set of global norms.

Through a new technology alliance, the United States and its allies can work together to ensure that democracies maintain their technological edge and foster new technologies in a manner consistent with democratic values, while acting to uphold the rules-based international system.



China's increasing capabilities in the technology realm pose significant risks for the democratic world. (via REUTERS)

II. STRATEGIC CONTEXT

Challenges to the Rules-Based International System

Following World War II, the United States and its democratic allies established and defended a rules-based international system. The security of the system has been underpinned by US military power and strong alliances in Europe and the Indo-Pacific. Guided by liberal principles at home, leading democracies sought to establish a liberal international system grounded in international institutions, open global markets, and democracy and human rights. A distinctive feature of this system is its sheer density of formal and informal rules as enshrined in international organizations, institutions, and agreements. During the Cold War, this system operated mostly in the West, but it was significantly expanded after the collapse of the Soviet Union, as countries previously behind the Iron Curtain, as well as many other nations in the developing world, adopted democratic capitalism as the best way to structure their domestic political economies.

The rules-based system has been successful far beyond what its founders could have imagined. According to almost every objective measure, the world is more peaceful, prosperous, and free today than prior to 1945. Despite its shortcomings, the system has fueled unprecedented innovations that have dramatically improved living standards for people around the world. However,

this system faces significant challenges today. Revisionist autocracies—Russia and China—are seeking to disrupt and displace it. As they grapple with internal political challenges, many in the West are increasingly uncertain about the model of open-market democracy. At the same time, the emergence of advanced and potentially disruptive technologies, including those often referred to as part of the Fourth Industrial Revolution (4IR), could have profound impacts on the future of the international system.

The Fourth Industrial Revolution

Over the past few centuries, several industrial revolutions have reshaped the human experience. In the First Industrial Revolution (1760 to 1830), the steam engine and waterpower enabled mechanized production. The second (1870 to 1914) saw electric power revolutionize mass production and railroads and telegraphs increase global connectivity. The third, also known as the Digital Revolution (1980 to present), witnessed the development of personal computers, the internet, smartphones, and a range of other digital technologies. All three fundamentally altered important aspects of the human experience, including for militaries, economies, societies, and geopolitics.

The world is now entering a Fourth Industrial Revolution. This concept gained widespread use after a 2015 article

published by Klaus Schwab in *Foreign Affairs*.² The founder of the World Economic Forum, Schwab has suggested that the current period in technological development is characterized by “a fusion of technologies that is blurring the lines between the physical, digital, and biological spheres.”³ The exponential pace of change, the impact of these new technologies on nearly every industry in every country, and the massive transformative power of these changes suggest that a “Fourth Industrial Revolution” is now taking shape.⁴

The 4IR features the development of numerous cutting-edge technologies. As with previous advances, these new technologies offer great promise but also threaten serious downside risks. Fire can fuel stoves and keep people warm but can also be used to torch villages. AI can be used to guide driverless cars and aid radiologists in spotting disease, or they can be used to help authoritarians spy on their populations and control killer robots. Additive manufacturing can be used to “make anything anywhere,” including medical equipment for hospitals, or components for nuclear weapons.⁵ Advances in biotechnology and gene editing can facilitate more effective tailored medicine, or more lethal bioweapons. Hypersonic technology may enable high-speed international travel, or missiles that can travel over five times the speed of sound and evade missile defenses. A key challenge facing the world is how can humanity best harness the upside potential of these technologies while managing their downside risks?

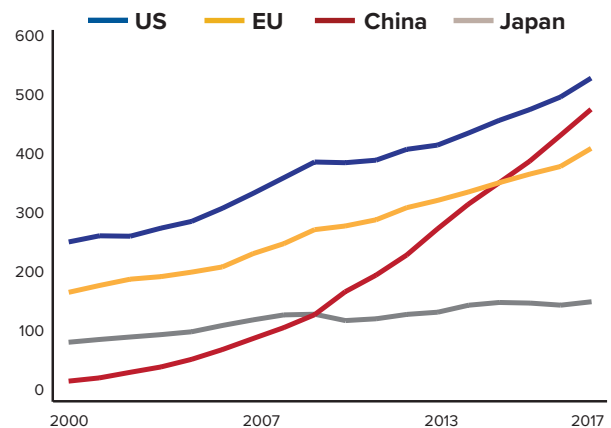
Democracy Versus Autocracy in the New Technology Race

Like the previous industrial revolutions, the 4IR will have major implications for geopolitics. The First and Second Industrial Revolutions originated in Western Europe and the third was led by the United States, which helped propel the West to a global leadership position over the past several centuries. The winner in the race for the new technologies of the 4IR will enjoy similar advantages. Economists predict that this suite of technologies will transform the global economy and that the firms and companies at the forefront of these developments will likely reap significant economic gains. Military strategists predict that the world may be on the verge of a new revolution in military affairs, and the

country that is first able to harness the new technologies of the 4IR and develop the operational concepts to employ them on the battlefield could achieve a decisive military advantage. As has been witnessed throughout history, technology often fuels economic and military strength, and can prove determinative in terms of geopolitical power.

China has gained significant advantages that may position it to become the leading global power in several technological domains over the next two decades. US intelligence officials have assessed that Beijing is actively working to become the world’s leader in AI and biotech-

Gross domestic expenditures on R&D



(billions of PPP dollars)

Source: National Science Board, 2020^a

nology.⁶ Under a program previously known as Made in China 2025, the CCP has begun to implement a systematic plan to dominate the new technologies of the 4IR. Eric Schmidt, the former CEO of Google, suggested China is now a “full-spectrum peer competitor” of the United States in the AI domain.⁷

China has invested heavily in research and development (R&D), and its academic institutions are producing a steady stream of science, technology, engineering, and mathematics (STEM) degrees. Compared to the United States, according to one study, China is graduating four times as

2 Klaus Schwab, “The Fourth Industrial Revolution: What it Means and How to Respond,” *Foreign Affairs*, December 12, 2015, <https://www.foreignaffairs.com/articles/2015-12-12/fourth-industrial-revolution>.

3 Ibid.

4 Ibid.

5 Matthew Kroenig and Tristan Volpe, “3-D Printing the Bomb? The Nuclear Nonproliferation Challenge,” *Washington Quarterly*, Fall 2015, https://csis-website-prod.s3.amazonaws.com/s3fs-public/legacy_files/files/attachments/151105_Presentation_Volpe.pdf.

6 Zachary Basu, “Officials Warn 5 Key Tech Sectors Will Determine Whether China Overtakes U.S.,” *Axios*, October 22, 2021, <https://www.axios.com/2021/10/22/china-advanced-tech-dominance-ai-quantum>.

7 Graham Allison et al., *The Great Tech Rivalry: China vs the U.S., Avoiding Great Power War Project*, Belfer Center for Science and International Affairs, Harvard Kennedy School, December 2021, 5, https://www.belfercenter.org/sites/default/files/GreatTechRivalry_ChinavsUS_211207.pdf.

many bachelor's students with STEM degrees and is on track to graduate twice as many STEM PhDs by 2025.⁸ Education in AI and emerging technology is being highly prioritized. The CCP has created a civilian-military technological ecosystem that merges commercial companies, university research laboratories, the military, and the central government, allowing the Chinese government to closely guide technological development priorities.⁹

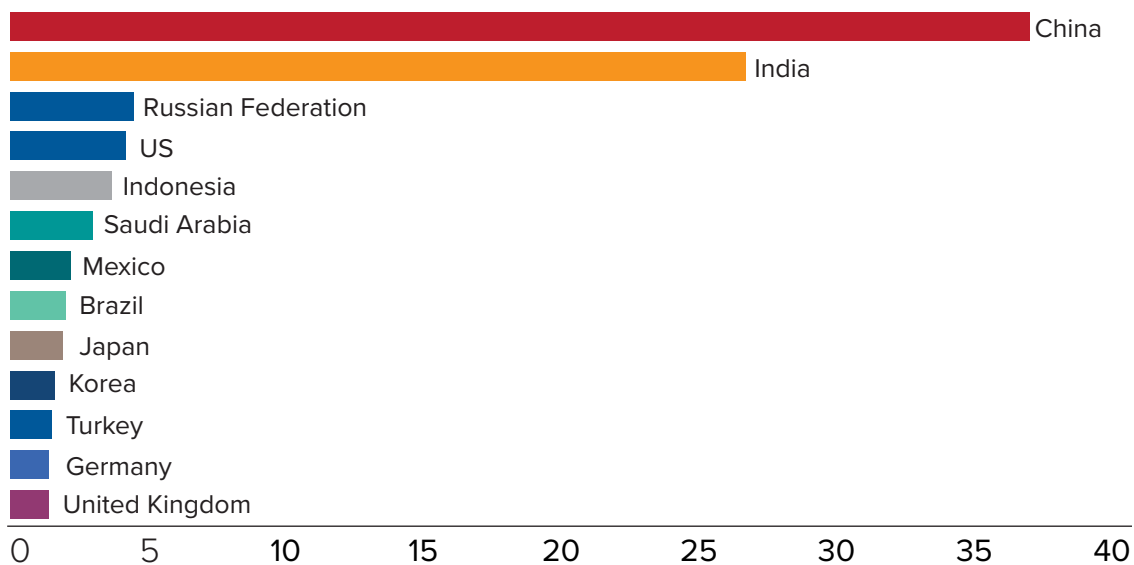
Chinese government investments in R&D and STEM education have been important, but they do not fully account for China's precipitous rise as a technology powerhouse. To achieve its goals, the CCP has also been engaging in unfair trade and technology practices that violate international law and norms. For decades, the CCP has conducted a widespread campaign of appropriating intellectual property (IP) from the West – one that FBI Director Christopher Wray labeled a “theft on a scale so massive that it represents one of the largest transfers of wealth in world history.”¹⁰ Common Chinese practices include cyber intrusion to steal IP; purchasing Western companies for the sole purpose of exploiting access to the IP; and engaging in forced technology transfer in which Western firms are required to partner with, and turn over technologies to, local Chinese companies in order to access Chinese markets – a practice that often results in

the Chinese partner producing the technology locally and forcing the Western firm out of the market. The CCP's “military-civil fusion” program requires Chinese companies and citizens, anywhere in the world, to share useful technology with the People's Liberation Army (PLA).

In addition, China has provided significant government subsidies to its technology giants, such as Huawei, Alibaba, Tencent, and ByteDance, which gives them an unfair advantage in global markets, and runs contrary to international trade rules. Many governments have chosen Huawei 5G over Western competitors not so much because of its technology, but because it is more affordable due to these subsidies.

China's increasing capabilities in the technology realm pose significant risks for the United States and its democratic allies and partners. These risks are evident in three main areas: defense and national security, economics, and values. First, in the defense and national security arena, China is using its increasingly advanced technological capabilities to develop advanced weapons systems. China's development of hypersonic weapons could enable it to evade US missile defenses, and the Defense Intelligence Agency has warned Beijing is seeking to develop directed-energy weapons “to disrupt, degrade,

STEM Graduates



Projected percentage share of graduates with STEM degrees in 2030

Source: OECD, 2015^b

⁸ Ibid., 6–7.

⁹ Kelley M. Saylor, Emerging Military Technologies: Background and Issues for Congress, Congressional Research Service, updated April 6, 2022, 5–6, <https://sgp.fas.org/crs/natsec/R46458.pdf>.

¹⁰ Wray, “The Threat Posed by the Chinese Government.”

or damage satellites and their sensors and possibly already has a limited capability to employ laser systems against satellite sensors.”¹¹ In the event of a conflict, these weapons could be used to undermine US and allied command, control, and communications on the battlefield.

China’s increasing capabilities in the technology realm pose significant risks for the United States and its democratic allies and partners.

Relatedly, there are clear national security risks for democracies that depend on China for the most important technologies of the twenty-first century. Huawei 5G provides a prime example. Data flowing over China’s 5G networks could make its way back to Beijing to assist the CCP in espionage. There is already evidence that Huawei’s digital technology at the African Union is being used for such a purpose.¹² In addition, Western countries relying on Chinese technology could be vulnerable to coercion or cyberattack. If, for example, China was to take a provocative action, such as invading Taiwan, it might succeed in deterring intervention by other countries by threatening to shut down or disrupt those nations’ digital systems. Given that 5G infrastructure is expected to run the smart cities of the future, such an attack could result in significant economic loss and physical destruction. Finally, reliance by US allies on Chinese technology poses risks to alliance relationships. The Pentagon cannot risk close military interoperability with a country using Chinese technology in critical systems.

Second, technology dominance could allow China to gain significant advantages on the global economic front. Beijing’s leadership in developing advanced technologies, such as renewable energy or robotics manufacturing, could help fuel China’s economic growth. At the same time, much of the world, including the United States and its allies, could end up becoming dependent on Beijing for these critical technologies.

Third, if autocracies prevail in the race to dominate twenty-first century technologies, it could pose significant

threats to democratic values. China is already employing AI algorithms to develop facial recognition technology and spy on its citizens. With the help of this technology, China has developed an Orwellian social credit score system. Chinese citizens lose credits if they commit anti-social behavior such as jaywalking. If citizens’ scores drop below a certain point, they can lose basic rights, such as the ability to purchase a train ticket. Moreover, China is exporting authoritarianism, selling this technology abroad to assist other dictators in tracking the behavior of their own citizens and cracking down on dissent. By leading the 4IR, China would be in a strong position to shape the norms and standards for the technologies of the twenty-first century.

More broadly, perhaps the greatest competition in the new technology race is over the future of the rules-based system itself. If China succeeds in dominating the key technologies of the twenty-first century, then it will likely reap the significant economic, military, and geopolitical advantages that previous global technology leaders have accrued. China could eventually attain the economic and military capabilities to establish a competing new order more consistent with Chinese autocratic values. The stakes in this new technology race could not be higher.

To be sure, not every aspect of China’s role in developing advanced technology is cause for concern. Efforts by Chinese scholars to develop AI for medical diagnostics, for example, could constructively advance scientific knowledge and provide health benefits for people around the world. The challenges posed by Beijing stem from its disregard of international norms and underlying attempts to displace key elements of the rules-based order.

Moreover, China is not the only challenger in this space. Russia has also invested in efforts to develop and harness advanced technologies. In the AI realm, Russia has focused on military applications such as autonomous vehicles, and it has also developed hypersonic weapons that it deployed for the first time in its invasion of Ukraine,¹³ though US and allied sanctions are impeding Moscow’s efforts in the technology space.¹⁴ Other countries, such as Iran, are also seeking to exploit advanced technologies by, for example, bolstering their cyber-offensive capabilities.¹⁵

11 Saylor, *Emerging Military Technologies*, 17–18.

12 Joshua Meservey, “How China Has Been Using Huawei-Made Cameras to Spy on the African Union Headquarters,” Heritage Foundation, December 23, 2020, <https://www.heritage.org/africa/commentary/how-china-has-been-using-huawei-made-cameras-spy-the-african-union-headquarters>.

13 Saylor, *Emerging Military Technologies*, 6; and Bryan McBurnie, “What to Know About Hypersonic Missiles Russia Is Using in Ukraine,” Axios, March 25, 2022, <https://www.axios.com/2022/03/25/kinzhal-hypersonic-missiles-russia-ukraine>.

14 Doug Palmer, “Tech Sanctions Have Hit Russia Harder Than Expected, Biden Official Says,” Politico, March 30, 2022, <https://www.politico.com/news/2022/03/30/u-s-boasts-99-percent-drop-in-controlled-technology-exports-to-russia-00021785>.

15 Eric Rosenbaum, “Iran Is ‘Leapfrogging Our Defenses’ in a Cyber War ‘My Gut Is We Lose’: Hacking Expert Kevin Mandia,” CNBC, November 18, 2021, <https://www.cnbc.com/2021/11/18/iran-leapfrogging-our-defenses-in-cyber-war-hacking-expert-mandia-.html>.

Calls for a New Technology Alliance

Recognizing the need for democracies to work more closely together, there have been several calls for the establishment of a new democratic technology alliance. A report issued by the Center for New American Security contends that technological leadership by the world's major democracies will be essential to safeguarding democratic values and “to counteract growing investments in and deployments of emerging technologies by authoritarian, revisionist powers.”¹⁶ Andrew Imbrie, Tarun Chhabra, and others suggested, in a Georgetown University report, that the United States needs to collaborate with its allies and partners to “shape the trajectory of artificial intelligence,” and proposed a three-pillar framework for cooperation consistent with those outlined in this report.¹⁷ Others have called for a new grouping of techno-democracies – a “T-12” – that would help

democracies “regain the initiative in global technology competition.”¹⁸ More recently, the British government proposed a “D-10 club of democracies” to focus on technology cooperation, though its reported plans to expand the G7 as a D-10 were deferred.¹⁹

In addition, Congress is considering legislation intended to foster democratic partnerships on emerging technologies. The Democracy Technology Partnership Act, sponsored by Senators Mark Warner (D-VA), Ben Sasse (R-NE), and a coalition of bipartisan senators, would create an inter-agency office at the State Department tasked with coordinating partnerships among the US and other democratic countries to promote research and set standards around emerging technologies.²⁰

16 Martijn Rasser, et al, Common Code: An Alliance Framework for Democratic Technology Policy, Center for New American Security, October 21, 2020, <https://www.cnas.org/publications/reports/common-code>

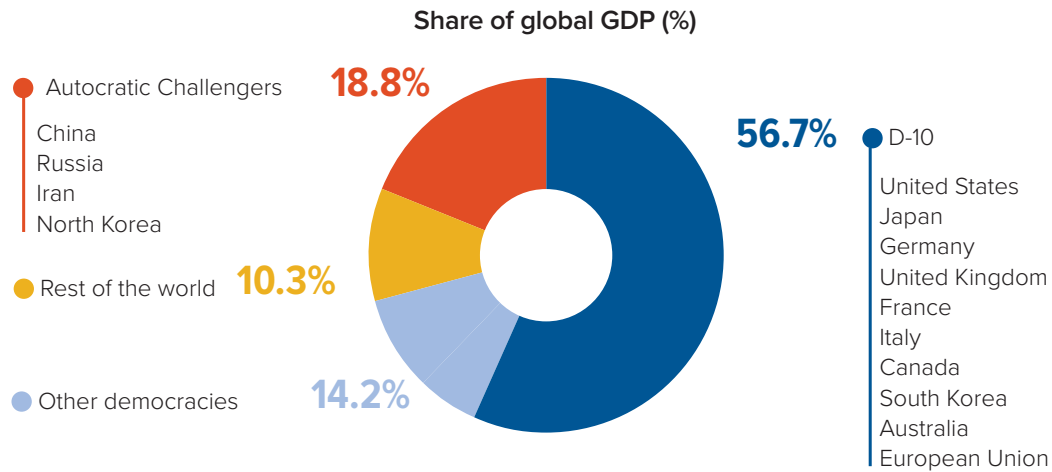
17 Andrew Imbrie, et al, “Agile Alliances: How the United States and Its Allies Can Deliver a Democratic Way of AI,” Center for Security and Emerging Technology, February 2020, <https://cset.georgetown.edu/publication/agile-alliances/>

18 Jared Cohen and Richard Fontaine, Unite the Techno-Democracies, Foreign Affairs, November/December 2020; also see Anja Manuel, “How to Win the Technology Race with China,” Stanford University, June 18, 2019, <https://fsi.stanford.edu/news/how-win-technology-race-china>

19 Lucy Fisher, “Downing Street Plans New 5G Club of Democracies,” *The Times*, May 29, 2020.

20 Maggie Miller, Senators introduce bill creating technology partnerships to compete with China, *The Hill*, March 4, 2021, <https://thehill.com/policy/cybersecurity/541726-senators-introduce-bill-creating-technology-partnerships-to-compete-with/>.

Democracies' Economic Power



Source: World Bank, 2019

III. THE NEED FOR A DEMOCRATIC TECHNOLOGY ALLIANCE

For the United States and its allies to succeed in the long-term strategic competition with autocracies, they must ensure that they win the race for advanced technologies. As described above, harnessing the technologies of the 4IR will be critical for success across the security, economic, and governance domains. The nation or group of nations that succeed in this race will have the ability to develop the most advanced weapons systems, drive sustained economic growth, and propagate the rules and norms for the use of these technologies in ways that are consistent with their own values and models of governance.

But to compete effectively with China and other autocratic rivals, the United States cannot act alone. It must work together with likeminded allies and partners, to leverage shared capabilities and resources and implement strategies and policies that are strategically aligned.

Several efforts have been initiated to help strengthen democratic cooperation on advanced technologies, including through the G7, the Quad, and the US-EU Trade and Technology Council. However, while these efforts are valuable, they are limited in geographic and technological scope. What is missing is an integrated framework for technology cooperation that

brings together leading democracies, under a common umbrella, to advance a comprehensive and coordinated set of strategies across a range of domains.

To compete effectively with China and other autocratic rivals, the United States must work together with likeminded allies and partners to leverage shared capabilities and resources.

The United States and leading democracies across North America, Europe, and the Indo-Pacific should come together and establish a Democratic Technology Alliance (DTA). Such an alliance would foster cooperation across a wide range of the most critical and emerging technologies, including AI, quantum computing, 5G, biotech, semiconductors, clean energy, nanotechnology, hypersonics, and others.

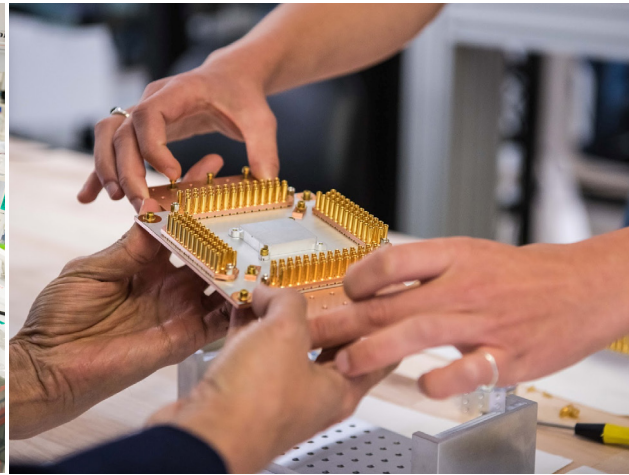
Leading democracies continue to maintain a preponderance of power in the international system. Together, the United States and its D-10 allies and partners possess

nearly 60 percent of global GDP, compared to only 16 percent in China.²¹ If leading democracies work together to accelerate technology innovation, counter China's unfair technology practices, and establish common norms, they will be able to position themselves for success in the broader strategic competition with autocracies.

While fostering technology cooperation among democracies, the DTA could also serve as a coordinating body to engage China and other global powers in areas of

potentially overlapping interest. As it engages in competition, the free world should look for opportunities to cooperate with China and other global powers, and seek to develop common rules and norms for managing the use of technology and mitigating its potentially harmful impacts. Such cooperation can be fostered through entities such as the Group of Twenty (G20), as well as other bilateral and multilateral venues where technology cooperation should be prioritized as a key area for dialogue and engagement.

21 The D-10, as organized by the Atlantic Council, includes Australia, Canada, France, Germany, Italy, Japan, South Korea, the United Kingdom, and the United States, plus the European Union.



Harnessing advanced technologies, such as synthetic biology and quantum computing, will be critical for democracies to succeed. (via REUTERS)

IV. DTA'S PRIMARY LINES OF EFFORT

The DTA should be oriented around three main pillars: (1) strengthening the free world's innovation ecosystem, (2) limiting unfair technology practices by autocratic rivals, and (3) establishing technology rules and norms that are consistent with democratic values.

Pillar One: Strengthen the Free World's Innovation Ecosystem

The first pillar of the DTA would be to strengthen the free world's innovation ecosystem; that is, the network of entities, resources, and structures, including those that support human capital, financing, R&D, and higher education, that join forces in a way that catalyzes new products, ideas, methods, and systems. Winning the new technology race will require sharpening the free world's longstanding innovation edge. Toward that end, the DTA should facilitate cooperation in several areas to spur innovation and enhance technological development in the free world.

PROMOTE JOINT RESEARCH AND DEVELOPMENT

The DTA should help ensure democracies devote sufficient resources to invest in R&D to guarantee that, collectively, these investments are significantly greater than those made by autocratic rivals, and encourage these efforts to be more coordinated and systematic.

As a recent Atlantic Council study noted, the world's top innovators—the United States, South Korea, Germany, Sweden, Japan, and others—also lead in R&D investment.²² The United States has long been the world's largest spender on R&D in aggregate terms, but China is increasing its R&D spending. According to the Organisation for Economic Co-operation and Development (OECD), the United States spent close to 3.5 percent of its GDP on R&D in 2020, while China spent just under 2.5 percent. In dollars, the United States spent \$100 billion more than China.²³ Beijing is increasing its R&D spending, but combined spending by democracies will continue to dwarf China's.²⁴ The challenge is to ensure that these R&D efforts are effectively coordinated.

Recent efforts have sought to promote greater R&D cooperation among the United States and its allies. The 2021 National Defense Authorization Act authorized funds for integrated development of telecommunications and microelectronics technologies between the United States and Japan, which already pursue around one hundred and sixty joint scientific research collaboration projects. The Multilateral Telecommunications Security Fund authorizes the federal government to develop a common funding mechanism with foreign partners “to support the development and adoption of secure and trusted telecommunications technologies,” and specifically names the United Kingdom, Canada, Australia, New Zealand, and Japan as potential partners in this endeavor.²⁵ In addition, a

22 Robert A. Manning and Peter Engelke, *The Global Innovation Sweepstakes: A Quest to Win the Future*, Atlantic Council, June 2018, <https://www.atlanticcouncil.org/wp-content/uploads/2018/06/The-Global-Innovation-Sweepstakes.pdf>.

23 “Gross Domestic Spending on R&D,” OECD, <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>.

24 Arjun Kharpal, “China Spending on Research and Development to Rise 7% Per Year in Push for Major Tech Breakthroughs,” CNBC, March 5, 2021, <https://www.cnbc.com/2021/03/05/china-to-boost-research-and-development-spend-in-push-for-tech-breakthroughs.html>.

25 William M. Thornberry National Defense Authorization Act for Fiscal Year 2021, US Congress, Public Law 116–283—Jan. 1, 2021, p. 1405, <https://www.congress.gov/116/plaws/publ283/PLAW-116publ283.pdf>.

Democracy Technology Partnership Act, which is currently pending in the US Congress, includes provisions aimed at advancing cooperation on R&D among democracies. Among other provisions, it calls for establishing an international Technology Partnership Fund “to support joint research projects between government research agencies, universities, technology companies and other businesses from partner countries.”²⁶

The DTA should build on these examples of R&D cooperation among democracies and develop integrated plans for the development of technologies critical for winning the new technology race. According to the OECD’s 2020 data, a majority of G7 countries and the European Union (EU) spend more than 2 percent of their GDP annually on R&D, but not all are all at this level.²⁷ DTA members should consult on establishing a joint commitment to spending a minimum percentage of their GDP on R&D. The DTA should facilitate joint R&D projects that marry the scientific and technological strengths of different democratic nations. Allies could also contribute to a fund that would be allocated to supporting the most promising research efforts anywhere in the free world. By taking these steps, the DTA can ensure that the whole of democracies’ R&D efforts is greater than the sum of its parts and propel the free world to a new century of technological leadership.

DEVELOP HUMAN CAPITAL

Innovation requires human capital, and the DTA should support efforts by member countries to cultivate this critical resource. STEM education, complemented by critical thinking skills, is essential to advancing groundbreaking innovation.

The free world appears to be falling behind on this front. The United States retains one of the world’s best university systems, which continues to attract top-notch students in the technology field from around the world. Other leading democracies, particularly in Europe, also serve as destinations for large numbers of foreign students. However, China now produces more STEM graduates than any other country, and this lead is projected to grow over the coming years.²⁸ Indeed, many of China’s best technologists were

trained in the West. While the quality of education in many Chinese universities is uneven, the sheer number of researchers that China has now dedicated to scientific R&D could challenge the ability of the free world to maintain technological leadership.

The DTA should work to ensure that the free world maintains a deep reserve of human capital. It could do so by pooling resources among member countries to support academic scholarships and competitive grants for the study of critical technologies.²⁹ The DTA could also look to increase exchange programs to ensure a steady flow of ideas and collaboration across borders and between institutions of higher education. The DTA could facilitate regular exchanges of information on STEM education, especially in higher education, so members can identify best practices for sustaining strong universities and high graduation rates in those subjects. Such exchanges could also focus on confronting the challenge of economic displacement where technology and automation replace jobs previously held by humans, including by identifying successful initiatives that prioritize job-retraining programs.³⁰

In addition, the United States and its allies benefit greatly from attracting talent from abroad, and the DTA should facilitate dialogues on ways to improve immigration policies that allow highly-skilled professionals in the technology field to work in member nations.

INCREASE DATA SHARING

China, which possesses the world’s largest population, lacks legal protections for privacy, thereby giving the CCP and China’s technology sector access to a vast, in-house pool of data for improving AI, among other applications. Several analysts have suggested that “data is the new oil,” and China is the “Saudi Arabia of data.”³¹ To be sure, AI innovation depends significantly on how data are processed, as well as on how much data are available. China has a substantial advantage in the latter given its size. Acting in concert, however, democracies can counteract that advantage, even as they maintain legal protections to secure privacy and respect the rights of citizens.

26 “Democracy Technology Partnership Act,” Mark R. Warner, US Senator from the Commonwealth of Virginia, accessed May 31, 2022, https://www.warner.senate.gov/public/_cache/files/8/9/895e0a40-65ee-43cc-8629-450555faefe7/AC6A0E54DB992E1612161C48BB34FC57.democracy-technology-partnership-act-two-pager-explainer.pdf.

27 Other partners, such as Sweden, spent more than 3.5 percent of GDP, while South Korea spent almost 5 percent of GDP on R&D in 2020. See “Gross Domestic Spending on R&D,” OECD, accessed May 31, 2022, <https://data.oecd.org/rd/gross-domestic-spending-on-r-d.htm>.

28 “How is the Global Talent Pool Changing (2013, 2030),” Education Indicators in Focus, OECD, April 2015, [https://www.oecd.org/education/skills-beyond-school/EDIF%2031%20\(2015\)-ENG-Final.pdf?fbclid=IwAR3dtAkSdSwRxU2qh8u9aWJEzRmeCVyL38uS54hy2ibuZ-4VZ2TgYEgSm0k](https://www.oecd.org/education/skills-beyond-school/EDIF%2031%20(2015)-ENG-Final.pdf?fbclid=IwAR3dtAkSdSwRxU2qh8u9aWJEzRmeCVyL38uS54hy2ibuZ-4VZ2TgYEgSm0k), see Figure 2.

29 Manning and Engelke, *The Global Innovation Sweepstakes*, 62–63.

30 Peter Engelke and Robert A. Manning, *Keeping America’s Innovative Edge: A Strategic Framework*, Atlantic Council, April 2017, 31, <https://www.atlanticcouncil.org/in-depth-research-reports/report/keeping-america-s-innovative-edge-2/>.

31 James Ryseff, “The United States Can Only Achieve AI Dominance with Its Allies,” *War on the Rocks*, October 9, 2020, <https://warontherocks.com/2020/10/the-united-states-can-only-achieve-ai-dominance-with-its-allies/>.

The DTA should seek to establish a common data pool for AI development in the free world. The EU has shown what a first step toward creating a common data pool for AI development can look like with the passage of the Data Governance Act. The act allows for the creation of common European data spaces relating to areas such as the environment and finance while also regulating the data marketplace between private sector companies.³² Applying a data framework that encourages sharing across the DTA will require the trust of all involved, and here the DTA should work to establish an entity that can secure and maintain the data shared amongst its members.

The United States and the EU ran into a stumbling block on data regulation after an EU Court of Justice ruling invalidated a mechanism for sharing data outside the EU.³³ Earlier this year, however, they announced an agreement on data privacy and data flows to remedy the challenge raised by the ruling. The United States agreed to new measures that would protect EU personal data privacy.³⁴ Despite divergent approaches to tech regulation, including in the realm of data protection, the US-EU resolution on this issue suggests that DTA members could overcome barriers to data sharing, even absent symmetrical regulatory frameworks.³⁵

DEVELOP A COMMON APPROACH TO TECHNOLOGY REGULATION

The DTA should work to develop common regulatory frameworks to ensure that democratic countries properly address antitrust, privacy, and other concerns, while also ensuring that regulation does not unduly hamper the free world's technological competitiveness. The proliferation of new technologies raises questions of regulation on issues ranging from antitrust to privacy. Diverging approaches to regulation between leading democracies, however, has led to friction among allies. In addition, the EU's Digital Markets Act has caused some concern in the United States, as the proposed regulation would disproportionately affect

several large US tech companies, while not applying to Russian or Chinese firms.³⁶

The DTA should facilitate greater coordination on these and related regulatory issues in the technology arena. This effort should begin with sustained continued dialogue on key issues related to technology regulation, with a gradualist approach that could build habits of cooperation over time.

SECURE SUPPLY CHAINS

The DTA should take steps to ensure democracies have robust and secure supply chains for advanced technology that are not dependent on autocracies, especially China. China dominates the global lithium-battery supply chain, producing 76 percent of the world's lithium-oxide and hydroxide exports.³⁷ China also provides more than 60 percent of the world's rare-earth metals, which are essential for the manufacture of electric-car batteries, satellites, weapons, wind turbines, and solar panels.³⁸ For much of the latter part of the twentieth century, the United States was the premier producer of rare earth elements, but by the 2010s, China has become the dominant global supplier. In 2019, the United States was 100% net import reliant on rare-earth elements. The United States and its allies are reliant on China for critical elements that are needed for everything from cell phones and electric vehicles to fluorescent lights and missile guidance systems.

To address these vulnerabilities, the United States should look to establish more resilient supply chains by relying on "ally shoring"—sourcing essential goods and services with countries that share democratic values and a commitment to an open, rules-based international order.³⁹ The DTA could facilitate efforts to reduce dependences on China and Russia in the area of critical technology supply chains. Through the use of financial incentives, including grants and tax breaks, the DTA could incentivize the shifting of supply chains away from these autocracies and toward

32 "Data Governance: Why Is the EU Data Sharing Law Important?" European Parliament News, April 6, 2022, <https://www.europarl.europa.eu/news/en/headlines/society/20220331STO26411/data-governance-why-is-the-eu-data-sharing-law-important>.

33 Blanka Soulaiva, Hamish Cameron, and Victoria Ying, Data Rules for Machine Learning: How Europe Can Unlock the Potential While Mitigating the Risks, Atlantic Council, November 2021, <https://www.atlanticcouncil.org/in-depth-research-reports/report/data-rules-for-machine-learning-how-europe-can-unlock-the-potential-while-mitigating-the-risks/#part-one>.

34 "Fact Sheet: United States and European Commission Announce Trans-Atlantic Data Privacy Framework," White House, March 25, 2022, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/03/25/fact-sheet-united-states-and-european-commission-announce-trans-atlantic-data-privacy-framework/#:~:text=The%20United%20States%20and%20the,decision%20underlying%20the%20EU%20U.S>.

35 Morten Skroerjer and Nicole Lawler, "Can the US and EU Rein in Big Tech with Diverging Approaches?" New Atlanticist, Atlantic Council, January 20, 2022, <https://www.atlanticcouncil.org/blogs/new-atlanticist/can-the-us-and-eu-rein-in-big-tech-with-diverging-approaches/>.

36 Evelyn N. Farkas, "To Counter China, the U.S. and EU Need to Get Back on the Same Page – Fast," *Politico*, September 20, 2021, <https://www.politico.com/news/agenda/2021/09/20/digital-markets-act-eu-china-us-512602>.

37 "Global Lithium Market: China is Unlikely to Tap into Afghanistan's Resources Fast," GlobeNewsWire, November 4, 2021, <https://www.globenewswire.com/news-release/2021/11/04/2327800/0/en/Global-Lithium-Market-China-is-Unlikely-to-Tap-into-Afghanistan-s-Resources-Fast-IndexBox.html>.

38 Jevans Nyabiagi, "China's Dominance of Rare Earth Supply Is a Growing Concern in the West," South China Morning Post, April 25, 2021, <https://www.scmp.com/news/china/diplomacy/article/3130990/chinas-dominance-rare-earths-supply-growing-concern-west>.

39 Dezenski and Austin, "Rebuilding America's Economy and Foreign Policy with 'Ally-Shoring.'" See also Ash Jain and Mathew Kroenig, "A Democratic Trade Partnership: Ally Shoring to Counter Coercion and Secure Supply Chains," Atlantic Council, June 2022.

more trusted and reliable member states. It could also consider creating a joint fund that would provide incentives to corporations that relocate production facilities to allied states.

DTA members can also shape technology production through procurement practices. Governments are important technology customers, particularly for those with defense applications, and they can use this influence to stimulate the development of emerging technologies and support businesses in allied countries. This could include a commitment by defense departments and ministries to only procure defense systems made with semiconductors fabricated in democracies. DTA members could employ similar “buy democratic” provisions to encourage private investment in the rare earths sector, and they could coordinate on public support for research into mapping mining capacity and lowering extraction costs.

Participating countries would benefit from secure supply chains and from bringing manufacturing jobs back home. The DTA could coordinate such efforts to ensure they are implemented in a more systematic way, so that member states can benefit from cross-national comparative advantages. In the area of semi-conductors, for example, China, which currently produces only 12 percent of the global supply, has invested in efforts to expand its global market share. In response, leading democracies have begun to take steps to accelerate domestic production. The EU has proposed a comprehensive set of measures to ensure the “supply, resilience and technological leadership in semiconductor technologies and applications.”⁴⁰ In autumn 2021, Quad partners announced they would launch a joint initiative to “map capacity, identify vulnerabilities, and bolster supply chain security for semiconductors.”⁴¹ The Biden administration has announced measures to encourage new investments in semi conductors, and the US Congress is currently working on legislation known as the America COMPETES Act that would authorize more than \$50 billion in subsidies to promote domestic semiconductor manufacturing. In addition, Representatives Michael McCaul (R-TX) and Doris Matsui (D-CA) co-sponsored legislation that aims to foster more secure semiconductor

supply chains.^{42,43} The DTA could play a leading role in encouraging and coordinating similar efforts across other critical technology sectors.

Pillar Two: Limit Unfair Technology Practices by Autocratic Rivals

The second pillar of the DTA would focus on constraining unfair technology practices by autocratic rivals, particularly China. As discussed above, China has become a global technology leader in large part by systematically engaging in unfair trade and technology practices that violate international law and norms. Leading democracies need to develop a more coordinated and sophisticated response to counteract China’s unfair practices. But the key to success is for leading democracies to work in unison. Without effective coordination on each of the measures described below, China may seek to exploit the weakest links in the chain. On export controls, for example, if only the United States or the EU have put in place strong export controls to prevent rival autocracies from buying critical technology, China may be able to acquire the same technology from nations that lack similar controls.

COMMON FOREIGN INVESTMENT SCREENING MECHANISMS

The DTA should develop common foreign investment screening mechanisms. Leading democracies should make it much more difficult for autocratic rivals to gain a technology advantage by purchasing sensitive technologies in the free world.

Several important steps have already been taken in this direction. In 2018, the US Congress passed the Foreign Investment Risk Review Modernization Act (FIRRMA) to strengthen the resources and authority of the Committee on Foreign Investment in the United States (CFIUS). In addition, other democratic partners, including Sweden and Israel, have proposed laws or implemented measures to monitor foreign investment.⁴⁴ An EU foreign direct investment (FDI) screening mechanism became fully operational in 2020.⁴⁵

40 European Commission Press Release, February 8, 2022, https://ec.europa.eu/commission/presscorner/detail/en/ip_22_729.

41 “Fact Sheet: Quad Leaders’ Summit,” White House, September 24, 2021, <https://www.whitehouse.gov/briefing-room/statements-releases/2021/09/24/fact-sheet-quad-leaders-summit/>.

42 “Fact Sheet: Securing a Made in America Supply Chain for Critical Minerals,” White House, February 22, 2022, <https://www.whitehouse.gov/briefing-room/statements-releases/2022/02/22/fact-sheet-securing-a-made-in-america-supply-chain-for-critical-minerals/>.

43 See “Analysis for CHIPS Act and BIA Briefing,” Department of Commerce, April 6, 2022, <https://www.commerce.gov/news/press-releases/2022/04/analysis-chips-act-and-bia-briefing>.

44 “Sweden – Proposal for New Foreign Direct Investment Screening Rules,” Mannheimer Swartling, November 26, 2021, <https://www.mannheimerswartling.se/en/publications-and-newsletter/sweden-proposal-for-new-foreign-direct-investment-screening-rules/>; and Steven Scheer, “With Eye to China, Israel Forms Panel to Vet Foreign Investments,” Reuters, October 30, 2019, <https://www.reuters.com/article/us-israel-investment-panel/with-eye-to-china-israel-forms-panel-to-vet-foreign-investments-idUSKBN1X926T>.

45 European Commission, EU foreign investment screening mechanism becomes fully operational, press release, October 9, 2020, https://ec.europa.eu/commission/presscorner/detail/en/ip_20_1867.

There is, however, more work to be done. Many democracies lack adequate FDI screening mechanisms.⁴⁶ Moreover, standards for FDI screening vary across nations. It is possible, for example, that Israel would deny a Chinese investment into an AI company with a specific application, but that the United States would permit it. This unevenness allows autocratic rivals to gain advantages by exploiting gaps in the system.

The DTA should bring leading democracies together to ensure that all have adequate FDI screening mechanisms in place, and to help develop common standards for approving FDI in sensitive technological areas.

COMMON EXPORT CONTROL STANDARDS

The DTA should seek to coordinate a common set of export control standards for advanced technologies. While the United States and its allies have developed common export control lists for sensitive technologies that could lead to the spread of nuclear weapons, for example, export control standards for the broader slate of emerging technologies are uneven and uncoordinated. Moreover, the standards for balancing commercial and national security interests related to the export of dual-use technologies vary widely among leading democracies, leading to situations where the same types of technology may be denied by one country and permitted by another. Furthermore, the cat and mouse game that exists with regard to updating export control lists provides additional opportunities for rival autocracies to exploit. The US Commerce Department, for example, has placed Huawei on its Consolidated Screening List, but Huawei Marine Networks, a company dealing with underwater cables, rebranded as HMN Technologies, is not currently on the list.

To address these challenges, the DTA should seek to harmonize export control regulations, including screening standards and lists of controlled items and entities. The US National Science and Technology Council's control list of emerging technologies should be a starting point for these lists.⁴⁷

COMMON APPROACH TO REGULATING OUTBOUND TECHNOLOGY INVESTMENTS

The DTA should also seek to develop a common approach to regulating outbound technology investments to ensure that Western companies are not subsidizing—directly or indirectly—China's efforts to develop advanced technologies, including those that could be used for military purposes. Under the existing framework, for example, Chinese technology companies, including those that work with the PLA to design weapons, are able to benefit from foreign investments that help accelerate their research and development efforts. This includes direct investments by multilateral corporations that entail joint partnerships with local Chinese companies, which often require them to transfer technological information as a condition of doing business. It also includes indirect investments, whereby institutions and individuals in leading democracies make portfolio investments that include companies in China's technology sector.

Partly in response to these concerns, the US Congress is currently considering legislation that could address these concerns by prohibiting investment from the United States into China's technology sector.⁴⁸ There are several issues that legislative efforts along these lines will need to address. Should all investment in Chinese technology be banned? Does it make sense to ban all technology-related investments or only those with firms producing technologies with a clear military application? Who will decide what crosses the line? Should the legislation specify the list of prohibited investments, or simply provide general guidelines and turn to the executive branch for the specifics? As a first step, companies should be required to disclose investments in China to help map the scale and nature of the problem, and pave the way for future legislation that imposes restrictions.

Moreover, such legislation alone will not be sufficient. A unilateral approach would disproportionately harm US investors, while failing to prevent Chinese companies from obtaining foreign investments in technology. A more effective solution requires a coordinated free-world approach to restrict investments in China's technology sector, a role that the DTA could facilitate.

46 Léon Korsten et al., Multi-Jurisdiction Guide for Screening Foreign Investments, DLA Piper, May 26, 2021, <https://www.dlapiper.com/en/belgium/insights/publications/2021/05/multi-jurisdiction-guide-for-screening-foreign-investments/>.

47 Technologies on the list include: advanced computing, advanced engineering materials, advanced gas turbine, engine technologies, advanced manufacturing, advanced and networked sensing and signature management, advanced nuclear energy technologies, artificial intelligence, autonomous systems and robotics, biotechnologies, communication and networking technologies, directed energy, financial technologies, human-machine interfaces, hypersonics, networked sensors and sensing, quantum information technologies, renewable energy generation and storage, semiconductors and microelectronics, and space technologies and systems.

48 Gavin Bade, "We're in an Economic War: White House, Congress Weigh New Oversight of U.S. Investments in China," Politico, February 19, 2022, <https://www.politico.com/news/2022/02/19/china-investments-economy-us-congress-00008745>.

COMMON APPROACH TO COUNTERING INTELLECTUAL PROPERTY THEFT

China has built a research and technology development strategy premised on the theft of large volumes of IP from the free world, especially the United States. The CCP relies on cyber intrusions, among other techniques including human and “open source” intelligence, to pilfer technical data, trade secrets, and other proprietary information from Western companies. Chinese intelligence agencies recruit individuals with access to sensitive data in Western technology firms, military organizations, and academic research programs, and persuade them to share that information with China.

China’s “thousand talents” program also serves as a means for China to bribe technologists living abroad to share technology with China—either by coming to work in China or simply handing over the technology to Chinese companies. Chinese spies are prioritizing a wide range of sensitive technologies, including biotech, nanotech, agricultural technology, and quantum computing. Nearly 80 percent of US economic espionage prosecutions are related to theft to benefit China.⁴⁹ The estimated cost of China’s IP theft for US businesses is several hundred billion dollars per year.⁵⁰ Chinese IP theft is also damaging to the ability of the free world to uphold a rules-based system in that it simultaneously undercuts the West’s innovation advantages as it boosts China’s innovation potential.

In response, the DTA should work to ensure that all members have a common set of economic espionage laws that prohibit China’s unfair activities. These laws should include provisions to protect liberal traditions of open inquiry even while rigorously countering Chinese espionage activities. In addition, and more importantly, DTA members should make it a priority to investigate and prosecute Chinese firms and individuals involved in IP theft where feasible, especially those that have a physical presence in DTA member states.

Furthermore, DTA members should continue to drive cooperation in cybersecurity activities, sharing information on known Chinese threat actors and working collectively to detect and deter cyber espionage. These efforts can center on existing best practices and standards, such as the National Institute of Standards and Technology’s (NIST’s) Cybersecurity Framework, as a basis for common

defensive measures across the DTA. A concerted effort by DTA countries to lower barriers to law enforcement intelligence sharing and cooperation could also be effective on this issue.

COUNTERVAILING MEASURES FOR UNFAIR TECHNOLOGY SUBSIDIES

China creates an unfair playing field in the technology sector by providing subsidies to its technology giants, such as Huawei, Alibaba, and Tencent, giving them an advantage in global markets. These companies, like Huawei, can offer cheaper products due to significant subsidies, enabling them to beat out competition. China has also sought to bolster key industries, such as semiconductors. Between 2010 and 2020, for example, Chinese government subsidies to the semiconductor industry increased twelvefold.⁵¹

To counter this, as previously mentioned, the US Congress is currently working on the America COMPETES Act that would authorize more than \$50 billion in subsidies to promote domestic semiconductor manufacturing, in addition to tens of billions of dollars toward strengthening supply chains promoting R&D. Trade ministers from the G7 countries have also pledged to challenge “harmful industrial subsidies.”⁵² The EU has taken steps to ramp up its semiconductor manufacturing capacity while South Korea and Japan have pursued similar efforts.⁵³

Coordinating through the DTA, democracies should balance a subsidies-based approach to counteracting China’s practices with leveraging the advantages of an open market. Open-market democracies have a proven innovation model that has long been more effective and efficient than state planning. Apart from subsidies, DTA members can encourage the development of key technologies through procurement practices. As noted above, governments can use their influence as important technology customers to stimulate the development of emerging technologies and support businesses in allied countries. While democratic governments are playing a more active role in bolstering technology efforts, it is also important to keep in mind the inherent risks of such industrial policies, which could lead to governments trying to pick winners and losers, potentially undermining free-market innovation.

49 Editorial Board, “America is Struggling to Counter China’s Intellectual Property Theft,” *Financial Times*, April 18, 2022, <https://www.ft.com/content/1d13ab71-bffd-4d63-a0bf-9e9bdfc33c39>.

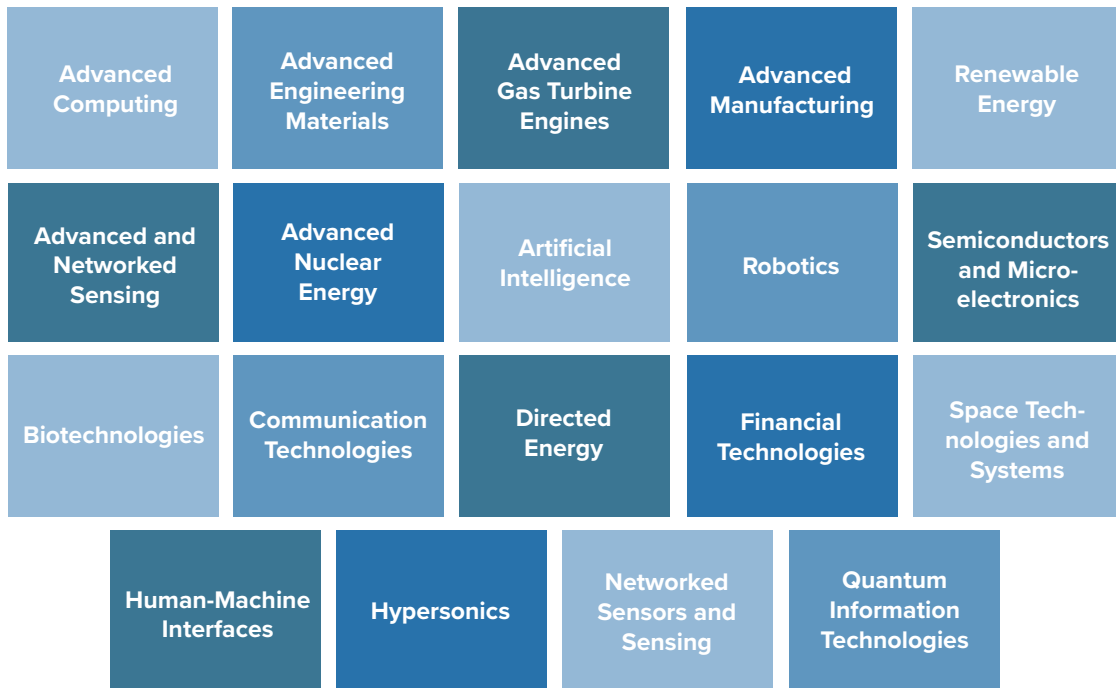
50 *Ibid.*

51 Yusho Cho, “Eyeing US, China Wields \$33bn Subsidies to Bolster Chips, Defense,” *Nikkei*, May 17, 2021, <https://asia.nikkei.com/Politics/International-relations/US-China-tensions/Eyeing-US-China-wields-33bn-subsidies-to-bolster-chips-defense>.

52 *Ibid.*

53 Ip, “‘Industrial Policy’ is Back.”

Critical and Emerging Technologies Key Domains for Competition



Source: US National Science and Technology Council ⁶

Moreover, the DTA should promote production in advanced-technology industries, including by coordinating on measures such as financial incentives to encourage companies to build capital-intensive facilities and produce emerging technologies in allied countries. DTA members may consider creating a bank or joint funding mechanism to support companies that open or transfer operations in member states.

The DTA could also consider additional coordinated measures to counteract Chinese subsidies. While neither the DTA nor China stand to benefit from a long-lasting trade war, tariffs could help offset the financial advantages Chinese companies derive from state subsidies.

Pillar Three: Establish Rules and Norms for Twenty-First Century Technologies

The third pillar of the DTA would focus on establishing common rules and norms for the technologies of the twenty-first century. To ensure that new technologies are designed and utilized in a manner that is consistent with democratic values, leading democracies should come together to negotiate shared standards related to AI,

biotechnology, directed energy, cyberspace, and other key technologies of the 4IR.

The DTA's efforts to establish global norms for new technologies would entail two distinct phases. First, the leading democracies should seek an agreement amongst themselves on appropriate rules and norms for specific areas of advanced technology. Such rules and norms should be developed, and subsequently implemented, in close coordination with industry representatives. The leading democracies have enormous market and regulatory power, and an agreement on such rules and norms could be influential in establishing global standards.

Second, the DTA should seek to engage a more inclusive group of global powers, including China and Russia, to determine if it is possible to develop common rules and norms for these technologies. Even if agreement in specific areas proves to be out of reach in the short-term, a dialogue on the challenges posed by advanced technologies, including how to mitigate potentially dangerous or unethical applications, could be useful over time. Indeed, as the authors have proposed in a previous strategy paper, this two-step approach is the best way to handle negotiations on a wide range of issues in order to revitalize and adapt a rules-based international system.⁵⁴

⁵⁴ Jain and Kroenig, *Present at the Re-Creation*.

Some argue for the opposite approach: that the United States and China, as the world's two leading economies and technology leaders, should first seek to negotiate shared rules and norms and then engage other nations across the world. Washington and Beijing, however, may simply be too far apart to reach a meaningful agreement on such rules. Moreover, the United States would be in a stronger negotiating position if it is able to reach a consensus among leading democracies on establishing such rules before it engages with China and other autocracies.

In several areas of technology, such as AI, there are existing multilateral efforts already under way to help develop common standards among leading democracies. The DTA should not supplant these efforts; rather it would oversee and coordinate these efforts, while developing new avenues for dialogues in areas that are currently not being addressed.

ARTIFICIAL INTELLIGENCE

AI raises many ethical dilemmas. How comfortable is humankind outsourcing important decisions to machines without a human in the loop? This is a question in many domains, including in medicine and transportation, but nowhere are the issues starker than in the military sphere. National militaries are already incorporating AI into weapons systems. On the horizon is the possibility of lethal autonomous weapons systems (LAWS) that can find and destroy human targets without a human in the loop. Are humans comfortable giving machines the ability to choose whether to take a human life on the battlefield? How could designers ensure that such usage would be consistent with international law, which requires military strikes to be discriminate and proportionate? On the other hand, the use of AI in weapons systems promises military effectiveness and the reduction of risk to human personnel. There is even discussion of incorporating AI into nuclear command and control, meaning that, conceivably in the future, the decision to order a nuclear attack could be taken by a machine. How can democratic societies balance these concerns?

Another potentially harmful application of AI is in facial recognition technology. These technologies have advanced greatly in recent years and are employed in many ways, such as in airport screening, to make airports more secure and humans' lives more efficient. But there

are also nefarious applications. As mentioned above, China is employing this technology to monitor its citizenry in an Orwellian fashion, and it is exporting this technology to other authoritarian governments. How can democratic societies benefit from this technology while ensuring that privacy and other basic rights are protected?

There are a number of current efforts to establish norms for AI, both among democracies and more inclusive groupings. For example, the OECD developed an inter-governmental set of principles concerning AI that seek to “promote artificial intelligence (AI) that is innovative and trustworthy and that respects human rights and democratic values.”⁵⁵ More than forty countries, including several non-OECD members, have adopted these principles.⁵⁶ In addition, NATO released an AI strategy in October 2021 that, in part, aims to “set standards for responsible use of artificial intelligence.”⁵⁷

The DTA should foster and coordinate existing efforts on the ethical uses of AI with the objective of setting new global standards and norms.

BIOTECHNOLOGY

Advances in biotechnology hold tremendous potential, while also prompting ethical concerns. On one hand, synthetic biology, including gene sequencing and gene editing, has clear medical applications that could improve disease outcomes by providing tailored treatments. On the other hand, this same technology could be used to design new viruses, as well as lethal biological weapons, including those that could be tailored for specific populations.

This also raises fundamental questions about what it means to be human. In 2015, China genetically engineered “super-strong” dogs with double the musculature of normal canines, and some US military strategists fear that China will use this technology to produce “super soldiers” in the future.⁵⁸ In 2018, a Chinese scientist used CRISPR to produce the world's first gene-edited babies.⁵⁹ Should parents be able to select and design desired characteristics for their children, such as height, hair color, or intelligence?

In the military realm, there have been efforts to regulate or set standards for biotechnology. The Biological Weapons Convention, which prohibits the development and use of biological weapons, has more than one hundred and

55 “Artificial Intelligence,” OECD, accessed May 31, 2022, <https://www.oecd.org/digital/artificial-intelligence/>.

56 Saylor, *Emerging Military Technologies*.

57 *Ibid.*

58 “Super-strong, Genetically-engineered Dogs – Could They Cure Parkinson’s Disease?” CNN, October 15, 2015, <https://www.cnn.com/2015/10/28/world/china-mutant-dogs-genetic-engineering/index.html>.

59 “Chinese Scientist Who Edited Babies’ Genes Jailed for Three Years,” *The Guardian*, December 30, 2019, <https://www.theguardian.com/world/2019/dec/30/gene-editing-chinese-scientist-he-jiankui-jailed-three-years>.

eighty parties.⁶⁰ The convention also requires regular review conferences to assess new developments in biotechnology. The United Nations (UN) Convention on Biological Diversity governs the development and use of genetically modified organisms.⁶¹ Other transnational entities, including the Roman Catholic Church, have offered ethical guidance on the use of biotechnology, including genetic engineering and stem cell research, though their guidance is not binding on states.⁶²

Other regulations, including, for example, the modification of lethal viruses to be vaccine-resistant, are largely self-imposed. Binding regulations are needed to establish safeguards related to engineered viruses. The DTA should establish a working group to discuss these and other ethical dilemmas posed by emerging biotechnology and coordinate the development of potential norms in this area.

COMMUNICATIONS TECHNOLOGY

The DTA should seek to achieve consensus around a set of liberal, democratic norms for the use of communications technology. Citing national security concerns, China, Russia, and other autocracies have sought to implement measures aimed at restricting information flows over the internet. The CCP has already begun proffering its view in multilateral settings, including the Belt and Road Initiative's "Digital Silk Road," which promotes China's vision of Internet governance. A UN Group of Government Experts

has met regularly to try to achieve consensus on cyber norms, but given the divide between democracies and autocracies in this realm, such efforts have proven to be challenging.

The DTA could look to embrace the recently issued Declaration for the Future of the Internet, developed by the United States and the EU, for guidance, as it includes an agreement on principles to protect human rights and privacy, and promote the free flow of information. The Declaration was prepared by a new global partnership led by the United States to focus on digital norms. Other efforts, including the Global Commission on the Stability of Cyberspace (GCSC), may provide useful guidance. The GCSC has proposed norms such as prohibitions on targeting electoral infrastructure through cyber means and tampering with key components in software and hardware IT products.⁶³

The cyber domain is also becoming a more important arena for military action below the traditional threshold of armed conflict. Clear-eyed discussions between democracies and autocratic rivals are necessary to define red lines for hostile action in the cyber domain. This could include a norm against attacking nuclear command, control, and communications infrastructure and critical infrastructure (e.g., oil pipelines) that directly impact civilians. While international cyber norms exist, these are voluntary and governance in individual states varies.

60 "Biological Weapons Convention," United Nations Office for Disarmament Affairs, accessed May 20, <https://www.un.org/disarmament/biological-weapons/>.

61 Saylor, *Emerging Military Technologies*, 23.

62 Brandon Keim, "Vatican Goes 21st Century with Biotech Advice," *Wired*, December 12, 2008, <https://www.wired.com/2008/12/vaticanbioethic/>.

63 *Advancing Cyberstability: Final Report*, Global Commission on the Stability of Cyberspace, November 2019, <https://cyberstability.org/report/>.

DIRECTED ENERGY

Another area that requires new norms relates to the use of directed energy weapons. The Department of Defense defines directed-energy weapons as those “using concentrated electromagnetic energy, rather than kinetic energy, to ‘incapacitate, damage, disable, or destroy enemy equipment, facilities, and/or personnel.’”⁶⁴ These weapons have large upside potential in that they can be employed on the battlefield for air and missile defense and other applications at a lower cost per shot.⁶⁵ These weapons can also be employed for more nefarious ends. Indeed, Russia has been suspected of using directed-energy weapons against US embassies around the world to sicken and disable US diplomats. These cases of Havana Syndrome have left US embassy officials around the world with lasting brain injuries. Such attacks are invisible and silent, and victims generally do not know they are under attack or what is causing their physical ailments.

Should the use of directed-energy weapons be banned outright, given the harmful consequences to the human body? Should their use be outlawed in peacetime? The DTA should bring together leading democracies to negotiate norms for the use of directed energy. While it would be useful to engage Russia and China as well, the United States and its allies would be in a stronger position if they could develop common norms among themselves first.

HYPERSONICS

Hypersonic technology has much promise for both commercial and civilian applications. It can be employed for rapid air travel or for missiles that travel at more than five times the speed of sound and are maneuverable. Many arms control experts believe that these characteristics of hypersonic missiles render them especially destabilizing to nuclear strategic stability. Leading powers around the world, including the United States, China, and Russia, are investing in hypersonic missile technology. These weapons could be even more dangerous if they were obtained by other rogue regimes, such as North Korea or Iran.

The Missile Technology Control Regime (MTCR)—an informal agreement among likeminded countries to limit the spread of missile technology—does not impose any binding restrictions on members, however, and major missile exporters, such as China, are not included. Moreover, there is also some ambiguity as to how

hypersonic missile technology should be covered in the MTCR.

The DTA should work with MTCR members to update the guidelines to explicitly account for hypersonic missiles. The US and its allies should also seek to expand MTCR membership to include other missile exporters.

ADDITIVE MANUFACTURING

New norms are also required to address the use of additive manufacturing. This technology can be used to “make anything anywhere.”⁶⁶ The technology is available on the commercial market and is dual-use in nature, meaning that the same machine can be used to print toys or weapons, including parts for nuclear arms. The weapons proliferation risks of 3D printing are understood in the expert community, but there are not yet adequate norms or controls on the technology.

The Treaty on the Non-Proliferation of Nuclear Weapons (NPT) and the Nuclear Suppliers Group (NSG) restrict the transfer of sensitive nuclear technology to nonnuclear states, but they cannot fully address the proliferation threat posed by 3D printing. The DTA could encourage the NSG to update global export controls and other nonproliferation policies to address the proliferation threat posed by 3D printing. One possibility would be to examine the possibility of end-user controls that prohibit the transfer of this technology to countries of proliferation concern.

SPACE TECHNOLOGY

Since the earliest days of the Space Race, it has been clear that advances in technology and scientific research have allowed humankind to venture into space and establish a useful presence there. But progress on the development of international norms for outer space has been mixed. The 1967 Outer Space Treaty bans weapons of mass destruction in space, and the United Nations passed a resolution on International Cooperation in the Peaceful Use of Outer Space in 2013. More recently, however, Sino-American tensions over satellites and space debris, in particular, have been a source of dispute. Clashing objectives of national security and assertion of power have prevented effective dialogue on international norms from taking place.⁶⁷

64 Kelley M. Saylor and John R. Hoehn, “Defense Primer: Directed-Energy Weapons,” Congressional Research Service, July 20, 2021, <https://apps.dtic.mil/sti/pdfs/AD1145136.pdf>.

65 Ibid.

66 Kroenig and Volpe, “3-D Printing the Bomb?”

67 Krepon, Michael. “Norm Setting for Outer Space,” *Space News*. 8 September 2014.

As spacefaring democracies and autocracies alike increase their presence throughout the space domain, additional norms and data-sharing mechanisms are needed.⁶⁸ Commercial firms are placing tens of thousands of small satellites in low-Earth orbit, creating potential issues for space traffic management (STM). The DTA can serve as a forum for facilitating the exchange of space situational awareness (SSA) data among trusted democracies. The DTA should help democracies speak with one voice in fora such as the UN Office for Outer Space Affairs and other intergovernmental bodies such as the Inter-Agency Space Debris Coordination Committee (IADC) to help develop norms for STM and space debris mitigation.

Recently, the United States and several allies and partners signed the Artemis Accords, which sets forth principles for cooperation in the civil exploration and peaceful

use of outer space. Separately, the EU has also drafted an International Code of Conduct for Outer Space Activities. These measures have provided a foundation for cooperation and future dialogue that the DTA could help advance.

The DTA can help democracies develop norms around space weapons. A DTA space working group could focus on the role of dual-capable space systems such as satellite servicing missions, which could interact with satellites in orbit either to extend their lives with refueling, or, repurposed as a weapon, destroy them through collision. These efforts could build on the Artemis Accords.⁶⁹ The United States and China have also been engaged directly on space-related issues in forums such as the Space Security Exchanges and the US-China Civil Space Dialogue. In consultation with DTA members, these dialogues could continue as a venue to encourage cooperation.

68 Clementine G. Starling et al., *The Future of Security in Space: A Thirty-Year US Strategy*, Atlantic Council, April 2021, <https://www.atlanticcouncil.org/wp-content/uploads/2021/04/TheFutureofSecurityinSpace.pdf>; and Nicholas Eftimiades, *Small Satellites: The Implications for National Security*, Atlantic Council, May 2022, <https://www.atlanticcouncil.org/in-depth-research-reports/report/small-satellites-the-implications-for-national-security/>.

69 Chris Johnson, "Draft International Code of Conduct for Outer Space Activities Fact Sheet," Secure World Foundation, February 2014, https://swfound.org/media/166384/swf_draft_international_code_of_conduct_for_outter_space_activities_fact_sheet_february_2014.pdf; and Joshua Posaner and Giorgio Leali, "America's New Moonshot: Getting Europe to Sign Up to Its Space Rules," Politico Europe, January 4, 2022, <https://www.politico.eu/article/space-rules-us-france-germany-europe-moon/>.



The DTA should consist of a core group of technologically advanced democracies, including those represented in the G7 or the D10. (via REUTERS)

V. ORGANIZATION

The DTA should consist of a core group of technologically advanced democracies that share a common interest in ensuring that the democratic world prevails in the race for emerging technologies. The D-10 could serve as a core group for membership in the DTA. This group, which includes the G7, plus South Korea and Australia, as well as the European Union, brings together leading democracies from North America, Europe, and the Indo-Pacific. This group, consisting of fully consolidated democracies, is influential—comprising more than half of the global GDP.⁷⁰ Given that this core group of countries will almost certainly be involved in every major discussion regarding new technology, it makes sense that they be given a permanent seat at the table.

In addition to the D-10, the DTA could engage with a broader, flexible grouping of countries depending on the

issue. This includes other leading democracies in the technology field, such as Israel, the Netherlands, Sweden, Finland, and India. Other nations, including non-democracies, as well as corporations, international organizations, and other entities should also be engaged in a pragmatic manner in order to address a wide range of technology challenges.

To help formalize the DTA, a working-level meeting of senior officials from leading democracies should come together to outline a charter document that frames the alliance's objectives. The group should also finalize the alliance's organizational structure and plan for regular engagement among members. Alliance members could aim to announce the creation of the DTA at a G7 summit, with Australia and South Korea also invited to participate.

⁷⁰ The group has experience working together, having met at the level of policy planning directors and Washington-based ambassadors for nearly a decade. "D-10 Strategy Forum," Atlantic Council, accessed May 30, 2022, <https://www.atlanticcouncil.org/programs/scowcroft-center-for-strategy-and-security/global-strategy-initiative/democratic-order-initiative/d-10-strategy-forum/>.

Upon agreement by the D-10 to establish a DTA, each member should establish a director and office for technology cooperation. These offices should engage in a sustained and structured dialogue with their counterparts in other DTA countries. In addition, at least once a year, the DTA should convene at higher levels with at least one cabinet/minister-level official from each country presiding over the proceedings. These higher-profile meetings will help bring attention to the work of the DTA and reinforce this priority among national leaderships.

As this report noted earlier, substantial progress has been made toward facilitating greater cooperation among democratic allies and partners in the technology domain. For the DTA to become a reality, US leadership will be important,

but active buy-in from allies is also essential. The EU has been proactive in regulating the technology domain, and through the US-EU Trade and Technology Council, it has already joined the United States in a dialogue on technology issues. This type of dialogue could be extended to a broader, more formal grouping of democracies.⁷¹

While these consultations are ongoing, leading democracies should continue to bolster cooperation on technology through the existing platforms, from the G7 Global Partnership on Artificial Intelligence to the Quad's Critical and Emerging Technology Working Group. These pre-existing forums can be used to foster habits of cooperation and could facilitate a transition to a formal DTA.

71 "UK Seeks Alliance to Avoid Reliance on Chinese Tech: The Times," Reuters, May 28, 2020, <https://www.reuters.com/article/us-britain-tech-coalition/uk-seeks-alliance-to-avoid-reliance-on-chinese-tech-the-times-idUSKBN2343JW>.

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French President Emmanuel Macron delivers a speech during the Global Forum on Artificial Intelligence for Humanity (GFAIH) at the Institut de France in Paris, France October 30, 2019. (Ludovic Marin/Pool via REUTERS)

VI. CHALLENGES AND OBSTACLES

A new DTA could play a valuable role in positioning the United States and its allies to succeed in the race for advanced technologies. But there are significant challenges that must also be considered.

- **DTA could further polarize the global order.** As with other proposed entities for cooperation among democracies, one significant concern is that by encouraging greater technology coordination among democratic allies, the DTA could further polarize the global order. While this is an important possibility to consider, the reality is that the global order is already polarized. Competition between democratic and autocratic powers is now an established feature of the current system. The key question is whether democratic nations can find effective ways to organize for success, even as they continue to engage with autocratic rivals, bilaterally and through other entities, such as the UN and the G20.
- **Technology norms will not be effective if China is excluded.** Another important concern is that efforts to develop norms for the use of advanced technologies will be ineffective if major technology producers, such as China, are not at the table to contribute to their development. Ideally, China would play a productive role in contributing to the development of rules and norms that are consistent with international norms and democratic values, and every effort should be made to

engage with China on this, including through entities such as the G20 and other technology-specific venues. But meaningful cooperation may be difficult to achieve in many areas of concern. Therefore, while seeking cooperation with China, the United States must simultaneously work with likeminded nations to make progress on technology challenges facing the free world. Once established, these norms can help regulate the use of technology among members of the DTA. They could also help set a global standard that may deter the misuse or misapplication of such technologies.

- **Progress will be easier in smaller coalitions of like-minded states.** Another critique that merits consideration is that by attempting to bring together a cross-regional group of leading democracies over a broad range of technology sectors, it will be more complicated to achieve progress in any specific area. While this may be the case in some instances, the goal of the DTA is not to substitute or replace existing venues for technology cooperation; rather, it is to provide a coordinating mechanism, with the premise that their outcomes will have greater impact if implemented as part of an integrated framework. It could also help identify and fill gaps in the existing architecture of technology cooperation.



Hypersonic technology holds much promise for both military and civilian applications. (via NASA)

VII. CONCLUSION

The United States and its democratic allies and partners are facing a contested global order, marked particularly by the challenges from autocratic rivals China and Russia. To maintain their power and influence in the international system, leading democracies must position themselves to succeed in the race for advanced technologies.

Through a new technology alliance, leading democracies will be stronger-positioned to lead the development of, and shape the rules and norms related to, the emerging technologies of the Fourth Industrial Revolution. As this report contends, the DTA would strengthen innovation

ecosystems in the free world, limit China's unfair tech advantages, and establish technology norms consistent with democratic norms.

For decades, the rules-based system has sought to expand peace, prosperity, and freedom. Sustaining and adapting this system to the twenty-first century world will require a concerted effort. The time is ripe for democracies to work together to fully harness the potentially groundbreaking innovations of the twenty-first century, while taking steps to mitigate against their potential harms.

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