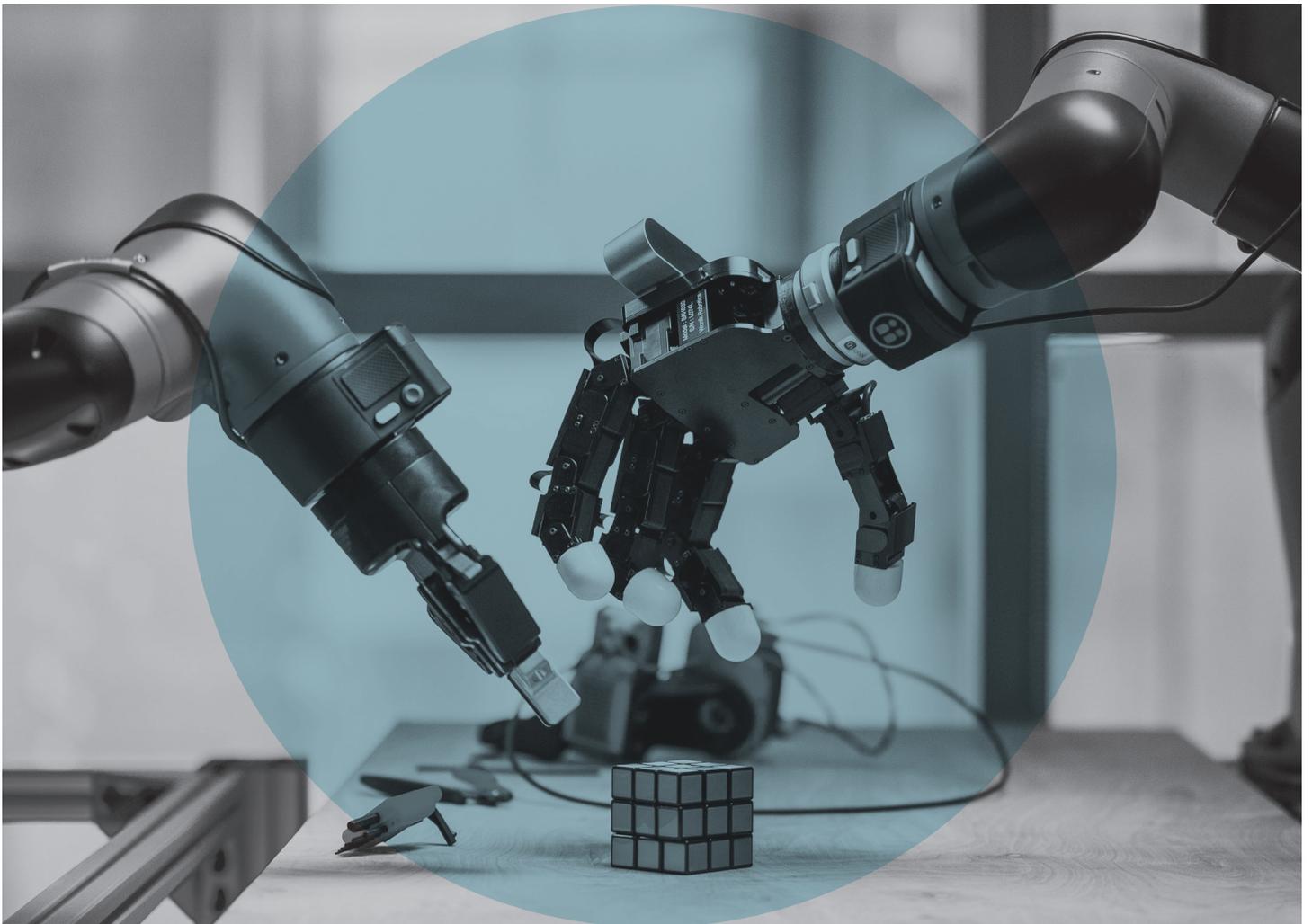


Techno-nationalism: The US-China tech innovation race

New challenges for markets, business and academia

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Introduction

Techno-nationalism is mercantilist-like behavior that links tech innovation and enterprise directly to the national security, economic prosperity and social stability of a nation.

China's brand of state capitalism has forced policy makers and business leaders around the world to rethink their approach to competitive innovation.

An escalating US-China technology cold war has set in motion a paradigm shift that is disrupting trade and commerce, and challenging the long-standing primacy of the laissez-faire economic model. This new way of thinking is tilting towards state activism and interventionism, not only in the technology landscape, but in many of the industries of the future.

Driving this change is techno-nationalism: mercantilist-like behavior that links tech innovation and enterprise directly to the national security, economic prosperity and social stability of a nation.¹

In response to decades of Beijing's techno-nationalism, the US has embarked on its own innovation

offensive. Looking ahead, Washington's future tech funding initiatives could surpass the scale of the "moonshot" projects during the space race with the former Soviet Union.

Innovation and governments

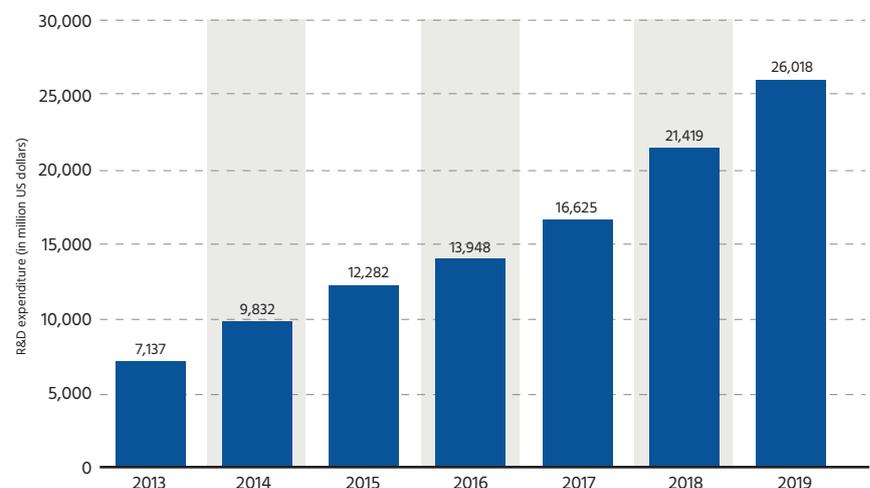
Eric Schmidt, the former CEO of Google and the Executive Chairman of its parent company, Alphabet, recently wrote:

"...Silicon Valley leaders have put too much faith in the private sector.... the government needs to get back in the game in a serious way."²

This statement marks an inflection point in economic history. Mr Schmidt was a top executive at what is arguably one of the most innovative, entrepreneurial and influential business enterprises of any era.

Alphabet spent more than US\$107 billion on R&D between 2013-2019.³

Graph I – Alphabet R&D spending 2013-2019



Source: Statista, <https://www.statista.com/statistics/507858/alphabet-google-rd-costs/>

The company's so-called "Moon Shot Factory", referred to as "X", has delivered a trove of visionary innovations that have changed the world, including self-driving cars, technology that beams the internet to remote parts of the planet, AI-empowered wearable tech, augmented reality, and the storage of renewable energy in molten salt.⁴

Yet, Mr Schmidt – as well as leaders at Microsoft, Facebook, Apple and other leading tech companies – has been agitating for the US government to play a much bigger role in countering China's mercantilist system of innovation.

Failure to do this, they say, could lead to America losing its edge as a global leader in technology and innovation.

Chinese innovation mercantilism has been steadily closing the technology gap with the US.⁵ The massive scale of Beijing's state-funded programs such as Made in China 2025, China Standards 2035, the Digital Belt and Road Initiative and the Thousand Talents Program, for example, present the US and its allies with a host of challenges.

Critical technologies

The innovation race involves a broad range of emerging and foundational technologies that will define the industries of the future but, for now, techno-nationalism focuses primarily on:

- Artificial Intelligence (AI) and machine learning
- Quantum computing and information systems
- Robotics
- Energy storage
- Semiconductors

- Next generation communication (including 5G and 6G)
- Hypersonics.

Components of US techno-nationalism

US techno-nationalist policy is bifurcating into two primary activities: "negative reciprocity" and "strategic innovation systems".

Negative reciprocity – Negative reciprocity pertains to funding initiatives designed to counter protectionism, subsidies and other kinds of state-backed activities that have produced unfair competitive advantages for Chinese companies. The word "negative" is used because, by nature, mercantilist practices run contrary to fair and free trade rules and are characterized by various forms of economic aggression.

Negative reciprocity includes funding for the re-shoring and ring-fencing of strategic manufacturing capabilities and, additionally, the weaponization of supply chains through the use of export controls, blacklists, blocked acquisitions and sanctions. More recently, the US has resorted to criminal indictments and prosecutions.⁶

Strategic innovation systems – For the longer term, the US and its allies will implement structural changes that enhance the innovative advantages of public-private ecosystems. The public sector will increase funding for basic and applied R&D, human capital development and STEM-related education (K-12, graduate and post-graduate). National defense initiatives in the US will absorb and fund increasing amounts of strategic and applied R&D.

Chinese innovation mercantilism has been steadily closing the technology gap with the US.

US techno-nationalist policy is bifurcating into two primary activities: "negative reciprocity" and "strategic innovation systems".

Underlying themes: US techno-nationalism and innovation

As Washington and its allies ramp up techno-nationalist initiatives, core themes will drive the paradigm shift.

Governments will increasingly provide vital “public goods” in the innovation landscape.

MNEs will be pulled into the US-China technology cold war in a variety of ways.

1. **Public-private partnerships (PPP)** – Technology alliances and government-funded initiatives will play an increasingly important role in advancing long-term innovation. The number and scale of PPPs will surge in the US, the EU and other technology centers as state actors look to foster technological innovation among key stakeholders. Businesses, academia, NGOs, and government (local, state, national) including the defense establishment will participate.
2. **Avoiding the China innovation model** – The US and EU innovation agendas, in particular, will not seek to emulate China’s centralized, authoritarian system of techno-nationalism. Instead, strategic PPPs will turbo-charge specialized markets and capitalize on a reservoir of entrepreneurial talent, academic excellence and rules-based frameworks.
3. **Role of non-state actors** – Multinational enterprises (MNEs) have become primary drivers of R&D and innovation in free markets, thus they are vital to PPP initiatives everywhere. However, because of the complexity of their global value chains and conflicting priorities arising from activities in different markets, especially in China, aligning government and MNE priorities

will present tensions and challenges. However, governments will increasingly provide vital “public goods” in the innovation landscape that MNEs cannot.

4. **Balancing tensions between MNEs, markets and techno-nationalism** – MNEs will be pulled into the US-China technology cold war in a variety of ways. For example, where an MNE provides a service to a government that furthers a techno-nationalist objective, it will become a strategic asset. This could result in favorable funding opportunities, increased revenues and other preferential treatment for MNEs.

Opposing governments, however, could view these same MNEs as hostile actors and apply retaliatory actions such as export controls and other non-tariff measures. Furthermore, as governments leverage MNEs to achieve techno-nationalist objectives, this could lead to further monopolization and distortion of markets.

5. **Multilateral technology alliances** – US techno-nationalist policy will seek to align with the security, economic and ideological objectives of the EU and other historic allies. This will lead to an increase in multilateral PPPs as well as international cooperation regarding R&D, standards-setting and good governance practices regarding the application of technologies.

Overview of this study

The US is deploying multiple initiatives in pursuit of “innovation advantage”.

Open-sourced innovation could be a game-changer in the US-China technology war.

This study is the second in a series of Hinrich Foundation essays on US-China techno-nationalism, authored by Research Fellow, Alex Capri.

The first essay in this series covered US-China strategic decoupling, and focused on the re-shoring and ring-fencing of critical supply chains, as well as on “in-China, for-China” planning and risk scenarios.⁷

This study focuses on the US-China techno-nationalist competition as it pertains to the pursuit of “innovation advantage”. In a broader context, it examines the underlying dynamics and tensions between markets, non-state actors and governments that are playing out under the current paradigm shift.

The report is comprised of three sections:

I. The US-China innovation race: The role of the state

In this section, we examine trends as they relate to public-spending for R&D and innovation. To highlight the paradigm shift currently underway, we perform a deep dive into a series of techno-nationalist funding initiatives being rolled out by the US government.

Next is an analysis of state activism in free markets and why governments are uniquely qualified to promote innovation and “blue-sky” technologies in ways that the private sector cannot.

Finally, Section I spotlights a historic example of techno-nationalism: SEMATECH and the US semiconductor

public-private partnership, which led to a technological leapfrog by the US semiconductor industry, past Japan, in the 1990s.

II. MNEs, markets and governments: Navigating new complexities

Section II of the report focuses on non-state actors and their increasingly complex role in public-private partnerships. The tensions between open market forces, multinational companies and techno-nationalist state activism are explored.

To highlight these tensions, we analyze Facebook’s “Libra”, a prospective digital currency, which has spurred Beijing’s efforts to reduce dependency on the US dollar and promote a renminbi-centric regional system, which puts into play a cascade of techno-nationalist challenges for MNEs.

Next, a case study involving the US semiconductor sector is presented to illustrate how state activism (this time in the context of US-China trade negotiations) can have detrimental effects on markets and can backfire on the very parties it is looking to protect.

Section II concludes with an analysis of how open-sourced innovation could be a game-changer in the US-China technology war, particularly regarding future 5G wireless competition.

III. Academia and techno-nationalism: Open versus closed systems

Universities, research organizations and academia, in general, have been become hot zones in the US-China innovation race. Human capital

Universities will be forced to manage a range of emerging complexities.

development is key to conducting leading edge R&D and driving innovation.

Section III presents an analysis of how increasingly pervasive US export controls are affecting R&D activities at universities. It highlights the new kind of rule-frameworks that universities must put in place to manage emerging complexities. This becomes imperative as a new wave of government funding will be funnelled into academia.

An important part of our analysis features a spotlight on China's Thousand Talents Program and how it presents challenges to public-private partnerships involving academia.

Next, we focus on the question of why the US, in particular, should keep its human capital and innovation pipeline open as it pertains to foreign students, fundamental research programs and, ultimately, why an open system (despite China's exploitation of it) is better than a closed one.

Finally, we look at how some inevitable strategic decoupling between Chinese and US entities will result in the ring-fencing of more "sensitive" R&D activities within the US defense establishment.

I. The US-China innovation race and the role of the state

China is on course to overtake the US in R&D expenditure.

Much of China's innovation funding is earmarked for its Made in China 2025 plan.

China's rise as an R&D power

The R&D World Global Funding forecast has estimated that by 2030, China will have an R&D budget of US\$900 billion and – unless the US make adjustments – will invest at least US\$70 billion more per annum than all US industrial, government and academic R&D institutions combined.⁸

A 2019 report by the Council on Foreign Relations states that, since 2000, China has increased its R&D expenditures on innovation by 18% per year.⁹ Public expenditures in the US, however, have gone in the opposite direction: the data indicates an overall downward trend in government funded R&D investment as a percentage of GDP from about 1973.¹⁰

Determining the exact amounts of funding that China is funnelling

into specific technologies is not an exact science. It is more important, however, to grasp the fact that the Chinese Communist Party (CCP) is funding its innovation agenda on a scale never before seen in history. In many of the so-called foundational and emerging technologies of the future, China has moved into a close second place behind the US.

Much of China's innovation funding is earmarked for its Made in China 2025 plan, the China Standards 2035 plan, the Digital Belt and Road initiative and other massive digital infrastructure projects within China. Additionally there are large pools of investment set aside for niche sectors, such as semiconductors, through the National Integrated Circuit Industry Investment Fund (China's Big Fund).¹¹

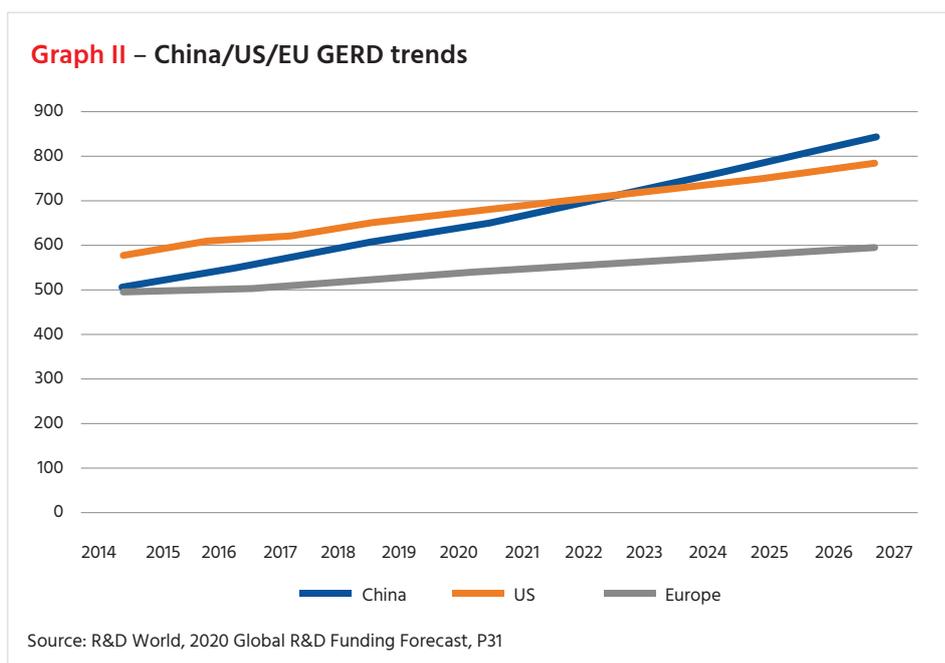


Table I – Country tech leaders by sector

	US	China	France	Germany	Japan	Russia	Korea	UK
Advanced materials	56.0%	35.2%	2.2%	16.0%	14.8%	5.6%	6.0%	4.2%
Agricultural/Food	60.6%	24.2%	6.3%	8.5%	5.8%	5.6%	2.2%	4.0%
Automotive	31.3%	16.0%	4.2%	36.0%	39.8%	1.5%	12.6%	2.9%
Commercial aerospace	69.9%	14.7%	15.3%	10.3%	5.2%	13.4%	2.9%	6.8%
Computing/IT	59.0%	38.9%	3.3%	6.1%	14.4%	9.2%	8.3%	5.9%
Energy	52.7%	25.2%	10.9%	22.9%	11.2%	12.0%	5.5%	6.4%
Environmental/sustainability	34.1%	12.0%	19.4%	34.5%	18.2%	4.6%	4.6%	14.7%
Information/communications/technologies	59.3%	38.5%	5.2%	10.0%	16.6%	8.8%	9.9%	7.4%
Electronics	47.3%	36.6%	4.7%	19.1%	25.5%	5.8%	13.6%	6.8%
Life science/healthcare	63.7%	11.7%	13.4%	21.7%	13.6%	5.3%	5.2%	16.5%
Military/space/defense	80.4%	23.1%	5.8%	8.4%	6.0%	24.4%	7.6%	6.1%

Technology leading country Runner-up tech leading country

Source: R&D World, 2020 Global R&D Funding Forecast, P31

China’s surge in VC investment has been directed towards computer vision, machine learning and augmented reality – all areas in AI that China wants to dominate by 2030.

The US will remain at the top of the world rankings, at least for now.

China AI venture capital scene

Another gauge of China’s progress is the amount of venture capital (VC) being spent on new deals. In 2017, some US\$27.7 billion was raised through VC deals for 369 AI start-ups, and the average deal size was nine times larger than those in the US. Investors consisted mostly of state-owned enterprises (SOEs), state and local governments and Chinese businesses.¹²

China’s surge in VC investment has been directed towards computer vision, machine learning and augmented reality – all areas in AI that China wants to dominate by 2030. In computer vision, for example, from 2016-2018, Chinese technology firms increased investments four-

fold, surpassing an aggregate of US\$8 billion.¹³ All of these AI fields represent so-called “dual-use” technologies – defined as commercial technologies that could also be used for military purposes – thus could be subject to export controls and other restrictions.

US innovation and R&D investment 2020

The US is projected to invest around US\$610 billion in R&D in 2020, where it will remain at the top of the world rankings, at least for now. According to R&D World Funding Forecast, which distills data from the OECD, the World Bank, the International Monetary Fund, the US National Science Foundation (NSF), and the National Center for Science and Engineering (NCSES), this

China’s techno-nationalist innovation plans will push the US and other governments to significantly increase public funding of research.

Spurred on by Chinese techno-nationalism, the US government appears poised to undergo a surge in innovation related spending.

represents an increase of 2.2% from US\$596 billion in 2019.¹⁴

Private (in-house) investment, makes up the majority of R&D in America, with US multinationals accounting for more than 66% of funding, while the US government’s direct funding of R&D is expected to account for about US\$162 billion, or about 26% of the total R&D spend for the year. This is significant, as China’s techno-nationalist innovation plans will require the US and other governments to significantly increase public funding of research – to be discussed further, in Section III of this report.

US academic researchers will have at their disposal about US\$90.1 billion-worth of research funds, or about 14.8% of the total US R&D expenditure.¹⁵

Overall, R&D investment in the US is expected to represent about 2% of GDP – a number that many believe must increase substantially in the future if the US is to maintain or increase its lead in technological innovation.

Wave of new US techno-nationalist spending

Spurred on by Chinese techno-nationalism, the US government appears poised to undergo a surge in innovation-related spending.

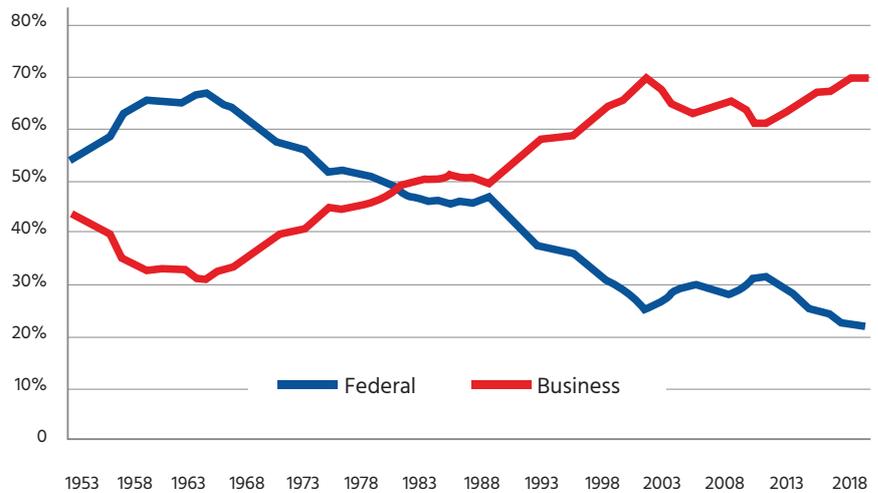
The Trump administration’s 2021 budget, for example, allocated over US\$1 billion to the National Science Foundation (a 70% increase over 2020) for its AI Initiative and its Quantum Computing Initiative.¹⁶ The NSF serves as a reliable barometer for the overall

Table II – AI, investment, innovation and implementation by country

Country	Talent	Infrastructure	Operating Environment	Research	Development	Government Strategy	Commercial	Total rank
United States of America	1	1	6	1	2	13	1	1
China	18	3	3	2	1	1	2	2
United Kingdom	5	8	1	3	11	7	4	3
Canada	4	23	5	8	10	4	5	4
Germany	9	12	7	4	12	5	9	5
France	8	30	2	12	9	6	7	6
Singapore	2	4	39	16	15	30	6	7
South Korea	28	5	30	12	3	31	25	8
Japan	26	16	17	6	7	12	8	9
Ireland	6	2	28	18	6	42	20	10
Australia	11	32	8	18	4	39	12	11
Israel	13	36	50	5	5	46	3	12

Source: Tortoise, <https://www.tortoisemedia.com/intelligence/ai/>

Graph III – US government vs. business R&D expenditures



Source: Congressional Research Service, U.S. Research and Development Funding and Performance: Fact Sheet, 2020

Notes: Some data for 2018 and 2018 data are preliminary and may be revised

The US International Development and Finance Corporation (DFC) has been tasked with assisting developing countries to steer purchases of telecoms equipment away from Chinese vendors.

R&D environment in the US. This will be discussed below in further detail.

China’s innovation plans have become a 2020 election year issue in the US, with Democratic presidential candidate Joe Biden pledging to spend US\$300 billion on R&D for the development of strategic technologies.

Since the onset of the US-China trade disputes in 2018, the US foreign policy and security establishments have been increasingly looking to counter the expansion of Chinese telecommunications players such as Huawei and ZTE in markets around the world.

A host of new US initiatives are manifesting themselves though the two primary prongs of nationalist strategy: negativity reciprocity and the funding of strategic innovation ecosystems.

Below is a summary of funding initiatives and public-private partnerships that have recently materialized.

US\$60 billion: The US International Development and Finance Corporation (DFC)

With a newly formed budget of some US\$60 billion, the DFC has been tasked with assisting developing countries to steer purchases of telecoms equipment away from Chinese vendors, who have been offering cheap financing deals via Chinese state-owned banks or credit programs.¹⁷

The DFC’s expanding foreign operations are aimed at promoting other telecommunications equipment providers such as Nokia of Finland and Ericsson of Sweden – even though no US companies are currently offering alternatives.

Key DFC objectives:

- Countering financing from Chinese state and non-state actors
- Taking equity stakes in strategic companies
- Providing loan guarantees
- Offering political risk insurance
- Providing offsetting funds to

decrease the costs of equipment from non-Chinese vendors

science, AI, quantum computing, semiconductors and advanced communications technology.¹⁸

The DFC’s role of countering Chinese financing and so-called “chequebook diplomacy” initiatives in foreign countries is an example of negative reciprocity. From a traditionalist free trade perspective, this is “negative” mercantilist behavior that would more aptly be attributable to Beijing’s state-centric economic model. This is a clear indicator that the techno-nationalism paradigm shift is changing the nature of global commerce.

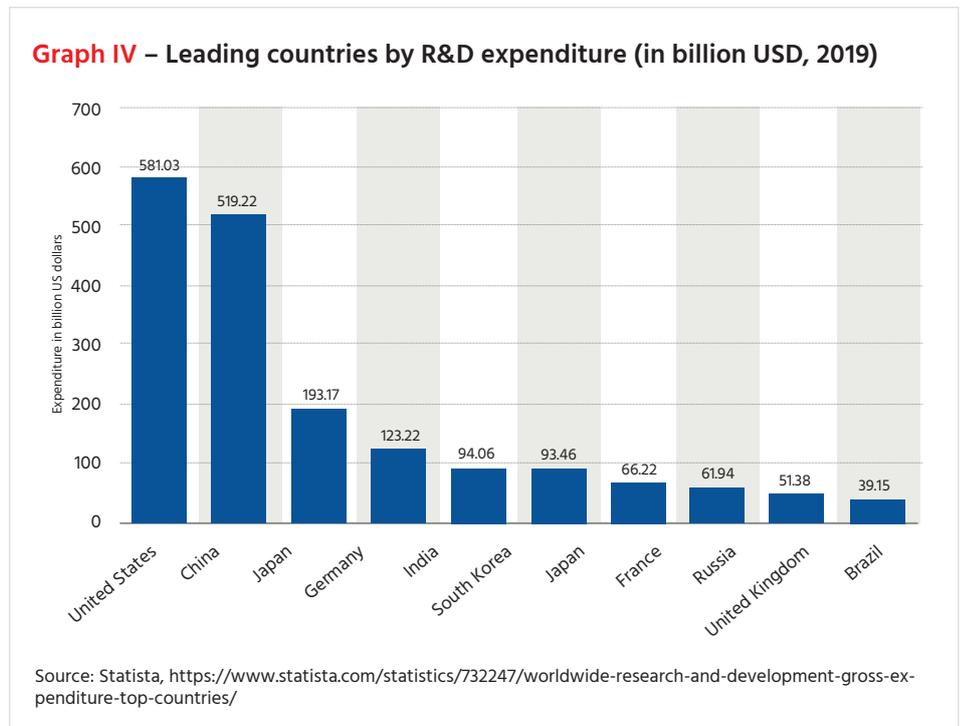
US\$22.8 billion funding for US semiconductor industry

Despite the dominant global position of US semiconductor companies, only about 12% of their chip manufacturing is done within the US (by companies such as Intel and Micron) while the rest has been offshored to Asia.¹⁹

US\$100 billion Endless Frontier Act

In May 2020, a bipartisan bill was introduced in the US Congress to create a US\$100 billion fund for science and technology initiatives that would establish a new Technology Directorate. Funding is to be allocated over five years to universities, businesses and research institutions and would cover 10 key sectors, including: materials

The majority of US chip companies outsource their manufacturing to Taiwan, primarily to Taiwan Semiconductor Manufacturing Company (TSMC) which, given its proximity to China and the deterioration of Sino-US ties, has exposed a series of national security risks, including the possibility of severed supply chains in the event of a “forced unification” scenario involving China and Taiwan.



The US Congress is providing funding to encourage the US semiconductor industry to re-shore its strategic manufacturing capacity to the US.

Thus, the US Congress is passing legislature to set aside funding to encourage the US semiconductor industry re-shores its strategic manufacturing capacity to the US.

if these standards are accepted by the International Telecommunications Union (ITU), present logic would dictate that Chinese state and non-state actors would gain economic and geopolitical advantages over foreign competitors.²¹

In addition to US\$12 billion in R&D funding and another US\$10 billion in federal funds to match state funding, the US Department of Defense would add additional funding to help create a network of “trusted foundries” in the US.²⁰

New laws in the US are providing increasing funding for 5G wireless innovation. The Wireless Supply Chain Innovation Grant Program, administered by the Department of Commerce’s National Telecommunications and Information Administration (NTIA), for example, has earmarked more than US\$1 billion in grants to support the deployment and use of 5G Open Radio Access Networks (O-RAN).²² The O-RAN initiative is covered in Section II of this report.

The US is reviving techno-nationalist funding initiatives not seen since the 1960s and the 1970s.

These are the kinds of techno-nationalist funding initiatives not seen since the 1960s and the 1970s, during the US Cold War with the Soviet Union and its “moonshot” projects such as NASA’s Gemini and Apollo programs.

The race for technology standards: New US public funding initiatives

The race to influence future technology standards in areas such as 5G has become a central fixture in the US-China technology race. Because, for example, Huawei’s 5G wireless technology differs from other providers,

The above grant program, which falls under the so-called Utilizing Strategic Allied Telecommunications Act, also provides US\$500 million in funding for US representation and participation in the drafting of international engineering standards, an area where Chinese companies have become very active.

5G has become a central fixture in the US-China technology race.

Table III – 2020 US R&D sources index (billions USD/percent changes from 2019)

	Federal govt	Industry	Academia	FFRDC	Non-profit	Total
Federal government	\$49.9 1.8%	\$41.0 5.1%	\$47.0 9.3%	\$17.4 4.8%	\$7.4 8.8%	\$162.7 14.0%
Industry		\$384.2 6.3%	\$10.0 25.0%	\$4.1 5.1%	\$2.6 8.7%	\$400.9 6.7%
Academia			\$22.9 4.1%	\$0.3 0.0%		\$23.2 4.0%
Other government			\$4.0 NA			\$4.0 NA
Non-profit			\$6.2 3.3%	\$0.3 50.0%	\$12.4 -16.8%	\$18.9 -10.4%
Total	\$49.9 1.8%	\$425.2 6.1%	\$90.1 4.5%	\$22.1 5.2%	\$22.4 -7.1%	\$609.7 2.2%

Top row indicates R&D performers
Left column indicates R&D source

Source: R&D World magazine 2019 Reader Surveys, IMF, World Bank, CIA Fact Book, National Science Foundation

Government activism and innovation: Why it matters

Back to the future? Searching for the next US moonshot.

Only governments can make commitments to long-term costs, timelines and ongoing failures that are required to fund basic science research and “blue-sky” experimentation, which looks to solve big problems and conceive bold new endeavors.

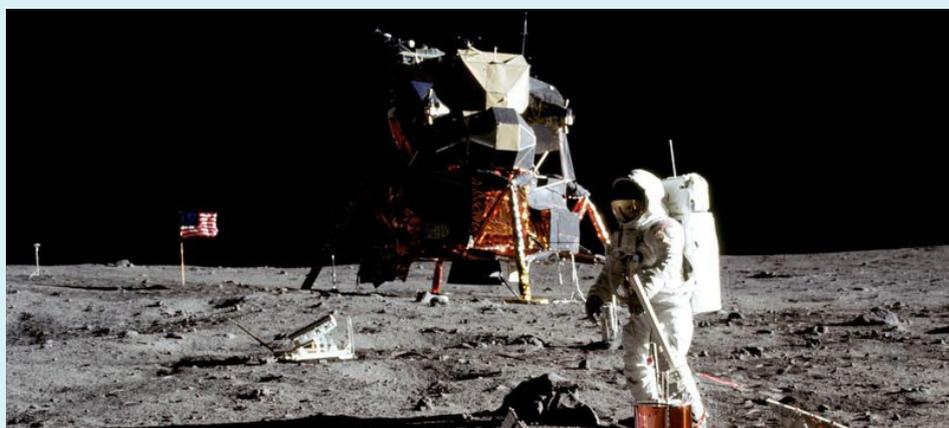
These kinds of projects are too risky for any single business enterprise, no matter how big or profitable. Yet, in the US, the world’s largest innovation market, more than 60% of R&D spending now comes from businesses.

In the US, industry leaders are increasingly looking to policy makers (federal, state and local) to become proactive in the innovation landscape in the following ways:

- Become early adopters of new technologies
- Provide funding for education and human capital development
- Lower innovation barriers-to-entry for smaller players
- Sponsor and fund open infrastructure and wireless (i.e. national research cloud)

- Upgrade digital grids and infrastructure
- Increase funding for long-term basic research²³
- Enforce rules-frameworks around IP
- Increase funding for cyber security-related research
- Pursue punitive and protective measures against predatory, unethical parties (state and non-state)
- Provide more tax incentives and tax relief programs
- Underwrite grants and other investment initiatives
- Leverage strategic public-private partnerships
- Found STEM and other relevant human capital development/ education

One has to go back to the 1970s, to NASA’s Apollo program, which resulted in the landing of 12 Americans on the moon between 1969 and 1972,²⁴ to find an example of the kind of techno-focused government activism and public-private partnerships that are, once again, emerging in the US.



Apollo 11 astronaut Buzz Aldrin works at the deployed Passive Seismic Experiment Package on July 20, 1969.

The catalyst of the so-called American “moonshot” undertaking was another systemic and ideological rivalry: the decades-long cold war with the former Soviet Union. When the Soviets successfully launched the first satellite, Sputnik, into earth’s orbit, it set in motion an innovation race between Washington and Moscow that would produce a whole generation of new technology – largely government funded.

Thus began a series of successful public-private partnerships in the US. NASA’s Apollo program, alone, resulted in ground breaking innovations in solar

panel technology and the world’s first digital flight controls, as well as the first silicon-integrated circuit-based computer guidance systems, built by Draper Laboratory, a Cambridge-Massachusetts non-profit R&D organization.²⁵

Since the historic moonshot, NASA has continued to participate in successful innovation partnerships with the private sector, academia and other key stakeholders which, between 1976 and 2016 produced 1,920 spinoff products, which can be found in NASA’s database with the same name.²⁶

SEMATECH: A successful innovation public-private partnership

The US response to Japan's semiconductor industry in the 1980s led directly to US dominance today.

During the 1980s, Japan's semiconductor industry surpassed that of the US, both in terms of levels of advancement and production capability. In response, in 1987, the US government and 14 US-based semiconductor manufacturers formed SEMATECH (Semiconductor Manufacturing Technology) as a public-private partnership.²⁷

At the time, the US's diminishing competitive position regarding Japan constituted a national security issue. Over five years, SEMATECH received public subsidies from the US Department of Defense via the Defense Advanced Research Projects Agency (DARPA), totaling US\$500 million. Member companies also contributed funding. Other institutions in this innovation system receiving funding included leading edge US universities and research organizations.

By the 1990s, the US microchip industry was on an innovation trajectory that propelled it past Japan, to become the world leader in semiconductors – a position it still holds today.²⁸

The initial focus of SEMATECH involved the development of new materials, processes and equipment for microchip manufacturing, and, it was so successful that SEMATECH's board of directors agreed to eliminate matching funds from the US government in 1996.

Today SEMATECH operates on dues paid by its members, which account for about a half of the world's entire chip market.

From a techno-nationalist perspective, the success of SEMATECH can be attributed to several key factors:

1. DARPA and the US Department of Defense allowed for broad exploration of bold new ideas and basic research, while working collaboratively with the organization's members. The US Government was careful not to suffocate the market and entrepreneurial dynamic within the group.
2. Funding of SEMATECH's innovation systems was one component in a broader US strategy of protecting the US domestic technology industry through the imposition of anti-dumping and countervailing duties on Japanese imports and the use of other non-tariff measures such as import quotas.

Similar strategies are being pursued today by the US, which now target Chinese imports, although export controls, sanctions and other tech restrictions are playing a much more significant role.

II. MNEs, markets and governments: Navigating new complexities

The partnership between NASA and SpaceX showcases the growing role that non-state actors are playing in key government programs.

On May 30, 2020, a SpaceX Falcon 9 rocket blasted off from Cape Canaveral, Florida, carrying NASA astronauts Bob Behnken and Doug Hurley into earth's orbit for a docking with the International Space Station.²⁹ The event marked the first manned launch from US soil in almost a decade, since NASA retired the US Space Shuttle program in 2011.

The partnership between NASA and SpaceX also showcased the growing role that non-state actors are playing in government programs involving national security and technological innovation.

Other SpaceX public-private partnership milestones:

- The first time a commercial aerospace company carried humans into outer space.
- The first time all innovation – including design and construction – for a space mission was outsourced to a commercial company. This included the fabrication of the space capsule and rockets as well the technology for the launch, in-orbit manoeuvres and docking and landing operations.
- NASA paid SpaceX approximately US\$86 million per astronaut, making the Falcon 9 launch significantly less expensive than previous Space Shuttle missions managed by the US government.³⁰
- The UK government is partnering with SpaceX to launch from UK spaceports. This will support the UK's need for home-based space infrastructure and will also open the public-private partnership to UK space companies such as Virgin Orbit and Virgin Galactic.³¹



Launch of a Falcon 9 rocket carrying the KoreaSat-5A satellite, Oct. 30, 2017, from the NASA Kennedy Space Center, Cape Canaveral, Florida.

As the US-China technology competition escalates, the world's largest technology firms will become increasingly co-opted to techno-nationalism.

The growing role of non-state actors

As the US-China technology competition escalates, the world's largest technology firms will become increasingly co-opted or compelled to participate in techno-nationalist public-private partnerships and initiatives.

Consequently, in the US, the EU and other free-market areas, new tensions between state and non-state actors will arise. These will emanate from opposing narratives between market-oriented preferences on one extreme, and aggressive state activism on the other.

As the techno-nationalist paradigm shift plays out, MNEs, governments and other stake holders will need to find middle-ground to avoid scenarios that create either adverse conditions or unfair advantages for MNEs.

Additionally, as MNEs are co-opted as strategic partners, markets could be distorted as governments transfer too many privileges and too much power to a few large MNEs.

CASE STUDY

Facebook's Libra versus China's digital currency



Consider the case of Facebook, which has proposed a blockchain enabled crypto-currency, called "Libra". In April, 2020, Libra announced plans to create an infrastructure for multiple crypto-currencies, linked directly to

individual fiat currencies.³² Because the US dollar remains the dominant and most widely used global currency, Libra would effectively increase US currency hegemony by digitizing the greenback.

One of Beijing’s geopolitical and techno-nationalist priorities has been to internationalize the renminbi and decouple financially from the US dollar.

Facebook’s Libra project has caused much anxiety in Beijing, where the CCP has been working to digitize its own official currency, the renminbi (also called the Yuan).³³

sanctions and export controls. This has been especially debilitating to Chinese technology companies on US restricted entities lists.³⁴

One of Beijing’s geopolitical and techno-nationalist priorities has been to internationalize the renminbi and decouple financially from the US dollar. The majority of China’s international commerce is carried out in US dollar-denominated transactions in the SWIFT international payments system, thus, these transactions are vulnerable to US

In order to create a digitized international e-RMB, Beijing has assembled extensive public-private-partnerships involving banks, IT companies, software and cloud-based platforms. Tencent, the Chinese digital platform company, is building blockchain infrastructure that will link the Chinese Central Bank to a digital ecosystem based on the e-RMB.

Table IV – Share of currencies in global foreign exchange reserves

Currency	US dollar	Euro	Pound sterling	Japanese Yen	Swiss franc	Other currencies
2009	62.05%	27.65%	4.25%	2.9%	0.1%	3.04%
2010	62.14%	25.71%	3.93%	3.66%	0.13%	4.43%
2011	62.59%	24.4%	3.83%	3.61%	0.08%	5.49%
2012	61.47%	24.05%	4.04%	4.09%	0.21%	3.26%
2013	61.24%	24.19%	3.98%	3.82%	0.27%	2.84%
2014	63.34%	21.9%	3.79%	3.79%	0.27%	3.14%
2015	64.16%	19.73%	4.86%	4.86%	0.29%	3.13%
2016	63.96%	19.74%	4.42%	4.42%	0.17%	3.41%
2017	62.72%	20.15%	4.54%	4.89%	0.18%	3.67%
2018	61.69%	20.68%	4.43%	5.2%	0.15%	4.37%
2019	69.89%	20.54%	4.62%	5.7%	0.15%	2.56%

Source: Statista, <https://www.statista.com/statistics/233674/distribution-of-global-currency-reserves/>

China's push to create an e-RMB will spark techno-nationalist reactions from other countries.

How China's digital currency will stoke further techno-nationalism

China's push to create an e-RMB will spark techno-nationalist reactions from other countries and present multinational companies with a host of new challenges.

Retaliation – Tencent, and other Chinese companies building Beijing's digital currency infrastructure, could face retaliatory actions from other governments as they expand outside of China. Because of their partnership with the CCP – an autocracy – Chinese companies are increasingly viewed as proxies of the CCP.

This dynamic has played out in India, where Tencent's WeChat, and 58 other apps, including the popular social media app, TikTok, were banned.³⁵

While this was in retaliation to a deadly border clash on June 15, 2020, between Indian and Chinese troops, Indian public opinion has become increasingly hostile to Chinese technology brands.

Technology empowered ideology and retaliatory sanctions – When China imposed its National Security Law over Hong Kong's semi-autonomous status, the US Senate passed the Hong Kong Autonomy Act, which enforces sanctions on individuals and entities within the government of China that undermine the rights of the people of Hong Kong. More importantly, the legislation targets any bank that would be seen as aiding and abetting violators.³⁶

A bank participating in Beijing's digital currency initiative, could, by association, be seen as complicit in Beijing's broader techno-nationalist ambitions. By extension, the same bank could also be seen as aiding and abetting Beijing's repression of political

freedom in Hong Kong under the National Security Law – which could make the bank subject to US sanctions.

Market fragmentation – As China attempts to decouple from the US dollar, the CCP has been looking to enhance its financial ties with its Asian trading partners. As such, China is leading an East Asian crypto-currency initiative.

This initiative would utilize a basket of currencies comprised of the Yuan (60%) and the Japanese Yen (20%), with the remainder of the balance accounted for by the South Korean Won and the Hong Kong Dollar. Beijing hopes to link its digital currency initiative to trade agreements, creating a virtuous cycle for the renminbi.

If successful, China's East Asian Initiative would further fragment the financial landscape by decoupling China and its trading partners from the US dollar.

Facebook, techno-nationalism and monopolistic behavior

Washington's strategic objective of preserving US dollar hegemony could change the dynamics of the current status of Libra. Like other governments, Washington had initially rejected the idea of Libra on the grounds that it would marginalize the authority of central banks. The latest modified version of Libra, however, with direct convertibility to the US dollar, could change this position.

Facebook – which has been the focus of anti-trust actions in both the US and the EU – could become a kind of techno-nationalist proxy for US interests.³⁷ As a major cog in a US-backed digital currency ecosystem, Facebook would increase its revenues and its power significantly.

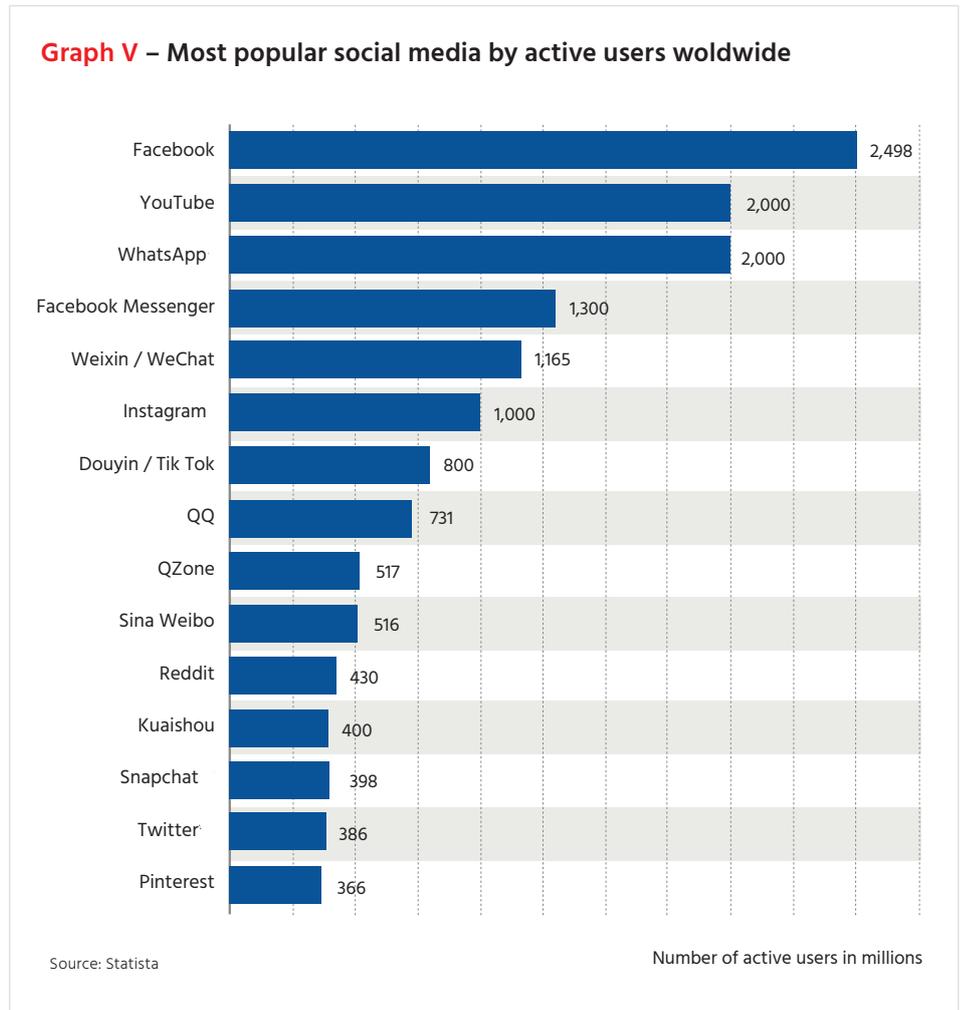
A bank participating in Beijing's digital currency initiative, could, by association, be seen as complicit in Beijing's broader techno-nationalist ambitions.

Techno-nationalism may crowd-out competitors which would be detrimental to market driven innovation in the long-term.

Under those circumstances, given its strategic value to the US government, the question becomes: would Facebook and other large MNEs no longer be subject to anti-trust measures? This same situation could apply to Microsoft, which was recently awarded a US\$10 billion contract to build the joint enterprise defense

infrastructure initiative (JEDI) for the US Department of Defense. A contract of this magnitude affords Microsoft incredible power in the digital cloud space, where it could easily crowd-out and acquire other would-be players, which would be detrimental market-driven innovation in the long-term.

Graph V – Most popular social media by active users worldwide



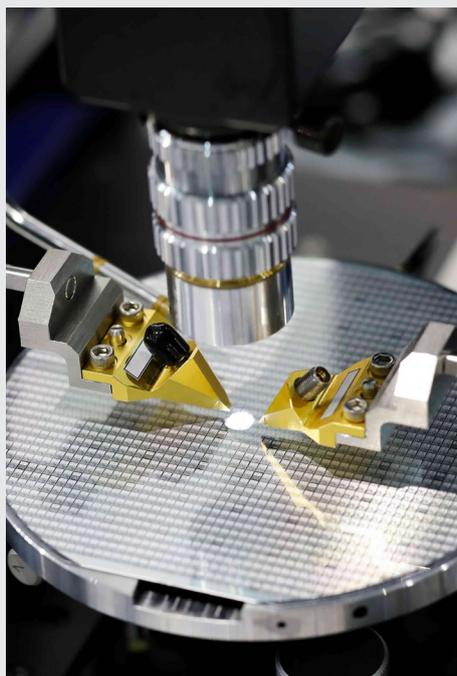
Semiconductors: The tension between markets and techno-nationalism

Techno-nationalism creates tensions between states and markets...

One of the Trump administration's objectives in its trade talks with Beijing has been to pressure the CCP to increase the amount of purchases of US goods and services by US\$1 trillion dollars over a period of six years. This amount was said to have included a guarantee from China to buy US\$30 billion in US semiconductors.

The semiconductor sector, however soundly rejected this idea. The logic: markets, not government fiat, should determine commercial success.³⁸ This might give one pause, given that US semiconductor companies have suffered extensive collateral damage from US export controls which have curtailed their sales to Chinese restricted entities such as Huawei, HikVision, SenseTime and others. This loss of revenue reduced the amount of money available for R&D, the lifeblood of the technology sector.

...but US semiconductor firms have been increasingly turning to the US public sector for R&D funding.



The US Semiconductor Industry Association (SIA) argued that a quota of microchip sales to the Chinese government would distort markets and end up doing more harm than good. For example, SIA argued:

- Because of high US production costs, US firms would be forced to move production to China, which would make US firms more vulnerable and dependent on the Chinese state, which would, ultimately, benefit Chinese competitors.
- An agreed "quota system" would result in Chinese companies receiving contracts as the CCP would inevitably look to promote China's national champions.
- A quota sales system would contribute to overcapacity in the market: as new Chinese firms came on line and the CCP continued to purchase chips under a binding US trade agreement, a market glut would result, further damaging US companies.

Under the current paradigm shift, however, US semiconductor firms have been increasingly turning to the US public sector, primarily for funding of R&D and human capital development. Like other technology companies, however, semiconductor companies will resist public-private partnerships that distort markets or impose suffocating regulatory constraints. They will, however, welcome government support regarding IP protection and rules enforcement against hostile actors.

Open-sourced 5G innovation as a techno-nationalist strategy

The idea of leveling playing fields in the technology sector, primarily by open-sourcing the innovation process, has been gaining ground.

The idea of levelling playing fields in the technology sector, primarily by open-sourcing the innovation process, has been gaining ground. The open-sourcing option has become especially attractive for the future of 5G.

In the case of 5G, an Open Radio Access Network (O-RAN) has been proposed by an industry trade body, the GSMA. This is a concept based on interoperability and standardization of radio network components. An O-RAN utilizes a universal inter-connection standard for so-called white-box³⁹ hardware and open source software elements – from any number of different vendors.

O-RAN opens the market up to countless smaller niche hardware and software providers – all able to operate and connect using the same software and basic architecture – which creates a level playing field for further innovation and competition, and expands the supply chain for advanced wireless technologies in 5G and beyond.⁴⁰

This could be a game-changer in today's 5G wireless market which is monopolistic or duopolistic, as it involves only a few players: namely, Huawei, Nokia and Ericsson.

Key benefits of O-RAN:

- Eliminates vendor lock-in (having to be dependent on a dominant company that controls all the technology)
- Third-party testing (raises standards and quality, embraces market forces)
- Choosing multiple operators

and service providers (allows full optimization, rationalization of networks)

- Open-source infrastructure and tools (such as Red Hat and Linux) lower market barriers-to-entry to smaller firms, thereby creating a virtuous cycle
- Creates greater diversity in the market and niche players with high levels of innovation and quality

The O-RAN Policy Coalition

Thirty-one global technology companies have joined the recently launched O-RAN Policy Coalition.⁴¹ The founding members include:

Network hardware – Cisco, Fujitsu, IBM, Intel, NEC, Qualcomm, and Samsung.

Cloud computing – AWS, Dell, Facebook, Google, Microsoft, and Oracle.

Cellular carriers – AT&T, Dish Network, and Verizon. Japanese carriers NTT Docomo and Rakuten Mobile also joined the coalition, as did international carriers Telefonica and Vodafone.

Software and radio – Airspan, Altiostar, CommScope, Juniper Networks, Mavenir, NewEdge Signal Solutions, Parallel Wireless, US Ignite, VMWare, World Wide Technology, and XCOM-Labs.

Open sourcing and Washington's techno-nationalist angle

Washington is attempting to leverage the O-RAN Policy Coalition to develop an alternative to Huawei's 5G offerings

Both Nokia and Ericsson are actively involved in building new 5G capacity in the US, partly in response to the US “rip and replace” law.

and, simultaneously, is looking to bolster a US-dominated innovation ecosystem and establish de facto global standards around 5G.

There are companies in the coalition from Japan, the UK, Spain and South Korea, but the majority are American. As such, the US government is set to commit to extensive funding for R&D and the facilitation of new PPPs around open-sourced innovation and O-RAN. Here, the breadth and depth of the US’s entrepreneurial landscape and open-market system give the Washington’s O-RAN plan a high chance of success.

Other companies such as Japan’s NEC, and South Korea’s Samsung, see an opportunity to capture new market share.

Meanwhile, Ericsson and Nokia – the world’s two other leading telecommunications equipment

manufacturers after Huawei – have not joined the coalition. In the case of Ericsson, which derives much of its revenue from mobile equipment sales, an O-RAN world would see its market share sharply reduced.

Both Nokia and Ericsson, however, are actively involved in building new 5G capacity in the US, partly in response to the US “rip and replace” law that mandates the removal of both ZTE’s and Huawei’s equipment from US telecoms networks.⁴²

Given the US government’s desire to create alternatives to Chinese companies in the 5G space – even if they are not American – both Nokia and Ericsson would also become likely beneficiaries of funding and support from Washington, even if O-RAN was not immediately beneficial to either.⁴³

III. Academia, R&D and techno-nationalism: Open vs. closed systems

The US is doubling down on its efforts to prevent hostile actors from exploiting the openness of its educational system.

Washington and academic techno-nationalism

All roads to innovation eventually must pass through the world's top academic institutions, and the majority of them reside in the US or within other open-market oriented nations.

But even as Washington is looking to increase R&D funding for America's vast network of public and private universities, it is also doubling down on its efforts to prevent hostile actors from exploiting the openness of the US educational system.

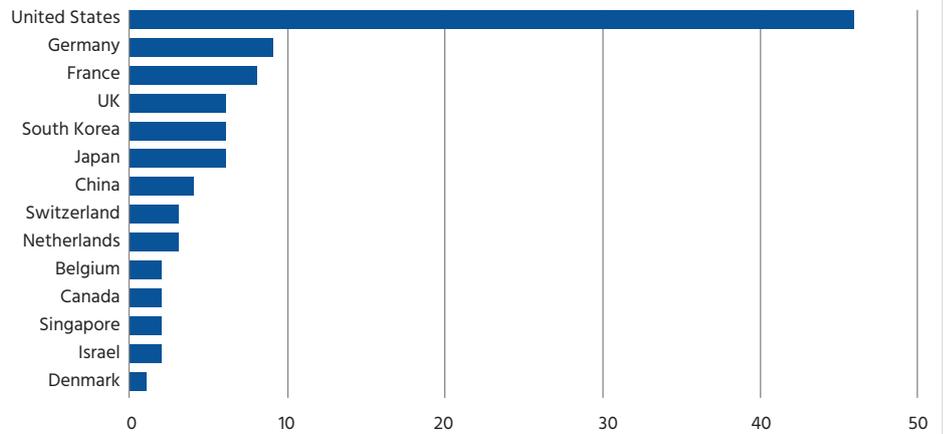
Table V – 2020 world university research rankings

2020 Research Rank	2019 Research Rank		2020 Research Score	2020 Overall Rank*
1	1	University of Oxford, UK	99.6	1
2	2	University of Cambridge, UK	98.7	3
3	3	Harvard University, US	98.6	7
4	4	California Institute of Technology, US	97.9	2
5	5	Stanford University, US	96.4	4
6	7	Princeton University, US	96.3	6
7	8	Yale University, US	94.8	8
8	6	Tsinghua University, China	94.0	23
9	11	ETH Zurich, Switzerland	92.8	13
10	9	Massachusetts Institute of Technology, US	92.4	5
11	13	University of Chicago, US	91.4	9
12	12	Johns Hopkins University, US	91.4	12
13	10	University of California, Berkeley, US	90.6	13
14	16	National University of Singapore, Singapore	90.4	25
15	15	University of Pennsylvania, US	90.4	11
16	27	Peking University, China	90.0	24
17	19	The University of Tokyo, Japan	89.6	36
18	20	The University of Toronto, Canada	89.5	18
19	14	UCL, UK	88.7	15
20	17	University of California, Los Angeles, US	88.6	17
21	18	Imperial College London, UK	87.6	10
22	21	University of Michigan-Ann Arbor, US	86.1	21
23	22	Cornell University, US	86.0	19
24	23	Northwestern University, US	83.8	22
25	25	London School of Economics and Political Science, UK	83.0	27

*Overall ranking is based on teaching, research, citations, international outlook and industry income.

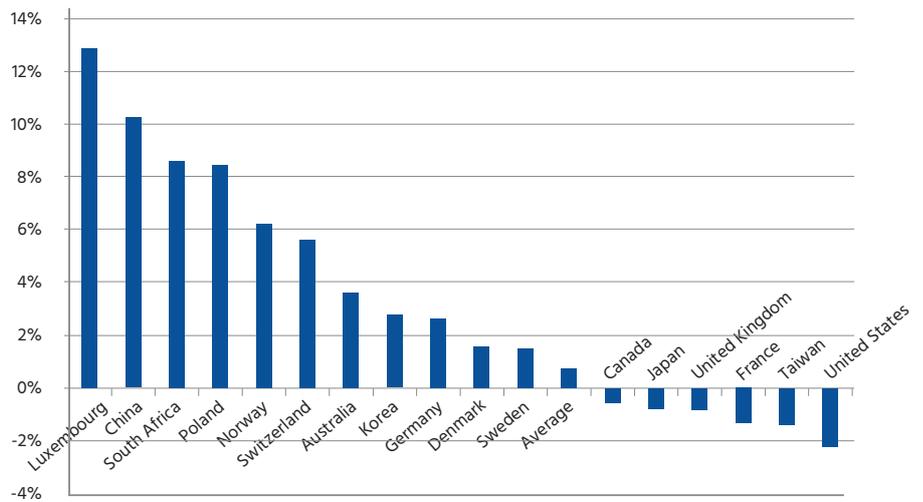
Source: Times Higher Education

Graph VI – World’s top universities by innovation



Source: Clarivate Analytics via Reuters, <https://www.reuters.com/innovative-universities-2019>

Graph VII – Average annual percentage change in government funding for university R&D in constant PPP dollars, 2011-2017



Source: OECD Science, Technology and R&D Statistics, 2019

To remain vibrant places of learning, universities, colleges and R&D organizations must begin to implement risk-management measures.

The next phase of techno-nationalism, therefore, will create tensions between government policies and the operating practices of open academic environments in the US, Europe and beyond. Once again, the challenge for public-private partnerships will about achieving a healthy middle ground.

To remain vibrant places of learning, therefore, universities, colleges and R&D organizations must begin to implement risk-management measures that address the complexities of the US-China technology race.

The academic world is going to see a massive infusion of public funding.

A wave of new university funding

With university R&D playing a critical role in the innovation race, the academic world is going to see a massive infusion of public funding.

In 2019, for example, an independent task force report by the Council on Foreign Relations – whose participants included MIT, UC Berkeley, Alphabet, Apple and McKinsey & Company – recommended that US universities should receive an additional US\$20 billion a year in federal funding for at least five years.⁴⁴ Another study conducted by the Information Technology and Innovation Foundation (ITIF), calls for the US Congress to increase R&D funding to universities by US\$45 billion per year.⁴⁵

A multi-pronged approach

The US political establishment has resorted to a multi-pronged approach when dealing with academic and research-oriented institutions. New measures will fundamentally change how universities enter into collaborative research partnerships, hire faculty and admit foreign students. Washington’s approach includes:

- Expansion of export controls and the placement of Chinese universities, academics and students on restricted entity lists
- Enforcement and prosecution for violations of academic integrity, conflicts of interest and non-disclosure of China ties
- New controls regarding foreign student enrolment and screening
- Increased separation of fundamental research into classified, ring-fenced environments controlled by the US defense establishment, such as DARPA.

US export controls and academia

US export controls will become more widespread at universities, research organizations and other institutions. Academic institutions will have to adjust to an expanding net of rules and compliance standards, such as:

- Export controls on software, networks, computer code and other IP
- The placement of foreign academic institutions on restricted entity lists
- The black-listing of individuals (academics and students)
- Quota and visa restrictions on the enrolment of foreign students at top universities
- Reduction or prohibition of acceptance of funding from foreign entities.

In June 2020, the US blacklisted several of China’s premier universities, including the Harbin Institute of Technology (HIT), which has been referred to as the “MIT of China”. The effects of restricted entity status were felt immediately: HIT faculty and students no longer have access to critical simulation and research software from the US, such as MATLAB, which is used extensively in R&D programs around the world.⁴⁶

Other ramifications include the severing of exchange programs between HIT and the University of Arizona and the University of California, Berkeley. More broadly, the placement of HIT on the restricted entity list exposes other Chinese academic institutions, which are also part of a wider network of research being funded by both the CCP and China’s People’s Liberation Army (PLA). The possibility that these other institutions might be next on Washington’s target list could lead to pre-emptive decoupling by other

New measures will fundamentally change how universities enter into collaborative research partnerships, hire faculty and admit foreign students.

Expanding the US export control net to more Chinese universities will cut off human capital needed to conduct R&D.

existing academic partners in the US and around the world.

Preserving open and collaborative universities

Expanding the US export control net to more Chinese universities, however, will cut off human capital needed to conduct R&D undertaken at US institutions, which would also reduce the talent pipeline to US-based technology companies.

Consider the following: In computer science, in 1995, there were nearly equal numbers of US and international full-time graduate students. Between 1995 and 2015, the number of US students increased by 45% (8,627 to 12,539), while the number of

international students soared by 480% (7,883 to 45,970). During the same period, the number of US graduate students in electrical engineering (EE) actually decreased by 17%, while the number of foreign students rose 270%.⁴⁷ The number of Chinese students enrolled in all higher education courses in the US rose from 98,235 in 2008-09 to 369,548 in 2018-19.⁴⁸

Although these circumstances will continue to allow Beijing to exploit the open educational systems in the US, a large-scale closing-off of the US educational system to Chinese students and academics, would be counter-productive to US interests.



Graduates of Columbia University wave flags during a commencement ceremony.

China's Thousand Talents Program

Accessing the best overseas talent has been vital to Beijing's efforts to transfer knowledge, build research capabilities and transfer intellectual property to its national innovation landscape.

The Thousand Talents Program targets high-level scientists and other experts from overseas, including foreign scientists. It offers significant financial support to relocate to China for conducting research in high-tech industries and technologies of the future, and for participating in China's major scientific programs in support of China's high-tech development plans.

China is reportedly on track to establish 40 new advanced manufacturing innovation institutes, in order to build key industry clusters needed to support the Made in China 2025 plan.⁴⁹

Much of the success of China's nascent R&D capabilities is tied to its "Thousand Talents Program"⁵⁰, which the CCP established in 2008, with the objective of absorbing top intellectual capital from around the world. Accessing the best overseas talent has been vital to Beijing's efforts to transfer knowledge, build research capabilities and transfer intellectual property to its national innovation landscape.

But, to many China observers, the Thousand Talents Program is closely tied to the Chinese state's corporate espionage and IP acquisition efforts, which include the use of rewards, deception, coercion and theft.⁵¹ These suspicions have been compounded by China's National Intelligence Law, which requires Chinese citizens and organizations to render assistance to the state security and intelligence organizations, when asked. Thus – whether justifiable or not – Chinese academics and students working and studying in the US have fallen under increased suspicion.

Table VI – Chinese universities rising in artificial intelligence field

2014 rankings

- 1 Carnegie Mellon University
- 2 **Tsinghua University**
- 3 Technion-Israel Institute of Technology
- 4 Massachusetts Institute of Technology
- 5 University of Michigan
- 6 University of Toronto
- 7 University of Alberta
- 8 Ben-Gurion University
- 9 Cornell University
- 10 Georgia Institute of Technology
- 11 University of Texas, Austin
- 12 University of Oxford
- 13 University of Southern California
- 14 Stanford University
- 15 University of California, Los Angeles

2018 rankings

- 1 Carnegie Mellon University
- 2 **Tsinghua University**
- 3 Stanford University
- 4 University of California, Berkeley
- 5 **Peking University**
- 6 University of Oxford
- 7 Georgia Institute of Technology
- 8 University of Massachusetts, Amherst
- 9 ETH Zurich
- 10 Massachusetts Institute of Technology
- 11 University of Texas, Austin
- 12 **Chinese Academy of Sciences**
- 13 Cornell University
- 14 **Nanjing University**
- 15 Nanyang Technological University

Source: MarcoPolo, Paulson Institute via Council on Foreign Relations, Independent Task Force Report No. 77 Innovation and National Security: Keeping our edge

Academic institutions and public officials face significant challenges as they adjust to the US-China technology cold war.

Enforcement and criminal prosecution cases

US law enforcement agencies such as the FBI are focusing on China's access to the American educational system, specifically, the manner in which Chinese institutions and citizens obtain access to intellectual property, critical research and world-class human capital.

In January 2020, Charles Lieber, a Harvard University nano-scientist and former chair of the Chemistry and Chemical Biology Department, was arrested on charges that he failed to declare his ties to China's Thousand Talents Program.

Mr Lieber is alleged to have been a "Strategic Scientist" at Wuhan University of Technology from 2012-2015, where he was paid US\$50,000 per month and allocated US\$1.5 million to establish a research lab. The lab was tasked with applying for research patents under the name of Wuhan University of Technology.⁵² The focus of the research was, allegedly,

the development of nanowire-based lithium ion batteries for high performance electric vehicles.⁵³

Also at the time of Charles Lieber's case, a Chinese graduate student, Yanqing Ye, was arrested for failing to disclose she was a lieutenant in the People's Liberation Army (PLA) when she gained a non-immigrant visa to conduct studies at Boston University, in the Department of Physics, Chemistry and Biomedical Engineering.

Ms Ye is accused of spying for the PLA. Devices seized from her showed she accessed US military websites, researched US military projects and compiled information for the PLA on two US citizens with expertise in robotics and computer science, according to federal documents.⁵⁴

Incidents such as these underscore the challenges facing both academic institutions and public officials as they adjust to the US-China technology cold war.

The academic community will need to implement due diligence practices similar to "know your customer" (KYC) standards in the banking industry.

New rules-frameworks in academia

The academic community will need to work closely with policy makers and law enforcement agencies to address the challenges of US-China techno-nationalism. This includes implementing rules-frameworks such as:

- Implementation of conflict of Interest audits – conducted by third parties – and due diligence practices similar to "know your customer" (KYC) standards in the banking industry. This would apply to faculty and certain graduate students conducting applied and specialized research.
- Increased enforcement of "research integrity" standards and penalties for violators (including faculty, students and entire academic institutions).
- Full disclosure and transparency standards. These should be audited and enforced by independent, certified third-parties, as required, between reciprocal and collaborative academic institutions.
- Continued adherence to NSDD-189, a US presidential directive dating back to 1985 and the Cold War with the Soviet Union that states that the output of

The long-term race for innovation advantage is ultimately about developing human capital.

fundamental research should remain open and unrestricted as much as possible.⁵⁵

- Ring-fencing and moving fundamental or applied research partnerships with national security implications within the defense establishment.
- Diversifying foreign student populations to avoid over-reliance of revenue or other funding from any particular one source.
- Rejecting funding outright from potentially hostile entities, both state and non-state.

Keeping the talent pipeline open

Even as US policy makers must take necessary measures to prevent the exploitation of US research by hostile actors, it must also ensure that the pipeline for human capital development remains open.

Closing off the US research and innovation community entirely to Chinese and other foreign students would be hugely counter-productive. From a “soft-power” perspective, alone, sealing off an academic system to a large swathe of talented foreign students limits the spread of US values and influence around the world.

As the COVID-19 pandemic has demonstrated, in a hyper-connected world, it is virtually impossible to prevent the flow of certain information and data within dedicated research communities. Even as the relationship between Beijing and Washington has deteriorated throughout the coronavirus pandemic, for example, the international medical, pharma and academic communities have continued to collaborate in the search for effective treatments of COVID-19.

Similarly, in the present US-China innovation race, an open academic system is far superior to a closed one, despite escalating techno-nationalism. As such, the US could expand the STEM pipeline with top talent from everywhere. This would build upon the existing advantages of the present educational system in the US.

The long-term race for innovation advantage is ultimately about developing human capital. This means funding STEM education in K-12, as well as for graduate and post-graduate levels of college and polytechnic programs. To better develop local talent, the US should roll out more scholarships, college debt forgiveness programs and grants for minorities and under-privileged students. It should invest in learning centers and resources for communities everywhere.

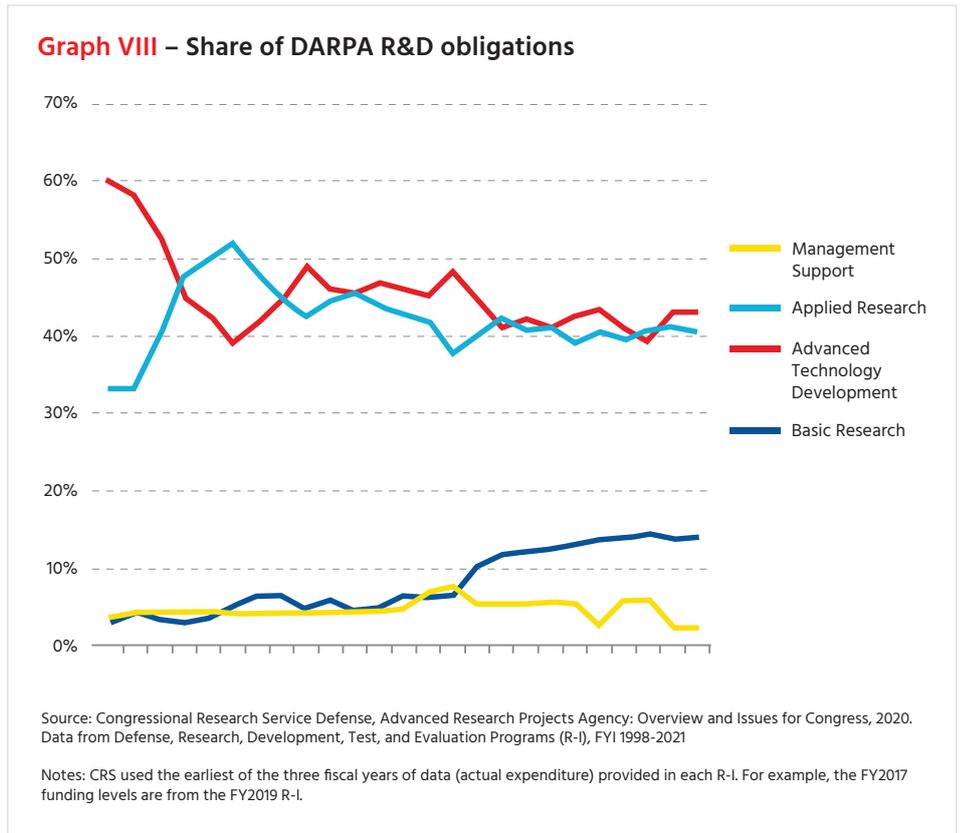
To attract the best foreign talent, even under a techno-nationalist innovation system, the US would have to remove barriers to temporary work and student programs such as the H-1b visa. It could provide long-term stay visas and residency permits to foreign students involved in tech start-ups and employment with leading edge tech companies.

Once again, the tensions of an emergent techno-nationalist agenda will strain public-private partnerships with academia but, eventually, a middle-ground can be reached that addresses these issues appropriately.

The military and academia

As more technology and innovation is designated critical to national security, academic public-private partnerships will increasingly migrate to the confines of the US military-industrial complex.

Closing off the US research and innovation community entirely to Chinese and other foreign students would be hugely counterproductive.



Techno-nationalism will inevitably lead to more academic decoupling between the US and China.

The US-China technology cold war will galvanize new alliances and partnerships between nations.

Techno-nationalism will inevitably lead to more academic decoupling between the US and China, as the recent US action against the Harbin Institute of Technology demonstrates. There will also likely be a drop off in foreign student participation in certain areas of fundamental research. US defense R&D is now at its highest levels since the end of the US-Soviet cold war.⁵⁶ DARPA (Defense Research Projects Agency) was involved in regaining the innovation advantage for the US semiconductor industry in the 1980s and 1990s. DARPA and other defense-related agencies are once again expanding research and innovation systems into academia. Recent initiatives under the National Defense Education Act include:

- US\$1.5 billion five-year R&D project for advanced microchip design,

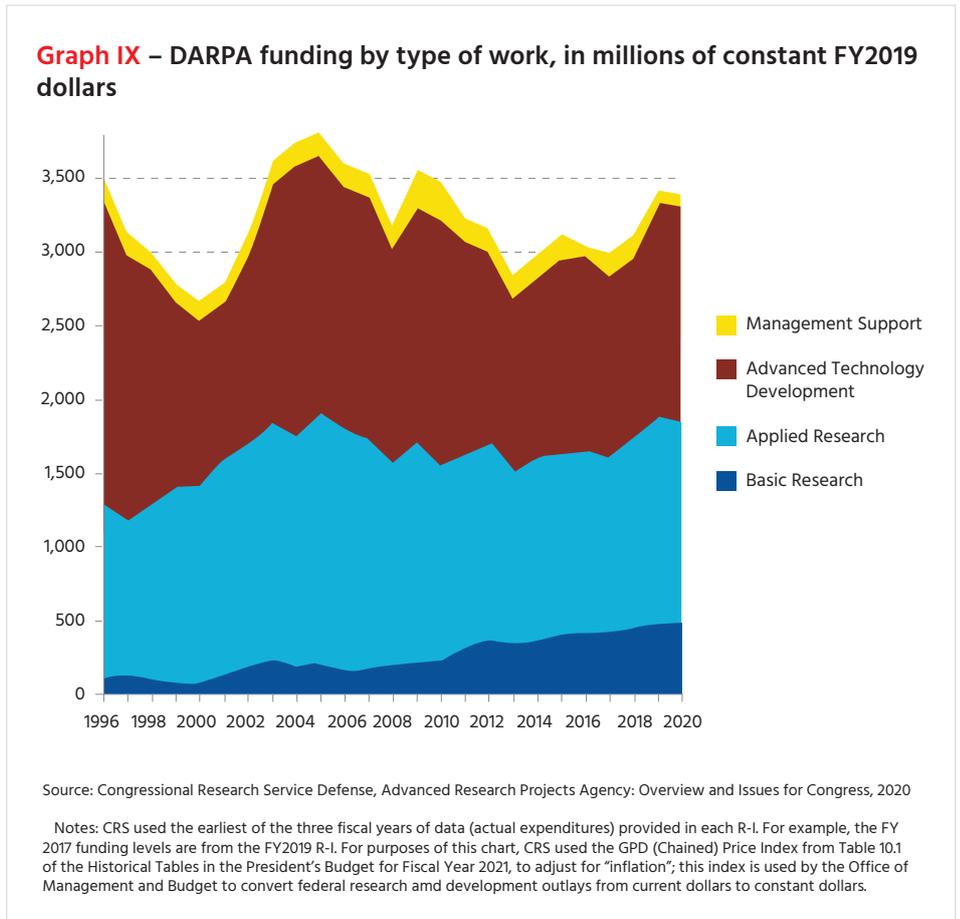
conducted under its Electronics Resurgence Unit.

- US\$5 billion in AI R&D from the US Defense Department for the AI Initiative.

And, as was previously covered, a range of other initiatives such as the US\$100 billion Endless Frontier Act and other R&D funding initiatives will be increasingly ring-fenced within the defense establishment.

International alliances and cooperation

US-China techno-nationalism and its effect on markets and non-state actors is not confined to just China and the US. The global paradigm shift around a technology cold war will galvanize new alliances and partnerships between nations, and spur new rounds of trade



and diplomacy. This will require a multilateral approach to conducting research, forming partnerships and implementing new rules frameworks.

This topic will be covered in the third essay in this Hinrich Foundation series on techno-nationalism.

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