THE NEW CENTER



Policy Paper

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How Does the U.S. Beat China in the 21st Century Tech Race?

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ABOUT THE NEW CENTER

American politics is broken, with the far left and far right making it increasingly impossible to govern. This will not change until a vibrant center emerges with an agenda that appeals to the vast majority of the American people. This is the mission of The New Center, which aims to establish the ideas and the community to create a powerful political center in today's America.

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THE FOURTH INDUSTRIAL REVOLUTION IS HERE

In early August, the Trump administration issued executive orders banning the popular Chinese mobile applications TikTok and WeChat, citing national security concerns about data privacy. While China has blocked some of the largest American services such as Facebook and Google for years, the U.S. has only recently reciprocated. Although the Trump administration justified its move on national security grounds, the move against TikTok and WeChat is part of a broader, long-term competition between China and the U.S. over the most important technologies of the future. Fier_ob ROR X": True False False RROR Y = False True False IRROR Z" False False True end -add cts.act modifie

The world is in the early stages of the Fourth Industrial Revolution, which the World Economic Forum characterizes as "a range of new technologies that are fusing the physical, digital and biological worlds, impacting all disciplines, economies and industries, and even challenging ideas about what it means to be human."

While the U.S. outpaced the world in previous tech innovations-from the creation of the first computers and the Internet-our future leadership in the Fourth Industrial Revolution is an open question. China has put the full weight of its government and state-owned banks behind an effort to build up "national champions" in key sectors, and the U.S. government has only started to fashion a coherent long-term response. In this paper, The New Center will outline the current state of competition between the U.S. and China in emerging technology areas and highlight how the U.S. can ensure its preeminence in them.



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WHAT'S AT STAKE?

THE ECONOMIC POTENTIAL

• According to a Global System for Mobile Communications (GSMA) Intelligence Report, 5G is expected to add \$2.2 trillion to the global economy over the next 15 years

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- According to the McKinsey Global Institute, artificial intelligence is expected to add \$13 trillion to the global economy by 2030
- According to a World Economic Forum report, AI is expected to create 58 million new jobs by 2022
- According to Grand View Research, biotechnology is expected to reach a global market size of over \$727 billion by 2025
- According to Boston Consulting Group, quantum computing is expected to create productivity gains surpassing \$450 billion annually in the next decade
- According to the Semiconductor Industry Association, every dollar invested in high tech semiconductor research by the federal government creates \$16 in U.S. GDP growth



THE U.S. STILL LEADS IN TECH, BUT FOR HOW LONG?

While the media has lately been fixated on the U.S. seeking to ban or minimize market access to Chinese tech companies like TikTok, WeChat, and global 5G leader, Huawei (click here for The New Center's recent paper on 5G), the U.S.-China competition is playing out across an array of cutting edge industries and technologies. Here is a primer on the current state of innovation in artificial intelligence (AI), biotechnology, and advanced computing.

ARTIFICIAL INTELLIGENCE

A recent report by Citi that studied the AI competitiveness of 48 economies found that the U.S. still leads significantly. The other 47 economies included in the index would face "severe difficulties in catching up to the U.S.'s AI industry in 2020-30," the report said. This was attributed to the U.S.'s strength, particularly in AI patents, investment, and academic research. However, the report also found that only China, ranked second behind the U.S. in the index, would be likely to "cultivate an independent strong ecosystem for the AI industry due to both economic and geopolitical reasons."

Three years ago, Beijing declared its intention to be the world leader in AI by 2030, envisioning a domestic industry alone worth some \$150 billion. China's publicly traded tech giants, including Alibaba and Baidu, have plowed billions of dollars into AI research and set up labs in China and Silicon Valley, taking advantage of the latter's openness. That has made them juggernauts, outshining global rivals in areas including e-commerce, algorithms, and facial recognition. The performance of AI technologies depends to a large degree on the volume and quality of data being fed into the system. China's huge population, surveillance infrastructure, and more lax attitude on privacy rights generate huge volumes of data, which produces ever-smarter AI.

But while China may contribute more AI research and be ahead in some important subsets of AI like facial recognition, it's not ahead in all of them. And when it comes to research into artificial general intelligence, or AI with broader, humanlike thinking abilities, U.S. companies— Microsoft, Google and others—are in the lead. U.S. AI companies attracted over half of all global investments in AI between 2015 and 2019, which they've invested in recommendation engines, targeted advertising, and automatic filtering of obscene or otherwise banned pictures and videos, as well as AI services which enable letting companies, governments, and police departments tap into the power of their algorithms.

The U.S. produces some of the world's best AI research and talent because of its combination of leading universities, deep-pocketed tech companies, and an openness to ideas and people from across the globe areas where the U.S. has a sustainable advantage, at least in the medium term.





BIOTECHNOLOGY

Biotechnology has the potential to utterly transform geopolitics, economics, and society in the 21st century. Yet while the United States has long been the world leader in most segments of the global biotechnology sector, China is fast becoming a significant player.

Biotechnology is an area of biology that uses living processes, organisms, or systems to manufacture products or technology intended to improve the quality of human life. Its applications are immensely important for food production, synthetic materials, and medical care. Biotechnology is responsible for manufacturing existing drugs such as insulin more easily and cheaply, as well as helping to create potentially breakthrough drugs for treating cancer, heart disease, and Alzheimer's. On current trends, the United States is likely to remain the world leader in most biotechnology areas. However, the gap between China and the U.S. is narrowing in the biotechnology sector.

The United States accounted for almost half of all biotechnology patents filed worldwide from 1999 to 2013, thanks to extensive government funding for biomedical research, an unparalleled ability to translate basic research into commercial products and applications, and strong intellectual property protections. However, a report prepared for the U.S.-China Economic and Security Review Commission claims that collectively, China's central, local, and provincial governments have invested billions in life sciences research and development. In just the two-year period from 2015 to 2017, China's venture capital and private equity investment in the sector totaled some \$45 billion. An executive from In-Q-Tel, a "not-for-profit strategic investor that accelerates the development and delivery of cutting-edge technologies to national security agencies," warned Congress in a November 2019 hearing that China "intends to own the biorevolution... and they are building the infrastructure, the talent pipeline, the regulatory system, and the financial system they need to do that."

SEMICONDUCTORS

John Bardeen, Walter Brattain, and William Shockley created the first working transistor, an early semiconductor device, at Bell Labs in Murray Hill, New Jersey in 1947. Since then, semiconductors have become the basic component of nearly every modern electronic device such as televisions, computers, and phones.

China has spent tens of billions of dollars over decades trying to get a leg up in semiconductors, essential ingredients in the race for faster computers and smartphones and more sophisticated weaponry. China accounts for about 60% of global demand for semiconductors but only produces some 13% of global supply. Statistics from the Semiconductor Industry Association (SIA) suggest U.S. exports of chips to China have stayed around the same level for years, and that Chinese companies haven't gained much market share, even domestically. About 47.5% of chips sold in China were American made as of 2018, according to SIA figures. China's neighbors have emerged as prominent suppliers, with South Korea's Samsung Electronics becoming a dominant smartphone and chip supplier and Taiwan Semiconductor Manufacturing becoming the world's largest



contract chip manufacturer.

Meanwhile, China's leading chip maker, Semiconductor Manufacturing International Corporation (SMIC), isn't able to produce the most cutting-edge chips with the smallest transistors. The U.S. Department of Defense is currently considering adding SMIC to the Commerce Department's entity list, which would restrict SMIC from receiving specific goods made in the U.S. The Center for Strategic and International Studies estimates that China is five to seven years behind the U.S. and Taiwan on chip technology, but it may take longer for China to catch up because cutting-edge chips are a moving target. By the time China is able to make chips that compete with the best available today, the rest of the industry will likely have taken another leap ahead.

For the short term, China's semiconductor strategy is focused on reducing reliance on the U.S., which often means finding other non-Chinese substitutes. In the long term, though, China's huge investments in semiconductors will likely pay off.

HOW DID CHINA GET HERE?

MADE IN CHINA 2025

Released in 2015, Made in China 2025 is the Chinese government's ten-year plan to update its manufacturing base by rapidly developing high-tech industries. Chief among these are electric cars, next-generation information technology (IT) and telecommunications, and advanced robotics and artificial intelligence (AI). China's ultimate goal is to reduce dependence on foreign technology and promote Chinese high-tech manufacturers in the global marketplace. By 2025, China aims to achieve 70% self-sufficiency in high-tech industries, and by 2049—the hundredth anniversary of the People's Republic of China—it seeks a dominant position in global markets.

Made in China 2025 reflects Beijing's longstanding development goals. In recent decades, the Chinese Communist Party has taken steps to shift the economy away from resource extraction and low value-added, low wage manufacturing—largely mining, energy, and consumer goods such as clothing and footwear, which make up almost half of the country's economy—to a high-tech, high-productivity economy. China 2025 is intended to push the economy through this difficult transition and over the so-called middle-income trap, in which growth plateaus as wages start to rise, that has bedeviled many other developing countries.

China 2025 devotes more government resources and centralized policy planning to coordinate across government, private companies, and academia. The plan includes publicly stated policies, as well as more opaque actions, which are meant to shield China from accusations of violating its commitments to the World Trade Organization (WTO) and avoid retaliation. The Council on Foreign Relations details these tactics, which include:

- Setting explicit targets. Through both public goal setting and semi-official, backchannel coordination, China's leadership encourages private and public firms to shape their decision-making around the plan's priorities.
- Providing direct subsidies. The government provides direct support to industries through state funding, low interest loans, tax breaks, and other subsidies. The exact amount is unclear, but some outside estimates by the EU Chamber of Commerce put the likely number in the hundreds of billions of dollars.
- Foreign investment and acquisitions. Chinese companies, both private and state-backed, have been encouraged by the government to invest in foreign companies, notably semiconductor firms, to gain access to advanced technology. The value of Chinese acquisitions in the United States peaked in 2016 at over \$45 billion.
- Mobilizing state-backed companies. China's economic reforms of the 1990s reduced the role of state firms in the economy, but they still account for a third of gross domestic product (GDP) and an estimated two-thirds of China's outbound investment. Many of China's global tech leaders, such as Huawei and ZTE, while privately run, are supported by the government.
- Forced transfer agreements. Foreign companies complain that to invest or do business in China, they must enter into joint ventures with Chinese firms under terms that require them to share sensitive intellectual property and advanced technological know-how.

Policymakers and security officials in the United States and other developed countries increasingly see China's efforts to become a dominant player in advanced technology as a national security problem.

The Pentagon warned in 2017 that state-led Chinese investment in U.S. firms working on facial recognition software, 3-D printing, virtual reality systems, and autonomous vehicles is a threat because such products have "blurred the lines" between civilian and military technologies. In April 2018, the U.S. National Intelligence Council said that China's recruitment of foreign scientists, its theft of U.S. intellectual property, and its targeted acquisitions of U.S. firms constituted an "unprecedented threat" to the U.S. industrial base.

More broadly, U.S. policymakers worry that China's state-led model and its ambition to control entire supply chains—for instance, the cobalt industry, which powers most modern electronics—means that entire industries could come under control of a rival geopolitical power. A June 2018 White House report warned that China's economic moves threaten "not only the U.S. economy but also the global innovation system as a whole."

CHINA STANDARDS 2035

China's latest ambitious plan, set to be released in 2020, focuses on writing global standards for the next generation of technology, a move that could have enormous implications for tech industries worldwide. The China Standards 2035 plan will lay out a blueprint for China's government and leading technology companies to set global standards for emerging technologies like 5G internet, the Internet of Things (IoT), and artificial intelligence, among other areas.

The plan is the culmination of a two-year research project that began at the start of 2018, led by the General Administration of Quality Supervision, Inspection and Quarantine (AQSIQ) and carried out by the Chinese Academy of Engineering.

While the full report has not yet been released to the public, the early preliminary report puts forward ambitious plans for China to reshape the global technology industry. Chinese policymakers often invoke the idea that third-tier companies make products, second-tier companies design technology, and first-tier companies set standards.

According to this line of thinking, China is currently home to mostly third-tier companies-those that produce designs originally created abroad. Made in China 2025 set up a plan to foster second-tier companies that are leaders in design and innovation.

To transform China into an incubator of first-tier companies that set the rules of the game, China Standards 2035 stresses the importance of becoming a leader in the next generation of emerging technologies.

NEW CENTER SOLUTIONS

How then can the U.S. maintain its advantage in key technologies and ensure it sets the standard for new innovations in the future? A comprehensive strategy to accomplish such a goal requires both a domestic and international focus.

WHAT CAN BE DONE AT HOME?

The bipartisan Endless Frontier Act bill, introduced to Congress in late May, provides a necessary blueprint of the strategy necessary to guarantee U.S. leadership in the scientific and technological innovations that are so vital to our economic future. The Endless Frontier Act proposes an expansion of the National Science Foundation (NSF)— to be renamed the National Science and Technology Foundation (NTSF)—and the establishment of a Technology Directorate within NTSF to advance technology in ten critical focus areas. The newly-established Technology Directorate would receive \$100 billion over five years to lead investment and research in several emerging technology areas. An additional \$10 billion would be authorized to designate at least ten regional technology hubs, awarding funds for comprehensive investment initiatives that position regions across the country to be global centers for the research, development, and manufacturing of key technologies.

The new Directorate would invest in key technology focus areas that include:

- 1. Artificial intelligence and machine learning
- 2. High performance computing, semiconductors, and advanced computer hardware
- 3. Quantum computing and information systems
- 4. Robotics, automation, and advanced manufacturing
- 5. Natural or anthropogenic disaster prevention
- 6. Advanced communications technology
- 7. Biotechnology, genomics, and synthetic biology
- 8. Advanced energy technology
- 9. Cybersecurity, data storage, and data management technologies
- 10. Materials science, engineering, and exploration relevant to the other key technology areas

The new directorate would also carry out activities that include:

- Increases in research spending at universities (which can form consortia that include industry) to advance U.S. progress in key technology areas, including the creation of focused research centers;
- New undergraduate scholarships, industry training programs, graduate fellowships and traineeships, and post-doctoral support in the targeted research areas to develop the U.S. workforce;
- The development of test-bed and fabrication facilities;
- Programs to facilitate and accelerate the transfer of new technologies from the lab to the marketplace, including expanding access to investment capital;
- Planning and coordination with state and local economic development stakeholders and the private sector to build regional innovation ecosystems; and
- Increases in research spending for collaboration with U.S. allies, partners, and international organizations.

WHAT CAN BE DONE ABROAD?

The Center for New American Security (CNAS) has proposed the idea of forging an "Alliance Innovation Base," which is a community made up of the U.S. and its allies who are determined to deepen cooperation on technology innovation and protection. To create such an alliance, the proposal suggests strengthening America's toolkit for technology engagement by broadening the mandate of the Defense Innovation Unit, an organization under the Department of Defense founded to help the military make use of emerging technologies, as well as adding technology scouting to the list of responsibilities for Defense Attaches posted to U.S. embassies.

Additionally, the proposal calls for building ally awareness capacity and launching new collaborative programs with allies. This could include expanding information sharing, promoting more awareness of China's actions, and establishing bilateral innovation funds.

Finally, the proposal advocates for creating more positive incentives for technology protection and specifically focusing on leveraging the U.S.-Japan alliance. Any future presidential administration would be wise to prioritize the creation of such an "Alliance Innovation Base" as a key foreign policy objective to curb China's ambitions.

