HEARING ON AN ASSESSMENT OF THE CCP'S ECONOMIC AMBITIONS, PLANS, AND METRICS OF SUCCESS

HEARING

BEFORE THE

U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

ONE HUNDRED SEVENTEENTH CONGRESS
FIRST SESSION

THURSDAY, APRIL 15, 2021

Printed for use of the
United States-China Economic and Security Review Commission
Available via the World Wide Web: www.uscc.gov

UNITED STATES-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

WASHINGTON: 2021

U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

CAROLYN BARTHOLOMEW, *CHAIRMAN*
ROBIN CLEVELAND, *VICE CHAIRMAN*

Commissioners:

BOB BOROCHOFF
JEFFREY FIEDLER
HON. CARTE P. GOODWIN
ROY D. KAMPHAUSEN
DEREK SCISSORS
HON. JAMES M. TALENT
ALEX N. WONG
MICHAEL R. WESSEL

The Commission was created on October 30, 2000 by the Floyd D. Spence National Defense Authorization Act of 2001, Pub. L. No. 106–398 (codified at 22 U.S.C. § 7002), as amended by: The Treasury and General Government Appropriations Act, 2002, Pub. L. No. 107–67 (Nov. 12, 2001) (regarding employment status of staff and changing annual report due date from March to June); The Consolidated Appropriations Resolution, 2003, Pub. L. No. 108–7 (Feb. 20, 2003) (regarding Commission name change, terms of Commissioners, and responsibilities of the Commission); The Science, State, Justice, Commerce, and Related Agencies Appropriations Act, 2006, Pub. L. No. 109–108 (Nov. 22, 2005) (regarding responsibilities of the Commission and applicability of FACA); The Consolidated Appropriations Act, 2008, Pub. L. No. 110–161 (Dec. 26, 2007) (regarding submission of accounting reports; printing and binding; compensation for the executive director; changing annual report due date from June to December; and travel by members of the Commission and its staff); The Carl Levin and Howard P. ‘‘Buck’’ McKeon National Defense Authorization Act for Fiscal Year 2015, Pub. L. No. 113–291 (Dec. 19, 2014) (regarding responsibilities of the Commission).

The Commission’s full charter and statutory mandate are available online at: https://www.uscc.gov/charter.

CONTENTS

THURSDAY, APRIL 15, 2021

HEARING ON AN ASSESSMENT OF THE CCP'S ECONOMIC AMBITIONS, PLANS, AND METRICS OF SUCCESS

Panel I: The Chinese Communist Party's Economic Ambitions: Is the Past Prologue?

Panel II: Understanding China's Economic Drivers and Ecosystem

Panel III: Policies and Planning for Emerging Industries: New Mobility, Cloud Computing, and Synthetic Biology

Panel IV: China's Pursuit of Leadership in Digital Currency

QUESTIONS FOR THE RECORD

PUBLIC COMMENT SUBMITTED FOR THE RECORD

AN ASSESSMENT OF THE CCP'S ECONOMIC AMBITIONS PLANS AND METRICS OF SUCCESS

THURSDAY, APRIL 15, 2021

U.S.-CHINA ECONOMIC AND SECURITY REVIEW COMMISSION

Washington, D.C.

The Commission met in Room 233 of Hall of the States Building, Washington, DC and via videoconference at 9:30 a.m., Vice Chairman Robin Cleveland and Commissioner Michael Wessel (Hearing Co-Chairs) presiding.

OPENING STATEMENT OF VICE CHAIRMAN ROBIN CLEVELAND HEARING CO-CHAIR

VICE CHAIRMAN CLEVELAND: Good morning.

Our hearing today will provide an assessment of China's past and current economic capabilities and plans, and how the Chinese Communist Party is directing and evaluating future success. In studying China for some time, it seems many often evaluate success through a Western lens, which means we overlook the CCP's key policies and practices and find ourselves often surprised when they choose a course inconsistent with global obligations and responsibilities. I welcome the fact that 9 of our 12 witnesses today have not appeared before the Commission, so will bring fresh, new thinking to the challenges before us.

For the better part of the last two decades, U.S. policymakers have pursued a path committed to expanding market access and opportunities aligned with global trading rules. We've actively promoted international treaty obligations protecting Hong Kong citizens and democracy, as well as sovereign rights for regional states in the South China Seas. We have consistently globally advocated for human rights and lead the world in providing generous humanitarian aid, unconditional foreign assistance, and unprecedented levels of debt relief for our poorest neighbors. We've collaborated with friends and allies in building a generation of innovation, prosperity, and freedom.

And throughout this history, we have offered the statement that we expect no state-nation to choose sides between the U.S. and China. The time has come to acknowledge that this approach has served the CCP and creates a false choice. We must recognize it for what it is, a scare tactic that the Xi regime has promoted.

Under Xi's leadership, we face an unprecedented threat which requires a collective response. As our witnesses will describe today, the CCP is accelerating and intensifying past practices to promote future industries. Today, we will look at current patterns and examine how the CCP is applying its approach in important and emerging sectors -- from cloud computing to new transportation models, biotech and digital currency.

The CCP's past is a prologue of what is to come in critical emerging commercial sectors. Our witnesses bring expertise in how the CCP will designate and subsidize national champions,

impose limits on foreign firms' access until local companies establish market dominance, restrict licensing agreements, engage in technology theft and transfer, promote massive government guidance funds to shore up future enterprises. And we will learn more about the crushing, coercive tactics used against any nation, firm, or person who disagrees with Xi's vision.

The choice is not between the United States or China. It is not between East or West. Indeed, localities, provinces, and citizens in China are faced with the same difficult choice. It is a choice between a world that pledges debt relief to poor nations suffering because of China's irresponsible management of the pandemic versus a world of the Communist-Party-backed privileged, state-owned enterprises bringing opaque, punishing concessions from sovereign borrowers, and then, threatening termination of political ties in the event of default.

It is a choice between a world in which we promote the right of Hong Kongers and Uighurs versus a world where crippling retaliatory restrictions on commercial enterprises are imposed against those who disagree with the CCP's genocidal slave labor policies in Xinjiang.

It is a choice between free speech or censorship; between free travel or economic sanctions and threats to airlines who identify Taiwan on their schedules; between collecting data to improve the next generation of vaccines or amassing data to fuel technoauthoritarian genetic research and surveillance on citizens around the world.

It is a choice built on freedom and defined by democracy, generosity, innovation, and collaboration or a world in which the Communist Party of China calls the shots. That is the choice ahead.

And I'll turn to my colleague, Mike Wessel.

PREPARED STATEMENT OF VICE CHAIRMAN ROBIN CLEVELAND
HEARING CO-CHAIR

Our hearing today will provide an assessment of China's past and current economic capabilities and plans and how the Chinese Communist Party (CCP) is shaping and evaluating future success. In studying China for some time, I often find we evaluate success through a western lens, which means we overlook the CCP's key policies and practices and find ourselves surprised when they choose a course inconsistent with global obligations and responsibilities. I welcome the fact that nine of our 11 witnesses have not appeared before the Commission and so bring fresh, new thinking to the challenges ahead.

For the better part of the last two decades, U.S. policy makers have pursued a path committed to expanding market access and opportunities aligned with global trading rules. We have actively promoted international treaty obligations protecting Hong Kong's democracy and sovereign rights in the South China Sea. We consistently advocate for human rights and lead the world in providing generous humanitarian aid, unconditional foreign assistance and unprecedented levels of debt relief for our poorest neighbors. We have collaborated with friends and allies in building a generation of innovation, prosperity and freedom. Throughout this history we have offered the reassuring refrain that we expect no nation to choose sides – privately, we have reassured the CCP that we neither ask nor seek a choice between engaging with the U.S. or pursuing interests in China.

The time has come to acknowledge that the CCP's approach creates a false choice. We must recognize it for what it is—a scare tactic that the Xi regime has promoted.

Under Xi's leadership, we face an unprecedented threat which requires a collective response. As our witnesses will describe today, the CCP is accelerating and intensifying past practices to promote future industries. Today we will look at current patterns and examine how the CCP is applying its approach in important and emerging sectors of cloud computing, new transportation models, biotech, and digital currency. The CCP's past is the prologue of what is to come in critical emerging commercial sectors – our witnesses bring expertise in how the CCP will designate and subsidize national champions, impose limits on foreign firms' access until local companies establish market dominance, restrict licensing agreements, engage in technology theft and transfer, promote massive government guidance funds to shore up future enterprises and, we will learn more about the crushing coercive tactics used against any nation, firm, or person who disagrees with Xi's vision.

The choice is not between the U.S. or China—it is not between east or west. Indeed, localities, provinces and citizens in China are faced with the same difficult choice.

It is a choice between a world that pledges debt relief to poor nations suffering because of China's irresponsible management of the pandemic versus a world of Party-backed, privileged, state-owned companies wringing opaque, punishing concessions from sovereign borrowers and threatening termination of political ties in the event of default.

It is a choice between a world in which we promote the rights of Hong Kongers and Uyghurs versus a world where we accept crippling retaliatory restrictions on commercial enterprises who disagree with the CCP's slave labor policies.

It is a choice between free speech or surveillance and censorship—between free travel or economic sanctions and threats to airlines who identify Taiwan on their schedules.

It is a choice built on freedom and defined by generosity, innovation, and collaboration. Or, a world in which the Communist Party of China calls the shots.

OPENING STATEMENT OF COMMISSIONER MICHAEL WESSEL
HEARING CO-CHAIR

COMMISSIONER WESSEL: Thank you, Vice Chairman Cleveland, and good morning, everyone.

And I want to thank the Vice Chairman for our continuing partnership on many of these hearings over many years.

I want to thank our witnesses for joining us today and for the thought and consideration they have given to their testimonies.

As China's policymakers chart the course for the next stage of China's development strategy, they have a renewed sense of confidence in the government's approach and believe the model pursued by the United States has failed. CCP General Secretary Xi told Party officials China is entering a time of opportunity with the, quote, "East rising and the West in decline." Unquote.

Though they often speak of greater economic openness, in reality, Chinese policymakers have diminished the potential role of the market and have strengthened the hand of the state. There are no truly private companies of any scale or importance, as they are all increasingly subjected to the hand of the state.

The Chinese government's efforts to become more self-sufficient rely on all-too-familiar tools, such as subsidies, extensive tax breaks, discriminatory procurement policies, and predatory pricing. The 14th Five-Year Plan makes clear that China is not interested in reform in the Western sense, but is interested in dominating key technologies and sectors.

The CCP's policies narrow the opportunities for U.S. companies operating in China, but also result in deep negative effects here in the U.S., undercutting the competitiveness of domestic firms and jeopardizing the livelihoods of U.S. workers. CCP policies have fueled a massive transfer of global productive capacity in technology to China and contributed to the hollowing-out of the U.S. industrial base.

The COVID-19 pandemic has painted a stark picture as to the cost of Chinese policies to the U.S. and the world with the CCP presiding over the capture and control of key supply chains. The vulnerabilities fostered by the CCP policies had disastrous consequences for products ranging from personal protective equipment to sophisticated technologies and services with severe consequences that can be far harder to correct.

The CCP has set its sights on technologies that will shape the future. Today, we will examine the Chinese government's pursuit of leadership in particular sectors like new mobility and synthetic biology. In new mobility, the government is advancing Chinese vehicle production and exports through investment and supporting policies with autonomous, intelligent, and clean energy technologies. Their efforts may challenge the strength of the U.S. auto industry, one of the biggest drivers of U.S. economic activity and employment.

The integration of digital platforms and public transportation infrastructures support the Chinese government's quest to acquire vast sums of data that would advance the technologies, but they can also be used for surveillance, control, and repression of its people. Massive data collection is also a key feature of the CCP's synthetic biology strategy, where genetic engineering will have numerous applications from health care to agricultural production. These developments will be key to Chinese growth, but also have implications for U.S. competitiveness, global dependence on Chinese sources, and Chinese influence in international standards-setting for these cutting-edge technologies.

To our distinguished witnesses, thank you for joining us to discuss these important questions. We look forward to hearing from each of you.

I also want to take a moment to thank our two primary staffers on this hearing today. Emma and Leyton, your work is deeply appreciated.

The testimony and transcript from today's hearing will be posted on our website, www.uscc.gov.

Also, please mark your calendar for the Commission's upcoming hearing on China's activities in Latin America and the Caribbean, which will take place on May 20th.

PREPARED STATEMENT OF COMMISSIONER MICHAEL WESSEL
HEARING CO-CHAIR

Thank you, Vice Chairman Cleveland, and good morning everyone. I want to thank our witnesses for joining us today, and for the thought and consideration that they have given their testimonies.

As China's policymakers chart the course for the next stage of China's development strategy, they have a renewed sense of confidence in the government's approach and believe the model pursued by the United States has failed. CCP General Secretary Xi Jinping told Party officials China is entering a time of opportunity with "the east rising and the west in decline." Though they often speak of greater economic openness, in reality Chinese policymakers have diminished the potential role of the market and have strengthened the hand of the state. There are no truly private companies of any scale or importance, as they all are increasingly subjected to the hand of the state.

As we have seen with the implementation of Made in China 2025, the Chinese government's efforts to become more self-sufficient rely on all-too-familiar tools such as subsidies, extensive tax breaks, discriminatory procurement policies, and predatory pricing. The 14th Five Year Plan and supporting policies have made clear that China is not interested in reform in the Western sense, but is interested in dominating key technologies and sectors.

The CCP's policies narrow the opportunities for U.S. companies operating in China, but also result in deep negative effects here in the U.S., undercutting the competitiveness of domestic firms and jeopardizing the livelihoods of U.S. workers. The Chinese government's subsidization and other forms of support for industries that the CCP has deemed strategic have fueled a massive transfer of global productive capacity and technology to China and contributed to the hollowing out of the U.S. industrial base. The COVID-19 pandemic has painted a stark picture as to the costs of China's policies to the U.S. and the world with the CCP presiding over the capture and control of key supply chains. The vulnerabilities fostered by the CCP's policies have had disastrous consequences not only for products like personal protective equipment but for other products, sophisticated technologies, and services with severe consequences that can be far harder to correct.

Following a pattern we've seen in sectors such as telecommunications and rare earths, the CCP has set its sights on technologies that will shape the future. In this hearing, we will examine the Chinese government's pursuit of leadership in particular sectors like new mobility and synthetic biology to advance its goals. In new mobility, the government is advancing Chinese vehicle production and exports through investment in autonomous, intelligent, and clean energy technologies. Their efforts may challenge the strength of the U.S. auto industry, one of the biggest drivers of U.S. economic activity and employment.

Integration of digital platforms and public transportation infrastructure is supporting the Chinese government's quest to acquire vast sums of data to advance the technologies but that can also be used for surveillance, control and repression of its people. Massive data collection is also a key feature of the CCP's synthetic biology strategy, where genetic engineering will have numerous applications from healthcare to agricultural production. These developments will be key to Chinese growth, but also have implications for U.S. competitiveness, global dependence on Chinese sources, and Chinese influence in international standards setting for these cutting-edge technologies.

To our distinguished witnesses, thank you for joining us to discuss these important

questions. We look forward to hearing from each of you.

Before we begin, I would like to remind you that the testimonies and transcript from today's hearing will be posted on our website, www.uscc.gov. Also, please mark your calendars for the Commission's upcoming hearing on China's activities in Latin America and the Caribbean, which will take place on May 20.

PANEL I INTRODUCTION BY COMMISSIONER MICHAEL WESSEL

Let me take time now to introduce our first panel, which will address China's current political and economic conditions, the prospects for China's success, and the implications for the United States.

First, we will hear from Matt Pottinger, Distinguished Visiting Fellow at the Hoover Institution. Mr. Pottinger served at the White House for four years in senior roles at the National Security Council, including as Deputy National Security Advisor from 2019 to 2021. Mr. Pottinger will address strengths and weaknesses in China's policymaking and the sustainability of China's stimulus-led growth model.

Next, we welcome back Dr. Miles Yu, Senior Fellow at the Hudson Institute and Visiting Fellow at the Hoover Institution. Dr. Yu previously served as the China Policy Advisor to Secretary of State Michael Pompeo, where he advised the Secretary on all China-related issues. Dr. Yu last testified before the Commission at our 2005 hearing on China's State-Controlled Mechanisms and Methods. Welcome back. Dr. Yu will address challenges in the U.S.-China relationship caused by China's economic development strategies.

Finally, we welcome Dr. Loren Brandt, Noranda Chair Professor of Economics at the University of Toronto. Dr. Brandt has published widely on China's economy in leading economic journals. His current research focuses on issues of industrial upgrading in China, inequality dynamics, and economic growth of the structural change. Dr. Brandt will address China's increasing emphasis on indigenous innovation and the implications for China's economic growth.

To our witnesses, all of your testimony will be inserted into the record and will be available on our website. We ask that each of you limit your oral comments to seven minutes, so that we can have a good round of questioning for each of the Commissioners.

And, Matt, why don't we start with you?

OPENING STATEMENT OF MATT POTTINGER, DISTINGUISHED VISITING FELLOW, HOOVER INSTITUTION

MR. POTTINGER: Perfect. Are you able to hear me okay?

COMMISSIONER WESSEL: Just fine.

MR. POTTINGER: Great. Well, Chairman Bartholomew and Vice Chairman-Dr. Cleveland, and all Commissioners and all staff, thanks very much for the opportunity to speak today about the Chinese Communist Party's economic strategy and, also, to touch on a few principles that I believe the United States and other free societies should apply, as we hone our collective counterstrategy.

So, the Chinese Communist regime's ambitions really shouldn't be a mystery to us anymore. If we listen to what China's leaders have been saying in their own language to their own Party members, and we cross-reference their rhetoric with their actions, we can see that their plans are really hiding in plain sight.

So, China's latest Five-Year Plan was published just last month, and it institutionalizes an audacious strategy for offensive decoupling. So, in short, Beijing intends to decrease China's dependency on the world while making the world increasingly dependent on China, and then, to use the resulting leverage to advance Beijing's authoritarian political aims around the globe.

So, the first step of Beijing's new strategy is to use the massive subsidies, the non-tariff barriers, and the continued theft of our intellectual property that Michael was just talking about to wean China off of high-tech imports from industrialized nations, while making those same nations heavily reliant on China for high-tech services and supplies.

And second, Beijing wants to continue to purchase raw materials and some critical supplies from the outside world, but it's going to work very assiduously and deliberately to ensure that any import from one country can be easily substituted with the same import from another country.

And so, the strategy really leverages the size of China's economy, what Chairman Xi Jinping calls China's, quote, "powerful gravitational field," while simultaneously exploiting the economic vulnerabilities of other countries. So, as Xi Jinping said in a seminal economic policy speech last year, quote, "We must sustain and enhance our superiority across the entire production chain...and we must tighten international production chains' dependence on China, forming a powerful countermeasure and deterrent capability against foreigners who would artificially cut off supply [to China]."

So, don't be fooled by this seemingly defensive phrasing in that quote because a deterrent is almost, by definition, an offensive capability, and Beijing is already demonstrating that it is more than willing to use its economic leverage offensively in pursuit of political objectives.

And consider the case of Australia, where Beijing is really treating Australia as a guinea pig on which to experiment with Xi Jinping's new strategy of offensive decoupling. They've been punishing Australian businesses for months, but also released a list of 14, quote-unquote, "disputes," which are really, in effect political demands that Beijing is making of the Australian government. And that includes the demand that Australia repeal its laws that are designed to counter Beijing's covert influence operations, that Australia muzzle its free press to suppress news that's critical to Beijing, and that Australia make concessions to Beijing's outrageous territorial claims in the South China Sea.

So, Australia's travails, which continue to this day -- they've been going on for about a year now -- are really a foretaste of what Beijing has in store for the rest of the world under this

new strategy. Now, fortunately, the United States, our allies, and much of the world have wised up to Beijing's goals. The policy approaches of the Trump Administration and the Biden Administration really have more in common than not. Allies are generally following America's lead on this, and new legislation, including the Strategic Competition Act and the Endless Frontier Act, are expressions of the bipartisan consensus on Capitol Hill to counter Beijing's economic and other forms of aggression.

So, as these bills are finetuned before making their way into law, there are three quick principles that I'd like to share that I think would be useful to keep in mind.

First, in every budget that the United States adopts, in every bill that Congress introduces, and in every partnership that government and industry undertake, we should always ask, first, whether the new measures that we're considering increase our leverage in this competition or surrender leverage to our opponents in Beijing.

As one quick example, Congress is considering the Biden Administration's plan for what I've read is a $174 billion amount for electric vehicle incentives. So, I would advise that Congress has to entertain whether that plan can simultaneously move our entire supply chain for batteries to the United States.

Dr. Nadia Schadlow illustrated in a recent article in The Hill that Beijing currently dominates those supply chains. So, it would be the height of irony, and really strategic folly if, having recently achieved American energy independence after decades of costly reliance upon the Middle East, the United States suddenly were to make ourselves dependent upon a hostile dictatorship in China for our energy needs.

Second, and related to the first principle, is the need to confront the reality that no U.S. counterstrategy is likely to succeed if it doesn't curtail the mighty flow of American capital into China's military industrial complex. Somehow Wall Street missed the memo that Beijing is waging an existential fight whose objective is, quote, "the eventual demise of capitalism and the ultimate victory of socialism." Close quote. That's to quote Chairman Xi Jinping himself.

So, it's not too much to ask to require American index funds and university endowments, pensions, and venture capital firms to stop funding the expansion of the Chinese Empire. Let Beijing finance its own bid for world domination.

At the same time, we should really explore ways of reinvigorating American anti-monopoly authorities to use not only against American companies, but Chinese state-backed monopolies that do at least as much harm to American workers. The Department of Justice has indicted the Chinese telecom company Huawei under RICO statutes, which is to say that the Justice Department views that company as akin to a criminal enterprise. How many other Chinese national champions play by the same rules as Huawei? I think we should ask the Department of Justice to find out.

And third and finally, our democratic ideals have the virtue of being not only the thing that we fight to protect, but also are the sharpest tool in our toolkit. Beijing has weaponized almost everything it can think of. It's weaponized trade, data, loans, fishing vessels, social media, diplomats, genetics, you name it. But the thing that the Communist Party cannot weaponize effectively is what it stands for, because the only thing it stands for is its own power.

So, we must never ever neglect the advantage that our values provide us in this fight. And Congress has a very important role to play here by using every opportunity to speak with candor to our businesses, our allies, and to our adversaries as well, about what Americans stand for and who we stand up for.

So, thanks very much.

PREPARED STATEMENT OF MATT POTTINGER, DISTINGUISHED VISITING FELLOW, HOOVER INSTITUTION

15 April 2021

Statement of Matt Pottinger

Distinguished Visiting Fellow at the Hoover Institution, Stanford University
Former Assistant to the President and Deputy National Security Advisor, the White House

Testimony Before the United States-China Economic and Security Review Commission

Chairman Bartholomew, Vice Chairman Dr. Cleveland, and all Commissioners, thank you for the opportunity to speak about the Chinese Communist Party's economic strategy, and to touch on a few principles that I believe the United States and other free nations should apply as we hone our collective counter-strategy.

The Communist regime's ambitions really shouldn't be a mystery to us anymore. If we listen to what China's leaders have been saying in their own language, to their own Party members, and cross-reference their rhetoric with their actions, we can see that their plans are hiding in plain sight.

China's latest Five-Year Plan, published last month, institutionalizes an audacious strategy for offensive decoupling. In short, Beijing intends to decrease China's dependency on the world while making the world increasingly dependent on China—and then use the resulting leverage to advance Beijing's authoritarian political aims around the globe.

The first step of Beijing's strategy is to use massive subsidies, non-tariff barriers, and the continued theft of our intellectual property to wean China off of high-tech imports from industrialized nations, while making those nations heavily reliant on China for high-tech services and supplies. Second, Beijing will continue to purchase raw materials from the outside world, but it will work assiduously to ensure that any import from one country can be easily substituted with the same import from another country.

This strategy leverages the size of China's economy – what Chairman Xi Jinping calls China's "powerful gravitational field" – while exploiting the economic vulnerabilities of other countries.

As Xi said in a seminal economic policy speech last year: "We must give full play to the significant advantages of our country's socialist system that concentrate power on large undertakings, and successfully fight tough battles for the key core technologies." In a related speech, Xi said: "We must sustain and enhance our superiority across the entire production chain … and we must tighten international production chains' dependence on China, forming a powerful countermeasure and deterrent capability against foreigners who would artificially cut off supply [to China]."

Don't be fooled by the seemingly defensive phrasing. A "deterrent" is almost by definition an offensive capability. And Beijing is already demonstrating that it is more than willing to use its economic leverage offensively in pursuit of political objectives.

Consider the case of Australia. When Australia proposed last spring that the World Health Organization investigate the origins of the Covid pandemic, the idea was supported by almost every other member of the WHO. Everyone, that is, except for Beijing, which was so annoyed that it began restricting imports of Australian beef, barley, wine, and coal. Australia depends on China to buy more than a third of Australian exports, and you can't export anything to China without the Communist Party's say so. But the Communist Party wasn't content with simply making this point and then moving on.

What happened next shows that Australia is a guinea pig on which Beijing is experimenting with Xi's new strategy of offensive decoupling. After punishing Australian businesses for months, Beijing released a list of 14 "disputes" that are, in effect, political demands made of the Australian government. They include a demand Australia repeal its laws designed to counter Beijing's covert influence operations; that Australia muzzle its free press to suppress news critical of Beijing; and that Australia make concessions to Beijing's outrageous territorial claims in the South China Sea.

Australia's travails, which continue today, are a foretaste of what Beijing has in store for the rest of the world.

Fortunately, the United States, our allies, and much of the world has wised up to Beijing's goals. The policy approaches of the Trump Administration and the Biden Administration have more in common than not. Allies are generally following America's lead. And new legislation, including the Strategic Competition Act and Endless Frontiers Act, are expressions of the bipartisan

consensus on Capitol Hill to counter Beijing's economic and other forms of aggression.

As these and other bills are fine-tuned before making their way into law, there are a few principles that I believe would be useful to keep in mind.

First, in every budget the United States adopts, in every bill Congress introduces, and in every partnership that government and industry undertake, we should always ask first whether the new measure *increases* our leverage in this competition or *surrenders* leverage to our opponents in Beijing.

For example, as Congress considers the Biden Administration's plan for $174 billion in electric vehicle incentives, it must ascertain whether that plan can simultaneously move our entire supply chain for batteries to the United States. As Dr. Nadia Schadlow illustrated in a recent article in *The Hill*, Beijing currently dominates those supply chains. It would be the height of irony and strategic folly if, having recently achieved American energy independence after decades of costly reliance upon the Middle East, the United States suddenly were to make ourselves dependent upon a hostile dictatorship in China for our energy needs.

Second, and related to the first principle, is the need to confront the reality that no U.S. counterstrategy is likely to succeed if it doesn't curtail the mighty flow of American capital into China's military industrial complex. Somehow Wall Street missed the memo that Beijing is waging an existential fight whose objective is "the eventual demise of capitalism and the ultimate victory of socialism," to quote Chairman Xi.

It's not too much to require American index funds, university endowments, pensions, and venture capital firms to stop funding the expansion of the Chinese empire. Let Beijing finance its own bid for world domination. We should turn into law the executive orders that President Trump signed prohibiting U.S. investment into Communist Chinese Military Companies as well as into China's military-civil fusion enterprise. While we're at it, Chinese companies that the Departments of Commerce or Treasury have sanctioned—including those on the "entity list"—should likewise be banned from accessing U.S. capital markets.

At the same time, we should explore ways of reinvigorating American anti-monopoly authorities to use not only against American companies, but against Chinese state-backed monopolies that do at least as much harm to American workers. The Department of Justice indicted the Chinese telecom company Huawei under RICO statutes, which is to say the Justice Department views that company as akin to a criminal enterprise. How many other Chinese "national champions" play by the same rules as Huawei? Let's ask the Department of Justice to find out.

Third and finally, our democratic ideals have the virtue of being not only the thing we fight to protect, but also the sharpest tool in our toolkit. Beijing has weaponized almost everything it can think of—trade, data, loans, fishing vessels, social media, diplomats, genetics, you name it. The one thing the Communist Party can't weaponize effectively is what it stands for, because the only thing it stands for is its own power.

We must never, ever neglect the advantage of our values in this fight. A quick aside: Of the hundreds of actions the Trump

Administration took against Beijing, including levying hundreds of billions of dollars in tariffs, ejecting many of its spies and closing one of its consulates, the one thing that upset the Communist rulers above all others was that we called them out publicly for crimes against humanity and genocide of its own people. That should tell you something about the vulnerability and catastrophic anxiety of the Communist Party. Congress has an important role to play here by using every opportunity to speak with candor to our businesses, our allies, and our adversaries about what Americans stand for, and who we stand up for.

Thank you.

OPENING STATEMENT OF MILES YU, SENIOR FELLOW, HUDSON INSTITUTE; VISITING FELLOW, HOOVER INSTITUTION

COMMISSIONER WESSEL: Thank you, Mr. Pottinger. Thank you, also, for your service. It's deeply appreciated.

Miles, we'll go to you now.

DR. YU: Good morning, everyone.

Vice Chair Cleveland, Commissioner Wessel, and other Distinguished Members of the Commission, I would like to thank you for inviting me today. And you've asked me to discuss the Chinese economy, the philosophical roots of China's economic system, and their implications for the United States. I submit to the Commission my written testimony, which is longer and for the context of my verbal remarks here.

My remarks today will focus on what makes the Chinese economy distinct; how it operates, and why it thrives under a monopolistic government that exploits and challenges the global free market system. I'll conclude with possible actions for the United States to take.

First, the peculiar and the paradoxical nature of the Chinese economy and the West's role in sustaining it. Unlike in most other communist countries, most notably, the Soviet Union, China has been afforded the benefits of a global free market system. It enjoys largely open access to international trade, capital markets, and advanced technologies.

The paradox of a communist nation fully participating in a largely capitalist system has enriched and strengthened the Chinese Communist Party to the point where Beijing poses the mortal threat to the United States and to the very international free market economic system that has enabled the rise of the communist state.

In the historic mea culpa, former President Richard Nixon admitted in his later years that his initiative to open up China in 1972 might have created a Frankenstein.

China is ruled by the dictatorial communist government that controls the Chinese economy and exploits the global free market system. Today, we see this most clearly in the Chinese Communist Party's ability to exploit the huge supply of cheap and skilled labor at its disposal. This workforce does not have meaningful labor protection. It does not have the right to form and operate independent trade unions to exercise collective bargaining and welfare negotiations. In Xinjiang, the site of the tragic genocide against religious and ethnic minorities, workers are put into camps and have no rights at all. The CCP has created a gigantic, country-sized sweatshop and the world is buying.

The Party's exploitation does not end with human capital. The Leninist centralized model of governance also means it can command the nation's enormous material resources and effectively pursue the high-capital-demand, landmark infrastructure projects, as in the Belt and Road Initiative. These include expensive highway and railway systems, wasteful and environmentally destructive housing and hydroelectric megaprojects, and, of course, expensive weapons of war in the conventional and in nuclear arenas, as well as the asymmetrical areas like space, cyber, deep sea, and biogenetics.

The CCP's monopoly on power also allows Beijing to impose strict control over financial resources, forcing non-state businesses to rely on state financing and banking institutions.

In a similar vein, the CCP is unrelenting on currency control and restrictions on currency flow, which makes foreign investors often unable to send profits out of China. This creates a vicious cycle where investors are left with no choice but to keep adding on more and more capital infusions into their Chinese investments.

Foreign companies also face challenges in accessing Chinese consumer markets. The government-inspired and encouraged xenophobia makes many foreign brands victims of crazed national boycotts and mob hooliganism.

While the advent of the Bitcoin age poses a challenge to all central banks, China views the digitalization of national currencies as an opportunity to increase its surveillance of its own people and to upend the U.S. dollar-dominated global trade settlement and transactional monitoring systems. It is taking ominous steps to explore that opportunity.

China's currency controls also severely restricts Chinese citizens' ability to send money abroad. This creates a destabilizing factor for the global currency system, including rampant money-laundering activities.

The final point I'd like to make in this section is about information. Transparency is anathema to the Chinese Communist Party, including when it comes to economic data. It makes arbitrary economic growth objectives based on political impetuses, rather than credible economic numbers.

Lack of transparency also endangers American investors, as many of the Chinese state-owned enterprises listed on Western capital markets provide vague and opaque information, often keeping their financial records hidden from regulators and investors in free market economies.

I would like to close by answering a question that Vladimir Lenin would have asked, "What is to be done?"

First and foremost, the United States should no longer ignore the enormous political and ideological differences between the Chinese Communist Party and the free world's systems. A fully free market system of international trade cannot coexist peacefully with a socialist market economy with Chinese Communist Party characteristics.

The first step I would recommend for the U.S. Government to take is an item-by-item reciprocal response to China's Negative List. That list is also known as Special Administrative Measures for Foreign Investment Access, and it constitutes a comprehensive list published annually by China's Development and Reform Commission that specifies all areas and sectors where foreign investments are allowed or not allowed in China.

A reciprocal response would prohibit Chinese investments in the United States in areas such as high-quality agricultural seeds, social surveys, humanities and social science research institutions, critical minerals mining, news organizations, radio and television productions, film studios, cinemas and theater chains, and cultural performance troupes, et cetera, et cetera.

The second step I would recommend involves reciprocity for America's private companies. Congress could create a mechanism for them to register complaints about discrimination by China. The ban on Facebook and Twitter in China should not be a Facebook and Twitter problem, but an American problem.

Based on this information, the U.S. Government could take sovereign reciprocal actions against China. As it is, too many American companies are effectively held hostage by the CCP and resort to the permanent class of China lobbyists and registered agents for China whose job is to sell corporate America access to senior Chinese officials, so that they can continue making big profits and not offending the CCP autocrats; thus, perpetuating America's corporate woes in the communist country.

The third step I think is the most important. It is for America to once again recognize the importance of leadership. The economic challenge of the Chinese Communist Party is not a matter of if we should or should not change Beijing's paradoxical economic reality. It is a matter

of if we don't change its behavior, the free world will be changed by Beijing.

The Chinese Communist Party's inner circle is based on the understanding that China's struggle with America and the free world is nothing but a zero-sum game. In a world of geopolitical great-power competition, the United States can and must win.

And thank you for the opportunity to testify before you today on this important topic, and I look forward to your questions and to working with the Commission.

PREPARED STATEMENT OF MILES YU, SENIOR FELLOW, HUDSON INSTITUTE; VISITING FELLOW, HOOVER INSTITUTION

The Chinese Communist Party's Economic Challenge to the Free World
Miles Yu, Senior Fellow at the Hudson Institute and Visiting Fellow at the Hoover Institution
Testimony before the U.S.-China Economic and Security Review Commission
Hearing on "An Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Success"
April 15, 2021

Chair Bartholomew, Vice Chair Cleveland, and other distinguished members of the Commission, I would like to thank you for inviting me today. You've asked me to discuss the Chinese economy, the philosophical roots of China's system, and their implications for the United States.

My remarks today will focus on what makes the Chinese economy distinct, how it operates, and why it thrives under a monopolistic government that exploits and challenges the global free-market system. I'll conclude with possible actions for the United States to take.

First, the peculiar and paradoxical nature of the Chinese economy and the West's role in sustaining it.

If there's one thing that every American should understand about the People's Republic of China, it is that it is a communist dictatorship ruled by a Marxist-Leninist party. The Party is dedicated to maintaining and strengthening its monopoly on all powers in the world's most populous country, and to mounting the most serious challenge to the free world since the Cold War.

However, unlike most other communist countries, China has been afforded the benefits of a global free-market system. It enjoys largely open access to international trade, capital markets and advanced technologies. The paradox of a communist nation fully participating in a largely capitalist system has enriched and strengthened the Chinese Communist Party, to the point where Beijing poses a mortal threat to the United States and to the very international free market economic system that has enabled the rise of the communist state.

In his historic speech at the Richard Nixon Library in July 2020, former Secretary of State Mike Pompeo described the situation and how we got here well: "Our policies—and those of other free nations—resurrected China's failing economy, only to see Beijing bite the international hands that were feeding it." Or as President Richard Nixon admitted in his later years, his initiative to open up China in 1972 might have created a Frankenstein.

The West played a role in creating the current state of play. But too many conversations in the United States focus only on our own strategic thinking. In the next part of my testimony, I'd like to focus on the thinking on the other side of the Pacific.

Again, China is ruled by a dictatorial communist government that controls the Chinese economy and exploits the global free market system. Today, we see this most clearly in the Chinese Communist Party's ability to exploit the huge supply of cheap and skilled labor at its disposal. This workforce does not have meaningful labor protections. It does not have the right to form and operate independent trade unions to exercise collective bargaining and welfare negotiations. In Xinjiang – the site of a tragic

genocide against religious and ethnic minorities – laborers are put into camps and have no rights at all. The CCP has created a gigantic, country-sized sweat shop, and the world is buying.

The Party's exploitation doesn't end with human capital. The Leninist centralized model of governance also means it can command the nation's enormous material resources and effectively pursue high-capital-demand landmark infrastructure projects, as in the Belt and Road initiative. These include extensive highway and railway systems, wasteful and environmentally destructive housing and hydroelectric mega projects, and of course, expensive weapons of war in the conventional and nuclear arenas, as well as asymmetrical areas like space, cyber, deep sea and bio-genetics.

The CCP's monopoly on power also allows Beijing to impose strict control over financial resources, forcing non-state businesses to rely on state financing and banking institutions. Any companies that dare to deviate from such reliance will end up like Jack Ma's Alibaba, whose demise is much in the news these days. What has happened should serve as a warning to investors looking to expand to China.

In a similar vein, the CCP is unrelenting on currency control and restrictions on currency flow, which make foreign investors often unable to send profits out of China. This creates a vicious cycle where investors are left with no choice but to keep adding on more and more capital infusions into their Chinese investments. Foreign companies in China also face challenges unlike anywhere else in the world – access to Chinese consumers is often restricted, and the government-inspired and encouraged xenophobia makes many foreign brands victims of crazed national boycotts and mob hooliganism. While the advent of the Bitcoin age poses a challenge to all central banks, China views the digitalization of national currencies as an opportunity to increase its surveillance of its own people and to upend the US dollar-dominated global trade settlement and transactional monitoring systems. It is taking ominous steps in exploring that opportunity.

Meanwhile, due to the lack of constitutional protection of private property and individual ownership, many Chinese who do not trust their government tend to move their money out of China. But the currency controls severely restrict Chinese citizens' ability to send money abroad. This creates a destabilizing factor for the global currency system, including rampant money laundering activities.

When the Chinese people succeed, the Communist Party feels threatened. Without constitutionally mandated private property protection, those who've made it big in China are often targets of the central government for being too rich and too influential, subjecting them to arbitrary extra-legal arrests and financial ruin. In the past 15 years alone, no fewer than 27 Chinese billionaires have been arrested – the charges range from the bizarre to the absurd. In America, we celebrate those who make it on the Forbes billionaires list. In China, getting on the on the Hurun rich people's roster can be like being added to a hit list.

The final point I want to make in this section is about information. The Chinese Communist Party, by its nature, has an innate urge to control the free flow of information. Transparency is anathema to the Party, including when it comes to economic data. It makes arbitrary economic growth objectives based upon political impetuses, rather than credible economic numbers. Lack of transparency also endangers American investors, as many of the Chinese state-owned companies listed on western capital markets

provide vague and opaque information, often keeping their financial records hidden from regulators and investors in free-market countries.

I'd like to close by answering a question that Vladimir Lenin would have asked: "What is to be done?"

First and foremost, the United States should no longer ignore the enormous political and ideological differences between the Chinese Communist Party and the free world's systems. A fully free-market system of international trade cannot coexist peacefully with a "socialist market economy with Chinese communist party characteristics." We should face the reality and redress the biggest foreign-policy failure of the past half a century. It was based on the comforting but misguided view – popularized by political and economic elites – that China and the U.S. could brush aside political and ideological differences, engage uncritically, and hope that democratic virtues and free market system would eventually make communist China change and become a responsible stake holder. Not only have we not changed the Chinese Communist Party with such thinking, the Party is now poised to change us. It is trying to remake the global order in its own image.

Thankfully, we are witnessing a great awakening on this issue, and there seems to be a bipartisan consensus that the old conventional wisdom was a mistake.

My second recommendation is that we must institutionalize this new awakening. Congress, the elected representatives of the American people, can play an important role here.

During the last administration, the United States adopted a new emphasis of engaging China based on the principle of reciprocity. Economic reciprocity with China can be institutionalized through congressional action.

The first step could be item-by-item reciprocal responses to China's Negative List. This is also known as Special Administrative Measures for Foreign Investment Access, and constitutes a comprehensive list published annually by China's Development and Reform Commission that specifies all areas and sectors where foreign investments are allowed or not allowed in China. A reciprocal response would prohibit Chinese investments in the United States in areas such as high-quality agricultural seed, social surveys, humanities and social science research institutions, critical minerals mining, news organizations, radio and television productions, film studios, cinemas and theater chains, and cultural performance troupes, etc, etc.

The second step should involve reciprocity for America's private companies. Congress could create a mechanism for them to register complaints about discrimination by China. The ban on Facebook and Twitter in China should not be a Facebook and Twitter problem, but an American problem. Based on this information, the U.S. government could take sovereign reciprocal actions against China. As it is, too many American companies are effectively held hostage by the CCP and resort to the permanent class of China lobbyists and registered agents for China whose job is to sell corporate America access to senior Chinese officials so that they can continue making big profits and not offending the CCP autocrats, thus perpetuating America's corporate woes in the communist country.

The third step is for America to once again recognize the importance of leadership. The economic challenge of the Chinese Communist Party is not a matter of if we should or should not change Beijing's paradoxical economic reality. It is a matter of if we don't change its behavior, the free world will be changed by Beijing.

We are approaching the 100th anniversary of the Chinese Communist Party this summer. Party leaders from Mao to Xi have repeatedly said their actions are guided by an epic struggle of *nisiwohuo*, or "You die, I live." The Party's shibboleth of Win-Win in U.S.-China engagement is nothing but a grand deception.

The Chinese Communist Party's inner core is based on the understanding that China's struggle with America and the free world is nothing but a zero-sum game.

In a world of geopolitical great-power competition, the United States can, and must, win.

Thank you for the opportunity to testify before you today on this important topic. I look forward to your questions, and to working with the Commission.

OPENING STATEMENT OF LOREN BRANDT, NORANDA CHAIR PROFESSOR OF ECONOMICS, UNIVERSITY OF TORONTO

COMMISSIONER WESSEL: Thank you.

Dr. Brandt, now to you.

DR. BRANDT: Okay. Good morning, everybody, and thank you very much again for the opportunity.

Historically, China has seen itself as the center of the world, however separate and distinct. The last 15 years a comprehensive new strategy has emerged that's reshaping the Chinese economy and its ties with the rest of the world. This represents an important departure from the policies and the changes that were the source of the dynamism and the growth the previous 30 years. It is also a strategy that harkens back to China's imperial past.

Motivated by a failure of earlier policies to promote national champions, at the core of this central-led, top-down strategy is a priority on indigenous innovation and technology development to provide independent control over mature industries as well as newly emerging technologies and value chains.

This strategy is complemented by efforts to leverage China's huge domestic market as a source of demand -- for most products, China is the largest market globally -- to acquire critical resources and technology through overseas foreign direct investment, and to use initiatives such as One Belt, One Road for accessing new markets.

The domestic and the global dimensions of the policy are highly complementary. Through promotion and self-sufficiency, and more balanced economic growth, the major aim is to reduce the internal as well as the external risks to CCP rule.

Historically, the Chinese state has seen the West with both promise -- it was the source of new technology that would support national self-strengthening 150 years ago -- but also danger. Western technology could directly undermine state power while Western ideas, attitudes, and institutions might weaken those enduring features of China that have supported authoritarian rule. Today, the latter perspective dominates.

With its focus on indigenous innovation and import substitution, initiatives such as One Belt, One Road, as well as more recent efforts to influence global standards-setting and governance, this new strategy represents a combination of both decoupling and recoupling on new terms.

What can we say about the effect of these policies? I would like to make several observations followed by several conjectures.

First, China has been successful in deepening its technological capabilities in both mature industries -- power generation equipment, transmission, and telecommunications -- as well as newly emerging technologies -- AI and platform technologies. In some newly emerging industries, the degree of localization is hard to pin down. There are also obvious cases of failure.

Second, that there are clear signs of changes the last 10 of 15 years in China's economic relationship with the rest of the world. Trade has become less important at the same time that more of Chinese exports are going to emerging markets.

After rising through the mid-2000s, the role of foreign-invested firms in China has declined considerably, measured both as a percentage of China's exports as well as sales to the domestic market. The role of inward foreign direct investment continues to decline at the same time that we observe significant increases in outward foreign direct investment to secure markets, resources, and technology.

And third, that we have seen a marked slowdown in growth in the Chinese economy the

last 8 or 10 years, with growth probably less than reported and far below China's potential growth. It is important to remember in this context that per capita GDP in China is on the order of a quarter of that in advanced countries, and productivity in levels on the order of 40 percent or so.

Significantly, the major reason for the decline in growth that we observe in China is the sharp drop in productivity growth, which had been the source of 70 percent of China's GDP growth through the first three decades of reform. One of the most important misnomers of the first three decades of reform is that growth was investment-led. However, the slowdown that we're currently observing is not limited to the state sector, but also extends to the private sector, which has been the source of so much of the dynamism.

The following three conjectures:

First, a case can be made that the decline in the growth of productivity in GDP is a direct product of the more top-down policies that are influencing the choices of technology sector and firms, as well as efforts of the CCP to exert even more control over the private sector.

These policies represent important departures from the bottom-up, decentralizing reforms that reduced barriers to entry, increased competition, facilitated the diffusion of new technology and knowhow, and increased factor mobility during the first three decades of reform.

The second conjecture: the global economy has been changing since the global financial crisis. But, nonetheless, China's repositioning vis-a-vis the rest of the world is much more a product of internal changes that those external to China.

And third, that these costs may multiple over time as China benefits much less from the global linkages in competition that were helping to drive innovation and growth, and as policies undermine the bottom-up changes that were the source of the dynamism. A declining labor force, as well as the fall in the rate of savings and investment, will make these choices even more so.

On the margin, policymakers and leaders in China are trying to limit these costs with incremental reforms -- we already see some of this -- but these are likely to be modest and will not eliminate the fundamental tensions that exist at the moment between the economic and political objectives of the state. Either way, the consequences of success or failure for the rest of the world are huge, albeit different.

Thank you very much.

PREPARED STATEMENT OF LOREN BRANDT, NORANDA CHAIR PROFESSOR OF ECONOMICS, UNIVERSITY OF TORONTO

Testimony before the US-China Economic and Security Review Commission

Hearing on "A Net Assessment of CCP's Economic Ambitions, Plans and Metrics of Success"

Panel I: "The Chinese Communist Party's Economic Ambitions: Is the Past Prologue?"

A Statement by

Loren Brandt
Noranda Chair Professor of Economics, University of Toronto
April 15, 2021

Introduction

In China, there has always been tension between political order and economic outcomes. A succession of highly centralized authoritarian states—imperial, republican and communist--have seen prosperity as a key source of legitimacy, however each has been equally aware of the need to protect a tightly interwoven set of political, economic and social ties that underpin centralized authoritarian rule. Bottom-up economic change is inherently disruptive of these ties.

Western technology has been viewed in a similar light. While a vehicle for building Chinese national strength, the introduction of new technologies can upset the flow of resources and rents aligning elite interests. New ideas, attitudes and institutional arrangements associated with Western technology and thinking can also threaten the foundation of China's polity. As prominent official Zhang Zhidong popularized in a famous epigram in the 19th century, "中学为体，西学为用"，China needed to **utilize** （用）western technology and devices while retaining its own cultural **essence**（体）.

Over the last decade and a half, China's leadership has articulated a comprehensive, top-down economic strategy that aims to reshape the country's economy and its economic interactions with the rest of the world.[1] At the core of this strategy is a priority on "indigenous" innovation and technological development to provide independent control over mature industries, as well as the newly emerging technologies and value chains that will define the 21st century. Leveraging its huge and growing domestic market, overseas foreign direct investment to secure access to critical raw materials and complementary technologies, and in concert with major initiatives such as One Belt, One Road (OBOR) for tapping new markets, Chinese leadership aims to promote a more "China-centric" system that increases "self-reliance", reduces external threats and risks, and enhances the prospects for sustained and more balanced growth. All three are viewed as critical to the long-run success of the CCP. Combined with even more

[1] The vision is reflected in the 15-year "Medium to Long Plan for the Development of Science and Technology (2006), the focus on "Strategic and Emerging Industry" in the 12th Five Year Plan (2010), "Made in China 2025" (2015), and most recently in the 14th Five-Year Plan.

recent efforts to extend China's influence over technology standard setting, global governance, etc., these policies entail both a decoupling *and* recoupling on new terms.

In key respects, this course represents a departure from main elements of a development path that evolved over the course of the first three decades of reform from 1978-2007. Through a combination of bottom-up, decentralizing domestic economic reform and external opening, China was able to achieve impressive average annual per capita economic growth of 8 percent, advance that helped pull hundreds of millions out of poverty. Integration with the rest of the world provided access to capital, technology, managerial knowhow, and markets, and was instrumental in forcing domestic economic restructuring. As Premier Zhu Rongji remarked at the time: "The competition arising [from WTO membership] will also promote a more rapid and more healthy development of China's national economy."

From the outset of economic reform, there have been competing visions of the role of the state versus the market in shaping China's economic future. We observe domestic market liberalization in the form of the "dual-track", openness to FDI, and falling barriers to new firm entry, but also more top-down interventionist polices and regulations working in the opposite direction that targeted critical industries, firms and technologies, and pushed self-sufficiency.

To make sense of China's more recent policy shift, it is helpful to take a step back and revisit the first three decades of reform. Over this period, tensions between alternative perspectives appear at both the micro and macro level. Without being too "deterministic", a much clearer thread runs through the post-1978 period than is usually acknowledged. The last 10-15 years, China has been successful in slowly reconfiguring how it is tied to the rest of world. Trade as a share of GDP has declined; more of exports now go to emerging markets; exports by domestic firms have increased significantly relative to foreign firms, and outward FDI is now on par with inward FDI. But by most measures, growth and dynamism in the Chinese has slowed considerably, well before diminishing economic potential would predict. This has important implications for China's ability achieve its ambitious objectives, but also for the rest of the world.

Context: The First Three Decades

Between 1978-2007, a combination of decentralizing economic reforms and openness provided powerful incentives for households, firms and cadres to leverage China's considerable human capital, entrepreneurship, and "latent" economic potential to generate impressive growth of 8 percent per annum. This potential existed in trade, industry and agriculture. On the eve of the Global Financial Crises, per capita GDP in China was on the order of 20 percent of that in the US. With a population nearly four times larger, its economy in absolute size was nearing that of the US.

China's economic success conceals important tensions that emerged early on between economic and political objectives, especially those tied to efforts to re-strengthen centralized authoritarian power and the state. The Cultural Revolution greatly weakened the central

bureaucracy and state, thereby enabling decentralizing, bottom-up economic reforms to go forward (Walder, 2016). The same reforms however left the state and the CCP without the critical resources needed to rebuild political patronage and networks, to implement ambitious economic plans centered on the state sector, and for supporting its non-economic objectives. Decentralization also offered new paths of upward mobility—economic, social and political--that potentially challenged the CCP.

Through the first 15 years of reform, the state and CCP struggled to find the resources to achieve their goals. Efforts to "enliven" the state sector through the "dual track", better managerial incentives, and technology transfer from the west through leading multinationals met with limited success. Much of the economic success was in the countryside in agriculture and the TVEs (township and village enterprises) complemented by a nascent external sector centered in the SEZs. Both the ratio of government fiscal revenue to GDP and the center's share of overall revenue, much of it coming from SOE profits, declined sharply. (Bird and Wong, 2008). The state's commitment to the state sector did not waver, however. Efforts to redistribute resources from the dynamic non-state sector to the lagging state sector through the financial system were the source of the boom-bust cycles China experienced (Brandt and Zhu, 2000). Urban protests in the spring of 1989, provoked by rising inflation and corruption, and the break-up of the Soviet Union were an important political call to arms.

In the mid-1990s, a major set of reforms helped resolve this fundamental contradiction. They also provided the basis for continued rapid growth up until the Global Financial Crises. These reforms included fiscal recentralization; the recapitalization of the banks and financial reform, including the reorganization of the Peoples' Bank of China (PBOC); restructuring and downsizing of the state sector, and entry into WTO. Tax reform implemented in 1994 reversed the long decline in the GDP share of fiscal revenue, increased the central government's claim on overall revenue, and perhaps more important for re-establishing central authority, ensured that provinces were dependent on central transfers to finance expenditures. The state also selectively retreated from the economy, exiting those sectors no longer deemed "strategic", shedding tens of thousands of firms, and tens of millions of urban workers in unproductive firms in the process. SOEs remained dominant however in "pillar" and "strategic" sectors such as aeronautics, chemicals, iron and steel, and electrical machinery, and in capital-intensive upstream sectors such as power, telecommunications, transportation, and finance (Pearson 2015).

The Role of Productivity-led Growth

Chinese growth is often mistakenly described as investment and export-led, however the most important source of growth during the first three decades was productivity gains, which were the source of in upwards of 70 percent of per capita GDP growth (Zhu, 2012). The remainder came from capital deepening and huge investments in human capital. This performance is in sharp contrast to the period between 1952-1978 during which productivity growth was negative.

Productivity gains at the aggregate level were a product of improvements within individual sectors, i.e., primary (agriculture), industry (mining, manufacturing, utilities and construction), and services, as well as from the reallocation of resources, e.g. labor and capital, from low to high productivity sectors and firms. Between 1978 and 2007, the share of the labor force in the primary sector (agriculture) fell from nearly 70% to 30%, as non-primary employment increased by more than 300 million workers. Relaxation on migration from the countryside to the cities, especially those in coastal provinces, played an important role in the transfer. China also benefitted from the reallocation of resources--labor and capital--between the state and non-state sectors.

Productivity growth in the aggregate conceals a mixture of dynamism and inefficiency permeating the Chinese economy. Much of this is tied to differences between the non-state (largely private) and state sectors and reflects deep-rooted tensions between economic advance and the state's non-economic objective. High returns to investments in the non-state more than offset the low and often negative returns in the state sector, allowing for economic advance. State investment increased in critical infrastructure such as transportation, ports, communications networks, and power, but huge rents were often embedded in these expenditures. State investment was often used to advance political objectives -- patronage and network building, regional development, e.g. China's western development program, national security, and demonstrations of national might. State-owned firms in strategic sectors (and state-connected individuals) were the major beneficiary of these policies. With capital formation by the state on the order of twenty percent or so of GDP, the flow of resources here was massive.

The mid-to late-1990s' reforms put China on a much more solid macro-economic footing and provided the state with the resources to meet their objectives without risking growth, at least in the near to medium term. Since the mid-1990s, the share of GDP tied directly to the state sector has remained remarkably constant at 45 percent, with non-financial SOEs consistently representing in the vicinity of 20 percent, and financial SOEs slightly more than 5 percent (Batson, 2020).[2] The state share of GDP through ownership in industry declined, but this was more than offset by the increase in the more rapidly growing tertiary sector. With the formation of the State Administrative of State Assets Commission (SASAC) in 2003, a succession of mergers consolidated central control within strategic industry and services in enterprise groups that would soon then enter the ranks of the Fortune 500.[3] At the same time, the state continued to dominate China's financial system, even as the share of China's four largest state-owned banks of total financial assets declined. The state's share of total capital formation also remained in the vicinity of a half, or nearly 20 percent of GDP.

[2] The remaining 20% is the government's share of GDP which can be estimated from the national flow of funds accounts. See Batson (2020) for details.

[3] Between 2003 and 2019, the number of groups under central SASAC fell from 187 to 97; over the same period, the number of subsidiaries and assets of these groups increased 2- and 4-fold, respectively.

A more microeconomic perspective

Differences at the sector and firm level parallel those at the macro level. In industry, the state pursued a strategy that maintained significant state control over critical "mature" sectors dominated by SOEs but lowered the barriers for nonstate firms in nonstrategic sectors (e.g., labor-intensive light industry). Foreign direct investment in newly established special economic zones (SEZs) was encouraged early on for the purpose of exporting, much of it through "processing" exports that did not compete with the SOEs. Leveraging China's comparative advantage, growth in exports in the nonstate sector was rapid over this period.

Success in nonstrategic sectors by non-state firms allowed for a steady flow of resources into the state sector in the form of preferential access to bank credit and foreign exchange, the latter used for technology licensing, the import of raw materials, intermediate inputs and new equipment, and expansion in capacity. Outside the SEZs, foreign firms often needed to partner with state firms in joint ventures (JVs), as, for example, in the case of the auto sector and in much of the machinery industry. Under the policy of "trading markets for technology," foreign firms were offered access to China's "protected" domestic market, but only if they complied with a series of complicated regulatory requirements designed to transfer technology and knowhow to local partners, usually SOEs and their suppliers.

Aggregate performance in China's manufacturing sector during this period was impressive. Growth averaged over twenty percent per annum. Even more telling, total factor productivity growth was the source of *more than half* of the total increase, on par with rates achieved by the manufacturing sector in other successful Asian economies (e.g., Japan, Korea, and Taiwan) at similar periods in their development (Brandt, Van Biesebroeck, and Zhang 2012).[4] Rapid productivity growth was instrumental in sustaining high returns to investment in manufacturing in the face of rapidly rising wages.

These huge gains were the product of firm-level efforts to lower costs, improve product quality, and move up the value chain.[5] Improvements were usually incremental (Breznitz and Murphey, 2011), as firms successfully moved from low to medium segments of the market (Brandt and Thun, 2010 and 2016). This dynamism is also reflected in the increasing sophistication of China's exports (Schott 2008) and the success of manufacturing firms in China—foreign and increasingly domestic—to capture growing market share in the highly competitive and demanding export markets in advanced countries (Mandel 2013). With the deepening of

[4] Estimates made by Brandt, Van Biesebroeck, and Zhang (2012) using the annual firm-level survey data of the National Bureau of Statistics (NBS) between 1998 and 2007 show that 57% of the growth in industrial output is a result of productivity growth.

[5] Estimates suggest that in the 10 to 15 years prior to the global financial crisis in 2007–2008, productivity at the firm level increased 2.8% and 8.0% per annum on a gross output and value-added basis, respectively, and at an even higher rate at the industry level.

capabilities in the Chinese domestic supply chain, domestic sourcing increased, as did the share of domestic value added in China's export sector (Kee and Tang 2017).

Analysis at the aggregate level once again conceals heterogeneity between sectors, and the influence of state policy. Productivity growth in state-dominated sectors upstream in the value chain, e.g. mining, petroleum refining, non-ferrous metals, lagged considerably, largely reflecting much weaker incentives for innovation and upgrading, less competition, and government influence over new firm entry, access to finance, and exit. Differences in productivity growth between sectors can be directly tied to falling barriers to entry, output tariff reductions that increased competition, and falling import tariffs that provided access to higher quality inputs (Brandt et. al, 2017; Amiti et. al., 2020).

A unique feature of China's productivity growth was the crucial role of new firm entry.[6] Significantly, the role of the reallocation of resources to more productive firms or firm exit is negligible. Capital market frictions are often cited as a major constraint on firm growth, but product market barriers, input subsidies for inefficient firms, and more generally, preferential treatment of politically connected firms impeded the growth of the best firms.[7]

We see similar differences within services. The more capital- and skill-intensive sectors such as finance, media, telecommunications, and transportation remained the preserve of state or state-connected firms, with limited inward FDI. These sectors were important for economic, political, and a combination of security and strategic reasons.[8] Estimates by the OECD on FDI restrictiveness in these sectors reveal highly restricted market access.[9] The more labor-intensive service sectors such as retail and wholesale trade and hospitality were much more open; they have also been left to absorb a growing share of the expanding labor force. Productivity growth in services however has lagged considerably that in industry which was much more open to competitive pressures. Competing state interests within services has also been more pronounced.

A key lesson from this experience was that sectors that were consistently most open to competition, in which entry and exit of firms was far less encumbered and, more generally, in which firms have been free from the all too "visible" and often distorting hand of the Chinese state at both the local and central level, are in fact those that have been most dynamic. They

[6] Productivity growth can be decomposed into four key sources: 1. improvements in existing firms; 2.a reallocation of resources to more productive of firms; 3. entry of better firms; and 4. the exit of poorly performing firms. Institutional barriers to entry and discrimination facing entrepreneurs fell significantly in many sectors. The higher productivity of new entrants relative to incumbents lifted overall productivity levels (Brandt, Kambourov and Storesletten, 2020).

[7] Interviews with firms over the years reveal cases of firms unwilling to make investments in R&D and new product development because of concerns over domestic market access, especially in sectors dominated by SOEs.

[8] For an excellent discussion of some of these issues in the context of the telecommunications sector, see Sturgeon and Thun (2019). Through 2015, network utilization rates remained very low (Interviews).

[9] These measures reflect *de jure* commitments to not discriminate and can differ from *defacto* discrimination.

are also the sectors in which Chinese firms were successfully competing in more demanding markets, domestic as well as overseas, and in which dynamic national champions emerged.

By contrast, those sectors that remained the preserve of the SOEs either exclusively, or occasionally through ventures with other types of firms; in which NDRC (National Development Reform Commission) or MIIT (Ministry of Industry and Information Technology) continues to influence sector dynamics through licensing and entry decisions, technology choices and investment, and regulatory behavior; and in which outcomes are often badly distorted by a combination of central government objectives and local governments incentives have usually failed to deliver dynamic local firms. They are also the same sectors, e.g. steel, shipbuilding, power generation, in which problems of excess capacity persist, despite repeated efforts administratively to deal with over-investment.

As the financial costs of supporting state sector firms and workers rose, the state significantly trimmed its commitment. By 2008, the share of the state sector in the gross value of industrial output (GVIO) fell to 36% in 2008, down from 58% in 1995. The share of firms classified as state-owned fell even more sharply, reflecting the huge sell off and often bankruptcy of the smaller SOEs in the late 1990s and early 2000s. After rising from 75 million to more than 110 million between 1978 and 1995, employment in the state sector also fell to 65 million by 2007.

China's Changing Strategy

Despite the success of the first three decades of reform, there were concerns within China's leadership and key segments of the policy-making community over China's future economic prospects. All of this preceded President, Xi Jinping. Several things are noteworthy.

In export industries, a common perception was that value added was relatively low, growth was tied to the supply of inexpensive labor from the countryside, and core technologies remained controlled by foreign firms.[10] Policymakers hoped that state intervention would lead to the development of national champions with their own brands and independent technological capabilities. Through the mid-2000s, foreign-invested firms in manufacturing in China became more, not less dominant, with their share of the domestic market and exports rising to one quarter and one-half, respectively.[11] In key sectors China failed to develop national champions—usually SOEs--that could compete with leading multinationals. Gains in market share by domestic brands in recent years were led largely by non-state firms.

This was perhaps most obvious in the auto sector – a sector that remains dominated by JVs between the leading multinational car companies, e.g. Volkswagen, Toyota, and General

[10] Some of this perception was tied to the role of processing exports. Recent estimates (Brandt, Morrow and Li, forthcoming) show that productivity growth in processing exports was on par with that of ordinary exports. Domestic value added in processing was also on the rise as domestic capabilities deepened.

[11] Adding imports to the output of FIEs in China sold domestically would increase the share of foreign firms in the domestic market. Although the share of FIEs rose, exports of domestic Chinese firms increased at a rate of 17 percent per annum.

Motors, and their state-owned counterparts such as First Auto Work (FAW) or Shanghai Automotive Industrial Company (SAIC). In the context of a protected domestic market, the expectation was that technology transfer through the JVs would lead to the development of independent capabilities in domestic Chinese car firms. This has not materialized. Critics of the "trading technology for market access" policies referred to the "JV mind-set" (合资主义). The combination of easy access to foreign brands and technology and the high profit margins that came with an oligopoly in the domestic market meant that the Chinese partners in the JVs had little incentive to invest in the development of independent technological capabilities.

Within China's science and technology community, there was a widespread belief that WTO accession had limited the policy tools that could be used as leverage vis-à-vis foreign firms.[12] Moreover, the royalties that Chinese firms were paying for technology imports were believed to be excessive, resources that could have been directed to local R&D (Cao et al. 2006, Serger and Breidne 2007).[13] Policymakers also perceived an emerging opportunity in nascent industries and new cutting-edge technologies. According to China's Ministry of Science and Technology in 2005, Chinese firms would be able to seize a leadership position by aiming "at the forefront of world technology development, intensify[ing] innovation efforts, and realiz[ing] strategic transitions from pacing front-runners to focusing on 'leap-frog' development in key high-tech fields in which China enjoys relative advantages (cited in Applebaum, Parker et al. 2011)."

An increasingly top-down approach to technology and innovation, reminiscent of that of pre-reform China, resurfaced in the mid-2000s. As Heilman and Shih (2013) document, China implemented national industrial policies as early as the 1980s, but these were typically limited in coverage, i.e. usually focused on a single sector, and few in number until 2004. A more comprehensive top-down approach was given the imprimatur of China's top leadership in January 2006, when President Hu Jintao announced a 15-year "Medium- to Long-term Plan for the Development of Science and Technology" (MLP).

The MLP identified both priorities (including 11 key areas relating to national needs, 8 areas relating to frontier technologies, and 13 engineering megaprojects), institutional reforms that were designed to improve the management and implementation of S&T policy, and a policy framework that was designed to reduce China's dependence on foreign technology. These policies were more comprehensive than in the past, the resources committed were far greater and the focus on *independent* capabilities was more central. The objective of the MLP was to make China an "innovation-oriented society" by 2020, and a world leader in science and technology by 2025. The much stronger fiscal position of the central government and the huge flow of savings through the state-dominated financial system helped make this possible.

[12] At the same time, China often took actions to undo the competitive effects of falling tariffs and non-tariff barriers mandated by WTO accession on domestic firms.

[13] There were dissenting voices——economists argued that technology transfer from foreign firms continued to be the most cost-effective means of upgrading, while scientists argued that the top-down approach led to funding decisions that were biased and inefficient (Cao, Suttmeier et al. 2006)— but these were in a minority.

The Global Financial Crisis of 2008 strengthened the new policy direction in two key respects. First, the failure of Western institutions leading up to the crisis, and disarray following the crisis, bolstered the belief of Chinese leaders that a "China model" of development, combining authoritarian rule with state-led economic development, was preferable to the liberal democratic model (Zhao 2017).[14] China's policy response to the crisis—which Nicholas Lardy (2012, pg. 5) called "early, large, and well designed"—was widely credited with playing a critical role in preventing an even more severe global crisis. Second, the massive stimulus plan of 4 trillion RMB ($586 billion) was channelled in many cases through the state sector and hence enhanced the role of state firms vis-à-vis private firms.[15]

A second wave of policies was issued in 2010, when the Five-Year Plan on Strategic and Emerging Industry (SEI) committed US$1.6 trillion to seven emerging technologies: energy saving and environmental protection, next-generation information technology, biotechnology, advanced equipment manufacturing, new energy, new materials, and new-energy vehicles. This was followed by Made in China 2025 in 2015, a comprehensive plan focused on fostering Chinese leadership in key high-technology sectors that was prepared by the Chinese Academy of Engineering. Through import substitution, massive government spending, and tighter restrictions on foreign firms, the policy seeks to aid Chinese firms in their effort to capture the high value-added activities in global value chains. A key aspect of the plan is "indigenous innovation" and "self-sufficiency" for "basic core components and important basic materials." Semi-official documents related to the plan outline concrete localization benchmarks that are to be achieved in targeted sectors by 2025 (Wubbeke, Meissner et al. 2016). China's 14th FYP provides additional details and direction, as does China Standards, 2035.

Economic Implications of China's Changing Strategy

The shift in strategy has implications for the direction and speed of China's technological upgrading, China's ties to the rest of the world, and economic growth. We examine each briefly in turn with a focus on growth and its possible links to the policy change.

Technological Upgrading

Assessing the upgrading of capabilities at the firm or industry in China is inherently difficult. In some industries, e.g. semiconductors, solar panels, steam turbines, there are often well-defined metrics that help in the technical benchmarking, but in others, e.g. AI, it is more difficult. Focusing on a product such as a handset, a computer chip, or wind turbine also has limitations – analysis at this level ignores the critical role of the capital equipment, intermediate inputs, IP, and software in the value chain, inputs that are often externally sourced. Core design tasks are also often left to international partners through JVs or licensing agreements. Even in a product

[14] The idea of a "China model" is one that has evolved over time and has alternative interpretations. Zhao (2017) provides a good overview in the introduction to a special issue on the topic in the *Journal of Contemporary China*.
[15] See Lardy (2018), pp. 11-13 and pp. 33-41, on this point.

such as the internal combustion engine (ICE) car, seventy percent or more of the IP resides with the OEM's suppliers. In addition, technical upgrading does not always translate into commercial success.

In China, we see a mixture of outcomes: technological upgrading accompanied by rising market shares in domestic and international markets; technical upgrading in which much of firm and industry expansion appears to rest on government support; technological and commercial failure as costs escalate and market opportunities fall short of expectations; and finally, cases of "successful" failure in which long run gains are believed to outweigh any short-terms losses. In China, we see all of the above. A few examples are helpful. Aggregating these effects up to the aggregate level is difficult, however.

Power Transmission

China's difficulties in civil aviation and semiconductors through prominent state-owned enterprise groups have been well-documented. In contrast, State Grid (State Grid Corporation of China, or SGCC) has become the world leader in ultra-high voltage (UHV) long distance power transmission, a technology identified in the 2006 MLP for S&T (Xu, 2019). Although a relatively "mature" technology" that several countries had previously tried to implement, at the end of the last century, there were no lines in commercial operation. Overcoming both domestic economic and political opposition, State Grid appealed to policymakers for support on two grounds: first, success would help establish the State Grid as an internationally competitive technology leader; and two, the technology would be key in the transition to low-carbon electricity. In addition, there were important spillover effects in basic R&D, materials and equipment manufacture. The SGCC has successfully built UHV lines connecting the renewable-energy rich western China with the rest of China, as well as in Brazil.

Heavy Construction

China's domestic heavy construction equipment sector, a sector that has been relatively open to inward FDI, private sector entry and competition, has experienced considerable success over more than three decades, largely in the context of a rapidly domestic market (Brandt and Thun, 2010 and 2016). Chinese firms initially succeeded in the lower end of the domestic market, e.g. wheel loaders, but later successfully moved into more demanding products such as excavators the markets for which had been dominated by the multinationals such as Caterpillar, Volvo and Komatsu. An in-depth analysis of the sector (CLSA, 2013) attributed this success to the ability of Chinese firms, private and SOEs, to compete on the basis of both price and quality in medium-market segments. In a test of 13 leading excavator brands in China in the mid-size excavator market (20–25 tons), performed over 185 working hours during a two-week period in 2013, CLSA found that "*technology gaps are non-existent* between top-tier Chinese and international companies."

The contrast with the ability of the domestic auto OEMs to compete with the leading JVs in China is sharp. A study of the auto sector carried out in the same year as the heavy

construction equipment study concluded: "The leading Chinese products now have bodies, safety and suspension hardware that are largely competitive. But they are behind on engine technology and are also let down by assembly standards, material choices, systems integration, refinement, and a lack of final development and testing. *They are still a long way from being genuinely 'world class.'*" (Warburton et. al 2013).

Solar

After taking off in the mid-2000s, China's solar sector has become the world's largest. The industries' growth has been distorted by government policy, but the industry's success is not because of government policy. A case can also be made that better domestic firms in the industry have *on net* actually been handicapped by government policy.

Much of China's expansion in the sector has been based on the absorption and improvements of a relatively mature first-generation solar panel technology. Domestic firms actually resisted some of the push of 2nd- and 3rd-generation technologies. Manufacture of panels using 1st-generation technology involves four highly discrete activities that can be carried out independently. Experts put the barriers to entry slightly above those for LED lighting, but much lower than semi-conductors, two other products based on silicon. Much of the initial critical know is embedded in equipment; China was also able to import turnkey equipment for key stages in the value chain. It also benefitted from returning overseas Chinese who helped to start local firms. Initially, in line with their comparative advantage, Chinese firms concentrated in the labor-intensive, downstream stages, sourcing globally key equipment, components and materials. But over time, they were highly successful in entering and occupying prominent positions in all segments of the value chain, at the same time as which domestic content rose.[16] Localization in the supply chain was facilitated by the technological complementarities throughout the value chain with other sectors in China. Demanding quality standards in export markets, the destination of most domestic production initially, meant that local sourcing could increase only as long as quality standards could be maintained.

Telecommunications

In the late 1990s, the China Wireless Telecommuncation Standard Group proposed TD-SCDMA to the International Technology Union as part of a call for 3G standards. China's bid was motivated by a desire to rapidly deepen technological capabilities in Chinese firms, but also to reduce licensing and IP costs as Chinese firms contributed more IP to the new technology standard. Use of the Chinese standard would also facilitate market sales outside China. National security concerns also figured prominently. With the adoption in 2000 of TD-SCDMA as one of the 3G global standards, huge government support followed. But interests between state telecom carriers, handset firms, and equipment manufacturers and chipset suppliers—all essential to the network--were often not aligned. As development and implementation were

[16] Between 2006 and 2014, imported intermediates as a share of total intermediates in the sector fell from 89.7% to 43.7% (Brandt and Wang, 2019, Table 9.4).

drawn out, costs rose, and immediate benefits fell. Perspectives on the experience differ. The more positive assessments view TD-SCMDA as a critical stepping-stone to China's even larger role in the development of 4G standards. Others are more cautious but argue that a weak version of the "successful failure" argument is hard to refute (Sturgeon and Thun, 2019). Assessing the benefits of the counterfactual are also difficult.

Ties with the Rest of the World

China's shifting ties to the rest of the world are reflected in the growth and composition of its exports and imports, the role of foreign-invested firms in China, as well as China's inward and outward FDI. Since the mid-2000s, the role of China's domestic market and domestic firms in that market have become more dominant as inward FDI into manufacturing became less salient; at the same, trade flows with emerging markets have increased in both absolute and in relative terms.

Table 1 reports the growth of Chinese exports (reported in $US) for the years between 1992 and 2019 and select sub-periods. Over the full 27-year period, Chinese exports grew by more than 13.3 percent per annum as China's share of global exports increased from less than 2 percent to nearly 13 percent. Export growth accelerated with WTO Accession, increasing from an annual rate of 14.4% between 1992-2000 to 25.5% between 2000-2007. Subsequently, export growth slowed, and between 2013-2019 averaged only 2.1 percent per annum.[17] Some of this decline reflects global trends and factors external to China, e.g. deglobalization and slower global economic growth, but a case can be made that a significant portion of the decline is a product of internal factors weakening Chinese export competitiveness (Brandt and Kim, 2021). If so, policy in China may be having much larger global implications than typically believed.

Changes in export growth have been accompanied by changes in the composition and the destination of Chinese exports. Early in China's opening, textiles and apparel dominated, and by the early 1990s represented more than 40 percent of China's total exports. The end of the Multi-Fiber Agreement (MFA) was a powerful liberalizing force for the domestic sector (Khandewal, Schott and Wei, 201x); however, the share of textiles and apparel in China's exports fell sharply through the mid-2000s, before leveling off at fifteen percent or so. Significant, but much smaller reductions were experienced in the export shares of three resource-based sectors, namely, food processing, wood products, and leather goods. These reductions were largely offset by the rapidly rising share of machinery which rose from 18 to 45 percent of total exports, and much smaller increases in transportation and rubber and plastics.

Table 2 provides a breakdown of the destination of Chinese exports for select years between 1993 and 2019. Exports to North America, Europe, and East Asia largely represent exports to

[17] Some of this reflects the disruption to trade with the US in 2019. Between 2013-2018, the increase was only 2.4 percent.

advanced, higher income countries, with the rest of China's exports going to emerging economies. Note the significant, albeit falling share to HK, much of which is then re-exported to other countries. We report the share of exports going to advanced countries; the share to advanced countries plus HK; and finally, the share going to advanced countries plus a proportion of those to HK that also likely ended up in advanced countries.[18] Since the 2000s, the share going to advanced countries has steadily declined by a total of 16 percentage points. Exports to almost all other emerging economies have expanded. Especially noteworthy is the rapid rise in the share going to South and Southeast Asia which rose by nearly 10 percentage points.

Foreign presence in the Chinese economy, an important source of both new knowhow and competition through the first three decades, now appears to be diminishing. We look at this from several perspectives. Table 3 provides data on inward FDI flows for select years between 1990-2019. Over time, FDI into China has increased in absolute terms. But measured as a percentage of either Chinese GDP, or as a % of total annual gross domestic capital formation, its role has fallen sharply. In 2019, FDI into China was only 2.2% of total gross domestic capital formation. Over the same period, China's outward FDI has increased and now equals the inflows.

Paralleling these trends is the changing importance of foreign-invested firms in China's manufacturing sector. Between 1992 and 2006, foreign-invested firms' share of China's exports rose sharply from 20.9% in 1992 to 56.6%. Over the same period, these firms succeeded in capturing a rising share of the domestic market, which peaked at a quarter in the mid-2000s. Subsequently, both shares began to fall, and by 2018 FIE's share of exports dropped to 41.6%. One factor responsible for the decline is the fall in the number of FIEs. In 2018, the number of foreign-invested firms in China's manufacturing sector was actually less than it was in 2008, a decline experienced in almost all 2-digit manufacturing sectors. The winners were China's private domestic firms, whose share of exports surpassed one-half by the end of this period. China's SOEs figure only marginally in the picture here. Their role in exporting has been very modest and currently they are the source of only 5% of exports.[19] Their share of the gross value of industrial output (GVIO) also continued to decline over this period (Lam and Schipke, 2017).

Growth and Productivity

Although China was able to buffer the domestic economy from the immediate shock of the Global Financial crises, economic growth has slowed. China's reported growth figures since 2008 or so may also be over-estimated by 1.5-2 percentage points per year (Chen et. al. 2019; Hu and Yao, 2019). Perhaps even more significant, the contribution of productivity growth to

[18] We assume that the proportion of exports to HK that are destined for advanced countries is equal to the share of the rest of Chinese exports that go to advanced countries. This implies that the composition of China's and HK's exports are similar. More work is required to confirm this.
[19] SOEs play an important role as trade intermediaries however, with a third of trade through state-owned trading companies. They are much less important as manufacturers of exports.

aggregate GDP growth has largely disappeared, in sharp contrast to the experience before 2007. This implies that growth is largely coming from the extensive margin and capital deepening (Bai et. al. 2017; Brandt et. al., 2020; Dollar, 2016). This links the marked slowdown in Chinese growth to the behavior of productivity. As returns to capital formation in the business sector have fallen, much of the increase in investment has been in infrastructure and housing, two sectors that the state exercises considerable influence over. The last ten years, the incremental capital-output ratio in China has nearly doubled.[20]

The reason for the pronounced decline in productivity growth is open for debate. Productivity growth has also slowed in advanced countries (Gordon, 2016), but the gap in productivity between China and these countries—a measure of remaining economic potential—remains on the order of fifty percent or more. Policy choices and the more visible hand of the state in China described earlier may be at the core of a decline that appears to be widespread.

There is a temptation to link this to an expanding state sector in the economy. But, in the aftermath of the Global Financial Crises, the share of state-owned firms in the non-financial sector has remained relatively constant at twenty percent of GDP (Batson, 2020). This limits how much of the decline in aggregate productivity growth can be directly attributed to falling productivity growth in the state sector. It also suggests that the most important reason for the decline in growth is falling productivity growth in China's private sector. As important as ownership may be for how well the Chinese economy performs, far more important is the entire regulatory and policy environment facing firms, state and nonstate alike.

In manufacturing, the contribution of new firm entry, an especially important source of productivity growth early on, has largely disappeared. After falling sharply through the mid-2000s, barriers to entry may be on the rise again. On the other hand, product and factor market imperfections appear to be impeding the reallocation of labor and capital to the best firms, an important source of productivity gains. Following the Global Financial Crises, the share of new credit going to private sector firms has fallen precipitously (Lardy, 2018). Restructuring and bankruptcy of poorly performing firms continues to face administrative hurdles. As a result, problems of excess capacity persist in a long list of traditional industries, e.g. steel, cement, aluminum, flat glass, automobiles and shipping, but now also in newly emerging industries such as renewable energy (solar and wind) and EVs. Utilization rates in power generation are also at historical lows, reflecting both weakened demand, and capacity expansion. The NBS reports annual estimates of capacity utilization for all of industry. After rising through the mid-2000s, capacity utilization rates fell and at the end of 2019 were at historic lows.

Findings from a recent study (Barwick, Jia and Kaloupsidi, 2021) of China's shipbuilding industry may be typical of these industries. The industry was identified as "pillar" in both the 11th (2006-2010) and 12th (2011-2015) Five-Year Plans, and the beneficiary of a long list of national policies

[20] The incremental capital-output ratio is the amount of capital it takes to produce an additional unit of output in value terms. A rise in the ICOR reflects a decrease in investment efficiency and productivity. See Herd (2020).

designed to elevate the industry to a global leader. Explicit targets were set for output and capacity. Subsidies were extended for firm entry, and separately for production and investment. Top-down consolidation was also carried out. Between 2006 and 2016, China's share of the global shipbuilding industry increased from 15 percent to more than half. The authors show the important role of subsidies, which totaled $US 90 billion between 2006 and 2013, in explaining this behavior. Because the subsidies were generally extended to inefficient and unproductive firms, industry profits declined, and problems of excess capacity were exacerbated. Lower efficiency of Chinese shipbuilders relative to their foreign counterparts also suggests a misallocation of resources globally.

In much of the capital and skilled-labor intensive services such as finance, media, telecommunications, and transportation, sectors that are strategically critical to China, state-owned firms continue to dominate. Private firms are much more prominent in information technology, e-commerce, software, and fin-tech, but even in these sectors dynamism may be affected by the market power enjoyed by leading fells, as well as state policy choices. Political pressure on these firms under Xi Jinping also appears to be rising (Bloomberg, 2021). More generally, the overall effect of the ITC sector on productivity, either within the service sector, or outside, so far appears to have been marginal. The likely long-run benefits are also open to debate.

In the context of China's technological upgrading, much is made of the rising share of GDP directed to R&D in China, as well as the huge increase in patenting activity. Between 2001 and 2011, for example, patent applications to the State Intellectual Patent Office (SIPO) grew 30 percent a year. Over the same period, R&D expenditure as a share of GDP rose from 0.9 to 1.8 percent.[21] By 2018, it hit 2.2 percent, with even more ambitious targets set for the next decade.

Not all of this increase in activity should be dismissed, but consistent with the behavior of productivity since the Global Financial Crises, there is reason to believe that policy may be distorting these choices, lowering returns in these activities in the process.[22] The association between patents and R&D, as well as between patents and labor productivity have weakened, consistent with the view that the patenting surge is tied to "non-innovation" related forces (Hu et. al., 2017; Putnam et. al. 2020). Measures of patent quality also suggest significant differences in patent quality between China and advanced countries (Boeing and Mueller, 2018). Returns to R&D in China also appear to be falling, and more rapidly than they are globally (Boeing and Hunermund, 2020). Equally telling, a new study (Han et. al., 2021) using patent citations to look at the technological linkages between the US and China reveals an

[21] https://data.worldbank.org/indicator/GB.XPD.RSDV.GD.ZS?locations=CN

[22] The Chinese government is equally interested in these same issues, and earlier this year announced plan to cancel patent subsidies. See https://www.chinamoneynetwork.com/2021/02/02/china-cancels-patent-subsidies-in-effort-to-boost-innovation

important shift. After "dependence-deepening" integration with the US through 2009, the next decade featured the exact opposite, namely, "dependence-declining". Moreover, towards the end of their sample (after 2018), they observe signs of increasing decoupling, but caution that the time period is too short to make definitive conclusions.

Looking forward

In the near to medium term, the costs of these policies may multiply as China benefits much less from the global linkages and competition that were helping to drive innovation and growth, and as policies undermine the bottom up changes that were the source of dynamism. A declining labor force as well as a fall in the rate of savings and investment will make these choices even more salient.

On the margin, policy makers will try to limit these costs with incremental reforms – we already see some of this – but these are likely to be modest and will not eliminate the fundamental tensions that currently exist between the economic and political objectives of the state.

Recommendations

Policy choices in the US need to be made on the basis of accurate assessment of the strengths and weaknesses of the Chinese economy. Current narratives both over-estimate as well as under-estimate. These assessments are also often handicapped by serious data limitations and a lack of deep knowledge of policymaking in China.

1. Congress should insist on rigorous assessments of the Chinese economy that reflect the difficulty of such a task.

How policy matters in China at the firm, sector, and aggregate level for technological upgrading, productivity and growth often remains a black box. Huge gaps also exist in our knowledge of how these same policies are often influencing global industry outcomes, including global market structure. There are significant returns to making such assessments, carefully cataloguing policy choices that often cut across industry lines.

2. Congress should ensure that policy choices are made on the basis of accurate assessments of the costs and benefits of policies implemented in China.

Top-down, centrally directed industrial policy of the sort now used in China has become fashionable again in some circles. Governments can and should play an important role in encouraging innovation and technological development, and in protecting national security interests, but the economic costs of the type of strategy China is pursuing are becoming clearer.

3. Congress should ensure that national security interests are protected, but also provide an economic environment conducive to innovation and technology development that will be the source of future productivity growth.

China's new strategy runs the risk of bifurcating the global economy over the long run in ways that have important long-run economic and strategic considerations. How countries, advanced as well as emerging, will be affected differs significantly. Interests of these countries will not always be perfectly aligned with the US. In the past, China has used a combination of narrow bilateral and regional agreements to conquer and divide. Broad multilateral agreements are key to counteracting this.

4. Congress should support US leadership over multilateral global trade and investment reform. In doing so, it must be prepared to accommodate broad interests in order to secure agreements that span both advanced and emerging economy. At the same time, it should resist excessive influence by narrow, albeit well-organized US interests that China often plays to.

References

Amiti, M., M. Dai, R. Feenstra and J. Romalis, 2020. "How did China's WTO entry affect US prices." *Journal of International Economics*. 126.

Barwick, P.J., M. Kalouptsidi and N.B. Zahur, 2019. "China's Industrial Policy: An Empirical Evaluation." NBER Working Paper, 26075.

Bai, C.E. and Q. Zhang, 2017. "Is the People's Republic of China's Current Slowdown a Cyclical Downturn or a Long-term Trend? A Productivity-based Analysis." Asian Development Bank Institute Working Paper, No. 635.

Batson, A., 2020. "The State Never Retreats". Gavekal Dragonomics, October 1.

Bloomberg Businessweek. "China's Big Chill". March 15, 2021.

Bloom, N., Jones, C.I., Van Reenen, J., Webb, M., 2020. Are ideas getting harder to find? Am. Econ. Rev. 110 (4), 1104–1144.

Boeing, Phillip and Hunermund, 2020. "A global decline in research productivity: Evidence from China and Germany." *Economic Letters*, 197.

Boeing, Phillip and Elisabeth Mueller, 2018. "Measuring patent quality based on ISR citations: Development of indices and application to Chinese firm-level data." China Center for Economic Research Working Paper Series E2018007. February 26.

Brandt, L., and K. Kim, 2021. "Opening Up in the 21st Century: A Quantitative Accounting of Chinese Export Growth". Working Paper.

Brandt, L., J. Litwack, E. Mileva, L. Wang, Y. Zhang and L. Zhao, 2020. "China's Productivity Slowdown and Future Growth Potential". World Bank Policy Research Working Paper, 9298.

Brandt, L., J. Van Biesebroeck, and Y. Zhang, 2012. "Creative accounting or creative destruction: Firm-level productivity growth in Chinese manufacturing." *Journal of Development Economics*. 97.2, pp 339-351.

Brandt, L. and E. Thun, 2010. "The Fight for the Middle: Upgrading, Competition and Industrial Development in China." *World Developme*nt. 38(11), pp. 1555-74.

Brandt, L. and E. Thun, 2010. "Constructing a Ladder for Growth: Policy, Markets and Industrial Upgrading in China." *World Development*. 80, pp. 78-95.

Brandt, L. and L. Wang, 2019. "China's Development of Solar and Wind". In L. Brandt and T.G. Rawski eds. *Policy, Regulation and Innovation in China's Electricity and Telecom Industries*. New York: Cambridge University Press, pp. 373-418.

Brandt, L. and X. Zhu, 2010. "Accounting for China's Growth". University of Toronto Department of Economics Working paper.

Breznitz, D. and M. Murphee, 2011. *Run of the Red Queen: Government, Innovation, Globalization and Economic Growth in China*. New Haven, CT: Yale University Press.

Cao, C., R.P. Suttmeier, and D.F. Simon, 2006. "China's 15-year science and technology plan." *Physics Today*. December, pp. 38043.

Chen, X. Hsieh, C. and Z. Song, 2019. "A Forensics Examination of China's National Accounts". *Brookings Papers on Economic Activity*, no. 1, pp. 77-141.

Dollar, D. 2016. "China's New Macroeconomic Normal". Unpublished.

Gordon, R.J., 2016. *The Rise and Fall of American Growth: The US Standard of Living Since the Civil War*. Princeton University Press, Princeton, NJ.

Heilmann, S. and L. Shih, 2013. "The rise of industrial policy in China, 1978-2012." Harvard-Yenching Institute Working Paper Series.

Han, P.F., W. Jiang and D. Ma, 2021. “Mapping US-China Technology Decoupling, Innovation, and Firm Performance.” Working Paper.

Hu, Y. and Yao, J., 2018. “Illuminating Economic Growth”. IMF Working Paper, WP/19/77/.

Khandwhal, A., P. Schott, and S.Wei, 2013. “Trade Liberalization and Embedded Institutional Reform: Evidence from Chinese Exporters.” American Economic Review. 103(6), pp. 2169-2195.

Kee, H. and Tang, H, 2016. “Domestic value added in exports: Theory and firm evidence from China.” American Economic Review. 106(6), pp. 1402-36.

Lardy, N. 2012. *Markets over Mao: The Rise of Private Business in China*. Washington, D.C.: Peterson Institute for International Economics.

Lardy, N. 2018. *The State Strikes Back: The End of Economic Reform in China*. Washington, D.C.: Peterson Institute for International Economics.

Mandel, Benjamin, 2013. “Chinese Exports and US import prices.” Federal Reserve Bank of New York Staff Reports No. 591.

Pearson, M. 2015. “State-owned business and party-state regulations in China’s modern political economy”. In B. Naughton and K.S. Tsai eds., *State capitalism, institutional adaption and the Chinese miracle*. New York: Cambridge University Press.

Putnam, J., H. Luu and N. Ngo, 2021. “Innovative Output in China.” Working Paper.

Schott, P.K., 2008. “The relative sophistication of Chinese exports.” *Economic Polic*y. 25(53), pp. 5-49.

Serger, S.S. and M. Breidne, 2007. “China’s fifteen-year plan for science and technology: An assessement.” *Asia Policy*, 4, pp. 135-164.

Sturgeon, T. and E. Thun, 2019. “When Global Technology Meets Local Standards: Reassessing China’s Communication Policy in the Age of Platform Innovation.” In L. Brandt and T.G. Rawski eds. *Policy, Regulation and Innovation in China’s Electricity and Telecom Industries*. New York: Cambridge University Press, pp. 221-261.

Walder, A. G., 2016. “Bending the Arc of History: The Cultural Revolution’s Paradoxical History.“ *China Quarterly*. 227, 613-631.

Wong, C.P.W. and R. Brid, 2008. “China’s Fiscal System: A Work in Progress.” In L. Brandt and T.G. Rawski eds., *China’s Great Economic Transformation*. Cambridge, Cambridge University Press, pp. 429-466.

Wubbeke, J., M. Meissner, Z. Zenglein, J. Ives, and B. Conrad, 2016. “Made in China 2025: The making of a high-tech superpower and consequences for industrial countries.” Merics Papers on China.

Xu, Yi-chong, 2019. “The Search for High Power in China: State Grid Corporation of China.” In L. Brandt and T.G. Rawski eds. *Policy, Regulation and Innovation in China’s Electricity and Telecom Industries*. New York: Cambridge University Press, pp. 221-261.

Zhao, S., 2017. “Whiter the China Model: Revisiting the debate.” *Journal of Contemporary China. 26*(103), pp. 1–17.

Zhu, X. 2012. “Understanding China’s Growth: Past, Present and Future.” *Journal of Economic Perspectives*. 26.4, pp. 103-1024.

Table 1: China's Annual Export Growth

Period	Annual Growth
1992-2000	14.4%
2000-2007	25.5%
2007-2013	10.4%
2013-2019	2.1%
1992-2019	13.3%

Source: Computed from UNCOMTRADE Data. Exports are expressed in $US.

Table 2: Destination of Chinese Exports, 1993-2019

Destination	1993	2000	2007	2013	2019
North America	22.1%	23.4%	21.2%	18.7%	18.7%
Western Europe	14.1%	16.2%	18.6%	14.0%	14.9%
East Asia	17.0%	19.8%	12.5%	11.0%	10.0%
South East Asia	6.3%	8.1%	9.1%	12.6%	15.7%
Eastern Europe & Russia	4.2%	2.6%	5.9%	5.4%	5.6%
Middle East	2.8%	3.1%	4.7%	5.3%	5.1%
Central & South America	1.6%	2.6%	3.7%	5.7%	5.5%
South Asia	1.4%	1.3%	2.8%	3.4%	4.6%
Africa	0.6%	1.2%	2.0%	2.8%	2.7%
HK & Macau	26.3%	18.2%	15.2%	15.9%	11.1%
ROW	3.5%	3.6%	4.2%	5.3%	6.0%
	100.0%	100.0%	100.0%	100.0%	100.0%
Adv Countries	53.2%	59.4%	52.3%	43.6%	43.7%
Adv + HK	79.5%	77.6%	67.5%	59.5%	54.8%
Adv + % of HK	72.2%	72.6%	61.7%	51.9%	49.1%

Source: Computed from UNCOMTRADE Data.

Table 3: FDI Flows

FDI inflows, 1990-2019

(Millions of dollars)

	1990	1995	2000	2005	2010	2015	2019
World	204,886	345,143	1,356,611	947,706	1,396,203	2,041,770	1,539,880
China	3,487	37,521	40,715	72,406	114,734	135,577	141,225
China, %	1.70	10.87	3.00	7.64	8.22	6.64	9.17
FDI inflow as % of GDP	0.88	5.11	3.36	3.17	1.88	1.23	0.98
FDI inflow as % GDCF	3.60	15.39	10.05	7.82	4.18	2.80	2.24

FDI inward stocks, 1990-2019

(Millions of dollars)

	1990	1995	2000	2005	2010	2015	2019
World	2,196,202	3,564,447	7,377,272	11,431,253	19,922,422	26,577,573	36,470,162
China	20,691	101,098	193,348	272,094	586,882	1,219,930	1,769,486
China, %	0.94	2.84	2.62	2.38	2.95	4.59	4.85
FDI Inflow Stock as % of GDP	5.24	13.76	15.96	11.90	9.64	11.08	12.32

Notes: GDP is gross domestic product; GDCF is gross domestic capital formation.

PANEL I QUESTION AND ANSWER

COMMISSIONER WESSEL: Thank you, Dr. Brandt.

We're still in a virtual world, and accordingly, we are using the scenario of going alphabetically among our Commissioners, and then, in reverse alphabetical order for the following panels.

So, we will start, if you're ready, Chairman Bartholomew.

CHAIRMAN BARTHOLOMEW: Thank you very much. Thank you to our Vice Chair and Commissioner Wessel for pulling this together.

And for our witnesses, Dr. Yu and Mr. Pottinger, thank you. I join Mike in thanking you for your service to the country.

I guess I want to start, Matt, with you used the phrase "offensive decoupling." And what always strikes me is that somehow the onus of all of this is put on the United States, right? I mean that we were the ones who started decoupling and we're the ones who need to make all of the concessions.

So, I'd be interested in hearing from, frankly, all three of you how we shift that dynamic. Because the Chinese are out there pitching their framework for the whole thing, and somehow the blame always gets put on us and the responsibility for changing things gets put on us. That's one thing.

But the second thing is, certainly, when we see what's happening with Australia, we really see that this is an extension of the deal that the CCP made with the Chinese people, or the deal they think that they made with the Chinese people, which is that they get economic opportunity, and in exchange they don't get political freedom. And it looks like that's the model.

We've always talked about sort of authoritarianism, but the Chinese authoritarianism is a model that they're trying to export, but this just seems so clear about this. And I wonder again how we work with our allies and our friends to break open what is a perception of economic dependency and make sure that there is space for the freedoms that people currently experience.

Those are my questions. They're kind of broad.

Matt, do you want to start?

MR. POTTINGER: Thanks, Chairman Bartholomew. Thanks very much.

And I share your frustration at the narrative that Beijing at times, before at times successfully pushed, that the United States was somehow an aggressor that was seeking to decouple. I think the best way to expose that for what it is, which is a falsehood, is just to remind ourselves, remind one another frequently, that decoupling has been Beijing's strategy in many respects now ever since they entered the World Trade Organization. Once they got over that finish line and got access to our capital markets and to the trade markets of the West, they began to start shutting down areas of cooperation.

And I always think that Document No. 9, that secret circular that got leaked out, is a very good indicator of decoupling by Beijing. It basically says reject all notions of Western ideas about the rule of law or constitutionalism; reject the idea of a free press; reject the idea of historical nihilism, which is really a way of saying that only the Communist Party can talk about history -- "It's going to be our narrative; no one else has the right to talk" -- and on and on and on, religious freedom, all these things that wanted to unwind. They've gone into universities and pulled textbooks off of the shelves.

So, there's already a decoupling in terms of people-to-people ties and culture, but what we have now, and what you see in this 14th Five-Year Plan, is a very explicit one-way

decoupling, this offensive decoupling where Beijing does want decouple, but purely on its terms. And it wants the decoupling to serve its goals, but no one else's.

And they're very good psychologists, the Chinese Communist Party. So, they play the psychological game to make us think that we're the ones who are trying to decouple. And really, the kind of decoupling they don't want is they still want to have access to our technology; they want to have access to our laboratories and our intellectual property. That above all, that's the thing that scare them, that gives them night sweats, is the fear that at some point we might pull the plug on their ability to gain so much access to our cutting-edge technology.

So, I think that's the main way, but I would defer, also, to Miles and Loren on it. Thank you.

DR. YU: All right, Mike that's a very good question. Thank you, Carolyn, for posing it.

China has always been a gold digger in this union and played the long game. It's not marrying the international system for true sentiment. They have this goal.

So, I think it's the two sides, basically, are based upon two very different understandings of the incompatibility of the two systems, the Chinese system and the Western system, led by the United States.

In the West, we have had 40 years of fantasy. We believe the virtues of democracy, the virtue of free market might change the Chinese Communist Party. The Chinese Communist Party never had the intention to be merged completely with the rest of the world. So, they have been very giddy about the fact that we have not realized the reality of this union. So, they call it (foreign language spoken), "strategic opportunities." They try to exploit this.

So, on the Chinese side, there has been no illusion of the marriage they've alluded to. From the beginning, they were very clear of the absolute incompatibility of the Chinese model of governance and the rest of the world.

So, it's a matter of time to me that we are going to realize, and they are really ready, as Matt alluded to once again, to throw us out in the decoupling after they have, essentially, controlled the two points of the international economic system. So, I think that's a reality that we are missing.

And I'm very glad that there has been a bipartisan awakening and realizing this fantasy is just that; it's a fantasy. So, therefore, even though decoupling has never been a national policy of this country, but I think there has been a lot of reasons to believe this is also inevitable.

COMMISSIONER WESSEL: Dr. Brandt, are you still there?

(No response.)

All right. He's gone dark for a moment. Hopefully, he'll reconnect. I'll let our staff engage.

Commissioner Borochoff, you're next, I think.

COMMISSIONER BOROCHOFF: Thank you.

Let me just say, first, what a great panel this is, and I appreciate you all coming. I have two different questions that fall under one category.

Mr. Pottinger, your comments were ones that I would heartily agree with it. And I think a large part of what you were saying was that the messaging has to change, so that the people of America and our leaders that we are reporting to from this Commission start to move forward on these issues that you talk about. Specifically, what happened in Australia and the fact that we just had a hearing about the investment in China and the huge amounts of money that are being invested over there.

And then, Dr. Yu, you specifically mentioned China's Negative List and really got

down -- while you just talked about the fact that we have a messaging problem, I think both of you have this concern and belief that we ought to be doing something that's a hard policy, reciprocal involvement in what's happening.

So, you mentioned, Dr. Yu, that you thought that Facebook and Twitter were not a company problem; they were an American problem. And I think, interpreting what you said, you thought there should be effectively a China complaint desk set up by the Congress, so that American companies can say, hey, we're being mistreated, and we have to come up with some kind of response to that.

So, I'd like to ask both of you if you want to expound a little bit on, specifically, what would you do to get the word out, so that we get the support that we need? And secondly, if we were to start setting up these reciprocal responses, what would you do to reciprocate in the case of Facebook and Twitter? And either of you can go first.

DR. YU: Do you want me to go first, Matt?

COMMISSIONER BOROCHOFF: Mr. Pottinger, go ahead.

DR. YU: Go ahead, Matt, you want to go first then?

MR. POTTINGER: Oh, sure. Okay.

Yes, this idea that Miles brought up about reciprocity, I think it's a beautiful concept. It's simple. It's universal. Everyone knows what that means, and it speaks to a base sense of fairness that all Americans share.

And so, while Miles and I were in government, we frequently talked about this concept and had guidance from the President to move out with that concept. And when we found was that we were always very clear with the Chinese. When we were retaliating for something that they had done, we didn't always retaliate in the same way. We're a rule-of-law society. We don't take hostages, for example, the way that Beijing does. But we will do other things.

For example, if they take hostages or they refuse to allow Americans to exit China, we'll make it harder for senior Chinese Communist Party members and their families to gain visas to the United States. We'll always "return the favor," so to speak. And I think that using that concept in legislation, as well as in the Executive Branch's diplomacy, is a pretty good guideline to follow.

I think it helps get the word out, too, when we explain what we're doing. China, as we just discussed a minute ago, always tries to put the onus on the other side. In fact, the more aggressive China is, the more it blames the other side for being aggressive. It's part of the psychology and psychological warfare, to use China's own terms for it, that all Leninist systems pursue.

So, I think having that idea of reciprocity rooted there will make sense when the American government makes clear we're just doing this in terms of fairness. When it comes to something like China's abuse and exploitation of our platforms now, our social media platforms, this is something that is frequently confused by people that, well, wait a minute, it's a First Amendment issue. Of course, it's not a First Amendment issue. It's really up to the social media platforms. So, they should be strongly encouraged not to make themselves channels for disinformation and outrageous propaganda by a genocidal totalitarian dictatorship.

It would be like if you went back 40 years to when we just had really broadcast television, and Walter Cronkite is finishing his news broadcast and he says, "Now we're turning over out primetime broadcast to an hour and a half of Chinese Communist Party propaganda." That's really what we have now, and we're getting a belly full of this junk day-in and day-out.

I think that we should encourage and provide incentives for the social media platforms to,

at a minimum, label everything that is connected to Chinese Communist Party propaganda as such, and maybe even cut them off, unplug them, given how much disinformation they're pushing.

And then, when it comes to China's own social media platforms, they have no right. That's not a First Amendment issue. The Chinese Communist Party has no right to access tens of millions of American teenagers to push content where they're tilting the playing field all the time, tilting certain content towards those kids, and by the way, stealing the data about those kids as well.

We took the step of banning several, nine, Chinese apps. Some of those are caught up in court. I think that some judges have been misinformed about the idea that this is a First Amendment issue. I went to war to protect the First Amendment. I was a journalist for years. When I joined the Marine Corps, one of the reasons I did it was to protect freedom of speech.

This is not a freedom of speech issue when you're allowing a surveillance apparatus to grab a hold of all of our children, influence them, and steal their data. We should be shutting down all of those apps, and we should have legislation to back up the initial steps that the Administration took late last year.

COMMISSIONER BOROCHOFF: Thank you for that. I really appreciate that answer.

DR. YU: Let me just chime in on this, too. America is an open society, by which we, basically, have two very distinctive features in terms of governance. One is we're a federalist system. We have a federal government; we have state and local governments.

And two, our system is based upon the free enterprise system. You have big companies, gigantic companies, that are different from the federal government.

So, there has been an unprecedented national consensus at the federal level in the last four or five years; that is, we reached consensus on China. So, our policies have been unprecedently tough and clear and candid.

So, the Chinese government, therefore, they shifted the focus from dealing with the federal government on a national level, predominantly to folks on the sovereign national level. Basically, they approach this open society in three ways.

One is the focus on the governors, local individual states and the local governments. Their penetration has been thorough. Using this united front work has been very effective.

No. 2, they have focused on the American companies. So, the companies, basically, are dealing with China separately. You know, when I was at the State Department, Secretary Pompeo invited on several occasions the CEOs of American big companies doing business in China. When they came in, in a private setting, they exploded with complaints against the Chinese government's restriction against them. But, in the open, nobody wants to say anything because they will spend a lot of money on China lobbyists. Many of them, unfortunately, are former senior officials of the U.S. Government. So, they have contact with the Chinese senior officials. And this, basically, essentially, is an effort to avoid the federal government. And we have laws, and we have powerful sovereign access to the Chinese government.

And so, thirdly, obviously, is this huge class of China lobbyists and brokers and their agents that are working for China. So, China approached this open society challenge to them with these three approaches.

So, I think our way is to make sure that this free enterprise, companies like Facebook and Google, they operate with American domestic assistance. Their issues are not just their individual woes. It's the government's responsibility to protect the American companies like Google and Facebook, clearly, even though they sometimes disagree with the U.S. Government

actions. But it is the principle. It is the American economic interest.

So, based on that understanding, I think that it's only fair and it is only imperative for us to take reciprocal action against the Chinese government.

COMMISSIONER BOROCHOFF: Thank you.

COMMISSIONER WESSEL: Thank you. The gentleman's time has well expired. I appreciate it.

Co-Chairman and Vice Chairman Cleveland?

VICE CHAIRMAN CLEVELAND: Thank you, and thank you to each of you for appearing.

Dr. Brandt, I'm interested in your characterization of the Chinese economy. And if I heard you right, you said that there is slowdown, there has been an overestimation of their growth and there is a slowdown underway, in part, due to top-down policies.

I'd be interested in a couple of things. You referenced the dynamism of the private sector. It would help us, I think, if you could define what the private sector is, because we get into a debate amongst ourselves as to whether there really is a private sector in China, or whether they are so beholden to the Party that it would be unreasonable to characterize it as truly free and private.

I'm interested in what you think the potential for new firm growth. In your longer, written statement, you talked about there has been a reduction in new firm growth and that will have economic consequences.

And I'm interested in your views on the demographic changes, the shrinking population, the aging population, what the demographic changes mean for productivity in China.

And I guess, finally, given the clear warning signs that the economy will slow down, I think that the Party is ideological, but not stupid. And so, I'm curious how you see them adjusting their approach to generate or resuscitate growth.

Thank you.

DR. BRANDT: Okay. Thank you very much. A long list of excellent questions there.

I need to kind of maybe just step back a little bit. Because when I kind of take a look at the last four decades, I take a look at the first three decades and I take a look at the last decade. And to me, those first three decades were just these incredibly dynamic decades of all kinds of economic and institutional change. But what you have to get your mind around when you take a look at those three decades is that there's an enormous amount of dynamism, but also an enormous amount of inefficiency that happens to be running through this economy at the same time.

And so, I think that we've been kind of misled. So, I said, I think, in my opening remarks that this notion of investment-led, export-led growth, to me, those are the two biggest misnomers that we happen to have about the Chinese economy.

This is an economy where the growth was really based on productivity. You see the productivity in individual sectors. You see it in agriculture. You see it in manufacturing. You see it slightly less in services. You see productivity growth coming as resources are allocated, again, from agriculture. Labor gets allocated from agriculture to non-agriculture, as resources are being reallocated from the state sector to the non-state sector. And all of that happened up through the 1980s.

But, at the same time, you did have this state sector that had enormous amounts of demand and resources. And so, there's an enormous amount that was funneled through the state sector. Some of it, again, served useful purposes. Some of it was the source, again, of that

investment in an infrastructure that helped to increase productivity outside, but a lot of it was serving kind of non-economic objectives, as well as just helping to secure again the power and control of the state.

So, those tensions, again, have always been there. And what's important is that there's a set of reforms that occurred in the mid to late 1990s. These are fiscal reforms, financial reforms, SOE reform, China's decision to enter into WTO. What these reforms did is that they put the central government and the Party and the state on a much more solid footing. There were all kinds of problems during the first 15 years of reform. So, they put the center on a much more solid footing. They provided much more resources for the center to be able to pursue this kind of policy trajectory that we've seen for the last 15 or so years, but they, also, again, increased the power of the center, again, in a variety of ways that began to take the economy, in some sense, down a slightly different path that undermined an awful lot of that dynamism.

Now, when we talk about the private sector, I often would use the term "non-state sector" because, throughout much of the eighties and nineties the dynamism was coming from these firms that we used to refer to as township and village enterprises. A lot of these enterprises were firms, again, that were kind of ambiguously owned by local governments. In some cases, they were referred to as "red hat firms" because they were actually privately held, but, in fact, they had these red hats, again, for purposes of trying to deal again with the ideological kinds of issues.

But we do see an enormous amount of entry, often small/medium-sized private sector firms through the eighties and nineties and the 2000s that are just the source of so much of the dynamism that we happened to observe.

I believe that you're absolutely right, that if you happen to be a big private sector firm today in China, you have this relationship, again, with the Party that you need to be able to maintain and to nurture. And that's going to influence your behavior in a variety of ways.

And then, I would also say that there's a lot of private entrepreneurs out there who in some sense want to keep a low profile. You only want to get yourself so big, because if you happen to get bigger, then you're going to run into exactly all of these kinds of concerns and issues that you raised.

Just lastly, then, you raise these issues about warning signs. They see the warning signs. They see, again, what's going on in terms of the financial markets. They know what's happened, again, to levels of debt. They know what's going on in terms of bonds, you know, in terms of bond markets.

So, there are a variety of things that they are trying to do. They have been in some sense in this position before. Late nineties/early 2000s, you know, people were in some sense selling them out, or not selling them out, but in some sense underestimating their ability to be able to deal with fundamental problems in the financial sector. They dealt with (audio interference).

So here, there's a set of issues that they're going to have to deal with. My own sense, though, is that these tensions between the politics and the economics, at this point in time that they're more than willing, again, to live with the lower growth, with the lower expectations, because there are these other non-economic objectives, both domestically and internationally, that they see to be most important.

So, I'll stop there.

VICE CHAIRMAN CLEVELAND: Thank you. Excellent answer.

COMMISSIONER WESSEL: And on the Chairman or my Co-Chair, quickly, Miles or Matt, did you also have any comments to add to Dr. Brandt's comments? And if not, we'll go on to the next question.

DR. YU: I have nothing further to add. I agree with Dr. Brandt.

COMMISSIONER WESSEL: Okay. Commissioner Fiedler?

COMMISSIONER FIEDLER: So, there's a perceptional disconnect, apparently, between Congress, the Executive Branch, the Defense Department, about China versus the perceptions of the U.S. business community. And I'd like to pursue a little bit more from the Chinese view how they doctrinarily -- you know, what's their doctrine about treating, using U.S. business for their political ends, I mean, clearly, for their economic ends? So, for instance, we've seen that in our hearing on the Chinese military-industrial complex and U.S. investment in that. But I'm talking not so specifically.

And, Miles, you made mention of lobbyists -- and people make that mention, but U.S. business is scared stiff of retaliation. And I'm trying to look for the intersection of the danger that is created by this dynamic with our national security.

So, Matt, you were National Security Advisor. So, let me start with you.

MR. POTTINGER: Yes, it's a great question, Commissioner. Things have changed a little bit. You're right, there is a change in the doctrine to some extent. Because, before, when it was mainly useful to China to have foreign business investing heavily to train Chinese workers, help them build up a competent corps of business managers and engineers, and the like, China tended to -- the bargain, if you will, tended to be, look, you've got to stay quiet when you're in China about what China is doing. But what you say back at your headquarters in your home country, we'll sort of let slide.

Beijing has made a very clear departure to a more aggressive approach on this now, where Beijing says: I don't care if you're sending a tweet back in Houston that no Chinese citizen will ever see anyway because we ban Twitter, we're still going to come after you. We're going to ban your basketball team and the whole league from being aired.

COMMISSIONER FIEDLER: We just lost you, Matt.

COMMISSIONER WESSEL: Do either of the other witnesses want to pick up?

DR. YU: Yes, let me just pick up where Matt has left off.

MR. POTTINGER: I'm sorry.

COMMISSIONER FIEDLER: There's Matt again.

MR. POTTINGER: Did I make it back?

COMMISSIONER FIEDLER: Yes, you've made it back.

MR. POTTINGER: Sorry, some hiccup.

COMMISSIONER FIEDLER: You just had it again. I had it in my computer.

COMMISSIONER WESSEL: All right, Miles, we'll go with you and go back to Matt later then. Go ahead, please.

DR. YU: Okay. So, I think, obviously, this is a very good question. And I think the Chinese attitude toward the Western technology, particularly, technology-rich companies, information companies, they know what these companies want. What these companies want is really the market share in China. So, therefore, they use market access to absolutely mold the behavior of these big companies and make them sort of subjugated to the Chinese demand.

And obviously, Facebook and Twitter are not allowed in China. But a lot of companies like Yahoo, like Google, they were allowed in China during a certain period of time. And when they were in China, they were allowed to join hands with some Chinese companies.

The very good example is Yahoo's business gambit with Alibaba. Alibaba was a junior partner of Yahoo in the early stage. In the end, using all kinds of restrictive government regulations and state policies, the junior partner of Yahoo in China became a gigantic entity and

eventually picked to swallow Yahoo and kick Yahoo out of China, and Alibaba became Alibaba.

So, that's the non-state business in China. Ma Yun's Alibaba, ostensibly, is not really the state sector. But, you know, the Communist Party has absolute control over big companies like Alibaba. Once it becomes so big, once it's absorbed Western technologies, the government takes over.

And I just saw a very interesting segment authored by Ma Yun a few years ago. He said all business entrepreneurs in China will have no good ending. And that's pretty telling coming from him. This is several years ago.

Because, ultimately, the Chinese government, you played the long game, and then, they use the market mechanism to absorb Western technologies, and then, make it grow big in China. Once it grows big, the government takes over. So, we see that pattern again and again.

The reason why I mentioned the Alibaba case is because almost the entire economic growth in recent years in China comes from the non-state sector. The non-state sector accounts for about 60 percent of China's GDP, but the economic growth almost exclusively comes from that sector. So, they have this kind of dynamic market economy power, and that, basically, has been controlled and subjected to state takeover in China, like the recent experience of Alibaba has demonstrated.

COMMISSIONER WESSEL: Thank you.

Senator Goodwin?

COMMISSIONER GOODWIN: Thank you, Mr. Chairman.

And my appreciation to the panel for your great testimony this morning.

I want to talk a little bit -- as past is prologue, the topic of this panel -- talk a little bit about China's ascension to the WTO and the congressional vote that set the table for that to occur, and how, under the flawed assumption that you all really touch on in your testimony, which is that allowing that increased access, increasing integration with China, increasing market interdependence would result in benefit, would result in market reforms in China, increase human rights protection, reform to the rule of law, you know, intellectual property protections, and the like. Quite clearly, that has not been borne out. To the contrary, they have (audio interference) dependence and access to market to fuel their rise.

But my question is that I think we see some folks now referring to that as a mistake. Mr. Yu, you referred to it as, well, a 40-year fantasy in your oral testimony, but also a foreign policy failure.

And my question: what would the world look like if that vote had been different? If Congress had to annually revisit China's trade status, what would the global trade environment look like; what would the global supply chain environment look like?

Especially, Mr. Pottinger, as you mentioned, Wall Street has gotten the memo, and most likely, they wouldn't have gotten the memo, irrespective of that vote. So, what would the world look like? What individual decisions by individual companies would be different, absent that vote?

I'm not suggesting that it would be (audio interference) that it would have the same impact on American wages and jobs, but curious as to what the world might look like today, if that vote had been different.

DR. YU: All right. So, let me just take that first. In 1967, President Richard Nixon -- this is before he won the 1968 presidential election -- he wrote a very famous article in which he said, you know, we have to abandon our policy of isolating China. We have to engage China. Because an isolated China is very dangerous, considering the size and its influence. And he said

our engagement with China should ultimately serve one goal, and that goal is to induce change. That is, whatever we do, welcoming China to the Western world should have the goal of changing China's behavior.

So, back to the issue of WTO, and many of the issues of engaging China, bringing China into the international community. Somehow, in our engagement with China, we were interested in just engaging China and forgetting that original goal, brilliantly said by President Nixon in 1967.

So, I would say, if that vote had not taken place, we would have fundamentally changed the Chinese government behavior because China wants to engage the world, but you have to change the way it functions; change the model of governance. Because WTO is based upon, philosophically, a fully market-oriented economy, and China, up to this day, has not been recognized as a free market economy. So, that is a very big paradox the world still has to resolve.

And I think that's my guess. And if we put pressure on China, and give them this condition: if you join this free system, then you have to be free. We did this to the Soviet Union without any philosophical dilemma. The only reason was that the world has very little fantasy and illusion about the nature of the Soviet regime. Yet, we have had 40 years of illusion, or what the famous writer, James Mann, said, "the China fantasy," about the nature of the Chinese Communist Party.

COMMISSIONER GOODWIN: Let me be a bit of a contrarian just for purposes of the discussion here. Obviously, there are some internal dynamics at play in China that are significantly different than the Soviet Union that also could have contributed to their ability to become a manufacturing and export hub -- an enormous labor market, a growing labor market with the migration to the cities.

So, absent that vote, absent a lot -- you know, successive administrations have articulated the same policy that you just laid out. If a different policy approach had been articulated, would it have changed that dynamic internally in China that still would have given them an (audio interference) and ability, not as extensive of an ability, to influence manufacturing in global terms?

DR. BRANDT: So, let me pick up on here, because my own take is I don't believe it would have. If you take a look at what happens before China entered WTO, tariffs in China fell more before China entered WTO than they fell afterwards. China's exports were already growing 15-18 percent in the 10 or 12 years before they entered WTO than they did afterwards.

The most important thing that WTO did from my perspective, it was not so much that it offered access to U.S. markets, although that was extremely important, but what that did is it complemented a set of internal reforms to China that have been extremely important to the dynamism and the productivity growth that we have gone ahead and that we've observed.

Once you start lowering tariffs, you start having an enormous impact, again, on prices and competition in that domestic market. All kinds of barriers to entry, again, to firms in China fell at the same time. China also began to lower mobility, again, of individuals out of the countryside to the cities that provided the availability of less expensive labor.

So, there were a variety of reforms and changes that were occurring internally that were complemented by these external reforms that helped to sustain an enormous amount of dynamism and productivity growth that we observed. Much of China's success on the export end through the first three decades was in relatively labor-intensive industries that over time they have improved their capabilities in. But they were, also, just because they got better at what they did in terms of being able to develop a domestic supply chain and increase domestic sourcing.

So, you take a look at the dynamic over that period of time, that there was a constellation of both domestic forces and domestic reform and changes at the same time that were external that were contributing to this dynamism.

Now none of this disputes the fact that at the same time there were all these other things that the state was trying to do, again, with respect to multinationals, with respect to the domestic market. And this just kind of reflects the fact that there has been this ongoing tension, even in policymaking in China, between these more liberalizing, decentralizing reforms and more top-down.

To me, perhaps the best indication of that, if you go and you take a look at a report called "China 2030," this was a report that came out in 2012-2013. It was commissioned, again, by Li Keqiang, when he was the Vice Premier. It's a study that was done by the World Bank and by the Development Research Center.

This is a study that, in some sense, if you take a look at it, this is an incredibly reformist document from the perspective of 2012 that talks about reforming the nature of the state; that talks about the state playing a more regulatory role and reducing, again, the more hands-on, top-down role again of the state.

All of this is just a reflection of the nature of these tensions that have been there for a long time; and that what we've seen over the course of the last 12 or 15 years is in some sense the more top-down, central-led perspectives are those, again, that have come to dominate policymaking in China, again, in that regard.

So, I think your point, more generally, I believe a lot of this would have happened independently of what happened in the United States, and China would have been successful in terms of its productivity growth, through lowering costs, doing all kinds of things of being able to increase, again, their presence in global markets.

DR. YU: Well, I would just add very briefly --

COMMISSIONER WESSEL: The time is up. And, Matt, did you have a quick comment you wanted to make? Otherwise, we'll have to go on.

MR. POTTINGER: Can I yield to Miles to continue --

COMMISSIONER WESSEL: Yes, you can. Miles, quickly, though.

DR. YU: Oh, yes, very quickly. I want to disagree slightly because we're talking about the role of the government. We're talking about the central state. I mean, WTO, obviously, would have certain rules about price controls, subsidy, labor laws, and free access to market. So, all these issues; it's not just about allowing the members to join the international trade system without certain other problems.

I think, Dr. Brandt, you mentioned about the top-down. That's precisely the point. I know we have a very different thinking about what reform actually means in China. Ultimately, it means how to strengthen the role of the government. It's monopolistic control of the Chinese economy.

So, I think on issues of market access, labor laws, and state subsidies, all these issues would have been very different if China were not a member of the WTO.

COMMISSIONER WESSEL: Thank you.

Commissioner Kamphausen?

COMMISSIONER KAMPHAUSEN: Thank you very much. Thanks to our panelists.

My question is for Mr. Pottinger. And, Matt, thanks so much for being here.

Your statement talked about the concept of offensive decoupling, and you've answered a couple of questions about it. You note in your statement that the first step Beijing is seeking is to

wean China off of the high-technology imports. But you also note the case of Australia and the measures that China has taken to punish Australia for the policies that they find unfavorable there. Yet, bans on Australian lobsters and wine, or the recent case of Taiwan pineapples, or earlier cases such as the ban on Filipino bananas, as high quality as those goods are, they're hardly high tech.

These bans, often of arbitrary and indeterminate duration, are simply tools of economic coercion. The actions fit neatly into the strategy of offensive decoupling that you've talked about, but it seems to me they're distinct from the high-tech approach that you discussed.

Now China needs these commodities, these inputs, but their sources are fungible. And as you note, it's a policy to seek an approach in which their sourcing can be flexible from Beijing's perspective.

Yet, the abrupt bans on these key imports from individual economies which depend so much on them can have immediate and deleterious effects. Now it's hard to make the case that pineapples and bananas are national security interests. Yet, the sudden and, as I said, painful impacts of their abrupt ban can really have serious impacts on countries that are often American partners and allies.

In the case of the recent ban on Taiwan pineapples, Foreign Minister Joseph Wu in Taiwan organized a campaign of what he called "freedom pineapples," which made up the lost sales, exports to Beijing within a short period of time from both domestic and foreign partners. I'm not sure that that approach is scalable across the whole range of potential commodities that Beijing might ban.

My question is really, given that long windup, are we thinking creatively enough about the policy support tools that we in the United States might engage in on behalf of, and in partnership with, our friends and allies, so that they're in a place to respond meaningfully to these acts of economic coercion?

I fear that, because they're individual, they're targeted, they're of, as I said, indeterminate duration, that we'll continue to have an approach of hand-wringing in solidarity with our friends and allies. And that just seems to me to be inadequate. So, I'd love to hear any thoughts you might have on how we should think about policy approaches.

MR. POTTINGER: Yes, Commissioner Kamphausen, that's a great point. I like how you put that, pineapples and bananas aren't a national security matter.

In terms of what we do about that, the first step, as you mentioned, is showing solidarity. I mean, when Australian wine got banned, we sent out tweets from the NSC account. You know, I actually have a poster up in my kitchen that is a picture -- it's an Australian propaganda sort of sendup thing that says, "Fight communism; drink Australian wine." And we actually did buy Australian wine for a White House event.

So, part of it is poking fun at it, showing solidarity, but also encouraging countries to be much more nimble in how they hedge with their supply chains. Luckily, a lot of these things are fungible. They are commodities. So, Australian beef has managed to recover. Australian coal, I don't know the latest on that, but coal is fungible. You just pick it up in a boat and you send it somewhere else. China still needs coal. So, they're going to buy it from somewhere in the world, and then, Australia can backfill wherever that came from. It's disruptive, but it's not fatal.

The other idea that we talked about in the last Administration, which I hope that the Biden Administration picks up and runs with, is the idea of sort of an economic NATO, an Article 5; that if one country is being uniformly bullied by China, that China is trying to, for political reasons, use its economic leverage to cause pain for business people and workers in

Taiwan or the Philippines or the United States, or where have you, that that coalition would pick up the slack; that there would be some mechanism to allow for those goods to be absorbed into the economies equitably of the other members of that state. So, that's a concept that might be worth pursuing because it would help create a deterrent against China.

Now China is doing this right now because it has this market power for commodities to inflict pain. The next step is that they want to be the only supplier of the high-tech items on the supply chain, so that they can start cutting off the world, not just saying, "We're not going to buy your commodities." We're also not going to send you critical supplies, semiconductors, electronics, fiber, fiber optics, pharmaceuticals, and, you know, masks when you have your next pandemic, which they've actually already done.

So, that's where we need to develop this concept in anticipation of the fact that China has already telegraphed where it's going with this. This is, the term I'm using is "offensive decoupling," but it is a highly coercive use of their economic leverage to achieve authoritarian political aims.

COMMISSIONER KAMPHAUSEN: Thanks very much, Matt.

COMMISSIONER WESSEL: Commissioner Scissors, you're next.

COMMISSIONER SCISSORS: Thanks.

I'll start briefly by agreeing with Matt on the importance of evaluating capital flow into China. We had a hearing covering some of that. So, I won't spend much time on it, but it is a crucial issue.

My comments and questions are for Professor Brandt. I'll start with a completely inappropriate comment. You cited Lardy praising China's global financial crisis response. Michael Pettis and I sharply disagreed with him in front of this Commission 12 years ago about China's global financial crisis response being praiseworthy. We were right and he was wrong. It's entirely off-topic, and no reasonable person should have expected me to just let that go by.

Turning electively to relevant things, and rephrasing one of your points -- so, there are actions actually coming now -- I'm rephrasing, so I do want you to agree or disagree and elaborate, if you want to. I see an R&D fad in China right now. You and I have been following the economy for a long time. We've seen lots of fads -- air conditioners, TVs, steel, phones, and so on, solar panels. We're getting an R&D fad now.

And following those other fads, I think we are in danger of exaggerating the importance of the level of spending. Because this is a fad, you're going to get a rush of unproductive spending, unnecessarily rapid decrease in marginal return. And so, we're going to overstate Chinese R&D because this is just like when they wasted money on all those other products.

And I'd appreciate, if you disagree, definitely; if you agree, and want to elaborate, that's fine.

I have a narrow question as well. The seemingly stable role of the state sector over the past decade almost looks like -- it's more than a decade -- it almost looks like it's engineered. I'm suspicious of them being able to manage it so well. So, I'm looking for other explanations. And I'm going to follow up on Robin asking about the private sector.

Can the stable role of the state sector be partly attributed to definitional issues? And the one that I harp on is, if you look at registration data, you've had this big move from state-owned to non-wholly-state-owned, limited-liability corporations. Those are still state-owned enterprises in most cases. Whereas, if you look at the production data, they compress the firm type and you get state, private, and then, sort of an "other" category.

So, I'm wondering about the stability you cite. Is it really engineered? Is it accidental? Or

is it partly because we don't really understand the categories that well?

DR. BRANDT: Okay. Good. Let me just take each of those in turn.

I think that in terms of R&D, I think I actually say in the report you've seen this increase in R&D numbers, and a lot of this impact reflects, again, the nature of policy and the nature of incentives that have been given, again, to firms to go ahead and to increase R&D. You see the exact same thing in terms of the patenting numbers. And so, you've seen this absolute increase in patent, an explosion in patenting. Again, over the course of the last 10 or 15 years, we know that a lot of that is related to the incentives, again, that firms are given directly, as well as indirectly, subsidies again for patenting, again, as well as just benefits that they realize because they happen to have patents.

So, I agree, again, 100 percent. As we would say, there's a lot (foreign language spoken). There's a lot of water, again, in those numbers. But what it means is that we just have to be really careful in terms of how we go ahead and how we assess, both in terms of R&D, the quality of the R&D, and the impact that it happens to be having, again, on capabilities.

And so, there's some interesting work that's being done that takes a look, again, at patents. It takes a look at international citations, again, to patients that are coming out of China. And that is providing a window in terms of the nature of the patenting in China; how it happens to be linked, or not linked, again, with other kinds of patenting activity with the rest of the world. And it also identifies in those sectors, downstream, upstream, in terms of where we're beginning to see again in some sense strength, again, in terms of China, in terms of its technological capabilities.

So, at a general level, I agree with you, but I would also say that we have to kind of look again really, really carefully in terms of what's going on, because there's no question that technical capabilities are increasing, again, throughout much of this economy.

In terms of the state sector, I agree with you, the state sector is one of these things that's extremely hard to be able to measure, and that we want to also be able to distinguish between its contribution to GDP as opposed to the influence that it happens to be having on the rest of the economy.

Here, the numbers that I was citing in the paper were just on the basis of the national income accounts. You can go ahead and you can measure the value added or the GDP that happens to be generated by state-owned enterprises. You can go ahead and you can measure the GDP contribution to governance. These are measurable kinds of things.

What's interesting in the case in terms of state ownership, in terms of state-owned enterprises, is that, clearly, we've seen a decline over time in terms of how important state-owned enterprises are in industry. And so, it's declined monotonically. At one point, it was 60 to 70 percent. Today, it's probably on the order of about 25 percent in terms of the contribution, again, that state-owned/state-controlled enterprises happen to have.

Clearly, there are issues, and in my own work I've tried to deal with these kinds of issues in a variety of ways. There's alternative ways that you can go ahead and you can measure ownership. China themselves classifies firms, again, on the basis of ownership. You can also use the information on the paid-in capital, or the equity in these firms, to try to identify ownership and who happens to have controlling interest in this regard.

At one level, you are right that the state, the hand of the state extends, that you see as you take a look at the state-owned enterprises and the subsidiaries that are in the state-owned enterprise groups. There's a fair amount, again, of investment as minority investors in those enterprises, in non-state entities, just as what we've also been seeing is more non-state

investment in state-owned enterprises as minority entities in that regard.

So, there's all kinds of issues here, but I think what's important is that the state can influence, and exerts influence, in a variety of ways, all of which in some sense are distinct, but may serve slightly different purposes. The fact that you happen to have these firms contributing to GDP, that's important. The state exercises, again, influence over the amount of investment that happens to go through the state central and gets classified as state investment.

The state influences in terms of the influence that it exercises over capital allocation in the economy. The state exercises influence over who gets licenses to be able to enter certain kinds of industries. The state influences in terms of government-guided investment funds, direct capital to new firms in emerging industries that have been identified as strategic or key.

And so, I think my take on all of this is that there is just so much that we see on paper, but being able in some sense to connect the dots between what we see on paper and what actually happens, and the extent of the influence that it actually has on how firms behave, as well as multinationals, is something that there's just like a huge -- it's a big, black box.

And I know of very few studies, again, out there that, for my mind, have been successful in doing that. One of my favorites is a recent study that's been done in the shipbuilding industry. This is an industry where China has gone from 15 percent of global shipbuilding to 50 percent. Here's a clear case where you can see the role of subsidies for entry of new firms, production subsidies, investment subsidies, how it's gone ahead and influenced that growth and expansion. But you can also see that this has had implications not only for the global industry, but a lot of these subsidies have been extended in very inefficient ways that are actually hurting China rather than helping it.

So, just one more reminder of these tensions between the economics and the non-economics. The non-economic is they want a shipping industry that's the biggest in the world. They're more than willing to live with enormous costs short term, medium term, in order to be able to achieve that objective. And I think there's a growing list of industries where that seems to be the modus operandi.

COMMISSIONER SCISSORS: Thanks. I'll follow up with you afterwards on the work on patents and citations that you mentioned. Thank you.

DR. BRANDT: Yes.

COMMISSIONER WESSEL: I should also point out, Dr. Brandt, that their inefficiency often kicks our workers in the teeth. So, that's something our policymakers are interested in.

Senator Talent, you're next.

COMMISSIONER TALENT: Thank you, Commissioner Wessel.

That was fascinating. I'm half-tempted to yield my time for an actual debate between Dr. Brandt and Commissioner Scissors about who was right and who was wrong regarding the Chinese. I'm sure that would be fascinating, but I won't.

The testimony so far has been great. I've agreed with the vast majority of it. For example, Matt, your point about reciprocity is really correct. As a matter of fact, it was our No. 1 recommendation in the Commission's report last year.

But I want to focus, in particular, Mr. Pottinger and Dr. Yu, on a particular question. So, our customer is the Congress, as you know. And Congress's major role in this competition, in the American-Chinese competition, is how to build or reform the national security apparatus so as to empower the Executive. There's a sense in which, in that sense, this is very similar to the 1945-55 period when Congress built the national security apparatus that we used to prosecute the Cold War.

So, I want to focus the two of you, in particular, on what the Congress could do institutionally to strengthen the Executive Branch, in particular, in the areas of investment and contesting the Chinese narrative. So, what can we do, similar to, for example, what Congress did with FIRRMA, the Development Finance Corporation. How can Congress empower the Executive in an ongoing way to be able to regulate or manage investment in China, so as to protect American interests? And how can we in an ongoing way ensure a strong American institutional response to the Chinese narrative? I mean, speeches by the Secretary of State and Vice President, or others, is good, but how can we institutionalize those approaches?

DR. YU: Okay. So, let me go first because this deals with the policy.

Senator, you mentioned this prologue, which is very important. In the 1940s, the late 1940s when we faced the Soviet Union, we faced a challenge which was global, and there was a similar sort of awakening of the nation to face this global challenge, and the formidable challenge.

So, we did a couple of things. No. 1 is we went on to convince the government, the American people, of the danger of this threat -- so, with the "Mr. X" article, with the Truman Doctrine, others' announcements.

So, we won the argument. So, we had the doctrine. But we had one very important piece that was, ultimately, completed by the Congress. That is the 1947 National Security Act. What that Act did was, basically, it was based upon the national awakening that was occurring at the time and the national consensus being formed at the time. The Congress mandated restructuring of the government structure, restructuring the government entity to deal with this formidable opponent that was the Soviet Union.

So, what we did was, if you recall, the 1947 National Security Act centralized the American defense establishment, forming the Department of Defense, and further, ended the departmentalized American Armed Services, the interservice rivalry between the Army, Navy, and the emerging Air Force. And so, it put it under one centralized civilian control responsible to one command; that is, the United States President.

In a similar vein, we also centralized our intelligence services and ending the departmentalized intelligence. We created the CIA.

And also, accordingly, we readjusted our financial policy, our domestic civil defense systems. Everything was done by Congress in acts.

We are facing the similar situation in the United States right now. That is, we have one argument -- we have unprecedented national consensus on the threat of China. I know we have all the mega-speeches done by the Secretary of State, by the Vice President. And so, we have the American people's backing.

All we need is to end this endless, scattered, decentralized approach to China. We have so much duplication regarding the efforts. Agencies of different stripes with different bureaucratic missions are doing exactly the same thing, competing for the same resources. That has to end.

So, only Congress can do this, and I think every time we have a national crisis, either Pearl Harbor or 9/11, we try to centralize some kind of bureaucracies. And I think now is the high time to do it.

And also, secondly, we have to put this national security as the major argument for many of the threats we face from the Chinese. So, there is the American domestic legal system. There is a "wokeness" going on. Many of these logical, legal, conceptual corollaries of this woke culture are stifling us in dealing with China. So, we allow China to use our domestic exchange, ideas, concepts to come at us.

We can see from the Alaska exchange, which is very unfortunate, we must say this is not a Republican problem; this is not a Democrat problem. This is an American problem. The only way to approach that is from a national security point of view.

COMMISSIONER TALENT: I agree with you on the urgent necessity. The question is, what would a new national security act include, particularly in the areas of investment? For example, my understanding is that the index funds listing these Chinese companies is going to generate, unless something is done, enormous inflows of passive investment into China, financing their debt.

What should Congress do? Should Congress empower, for example, the SEC to regulate the index funds in a way that isn't the case now? What should the standards be?

And also, again, with the State Department -- I guess I'm probably running out of time here -- but, with the State Department, Dr. Yu, what would you say we should do to get the State Department to institutionalize a strong response to the Chinese narrative? I mean, is it funding?

I mean, if you all want to think about it and give me a response in writing, because I don't want to go well past my five minutes. But, remember, we have to make recommendations to the Congress, and the more concrete we can get it, the better. So, maybe taken another minute, if it's okay with Mr. Wessel, and then, maybe written responses.

COMMISSIONER WESSEL: If it can be fairly quick. Otherwise, we'll look for it in writing.

DR. YU: Okay. So, I'll be happy to further engage the Commission on some of the specific measures the State Department should take, after serving in the Department for a number of years.

And I often say that we have found the enemy, and it's us. The bureaucracy is amazing, and the interservice mechanism also can be very helpful. And I think, under Secretary Pompeo, the Department was of one mind in many things, but we have so many bureaucratic turfs to fight. And I think we should really, really get rid of them, through leadership only, and the internal realignment of missions.

And so, I think one of the major things, very quickly -- very quickly -- is that government agencies, particularly like the State Department, the Department of State is, basically, a lot of career diplomats and they're very good people and, also, public servants, civil servants, and they're doing great things.

But they tend to be involving us in the process of doing things. We rarely have good time to think about which direction we're going, and a lot of times we're doing that much, much better, but, still, we're involved in the process of obsessing with doing things right, rather than doing the right thing. I think that can be done through leadership. I'm glad we have that leadership, and to a certain degree, the continuity of leadership in that regard in the last five-six years.

COMMISSIONER WESSEL: I'm going to have to cut it off there. Sorry, Matt, I see you poised to speak. We welcome comments in writing.

Commissioner Wong, I'll go to you, and I'll play cleanup.

COMMISSIONER WONG: Wonderful.

Well, first of all, thank you to all the panelists, Dr. Brandt, Matt, Miles. But I should say I especially am enjoying this panel because I get to see some old friends and old colleagues. And, Matt and Miles, glad to see you're continuing to contribute to this policy area and fight the good fight.

And I would only ask that my fellow Commissioners not permit their respect for the

testimony of Miles and Matt to be diminished today because of their past association with me.

(Laughter.)

They are good people.

But my questions really focus on Dr. Brandt's testimony. I really thought you laid out very well the overall tension between China's political and strategic goals and its current strategy and its economic goals. I mean, essentially, if I'm reading your testimony correctly, the Chinese are trying to expand and consolidate their political leverage domestically and their strategic leverage internationally, at the cost of tempering their economic growth, or at least economic growth that's broad-based and sustainable. And their hope here is that they can quickly consolidate that leverage domestically and abroad and have that strategy outrun whatever slowdown they have to endure in the economics sphere.

But diving deeper into that kind of framework, my feeling is, my take is, that the Chinese, the CCP doesn't so much are about economic growth or economic slowdown in terms of just the economics. They only care about it, or they mainly care about it, only in terms of how it affects internal stability.

So, I guess my question is, what is your take on, what are the key metrics that we should look at, or the key areas we should look at, to see if their current strategy to outrun economic slowdown is surviving threats to internal stability? So, for instance, if you look at the labor market internally, is one of the factors rising tension between labor and capital? Enhanced drives for unionization driven by a tighter labor market and bad demographics, as well as just simple upscaling of the labor market, and dealing with that internal strife?

Is another measure, and no matter how you would measure it -- maybe it's anecdotal -- popular or populist resentment, particularly among rural populations, due to rising income inequality, and dealing with that internal instability?

So, I guess my question is, is that true, in your view, that the economic growth factor here in the mind of the CCP is linked to internal instability and managing that? And if so, what are the key metrics of internal instability we should be looking at?

DR. BRANDT: Okay. Thank you very much. It's a well-articulated set of questions. I'm not so sure I'll be able to reply as articulately as you posed them.

But, in general, I think I would agree that the way in which you characterized, again, my kind of opening remarks about the nature of these tensions, again, is right in terms of how they're trying to secure both domestic as well as international control in ways that are serving a common purpose.

I think, under Xi Jinping, as well as certainly under the past and historically, I think that they are focused again on the domestic in a variety of ways. Any kind of Chinese regime, again, historically, has always in some sense been concerned about kind of domestic prosperity. I mean, it's always concerned, again, about what's going to happen if people are unhappy, if people aren't fed. So, this is very much, again, on their minds. And I would say that, under Xi Jinping, this is extremely, again, important in this regard.

And so, I think what they want to be able to do is that they want to be able to kind of continue the growth, the modest growth. They want to be able to continue to absorb these kids that are coming out of the universities. I mean, you have to remember that there's this huge expansion, again, in enrollment in the universities that began in the 2000s. They need to find ways to productively absorb these people.

The number of people that are left in the countryside, it has declined again significantly, as a lot of them have left and taken jobs that are in the cities. But they are very mindful of what's

going on in the countryside. They were very much concerned, again, with respect, for example, to land issues, when there was an awful lot of land that had been expropriated by the state for purposes of urbanization, a live kind of discontent, dissatisfaction. They're mindful of those kinds of issues. Xi Jinping the last year or two, a major initiative to try to redress/deal with issues of poverty in the countryside, the new modernization of the countryside.

So, there's all kinds of policies that are directed at exactly these kinds of things that you haven't identified. The larger question is, how successful will these policies be? And I think that that's something that's open for debate.

We've seen in the past the kind of state efforts to try to deal with inequality, differences of regional imbalances; that they weren't successful because, in some sense, they were going through the same kind of channels and mechanisms that they had used in the past. I mean, they had this policy to try to develop the great west, but much of that investment that occurred as part of that policy went through the same kinds of state channels that had been unbelievably inefficient. And rather than, in some sense, trying to contribute to the development of a much more dynamic non-state sector, what it actually did is it strengthened often the state sector in those provinces, in those regions that was counterproductive. The same thing may be going on in terms of the poverty alleviation programs that they happen to be delivering again as well.

So, I think the things to take a look at, and it's hard to do because it's just from a measurement point of view: what's happening to income inequality in China? We can all read the NBS numbers, again, that are generated. But, having done a lot of household survey work in China myself, and generated numbers to generate independent estimates, there's probably often a gap between those numbers that are reported and what's actually going on. So, look at those kinds of things.

Look at what's happening to employment. Look at the ability of job creation in the cities to be able to absorb, again, these people. And I think there's one other kind of dimension that's going to be important and I think a number of people are beginning to talk about. It's that you have this huge cohort that came out of the countryside that had maybe middle school education. So, in China, that's going to be nine years or less. But you also have this economy that's increasing in terms of its sophistication, in terms of the kinds of labor that's needed to be able to move itself forward, but you've got this massive cohort of individuals who happen to have nine years of education.

And so, the question is, how are you going to deal from a social perspective in terms of absorbing these kinds of individuals, providing them opportunities? And we're talking about some relatively big numbers, tens of millions of individuals who happen to fall into these kinds of categories.

So, I think all these things that you identify are going to be extremely important, and that the ability of the Party and the state to move forward in terms of helping, allowing people to meet their aspiring domestic ambitions, but we can't forget the nationalism and kind of the global recognition that China is receiving that's also important to people within China.

COMMISSIONER WESSEL: Thank you. Thank you, and I'm going to cut it off here, although I think all of us may have some written questions which we hope our witnesses will be able to respond to.

One of those that I would ask, Dr. Brandt, is, having looked at the R&D figures, my understanding is that the pace of R&D spending by U.S. firms in China actually exceeds the rate of increase in the U.S., not the dollar value, but the rate of increase. And I think that R&D is probably of a somewhat higher quality. Again, in writing, if you could.

Matt, I'd like to ask you or focus three -- they're not necessarily quick questions, but try to abbreviate your answers. No. 1, we've seen with PPE the stranglehold and dominance of China in terms of supply chains. We've also seen that with regard to rare earths and their willingness to weaponize those supply chains.

I now see a critical issue in semiconductors. We certainly have seen the attention given to semiconductors, a specific component of that with regard to the auto sector here that has sort of popularized the issue. But I think the issue goes much deeper.

So, I would like, No. 1, your thoughts on the semiconductor challenge and what actions of the previous Administration we need to accelerate, add to, et cetera. That's No. 1.

No. 2, since you raised the issue of capital earlier, and also the issue of reciprocity, one of the sectors I have a real concern about that is in the financial sector. And that also goes to President Trump's financial liberalization. It seems to me that that may advantage China more than it advantages the U.S. by increasing the flow of funds to meet China's debt. Our firms are interested in the fees and not the implications. And again, reciprocity, providing Chinese financial firms greater access to the U.S. to me is fraught with peril, not necessarily benefit.

And finally, quick thoughts, if you have them, on China's efforts to have a digital currency and the implications. We have a panel later today, and we would welcome any thoughts you have from your work at the NSC. I think that was maybe one of the legacy issues that might have merited more attention.

Sorry to throw all of those, but if you have some quick thoughts?

MR. POTTINGER: Yes, I will try to be very brief on each of those.

Look, on semiconductors, we took some initial important steps, but the steps we took are incomplete. And I think that we're at risk right now of things going off the rails a little bit. Remember, we put in place a foreign direct product rule. We made sure that companies cannot export to China's national champion, Fab and XMIC.

What's happening, what appears to be happening, from my vantage point on the outside now, is that licenses are being granted in spite of those rules in order to advantage one component of the U.S. semiconductor industry; namely, the toolmakers, the equipment makers who, understandably, are trying to go where the market appears to be going, but in a way that I think is going to prove self-defeating, ultimately, because it's going to help China build up capacity that's going to wipe out several other aspects of the American semiconductor industry. That's something that we can't afford to let happen. This is a foundational aspect of technology for industry, for defense, and artificial intelligence, and a whole range of other things.

We actually do have to protect that. I think the CHIPS Act, and getting that actually funded -- it's certainly authorized -- getting that funded is a good step in the right direction in the bucket of we need to run faster. But we also need to slow down our adversary, which has already made clear that they're not playing by market rules.

Someone told me that SMIC has an R&D budget of 150 percent of their revenue. Okay? That's not a company. Okay? That's just not real. That's funny money. And so, we can't pretend that we're all playing by market rules here.

But a quick metaphor about this. We took steps in the last Administration to restrict next-generation aircraft engines from going to China. And, of course, the GEs of the world -- there's really only two -- there's GE and there's Rolls Royce. Given the chance, of course, they're going to try to sell the next-generation engine. What that's ultimately going to lead to is China building wide-body aircrafts that they subsidize to end Boeing and Airbus' ability to sell into China, and, ultimately, to sell to other parts of the world as well. We have seen this movie over and over and

over again in myriad other industries.

So, sometimes you have to restrain one aspect, look at an industry holistically. And I think that's what needs to happen to some extent with the toolmakers now as well.

Some of the older nodes of semiconductor technology, it's fine for them to sell to, but we've got to get really strategic here and really ruthless. Because China is not going to be able to indigenize, not very easily, if they don't have access to that gear. People are arguing, "Oh, it's too late. We might as well sell it to them because they're going to indigenize." That's a false argument that's demonstrably false.

In terms of the financial liberalization, I'm with you. I mean, the investment banks I'm sure have a hell of a good lobby, historically, in Washington, D.C.

I was reading a Washington Post story the other day that said Goldman Sachs' profits for the last three years in Asia amount to less than 4 percent of their profits. And I don't know what cut of that China is, but it's less than that. Okay?

So, I don't see much reward or upside for us getting involved, given all of the downside, this flow that Commissioner Scissors was talking and that I was talking about earlier, this flow of capital, which is, essentially, compensating for all the weaknesses that Loren spoke so eloquently about, all of this push-pull between politics and economics.

This is a highly inefficient system China has. It's creaking and we're putting scaffolding under it by giving them smart capital. We're helping them build all of their new technology firms. China can't really do that on its own as well as Silicon Valley has been able to do that.

So, I think we need to get real, and maybe I can write you some answers on some of the things that we need do --

COMMISSIONER WESSEL: Right, right.

MR. POTTINGER: -- that would benefit, also, Senator Talent for his question.

Now the digital currency that China is pursuing right now, this one is interesting because it was couched as sort of a defensive play by China, what they were terming "monetary sovereignty." They want to make sure that the Alibabas and Tencents don't take over China, and that the People's Bank of China still reigns supreme.

But that may have been the inception of this idea for digital currency, but, since then, it's become clear that China has other much, much bigger ambitions for this technology. One is to be able to surveil and control their population and any other population that transacts in the digital currency.

I mean, if you think that the United States has a lot of power through our Treasury sanctions authorities, you ain't seen nothing yet compared to people who have to transact in digital serialized currency that can be tracked, its entire history up to where it is in a moment. That currency can be turned off like a light switch and rendered meaningless. I mean, I think you would have to be crazy to want to transact in China's digital currency, given the nature of that regime.

The other ambition that they have for it, which I think will be harder for them to achieve, but we should pay very close attention to this ambition, is the idea of what they term "de-dollarizing" the world economy. And they dropped their fig leaf just the other day on this when one of the PBOC officials started talking openly about the idea that monetary sovereignty now also includes not having to deal with the Americans and the greenback.

So that companies that want to do criminal activities or trade in proliferating dangerous weapons, and committing human rights atrocities, it will all be made easier by a digital currency that China runs, that other countries, starting with, undoubtedly, Cambodia, you know, the

satellite state of China, as well as Russia, which, if it's not careful, is also going to be a satellite state of China.

This is something that we've got to watch very, very closely. And I am heartened to hear that this is something that you're planning to do more investigation into.

COMMISSIONER WESSEL: Thank you. Thank you to the three witnesses for not only your written testimony, but your great testimony today and interaction. We look forward to some further interaction in writing afterwards.

And we will take a 10-minute break and return at 11:40 for the next panel. Thank you.

(Whereupon, the above-entitled matter went off the record at 11:30 a.m. and resumed at 11:40 a.m.)

PANEL II INTRODUCTION BY COMMISSIONER MICHAEL WESSEL

COMMISSIONER WESSEL: Welcome back. Our second panel will address trends in China's economic planning heading into the 14th 5-year plan and beyond.

First, we welcome back Jude Blanchette, Freeman Chair in China Studies at the Center for Strategic and International Studies. Mr. Blanchette testified before the Commission at our 2019 hearing What Keeps Xi Up at Night, Beijing's Internal and External Challenges. At today's hearing, he will address the fusion of government and markets and economic planning.

Next, we welcome Dr. Ling Chen, Assistant Professor of Political Economy at Johns Hopkins University School of Advanced International Studies. Her research studies state business relations as well as economic, tax, andindustrial policies in China. Dr. Chen will address the addressing dynamics among different actors in China's economic ecosystem.

As a matter of housekeeping, each of your prepared testimonies which we appreciate will be entered into the record and if you could limit your oral comments to seven minutes so that there can be a good question and answer with the Commissioners, we'd appreciate it.

We will be starting questioning in reverse alphabetic order, so Commissioner Wong will be first up when questioning begins.

Jude?

OPENING STATEMENT OF JUDE BLANCHETTE, FREEMAN CHAIR IN CHINA STUDIES, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

MR. BLANCHETTE: Well, thank you very much and thank you to the Commission for the opportunity to testify today and especially thank you to the staff of the Commission for their acumen and organizational wrangling today, so very much appreciate it.

I'm going to do my best to stay well within the allotted now 6 minutes and 41 seconds remaining to make just a few points from the written testimony.

The first is I think despite a lot of the rhetoric about China playing the long game, I believe that actually the Xi Jinping Administration is decidedly focused on achieving critical policy in geopolitical outcomes over the next decade to a decade and a half and that's for all the focus in the United States on some of this 2049 national rejuvenation goals which Beijing has articulated most recently at the 19th Party Congress.

I actually think what matters for Beijing now as a strategist is the Year 2030 to 2035. And so functionally speaking, I think that means Beijing is in more of a 100-yard dash than it is a marathon. And there are two drivers of that sense of urgency and focus. The first, and I think arguably the most importantly and maybe picking up on some of the discussions in the previous section by Loren Brandt, I think the Xi Administration recognizes that long-standing and emergent domestic challenges can no longer be can-kicked as previous administrations have so aptly done for decades and also that there are new and emergent challenges that require solutions now, otherwise, it's fundamentally undermined China's continued rise.

Previous witnesses before the Commission have stressed that from a domestic governance and regulatory perspective, China's human capital and demographic picture is stark. And I think will soon become dire. So China's work force is shrinking, is under educated, and lacks sufficient skills and training needed to scale and sustain Xi's grand vision of transforming the country to become a global high tech manufacturing powerhouse. And related to this as a previous witness, Andrew Polk, said, boosting productivity is really the only leverage that Beijing has to drive new growth.

So when you add these together, I think this is why you see the impetus and the challenge facing the Xi Administration. It needs productivity-enhancing technological breakthroughs now if it's going to surmount human capital and demographic headwinds, yet at the same time these headwinds are structural in nature and place powerful constraints on how successful Xi Jinping will be in the future.

Activists' coming retirement boom which is going to see tens, if not hundreds of millions of individuals exit the work force, only a significant technological leap will prevent this labor shortage from putting significant pressure on the economy. But at the same time, if the transition to an automated future is overly successful, this potentially threatens hundreds of millions of blue-collar industrial manufacturing and logistics jobs, at a time when the country still has under educated, lower income work force.

The second driver of this urgency in addition to the domestic focus is the geopolitical environment and Beijing's understanding of what it takes to become a truly great global super power. Early in his administration, Xi Jinping made a remark while in Shanghai which I think is apposite here. He said in today's world whoever holds the nose of the ox of science and technology innovation, whoever takes the first move on science and technology will be able to seize the first advantage to gain what he calls first-mover advantage.

And so this nose of the ox strategy to me entails massive allocations of state capital into

emerging and foundational technologies, as well as a concerted focus on technological standards and rules. I don't understand why or the underlying logic of that nose of the ox strategy.

I actually turn to a comparative example here as Lina Khan wrote in a really influential law review article, although Amazon has clocked staggering growth, it generates meager profits, choosing to price below cost and expand widely instead. Through this strategy the company has positioned itself as a center of e-commerce and now serves as essential infrastructure for a host of other businesses that depend on it.

That sort of Amazon logic to me explains in many ways how Beijing is acting.

There's a book called Blitzscaling by Reid Hoffman and Chris Yeh which basically recommends for starts ups the strategy of driving rapid, rapid growth and market share prioritizing speed over efficiency, the understanding being once you get dominant market position that gives you a much better position to dictate rules of the road and to sort of set your own course of action, so you're happy to bleed capital, bleed efficiency in that rush for scale.

That start-up strategy to me, combined with this concerted understanding and focus of Xi Jinping on this sort of nose of the ox strategy of how gaining control of critical and emerging technologies and standards will be critical to future geopolitical competition explains why there is such a concerted focus this way.

And so returning to my 100-yard dash analogy, if by 2030, if by 2035, China is still a dominant global power and a significant geopolitical competitor to the United States, that means the Xi Jinping model of governance will in many ways have been successful in surmounting or circumventing some of these challenges that it is now facing. But, and I'll end with my last minute here, this is far from certain. And in a way, I think Xi Jinping's fixation on technology as a salve or as the primary means by which they're going to address these challenges instead of painful institutional reform, possibly leads China to a situation where more and more capital is being placed on this bet of getting real breakthroughs in technology, whereas, what it would take is Xi Jinping doubling down on some of these institutional reforms which folks have been recommending for a long time including de-emphasizing the role of the state, allowing markets play more force in allocating resources.

And so I think what you're going to see is and this is something that Loren wrote about very aptly in a paper, is you're going to see lots of these kind of -- or some of these Sputnik-style breakthroughs but in the universe of mediocrity and misallocated capital.

So five seconds left, I will just summarily cut myself off, that way I'm under time.

PREPARED STATEMENT OF JUDE BLANCHETTE, FREEMAN CHAIR IN CHINA STUDIES, CENTER FOR STRATEGIC AND INTERNATIONAL STUDIES

Testimony before the U.S.-China Economic and Security Review Commission
Hearing on "An Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Success"
Panel II: "Understanding China's Economic Drivers and Ecosystem"
Jude Blanchette, Freeman Chair in China Studies, CSIS
April 15, 2020

For most of the past 70 years, the theory and reality of China's national development has consisted of a curious mix of revolutionary eschatology, command-and-control planning, neo-liberalism, more recently, techno-utopianism.

Planning, guiding, steering, and coercing the country's direction has always been in the CCP's political DNA, even as the enthusiasm for and effectiveness of these efforts has waxed and waned. Since the early efforts at socialist construction in the 1950s through today, political leaders and regulatory bureaucracies have pumped out a steady stream of public exhortations and planning documents that sought to control and channel the nation's resources towards the achievement of pre-defined outcomes or end-states, be they revolutionary, technological, political, economic, military, or societal. This teleological impulse was highly visible in the Mao era, especially during the Land Reform Movement, the Great Leap Forward, the Third Front Movement, and during the Cultural Revolution.

For much of the post-Mao "Reform and Opening" period, planning gave way to authoritarian neo-liberalism, with high degrees of local-level autonomy (and disobedience) helping put China on its explosive growth trajectory. From Beijing's perspective, so long as China's underlying material foundation continued to deepen and widen, the CCP leadership was (largely) content. Afterall, until the mid-1990s, the CCP's grand strategy was to "get rich," and this necessitated a good deal of ignorance or indifference as to how wealth was being created and unevenly distributed. Regular interventions to centralize macro-control notwithstanding (such as the 1994 tax reforms or the creation of the National Development and Reform Commission), sub-national cadres could well imagine that they would be largely left alone to manage their affairs – and rent seek – as they saw fit, so long as their local economy continued to grow.

Under the leadership of CCP General Secretary Xi Jinping, there is a renewed emphasis on planning, driven by Beijing's view that mounting domestic challenges and international threats require a more activist and interventionist approach, including the creation of new mechanisms and levers to channel resources towards strategic end-states. Yet at the same time, and as a practical matter, China remains one of the *least* effectively regulated of the world's major economies, with significantly more space for actions that would be considered unsafe, fraudulent, or wasteful by many other political and regulatory systems. This is both a combination of benign and strategic neglect, but also a reflection of governance practicalities and limitations, as well as national security priorities. As a result, perplexing and seemingly contradictory outcomes are commonly seen. For example, Beijing can create thoroughgoing coercive dragnets of incredible scale and sophistication where it feels its core security interests are threatened, such as in the Xinjiang Uygur Autonomous Region or in response to the Covid-

19 outbreak, while at the same time Wuhan Hongxin Semiconductor Manufacturing (HSMC) can perpetrate a massive fraud in an area of core strategic importance to the Xi administration.[1]

In the new Xi paradigm, market forces, which have demonstrated unrivaled ability to direct capital towards their efficient uses, are seen by Beijing as unreliable and unpredictable mechanisms for ensuring specific companies dominate domestic and international markets, and that key national security concerns are satisfactorily addressed. But whereas Beijing's prior command-and-control approach to planning stood in tension with market forces, Xi is attempting to update Deng Xiaoping's fusionist "market socialist" paradigm to meet the exigencies and necessities of 21st century governance. Here, markets, when sufficiently controlled, are seen as important subcomponents, or adjuncts, to the broader planned approach to national development. Under Xi, it's not a case of planning *versus* markets, but rather planning *and* markets.

Consider the case of government guidance funds (政府引导基金). These investment entities leverage both state and private capital for the purpose of developing technologies and industries of strategic importance to Beijing, including semiconductors and Artificial Intelligence. While the management quality and investment track record of the estimated 1,800 funds is spotty, at best, they are emblematic of the Xi administration's fusionist approach to combining markets and the state to create new hybrid entities that defy traditional demarcations between "government" and "private sector."[2]

This fusionist approach is also shaping the trajectory of China's private and state-owned sectors, with Beijing pushing a blended approach that sees public and private capital cohabitating key markets, sectors, industries, and technologies. New approaches and policies, including "mixed-ownership reform", "managed capital", and the collection of policies and institutions collectively known as "Military-Civil Fusion" are driving novel amalgamations of public and private capital and ownership that further complicate neater *de jure* and *de facto* distinctions between the two.

While state capital has distinct ideological and ethical considerations for the CCP, owing to its socialist roots, the normative considerations that constrain how it uses market forces are far less potent, which gives Beijing new freedoms to innovate and adapt where and how it leverages the private sector. This development was captured well by State-owned Assets

[1] On Xinjiang, see James Millward and Dahlia Peterson, "China's System of Oppression in Xinjiang: How it Developed and How to Curb It," Brookings Institution, September 2020. Available at brookings.edu/research/chinas-system-of-oppression-in-xinjiang-how-it-developed-and-how-to-curb-it. On HSMC, see Kevin Xu, "China's 'Semiconductor Theranos': HSMC," https://interconnected.blog/chinas-semiconductor-theranos-hsmc

[2] For more on government guidance funds, see Ngor Luong, Zachary Arnold, and Ben Murphy "Understanding Chinese Government Guidance Funds: An Analysis of Chinese-Language Sources," CSET Issue Brief, Center for Security and Emerging Technology, March 2021. Available at https://cset.georgetown.edu/research/understanding-chinese-government-guidance-funds/

Supervision and Administration Commission (SASAC) Party Secretary Hao Peng in a 2020 interview: "Regardless of whether state-owned or private enterprises, they are all Chinese enterprises. [We] will firmly promote the upstream and downstream integration of firms of various ownership structures, the integration of large, medium, and small, and the coordinated and innovative development of various market entities to jointly build a group of world-class enterprises."[3]

One critical area this adaptive market-planning apparatus has been most concretely deployed is in the domain of critical and emerging technologies, with Beijing's focus on innovation deriving from two primary assessments.

First, following in the footsteps of past leaders, Xi Jinping views technology as a key component of geopolitical rivalry with the United States. As he and other senior-officials and high-level strategies and plans have confirmed on multiple occasions, China's technological ambitions are directly tied to its evolving view of the international environment, which Beijing has assessed will become more hostile to its political and development interests.[4] Indeed, Xi began expressing this view early in his tenure as General Secretary, well before the bilateral relationship with the U.S. entered the Trump-era downturn. As he put it in remarks made in 2014, "In today's world, whoever holds the 'nose of the ox' of science and technology innovation, whoever takes the first move of science and technology innovation, will be able to seize the first opportunity to gain the first-mover advantage."[5] For Xi, using the entire state capitalist toolkit to obtain early successes in developing and controlling critical and emerging technologies, as well as asserting leadership in standards and rules setting bodies, positions China on the geostrategic and competitive high ground. By way of comparison, this is a path many Silicon Valley start-ups also follow, including now-dominant companies like Amazon. As Lina Khan wrote in an influential law review article, "Although Amazon has clocked staggering growth, it generates meager profits, choosing to price below-cost and expand widely instead. Through this strategy, the company has positioned itself at the center of e-commerce and now serves as essential infrastructure for a host of other businesses that depend upon it."[6] Reid Hoffman and Chris Yeh call this "blitzscaling," which they describe as "a strategy and set of techniques for driving and managing extremely rapid growth that prioritizes speed over efficiency in an environment of uncertainty."[7]

Second, Xi's determination to boost China's innovation capacity stands at the center of his approach to solving the country's domestic challenges, including low levels of productivity, demographic head winds, and environmental challenges. While many observers, both internal and external, expected that the Xi administration would turn to painful structural reforms to

[3] "郝鹏接受中央主流媒体采访 谈当前中央企业发展态势," available at http://www.sasac.gov.cn/n2588020/n2877938/n2879597/n2879599/c15343606/content.html.
[4] See Ryan Hass, "How China is Responding to Escalating Strategic Competition with the U.S.," China Leadership Monitor, March 1, 2021. Available at https://www.prcleader.org/hass
[5] http://cpc.people.com.cn/n1/2016/0301/c64094-28159798-2.html
[6] https://www.yalelawjournal.org/note/amazons-antitrust-paradox
[7] See *Blitzscaling: The Lightning-Fast Path to Building Massively Valuable Companies*, Currency, 2018

address these issues, it's clear that Xi's fixation on technology stems from his view that it is a universal salve for all of China's domestic ills. Indeed, as Xi stated in that same 2014 speech, "Whether we can stiffen our back in the international arena and cross the 'middle-income trap' depends to a large extent on the improvement of science and technology innovation capability."[8] This often leaves Xi looking for a technological fix in lieu of an institutional one.

Understanding that the Xi administration's focus on technology is driven by both geopolitical and domestic imperatives helps explain Beijing's manifest sense of urgency in developing domestic technological capacities, securing and protecting supply chains, establishing new global rules and standards, and building capacity in critical new global chokepoints. The resolute focus on S&T stems from the scale and scope of the challenges China faces in the coming decade, both from international scrutiny and from domestic obstacles, combined with Xi's techno-solutionist worldview and Beijing's assessments that U.S. power is derived in large part from its innovation dominance.

Given that many of the above-mentioned challenges are now emerging, some of which threaten to derail China's development path and global ambitions, it's clear that Beijing is engaged in a decade-long sprint, not a hundred-year marathon. This view is reinforced by the rising primacy of the now-numerous 2035 deadlines, which have produced far greater emphasis and focus than the 2049 markers for "rejuvenation" that Xi laid down at the 19th Party Congress in 2017. If, by 2035, China is still a dominant global power and significant geopolitical competitor to the United States, then the Xi model of policy and governance will have found a way to surmount or circumvent the growing number of challenges and obstacles.

But even if China has the advantage of focus, the future is far from certain. To quote Barry Naughton:

> "In essence, China is engaging in an unprecedented gamble. If it succeeds in steering its economy to a high-tech future, China's already large economy will achieve a sort of global dominance (perhaps shared with the United States, or perhaps not). If it fails, China will be condemned to awkward second-tier status as it grapples with difficult economic problems while unpleasant demographic realities start to kick in."[9]

Yet robots won't solve China's critical institutional and policy shortcomings, even if they can be a part of the solution. The more entrenched Xi's views on technology, the more inpatient he becomes to solve domestic challenges and assert dominance internationally, the more China's increasingly scarce capital will be channeled into securing technological "victories." Some of these will succeed and yield important technologies that can materially impact China's growth prospects. If recent history is a guide, this campaign-style push will produce enormous amounts

[8] This quote can be found among a collection of Xi's S&T related comments found in "Excerpts from Xi Jinping's Discussions about Scientific and Technical Innovation" ("习近平关于科技创新论述摘编")

[9] Barry Naughton, "Grand Steerage," in Thomas Fingar and Jean C. Oi, eds., *Fateful Decisions: Choices That Will Shape China's Future* (Stanford, CA: Stanford University Press, 2020)

of waste, white elephants, overcapacity, and a string of broken promises. Beijing's approach to innovation is as much shotgun as scalpel, and in the future, larger amounts of capital will be thrown at increasingly risky or unlikely breakthroughs.

Further, owing to new demographic realities, China's coming retirement boom will see tens if not hundreds of millions of individuals exit the workforce, and only a significant technological leap will prevent this labor shortage from putting significant downward pressure on the economy. But at the same time, if the transition to an automated future is overly successful, this will potentially threaten hundreds of millions of blue-collar industrial manufacturing and logistics jobs, at a time when the country still has a huge undereducated lower-income workforce.

Xi's great and grand vision will need to wrestle with these tradeoffs.

Again, there's no doubt that this model will produce technological innovations, many of which pose military, economic, and moral challenges for the U.S. But at the same time, Xi's state-driven economic model already has the proven capacity to lead to "Soviet-style outcome[s] in which the occasional Sputnik illuminates galaxies of mediocrity," in the memorable words of Loren Brandt and Thomas Rawsky.[10]

Uncertainties about China's future do not obviate the challenge to the U.S. As one China-based executive for a European company told me years, "I know that none of my local competitors will still be in business in five years. The problem is, I need to compete against them for the next five years." China has defied easy predictions of collapse and decay for decades. While the coming ten years poses heretofore unseen and uniquely complicated problems for the CCP, the U.S. can't count Beijing out of the race. Far from it.

Recommendations

There are many verbal shortcuts to sounding smart in Washington DC. Here is one of them: "We need a long-term strategy on China."

In truth, however, we don't need a "long-term" strategy. In fact, quite the opposite. What the United States needs is, like China, a ten-year sprint strategy. Or, reworded to match the undulations of an electoral democracy, we need a two presidential-term approach. By focusing on a vague and indeterminate timeline, our fixation with finding a "long-term" strategy clouds our judgement over what to prioritize (over a long-enough time horizon, everything can conceivably be important). It also has the practical effect of allowing current political leaders to procrastinate or to focus on the trivial, thus kicking the can to future leaders. If, instead, the framing was, "we've got ten years to get our house in order and to set the course of our relationship with China for the coming two to three decades," the sense of urgency and focus

[10] Loren Brandt and Thomas G. Rawski, "China's Great Boom as a Historical Process," IZA Working Paper. Available at https://www.iza.org/publications/dp/13940/chinas-great-boom-as-a-historical-process

would be manifest. This would position the United States for a proactive focus on U.S. goals along U.S.-established time horizons. As I alluded to above, Beijing understands that in ten years, the competition will be largely decided, even if the game has three more quarters to play.

If we're in a decade-long sprint and not a hundred-year marathon, what should the U.S. prioritize? Limiting myself to the domestic side of the economic and technological competition, I would start with the Five I's:

Infrastructure. So long as the infrastructure underpinning of the American economy remains under-invested and/or decaying, there is an artificial ceiling on future prosperity for American citizens, our funding of next-generation technological breakthroughs, and our ability to ensure military preeminence.

Immigration. Openness to human capital from around the world is America's greatest strategic asset and the most visible manifestation of our core values. Any national security concerns related to our openness must be weighed against the overwhelming benefits the U.S. gains from welcoming new members to our community, regardless of ethnicity, race, or sexual orientation. Our complex, unwelcoming, and malfunctioning immigration system essentially hangs a placard that reads: "You're not welcome here." It will be a tragedy if we do not address this to make the US once more a magnet for individuals from around the world who seek a better life and new opportunities.

Institutions. In the wake of WWII, the United States helped build and sustain new institutional architecture that promoted global peace and prosperity, however imperfect. But institutions have shelf-lives, and as new challenges arise, we need new mechanisms, bodies, and rules to address them. China understands this truth, yet its solutions are often at odds with our own values and those of a large proportion of our allies and partners. Here, the U.S. is in a unique position, yet again, to help build a new global order, one that aims *not* to maintain U.S. primacy per se, but rather to leverages our leadership to address existing and emergent global challenges.

Industrial Policy. Or call it an innovation strategy, if that's more politically palatable. Regardless, the U.S. government has a long and deep experience with making targeted investments in industries and sectors that are under-invested and under-prioritized. This doesn't require Washington DC to start setting the price for pig iron or for companies to seek permission from Gosplan to build factories. If our capitalist economy survived ARPANET, it can survive future such initiatives.

Investment. The U.S. should establish a sovereign wealth fund (SWF). This is not a case of emulating China's approach. Norway has a SWF. So does Australia, Japan, France, South Korea, and Singapore. In fact, several U.S. states have them, including the Alaska Permanent Fund, which uses its revenue to make direct payments to Alaskan citizens. A newly established SWF

could help both companies and citizens in down times, but also make strategic investments in firms and technologies that are under-funded.

OPENING STATEMENT OF LING CHEN, ASSISTANT PROFESSOR OF POLITICAL ECONOMY, JOHNS HOPKINS SCHOOL OF ADVANCED INTERNATIONAL STUDIES

COMMISSIONER WESSEL: Thank you very much.

Dr. Chen, thank you for being here. Thank you for your backdrop there. I hope you and our viewers today understand the sincerity we bring to the issue here of focusing attention on the CCP leadership, not the acts of the great Chinese people. This is important as to how we manage this debate and make sure that we don't fuel any of the hate-filled comments that have underlined so much recently. So thank you and please begin.

DR. CHEN: Thank you, Vice Chairman and Commissioners. Thanks for having me here.

Today my testimony will focus on important economic players in China, their mutual relations and the rise of nationwide system for technology innovation in China.

I would first like to draw attention to the fact that over the past few decades, the players in China's economic system have significantly pluralized, so contrary to the general assumption that the state and state-owned enterprises are the two major economic players, China's development path has been driven by central governments, local governments, state-owned enterprises, private business, and foreign investment firms.

And central and local governments have formed various coalitions with these firms to gain resources and bring development outcomes in the 1990s and 2000s, but today, I don't have time to go in detail.

Since the start of the present Xi Jinping era, there have been several distinctive features. First, the decision making has overall been more centralized with the local governments having less role in the process of policy implementation. At the same time, the anti-corruption campaign to some extent has cut networks between the state and the business and it has certain effects of curbing corruption and bribing, but also led to shirking of duties among local state bureaucrats and their lack of incentives to further promote growth. But as we will see, that is not necessarily the case when it comes to high-tech technology area.

And the second is domestic private businesses have reached a far more mature stage and have grown more significantly in terms of their size. In contrast, the rise of international attentions has reduced the role of foreign business. The momentum for the growth of private business has been decades long, not just starting from today, but compared to previous periods, top private businesses such as Huawei and Alibaba have significantly strengthened the roles domestically and internationally.

There are two categories among these private firms which also gave rise to two types of government business relations. The first type of business such as Anbang and Wanda are companies in service industries such as insurance, finance, real estate, entertainment, that are potentially gray rhinos with financial bubbles. And these businesses display a pattern of fast extensions with policy loopholes followed by sudden collapse or government crackdown when they reach the red line.

However, the picture is quite different for high-tech companies that focus on industries themselves. Although having experienced leadership transitions throughout these years, the high-tech firms have overall being a group of firms that the state consistently promotes. These industries such as IT and digital quantum technology, electronics, AI, advanced manufacturing, have a much lower risk of financial bubbles, as long as they stay close to their core business. And the state has mostly focused on rewarding or helping these industries using funding, tax

breaks, and talent policies. And there hasn't been much discipline policy.

The increasing U.S.-China tension and the recent tech war have pressed the Chinese business and the state to carry out more intensive R&D and raised a strong sense of urgency. The tech nationalism is rising. The competition between Huawei and ZTE used to be really fierce, has been substantially reduced because now overcoming the technology bottleneck has become the priority. But the tech system goes far beyond these most prominent firms that everyone has heard of.

The 14th 5-Year Plan devoted significant attention to creating a nationwide system that supports science and technology development, which is the only place where a nationwide system is mentioned in the plan.

Vertically, this means that the local governments at the provincial and district level would provide capital investment for major projects and offer funding or rebates for R&D costs and tax breaks.

Horizontally, this means that with firms occupying a major role in research and innovation of system, connects high tech development zones, high-tech parks, incubators, research institutions and universities.

In some cities, the administrations of high-tech industrial parks have risen to be on par with city governments and sometimes are referred to directly as high-tech district governments.

Firms are categorized into different tiers usually such as a startup firms, gazelles, those that passed their initial risky periods, and unicorns, those that were valued at over $1 billion U.S. dollars. There are different evaluation criteria for acquiring government funds and the higher the stakes are, the more comprehensive the evaluations are. Therefore, at least in the area of promoting high-tech firms, but not necessarily other areas, local governments are still responding strongly to central governments and this is especially so in the recent trend of promoting the chip making industry throughout the country, although not necessarily all efforts succeed.

I would like to end my testimony with policy recommendations. First, U.S. foreign policy should differentiate between different actors and not bracket them all together. That may be more effective.

And secondly, the U.S. Government's current decoupling strategy may be counterproductive as it has propelled China to innovate even faster, even with some chance of not succeeding, some industry or some areas, given the scale they are doing that we still need to pay attention. Instead, increasing federal funding in R&D is more urgent now than before with intensified global competition.

In addition, facilitating federal investment in education and cultivating linkages between educational research and firm-level innovations, as well as public and private cooperation are also key for winning the competition. Thank you.

PREPARED STATEMENT OF LING CHEN, ASSISTANT PROFESSOR OF POLITICAL ECONOMY, JOHNS HOPKINS SCHOOL OF ADVANCED INTERNATIONAL STUDIES

Testimony before the US-China Economic & Security Review Commission
Hearing on "An Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Success."
Panel on "Understanding China's Economic Drivers and Ecosystem."

April 15, 2021

Ling Chen

Assistant Professor of Political Economy

School of Advanced International Studies

Johns Hopkins University

State and Business Players in the Evolution of China's Industrial Development

China's decades of economic development involve both state and business actors. The general assumption in policy circles is that the state and state-owned enterprises are the two major drivers of economic development. However, in an economy as large as China's, the relations among a series of actors are key: central governments, local governments, state-owned enterprises, private businesses, and foreign-invested firms. One would not be able to gain a fundamental understanding of China's economic ecosystem without examining the changing dynamics among these actors.

1. The Reform Period and the Pluralization of Actors

Before China's open-door policy, the state focused on supporting the state-owned enterprises based on Soviet technology. In a major shift of economic trajectory, Deng launched the reform and open-door policy. In the beginning, it was a much more controlled opening in the form of forming joint ventures, guided under the idea of "exchanging market for technology." Central governments, as well as the provincial governments (including municipalities), sought to promote domestic industries and gain technology by forging marriages between bilateral JVs between state-owned enterprises and foreign-invested firms.

At the provincial and city levels, and starting in the 1990s, the central government started moving away from the centrally controlled JVs into a much wider form of attracting foreign investment across the entire country, delegating more authorities to localities. Once this process took place, it significantly pluralized actors driving the economic development. Central and local governments, as well as domestic and foreign firms, became active players.

It was during this period that the cadre evaluation system was systematically implemented across localities at the provincial, city and county levels. It is an institution where upper-level officials used a series of indicators to evaluate lower-level officials (one level down), and the results became the basis for promotion and bonuses. Top among the list of targets were GDP, GDP growth, industrial output, investment attraction, foreign investment, and revenue. The cadre evaluation system instilled strong political incentives for local bureaucrats to accomplish policy mandates and build achievements through economic and industrial performance. This cadre evaluation system, paired with budget constraints created by the fiscal reform, turned localities into engines of growth. The period saw a proliferation of development zones, campaigns of investment attraction, and the use of tax-break and land discounts.

Both domestic and foreign firms experience a golden period of fast growth. Foreign firms became increasingly wholly foreign-owned. Although domestic firms, especially domestic private firms, often complained about themselves being third-class citizens compared to state-owned and foreign firms at the time, their integration into the global value chains through outsourcing and offshoring has the *de facto* effect of increasing their production orders. Compared to SOEs and foreign-invested firms, which often have established channels of information exchange (SOEs through the government, and foreign firms through the department that manages them and FIES through the office of development zone governments) domestic private firms often had to establish their own political connections with the government in order to facilitate their business.

2. The Rise of Indigenous Innovation

As China became the world's workshop, two challenges/limitations immediately arise. First, Beijing has recognized that the country has been located at the end of the global value chain competing on razor-thin profits with cheap labor. Second, foreign firms that resourced in China can hardly transfer any proprietary technology (let alone core technology), and were mainly interested in taking advantage of the supply chain and labor. These two concerns gave rise to voices in China for upgrading and innovation. Under such background, the Ministry of Science and Technology commissioned a series of research reports, which gained attention from central leaders. The formal launch of the initiative in 2006 and the use of the vocabulary "indigenous innovation" rather than "open innovation," signified the determination of the leadership at the time. Thus rather than gaining significantly through theft of technology, as many observers believed, China launched this initiative precisely because it gained little key technology by simply opening up the markets. As of then, high-tech development zones were established across entire jurisdictions in addition to the previous FDI zones. Government funding, subsidies

and tax break policies for science and technology innovations were also created at the central and the local levels.[1]

However, at the provincial and city levels, officials were left with much room to interpret and implement policies in their own ways, which profoundly influenced the players at stake. The city's leadership team (*lingdao banzi*), showed increased incentives to develop technology, because many cities added high-tech indicators such as high-tech product output to the cadre evaluation system. At the department level, there were more fights along vertical lines of authority. Some departments such as foreign economic and trade, saw their associations more with foreign firms and held urgent meetings to respond to the situation. Other departments such as science and technology (ministry and the bureaus) saw the rise of indigenous innovation as opportunities but were under pressure from other departments that historically control more resources.[2]

In some regions, mostly the Yangtze River Delta, the agenda was ultimately translated into "upgrading," which continued attracting multinational high-tech firms (such as Compal, Samsung, Philips) to invest in the high-tech zones. Sometimes these firms were matched with state capital for share-holding (different from matching with existing SOEs). Local governments and multinational firms became the key players. In other regions, such as Shenzhen, indigenous innovation was translated by officials as providing support for indigenous firms (even though sometimes they might not be doing exactly tech innovation). In these localities, the role of domestic firms in the economy and upgrading increased. One saw further differentiation among firms during this time: firms that focused on innovation and technology started rising and approaching the top of the value chain, whereas those that didn't, started to be further trapped at the bottom of the value chain.[3] But overall, the majority of the industrial firms did not compete on cutting-edge technologies and focused on the middle segment of the market.[4]

4. Centralized Development and the Nationwide System in the Xi era

The Xi era saw several very different developments in China's economic system, which departed from the past. First, the decision-making has overall been more centralized, with local governments having less room in the process of policy implementation. At the same time, the anti-corruption campaigns to some extent cut the ties and networks between the state and the

[1] Ling Chen, *Manipulating Globalization: The Influence of Bureaucrats on Business in China* (Stanford, CA: Stanford University Press, 2018).
[2] Ling Chen, "Grounded Globalization: Foreign Capital and Local Bureaucrats in China's Economic Transformation." *World Development* 98 (2017): 381-399.
[3] Ling Chen, "Varieties of Global Capital and the Paradox of Local Upgrading in China," *Politics & Society* 42, no.2 (2014): 223-252.
[4] Loren Brandt and Eric Thun, "The Fight for the Middle: Upgrading, Competition, and Industrial Development in China," *World Development* 38, 11 (2010): 1555-1574.

business, with certain effects of curbing corruption, rendering some businesses harder to bribe for illegal resources, but also led to non-action or shirk of duties in the bureaucracy. Second, the scale and size of the private businesses have continued to rise, but there have been divergent paths between businesses in risky, non-industry sectors and those in high-tech industries. The former often display a pattern of fast expansion followed by sudden collapse or government crackdown, whereas the latter has been steadily and systematically promoted by both the central and the local governments under the influence of rising techno nationalism.

4.1 The re-centralization of economic policies and the anti-corruption campaign

In the Xi era, the authority of the government to supervise the economy has been more centralized. The NDRC, which used to be a powerful agent in economic and industrial planning, lost significant power over areas such as key national projects, creation of development zones, climate changes, agriculture investment, anti-monopoly regulations, and SOE reforms. By curtailing its power, the central government advanced "top-level design" and consolidated authority into the hands of the small leading groups.[5] The authority, especially personnel and fiscal authority, has increasingly been directed towards the central government, but some of the responsibilities such as housing, education, business licenses have remained local.

The anti-corruption campaign has resulted in 1.5 million officials being disciplined with closer supervision than before.[6] There is evidence suggesting that the anti-corruption campaign has indeed been targeting corruptions instead of pure factional fights, which converged with the original goal of disciplining the party-state.[7] Before the launch of the campaign, government-business collusion and petty corruption in the form of bribing and banquets were prevalent, yet this trend has reportedly been sharply declined since the start of the campaign. Many beneficial policies in land, taxes, utility discounts that the government granted to firms were based on local government discrepancies, but officials are now cautious to do so, which has the de facto experience of curtailing patronage networks.[8] Businesses with previous corrupt experiences, such as acquiring land illegally or skipping inspection for sub-standard products through personal ties were also punished.

[5] Frank Tang, "Too big and too powerful': why Xi Jinping is reining in China's economic planning agency," South China Morning Post, March 14, 2018 https://www.scmp.com/news/china/economy/article/2137043/too-big-and-too-powerful-why-xi-jinping-reining-chinas-economic; Neil Thomas, "Change of Plans: Making Market Capitalism Safe for China," Macro Polo, December 30, 2018 https://macropolo.org/analysis/change-of-plans-making-market-capitalism-safe-for-china/; Wendy Leutert, "Firm Control: Governing the State-owned Economy Under Xi Jinping," *China Perspective,* 1-2 (2018): 27-36.

[6] "China's Effective Campaign Sets Model for Global Anticorruption Cause," Xinhua, 11, March 2018.

[7] But there was also evidence that certain political connections can serve as protection. See Peter Lorentzen and Xi Lu, "Personal Ties, Meritocracy, and China's Anti-Corruption Campaign," 2018, working paper https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2835841.

[8] Peng Wang and Xia Yan, "Bureaucratic Slack in China: The Anti-corruption Campaign and the Decline of Patronage Networks in Developing Local Economies." *The China Quarterley,* 243 (2020): 611 – 634.

On the other hand, however, there are also concerns that because local governments were cautious in their behavior, they were shirking from their duties, which caused paralysis, bureaucratic slack, and non-action. Most of the time they would rather not have initiatives or mobilize their resources rather than committing errors. Paired with the shrinkage of space in which local governments can interpret, implement or manipulate policies, the enthusiasm of launching local initiatives on their own seems to be quenched.[9] Whether this has directly influenced economy is still up to debate, but there are initial findings such as the visits by anti-corruption inspection teams reduced the number of business entries in localities.[10] At the same time, connections rather than performance seem to be helpful in both avoiding disciplinary action and further promotion. Overall, the importance of superseding in economic performance seemed to have declined, contrary to the cadre evaluation system in the previous periods.[11]

4.2 Growing importance of private businesses and their divergent paths

Private businesses have reached a far more mature stage and have grown more significantly in terms of their sizes, becoming an undeniably important player during this time, whereas the rise of international tension has decreased the role of foreign businesses. The momentum for the growth of private businesses has been decades-long, but compared to the era when Jiang Zemin advanced the three representative periods, top private businesses such as Huawei and Alibaba, have significantly strengthened their roles domestically and internationally.[12]

Of these businesses, there have been divergent paths among two types of businesses, which also given rise to two different types of government-business relations. The first type of businesses were companies in service industries such as insurance, finance, real estate and entertainment that have the risk of bubbles when they expand, the so-called grey rhinos problems. When faced with disciplined pressure at home, ambitious firms such as Anbang and Wanda expanded externally, especially when the state further loosened such investment for private businesses in 2012. Yet this unleashed a rapid fleeing of capital, with billions of dollars involved in acquisitions in sectors such as hotels and entertainment, which were not deemed as key industries. The central regulators were alarmed and decided to crack down on such activities. A similar story has happened to the Ants Group. For these private businesses, the

[9] Yuen Yuen Ang, *China's Gilded Age: The Paradox of Economic Boom and Vast Corruption* (New York: Cambridge University Press, 2020); Nick Marro, "The Unintended Consequences of China's Anti-corruption Drive," US-China Business Council, November, 2012; Peng Wang and Xia Yan, "Bureaucratic Slack."
[10] Nan Chen and Zemin Zhong, "The Economic Impact of China's Anti-Corruption Campaign," September 4, 2020, working paper, https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2996009
[11] Yuen Yuen Ang, *China's Gilded Age,* Chapter 6; Tianyang Xi, Yang Yao, and Qian Zhang, "Purifying the Leviathan: The Anti-Corruption Campaign and Changing Governance Models in China," working paper, 2018.
[12] This does not necessarily contradict the *guo jin min tui* argument, which mostly focus on the amount of fixed asset investment and state capital investment. See Yasheng Huang, "Varieties of Capitalism in China: Private-Sector Development During the Xi Jinping Era," in Jacques deLisle and Avery Goldstein eds., *To Get Rich is Glorious: Challenges Facing China's Economic Reofrm and Opening at Forty*; Hao Chen and Meg Rithmire, "The Rise of the Investor State: State Capital in the Chinese Economy*," Studies in Comparative International Development* 55 (2020): 257–277.

central state often alternates between tightening and loosening, producing a pattern that businesses expand by taking advantage of policy loopholes followed by a period where the state recognized that a red line has been reached.

However, the picture is quite different for high-tech companies that focus on industries (*shi ye*). Although having experienced leadership transitions (from Jiang-Li to Hu-Wen to Xi-Li), the high tech firms have been overall a group of firms that the state promotes. These industries, such as IT, digital quantum technology, electronics, and advanced manufacturing also have a much lower risk of financial bubbles as long as they stay close to their core business. Furthermore, the state has mostly focused on rewarding or helping these industries using funding, tax breaks and talent policies, and would use much fewer discipline policies even if these industries failed to meet the goals.

4.3 Techno-nationalism and the nationwide system of innovation

The rising international tension, especially deterioration of US-China relations and the cut-off of supply chains for businesses such as Huawei and ZTE have given rise to techno-nationalism in China. Before the tech war, China avoided head-on competition in tough tech components such as computer and mobile phone chips. Instead, it sought to use manufacturing to break into emerging areas where China still can be a leader, such as new materials, green energy and robots, and aimed to establish China as a major global competitor in advanced manufacturing.[13]

Now the Chinese tech firms have been put in the spotlight in the US-China competition and their success or failure was interpreted as a matter of national survival. The Chinese state leadership has recognized the importance of supporting high-tech firms and digital technology. The pressure from the U.S. has galvanized Chinese businesses and the state to carry out more intensive R&D and raised a strong sense of urgency. Also, prior to the US-China tech war, competition between Huawei and ZTE and between Alibaba and other online platforms was fierce. Yet in face of a bigger challenge from the US, overcoming the technology bottleneck became the priority. Between 2018-2020, Huawei has cut 1.6 thousand personnel in non-R&D areas and has increased 2.5 thousand personnel in R&D. Alibaba has also made significant progress in AI chip development.[14] China started to build a national ecosystem that runs at multiple levels and connects numerous actors for technology innovation.

At the national level, the state has provided support for businesses to make a faster technology leap in chip making, investing $29 billion in initial funding.[15] In late 2020, the politburo holds a

[13] Ling Chen, "How this Trade War Could Backfire — in China's Favor." The Washington Post, June 25 (2018). Also this is partly due to the fact that previous efforts to develop the chip industry (such as the Huajing and Huahong projects) were not met with success. See Douglas Fuller, *Paper Tigers, Hidden Dragons: Firms and the Political Economy of China's Technological Development* (New York: Oxford University Press, 2016).
[14] Shoupeng Li, "Alibaba announced the production of one of the strongest AI chips," *Semiconductor Observer,* Sep 25, 2019.
[15] Yoko Kubota,"China Sets Up New $29 Billion Semiconductor Fund." *Wall Street Journal*, October 25, 2019.

collective study of quantum technology and emphasized the importance of having a major breakthrough in core and crucial technology. The 14th Five Year Plan also devoted significant attention to creating a nationwide system (*juguo tizhi*) that supports science and technology development, which is the only place where a "nationwide" system is mentioned in the plan. Although the support of science and technology is not new and can be traced back to the establishment of the country, the emphasis in recent years has been on the "central role" of businesses and firms rather than pure research institutions or government agencies such as the ministry (bureaus) of science and technology.

Vertically, this means that the local governments (at the provincial, city and the district levels) would provide capital investment for major projects, offer funding or rebates for R&D cost, implement tax breaks, attracting talent from a highly-educated pool. Horizontally, this means that with firms occupying the major role in research and innovation, the system connects interactions with numerous other entities, including high-tech development zones, high-tech parks, incubators, research institutions, and universities. In some selective cities, the administrations of high-tech industrial parks have risen to be on par with city governments, and sometimes they were referred to directly as high-tech district governments.

At the same time, firms are embedded in the ecosystem through multi-tiered institutions, seeking to avoid the previous situation of applying one method to all kinds of entities (*yi dao qie*). Among high-tech firms, there are firms that are much larger and stronger, such as Huawei, and smaller, start-up firms. Among the smaller firms, there are initial start-up tech firms, gazelles (those that passed the initial risky periods and have entered high-growth periods), and unicorns (those that were valued at over $ 1 billion). The tiered ranking has been used by local governments and industrial parks. Different tiers of firms involve different evaluation criteria for acquiring government funds, and the higher the stakes are, the more comprehensive the evaluations are. For higher stake projects, the evaluation process involves departments such as bureaus of finance, science and technology, and environmental protection, as well as independent experts from these areas.

Therefore, at least in the area of promoting high-tech firms (but not necessarily in other areas), local governments are still responding strongly to central governments. For example, as soon as chip-making has become a trend since the start of the US-China tech war (pretty much like what solar panels and electrical vehicles used to be), local governments were reported to give up on the lucrative real estate sectors and invested billions on chip-making so as to gain central funding and to increase investment and revenue.

Does this mean that the central and local governments have always been aligned with each other? Not necessarily. Yet the misalignment seems to lie less in intention than the lack of knowledge or information in specific industries. The recent collapse of the 100 billion yuan HSMC chip project in Wuhan was a clear case where both local governments and the experts in

chip-making were cheated by a team of outsiders who persuaded the district government of Wuhan to make the investment but covered the actual debt in the money-raising process. When the project was found to be fraudulent and it collapsed, the team took part of the money and fled.[16] Similar processes took place in Anhui province and other localities.[17] This phenomenon, later regarded as cheating to obtain government subsidies (*pian bu*), showed that in order to make the state-led development work, it is important to have basic knowledge in semiconductor, electronics, AI and other industries in the decision-making process for local officials when making investment and allocating resources.

Despite these initial problems and even considering certain proportions of failed projects, the emergence of such a multi-layered nationwide innovation system that expanded vertically and horizontally at a rapid speed will likely accelerate the pace of innovation in areas deemed as crucial technologies, such as integrated circuits, AI, and quantum technology. As mentioned above, the key decisions such as approving developing zones and establishing major initiatives were more centralized. But there has been more continuity rather than abrupt disruption from the past in terms of providing policy support to tech firms (capital, fixed assets, tax breaks) for innovation behavior.

Overall, the state, both at the central and the local levels, has continued to play important roles throughout different periods, and the local governments have continued their roles in industrial policies of high-tech areas even when authorities are more centralized. While foreign-invested and domestic firms, state-owned and private firms have all been important players and have had different relationships with the government, as far as industrial and technology competitiveness is concerned, domestic firms, especially non-state-owned firms and private businesses, have gained increasing importance.

5. Policy Recommendations:

1) There are multiple players and state and business actors involving complicated and changing relationships over the past few decades. Even among the same group of domestic private businesses, there are diverse paths. One cannot assume that all government and business entities are tools of the central state or act on behalf of Beijing's interests. The U.S. foreign policy must also differentiate between these actors in response to their diverse incentives.

2) The current US policy in containing China's technology rise has in fact aroused a more unified response from China, which has pursued and accelerated the development of core technology and established a nationwide innovation system. This effect, combined with the cost to the US

[16] Xiaofen Qiu and Jianxun Su, "In-depth investigation of the 100 billion fraud in a Chip firm," https://finance.sina.com.cn/tech/2021-01-28/doc-ikftssap1547906.shtml;
[17] Ye Feng and Congying Feng, "How a Jiangsu businessman gained government subsidies in the past ten years," *Southern Weekly,* December 13, 2020.

business community and the recent shortage of chips in the U.S., suggests that cutting off supply chains may be a counterproductive strategy, whose cost far exceeds the gains.

3) The government plays different roles in the U.S. and China, but ultimately, its investment in cutting-edge technology and its establishment of an innovation-friendly environment is one of the key elements in winning the competition in the 21st century. The U.S. government's funding of R&D as a percentage of GDP has been consistently declining since the Cold War, and its global ranking struggled to remain in the top 10. The U.S. had far more links with contemporary China than with the Soviet Union in terms of economics, technology, and education. Therefore the cost of decoupling or de-globalization is much higher than during the Cold War and the gain much lower. In contrast, increasing federal funding in R&D is more urgent than before with intensified global competition. Yet, the U.S. has chosen the high-cost approach of decoupling while underinvesting in this most urgent R&D priority. In addition, facilitating federal investment in education and facilitating the linkage between education, research and firm-level innovation as well as public-private cooperation is also of critical importance.

COMMISSIONER WESSEL: Thank you, both. We appreciate it. I'm going to be stricter in terms of time constraints on this panel.

Commissioner Wong, you're first.

COMMISSIONER WONG: Great. Thank you to both our panelists for joining us today. My questions are for I think it's Doctor -- or just Jude. I'll just stick to Jude. All the titles, I want to be proper and all.

You know, I looked at your recommendations in your written testimony and I appreciate the specificity with which you outlined them. I want to focus on a couple of them. You talk a little bit about industrial policy and advocated for that, not being the political or so fraught with political tension, that phrase, as it has been. But I just wanted to define a little bit more what you mean by that.

You know, in my mind, industrial policy usually entails modifications to trade policy, modifications to tax structures, and modifications perhaps to antitrust law, making exceptions at the firm or sector level to encourage growth and development of these sectors and at some point in the future when these sectors or firms are at a mature level you lift those restrictions and let them play very freely in the market.

But it seems like you're talking at least in this one paragraph, a little bit differently about targeted investments or subsidies at the firm and sector level. Then you also mention ARPANET which in my understanding of the development of ARPANET, that was basic research, not so much applied or industrial policy as I would define it.

So maybe I should just give you a little bit of time to maybe specify exactly what type of actions you would advocate the Federal Government take. Is it at the firm level, the sector level? Is it basic research? Is it policy changes or is it actual direct subsidization and investment?

MR. BLANCHETTE: Well, a very effective identification of the inconsistency and incoherence of my description in that paragraph though. No, it's a great question and one of the reasons that I kept it vague is because -- or that I kept it ill-defined is because the important point to me is that we begin having a more mature discussion about how we can intervene in the market to make up for shortcomings in existing sort of investment trade patterns that we're seeing now where we're feeling now the brunt effect of mal-investment or under investment in key technology sectors, industries that then race to scramble to catch up on, you know, and 5G being a great one.

So I think the first conceptual shift is what you've articulated which is a really -- really good description of the historical pattern and structure of industrial policy is we can actually redefine this in a completely new way now. We're not tied to any legacies of what industrial policy looked like in the early '80s or indeed how industrial policy is emerging or being practiced in other countries, China being a great example of it.

China uses a de novo approach to -- or a blank slate approach to how it thinks about industrial policy where it involves and creates new institutions and mechanisms that we all put under the rubric of industrial policy, but just has one fundamental end of making sure there are assured market outcomes in areas that it defines as being of national strategic or economic importance.

So this could run the entire spectrum of, you know, China is not good at basic research. Most of its R&D spending is in applied research. Some elements of Chinese industrial policy are looking at strengthening basic research. And, of course, China is creating new mechanisms like

government guidance funds to intervene in the market to make sure capital is allocated to areas it sees as priorities.

I think for us, as I said in that short recommendation, you know, call it an innovation policy, it's really just about first determining where the priority sector technologies, not only current existing ones, but trying to be flexible enough to where we provide seed funding, what would be kind of investor of first resort to emergent or over the horizon technologies or sectors that are of importance. So this could run the gamut from I think a focus on basic on research, sorry, I'm looking at the time here.

So let me just wrap up by saying it's intentionally ill-defined precisely because what we need to do at this point is re-conceptualize how we're thinking about systematically intervening in the market under a rubric of something called industrial policy, but I think we can take it in many ways, but it's fundamentally about supporting gaps in current investment patterns and areas of technology that we see as being critical to competition in the future.

COMMISSIONER WONG: Thank you. Just with the time, I will just note I will be following up with a written question regarding the sovereign wealth fund recommendation as well. I'm just concerned a little bit about how we see the sovereign wealth fund controlled by the U.S. Government, the largest U.S. Government, how that -- what unintended consequences it may have and distorting the market might have, and also just why certain countries have sovereign wealth funds. I mean it tends to be commodity rich, or natural resource commodity rich countries that need a way to use that public ownership of that funds it needs to channel that.

I'll send you a written question on that just in the interest of time, but I appreciate your testimony. Thank you.

COMMISSIONER WESSEL: Thank you. Senator Talent, you're next, and then Commissioner Scissors.

COMMISSIONER TALENT: Thank you. I'll be quick with my questions.

Dr. Chen, you mentioned in your written testimony, I think you said orally also that the rising international tension and especially deterioration of U.S.-China relationships cut off supply chains, et cetera, have given rise to techno-nationalism in China.

So it was my impression and this is not my area of expertise. Others here know more about it that really China has had an emphasis on techno-nationalism for some time, for example, Made in China, I believe was a 2015 policy.

We have a really good paper on our website called the Tech of China's Techno-Nationalism Primer. So if you could just maybe explain that assertion a little bit more in your testimony.

And then Mr. Blanchette, you have highlighted in your recommendations the need for the institutional reform. So I'm going to ask you what I asked people in the last panel which is what recommendations would you suggest we give the Congress about further institutional reform along the lines of FIRRMA and the Development Finance Corporation? In other words, changes in American government institutions to enable us to prosecute this competition better in both the short and long term.

DR. CHEN: Thank you. Thanks for the great question. So yes, technonationalism has been for quite long in China. The versions are not exactly the same. And before the mid-2000s, the support for high-tech industries mostly are constrained to research. Basically, research and research area are Ministry of Science and Technology.

And it was since the mid-2000s, especially 2006, that there is a rise of indigenous innovation. The paradigm of indigenous innovation itself has already aroused certain kind of

techonationalism and that time is in wake of the hope that China could get a lot of core technology through the so-called paradigm of exchanging markets for technology. But China is not satisfied with the speed. So in 2006, there's a rise in indigenous innovation.

But the current version is different in several regards. First, it puts more and more attention on the level of the central role of firms in innovation which hasn't been stressed enough in the past. And second is that the current area focused more on core, the hard core technology.

When we talk about the rise of or the plan of Made in China 2025, a lot of those Made in China 2025 are advanced manufacturing industry such as advanced materials. But now given the rise of U.S.-China tension or deteriorating of U.S.-China relations, the focus has been coming back on the core, hard-core technology which the Made in China 2025 actually has been more softer on that.

So I'm trying to make my point clear is that China in Li Keqiang's earlier proposal 2025 plan was having a lot of components of advanced manufacturing and is trying to say that China can make a lot of achievement not just on the most hard-core technology, but maybe faster catch up on the advanced manufacturing technology that can take advantage of China's supply chains. But now the focus suddenly has come back to the hard-core technology.

COMMISSIONER TALENT: Mr. Blanchette.

MR. BLANCHETTE: Yes, sir. Just to name one thing to be concrete for this discussion, one of the areas that I think and may be building on the idea of FIRRMA, we've seen democratic market economies around the world follow the lead of the United States in trying to strengthen their inbound investment screening mechanisms, but of course, that leads to a patchwork approach to dealing with China's outbound M&A.

And so an idea of like what we've done with the WTO, but better, fully recognizing the China we're dealing with and its state capitalist system, thinking about something like a multi-lateral cross order M&A regime which would essentially bring together market economies have requirements of corporate disclosure, for example, so we can better suss out what is a state proxy or state-connected firm and what is a more market player, and also harmonize how we're thinking about vetting for national security concerns and investments across market economies rather than having a patchwork where, again, there are similarities between what Canada and the United States, EU, UK, and Australia is doing, but they don't all overlap or align. So moving towards something that finds more synergies there would be an example of we don't have a institutional mechanism for that right now. We do for trade, not working well, but we at least attempted to facilitate trade through the WTO, I think something on investment would be an example of creating a new multilateral institution. So I'll end there.

COMMISSIONER WESSEL: Commissioner Scissors.

COMMISSIONER SCISSORS: Thanks. I'm going to echo and I'm going to put words in their mouth the direction of the last two commissioners and having been a witness and have been on the other side of the -- in this case virtual table, this is not a criticism. I would say I found both of your China -- your assessments of what's going on in China in the different areas to be very useful and then I find the recommendations to be extremely abrupt and not connected, really, to assessment. They sort of come out of nowhere, so why they follow and they're justified given your view of China and again, there's not a lot time. I've been a witness. I understand how this has happened and I'm not asking you for yet more work. But if you happen to have or get into a written something or will write something where you say look, this is my assessment and this how the recommendation directly follows to my assessment and this is the evidence for why

the recommendation makes sense that would be great.

It came across to me like oh, these are good assessments and then these recommendations came out that were not tied to the assessments. They were tied to other facts not in evidence and I think some of the commissioners' questions indicate some similar reaction. That was my comment.

My question is for Jude. I agree wholeheartedly that Xi Jinping is substituting technology for conventional prosperity and I think it's really important this is not widely understood yet, the change in Chinese economic direction as they realize they're not going to become a rich country while any of us are alive. But they could become a technologically very advanced country.

I also appreciate your emphasizing full-time competition versus the long-term competition that's been brought up before. I think it's an important point that we get our time horizons right or at least discuss them.

But putting them together, I was confused or maybe I just disagree, I'm not sure which, with your point about in ten years we're going to decide if this was successful. We're expecting extremely weak, I mean like unprecedented weak Chinese demography in the 2030s. Most likely, very weak Chinese finance with very heavy debt levels and not a lot of wealth generation because they're not going to succeed probably on a conventional economic basis.

So why would this be decided? This is that Xi focuses on tech and even to be successful, why is this decided in ten years? In other words, I am sympathetic to your point about hey, we have to think about the short term, but I don't want to get carried away.

The 2030s, in my mind, are going to be a terrible decade for China on the direction they're going with. And so I'm wondering why you think, hey, ten years from now we can decide if Xi is successful when ten years after that it could be very poor?

MR. BLANCHETTE: I guess it's just -- I think we're disagreeing. I think it's just a matter of judgment on when you think the rooster is coming home. Is it going to be -- are we going to see the significant bite of some of these headwinds or inefficiencies and weaknesses of the system manifest in the next 10 or 15 years? And I mean as I was saying in my testimony I think if China is in a strong global position that will have demonstrated that the Xi approach to dealing with these challenges which I attest will begin significantly materializing over the next ten years that will show some efficacy, if not the efficacy of Xi's approach which my sense is he's not on the right approach, but of course, that's just an assessment which I can't mathematically prove.

I guess your point is we could have a crummy ten years and a crummy ten years after that.

COMMISSIONER SCISSORS: My point is we've had a good ten years and a crummy ten years after that. Sorry, go ahead.

MR. BLANCHETTE: I hear your point. I guess it's just a different assessment of it feels to me the can-kicking runway to mix my metaphors will be -- they will run out of it in 15 years. And so indeed, we're going to start seeing the really downward pressure on this especially in the total factor productivity realm. They need to either get some massive technological explosions which can really boost productivity and if they don't soon, then I think 2030 you will really start to see the downward pressure manifested in China's growth rate.

So I hear your point and I don't -- it's just an assessment on when the problems are going to bite and to me, they're sooner than later.

COMMISSIONER SCISSORS: I appreciate that. Like I said, we need to discuss the time horizon and I just want to be -- I'm not saying I know I'm right because obviously neither of us can know that, but I think it's a good thing to talk about when we're going to know the trajectory

because if Xi Jinping -- part of this is if Xi Jinping becomes increasingly desperate to show that he was right, we need to know when that's going to occur. So we do disagree a little bit, I think the point you're raising is really important. Thank you.

COMMISSIONER WESSEL: Commissioner Kamphausen.

COMMISSIONER KAMPHAUSEN: Thank you very much. I think I'm going to follow up on Commissioner Scissors' line of inquiry with you, Jude. I think your observations about China's near-term challenges are apt. They're a very helpful reminder, even corrective of perhaps lazy orientation that there's sometimes been manifested that we have time, right, we have a decade and a half. So in that sense I think it's really helpful.

I guess two questions ensue from, from reading your testimony. The first is to what extent do CCP leaders and perhaps more importantly the senior bureaucrats who support them, think of this coming decade in the same way you have, as a 100-meter sprint?

These are certainly not new challenges, right? Demography is a slow-moving train, but you know where it's going to end, right? We know the outcomes. And these senior bureaucrats of China, they're not oblivious to these challenges. They're quite able.

So is it the case, this is the first question, as you indicate in your testimony, that the party is betting the house on achieving a sufficient number or critical mass of high-tech innovations, less to be relegated to this awkward second tier status that Barry Naughton knows. Is that really the strategy? We've got to have a sufficient number of these breakthroughs and that will get us through at least this initial 10 to 15-year period, set aside what Derek was talking about, about the 2030s. That hardly seems a strategy, I guess is what I'm asking.

MR. BLANCHETTE: Well, let me put aside your second part which is that hardly seems a strategy. I think my argument was and obviously, was not clear enough of yes, I do think -- I think the senior leadership is decidedly aware of the challenges in front of it. Indeed, I think that's why there is the massive push coming from Beijing and especially from Xi himself of technology, technology, technology. It is the kind of the universal salve for all of the problems China has.

And so I think there's a huge mismatch between Xi is focused on, the senior leadership is focused on the shiny technological breakthroughs. Unfortunately, for them, this is where the practicalities of some of these headwinds manifest because, you know, you can want to have a leading EV, electric vehicle. You can be the leader in that. The problem is a mechanic for an electric vehicle is a computer programmer, essentially. And you can't will a generation nor sufficiently staff workforce of high tech, high skilled labor right now. And so China -- Korn Ferry has -- the management consulting firm has a report out on this where they talk about this deficit in high skill manufacturing workforce.

It's not just China by the way. We're going to face this, but China is going to have a pretty significant deficit by 2030. So in other words, Xi has if you look at his speeches, is saying S&T is our way out of these productivity slowdowns. What I think he's missing though is it's the soft stuff underneath that which there's not a whole lot they can do about transforming the workforce and that to the question Derek asked, I think that's where you get the challenge over the next ten years. The mission is there, but there's some significant headwinds.

COMMISSIONER KAMPHAUSEN: Good. Thank you. That's very helpful. Let me just ask another quick question.

I'm not sure your recommendations are uniquely positioned to address this time horizon challenge, right? As important as infrastructure, renovation, restoration, immigration reform, and so forth, as important as they are, as worthwhile as they are for us to do, they're not necessarily

short term or tied to this 100-meter sprint decade that you've talked about.

I wonder if there are and maybe we can follow up and I'll ask a question for the record. I wonder if there are additional outward-oriented recommendations you might have that would actually more try to focus where we potentially put stress on the points in their model that would slow down or otherwise complicate their approach?

COMMISSIONER WESSEL: If we could get a response to that in writing, that would be helpful. Time is just about up.

COMMISSIONER KAMPHAUSEN: Sure.

COMMISSIONER WESSEL: Sorry. Senator Goodwin.

COMMISSIONER GOODWIN: Sticking to that clock on this, aren't we?

COMMISSIONER WESSEL: Yes.

COMMISSIONER GOODWIN: Thank you, Mr. Chairman, and my appreciation to both the witnesses for their excellent testimony and recommendations.

Dr. Chen, I wanted to talk with you about a portion of your testimony where you suggest that the policy that the U.S. has implemented to counter the PRC's technological rise has certainly roused more unified response from China. But perhaps in your estimation it's been counterproductive in the sense that potential loss may simply outweigh the gains that we get. But I have two questions.

Number one, what have we seen in the marketplace? Have suppliers and other vendors, other global buyers in Europe or Asia stepped in to fill the void as China moves away from America's suppliers?

And number two, if your assessment is that the policy that we are pursuing now is counterproductive, what would a more robust and effective policy look like?

DR. CHEN: Thank you. So for your first question, my answer is slightly -- looks at a slight difference. We are right now the (unintelligible) high tech area, for example, are (unintelligible) selling to Huawei and ZTE, for example. So it's not necessarily removing them out of market as not giving them access to achieve which actually facilitate their speed in chip manufacturing.

But more importantly is we will see that there are U.S. suppliers, European suppliers and U.S. suppliers as well, that have an interest in supplying and selling those chips and they're actually, the semi-conductor industry as you are lobbying against these because they want to continue to make profits.

So the picture is more complicated. The reason they're doing that is because precisely China doesn't -- they think that China still doesn't have the core chip technology, so they still are seeing a complementary advantage between China and the U.S. and chip makers.

Now their interest does not necessarily stand with the U.S. Government. When their interests are going to stand together with the U.S. Government is actually when China rises up to completely manufacturing all their own chips. At the time the U.S. businesses are going to feel more threatened and they're more willing to say okay, we're on the same board as this government. That is also the moment when China has gained all the capacity, even though the interest now more on the U.S. side to go in business, but that's also the moment that China's capacity has already gained in chip making.

So there is a huge paradox here and as to your second question which I don't have a perfect -- 100 percent perfect solution, but I feel that what we should focus on doing, for example, is to have more funding or more resources, whatever, in making --- in facilitating our own technology. For example, China is currently not actually focused on the 5G. They are doing

6G now. Can U.S. actually lead the world in 6G technology? Now we're using a 5G, but we're looking ahead, right?

Can U.S. actually lead in the 6G technology? That is the question I think we should focus on. Or should we always borrow Ericsson or Nokia or whatever out of European brands to achieve the coverage strategy? Can we have our own U.S. 6G technology ahead of China? That's where the race is. Thank you.

COMMISSIONER GOODWIN: Thank you.

COMMISSIONER WESSEL: Commissioner Fiedler.

COMMISSIONER FIEDLER: Yes, and this is to both of you. So we're talking high tech here. U.S. private equity is raising increased -- I mean huge amounts of money for new funds for investing in China and a lot of that investing is going into high tech.

Can somebody explain to me how the Chinese Government incentivizes private equity, U.S. private equity investments in high tech that are sort of compatible with their national objectives?

MR. BLANCHETTE: I'll just give you -- and actually I just had a discussion with a PE firm the other day on their China investments. And what was interesting to me is well, the first umbrella way that they incentivize or that they treat PE is China is in a FDI investment hungry mood and will be for the foreseeable future.

And the deal is market access for investment access for returns. And China has billed an extraordinary profitable story for a lot of global investors and especially in some of these high-tech spaces likely will be especially when you're looking at domestic equity markets and a robust pipeline of Chinese tech firms going public, not only internationally, but of course, going public in China and including on some of the new markets like the STAR market.

But what was interesting in my discussion the other day is Chinese Government is also being very clear with some of these firms about where they are now, where they are increasingly not allowed to go. And interestingly enough, some of the areas that we in the United States have concerns about Chinese investment for national security concerns, Beijing is articulating to some of these folks quietly where they have concerns about foreign capital, foreign investors being involved in, so areas like cyber security technology, you know, being one of them.

So I think there's some sort of soft market barriers being erected for foreign investors, while at the same time they're allowing massive areas of technology to be open for foreign capital investors because that's in China's interest very much aligned with what we talked about earlier today about where they want to take the country technologically.

COMMISSIONER FIEDLER: And part of the problem with high tech in any discussion of high tech is dual use. I mean if something is intrinsically valuable, but especially say valuable on a defense side.

MR. BLANCHETTE: Just quickly, and I think the structural problem here is what is dual use is now almost all critical and frontier technology. I wasn't -- you know, 15, 20 years ago we could narrowly define what were the dual use technologies, but of course, you know, robotics, AI, these are all -- biotech -- these are all potentially -- 3D printing, these are all potentially dual use. So that's a structural problem here.

And then you add the blended party-state civ-mil fusion structures which further confuse where the delineation is between national security, the military, and private sector.

COMMISSIONER FIEDLER: Thank you very much.

COMMISSIONER WESSEL: Dr. Ling, do you have any comment on that?

DR. CHEN: I largely agree with what Jude has mentioned so I don't too much to add,

only to mention that China thinks the start of foreign investment in China that China has a very strict category of what is the prohibited category, what is the strictly prohibited, what are the partially prohibited and what are the categories that are completely free investment?

So on the one hand, China wanted to have investment in the high tech area, but not to the extent that the high tech has involved national security or any excepted areas. So there's a tricky balance --

COMMISSIONER FIEDLER: Well, there's --

DR. CHEN: It keeps updating that catalog.

COMMISSIONER FIEDLER: Well, the critical technology -- new critical technologies have unknown military applications, okay? And until you develop the technology, you don't know what its use is going to be. So that all these cutting-edge technologies are potentially dual-use technologies.

My suspicion is they're not opposing investment in what let's call unknown use technologies at this point, right? I mean you only -- in all these high tech -- even in the United States absent any other discussion, we find out uses of technology after we develop it. Right? It's not like let's do this for this purpose. It's let's get this technology and see what it does.

So my instinct is that they're encouraging investment in these newer technologies and later they may then say oh, well, we want to control them and you're out.

DR. CHEN: Yes.

COMMISSIONER FIEDLER: And I'm concerned about what U.S. investment is doing on the critical new technologies front. I don't think there's a lot of information out there.

DR. CHEN: I agree. Some of the technology is too new, so for example, the AI technology. That's certainly new for them to judge, to assess. And for both them and us to assess.

COMMISSIONER FIEDLER: Thank you.

COMMISSIONER WESSEL: Commissioner Borochoff.

COMMISSIONER BOROCHOFF: I was particularly taken, Jude, by your description of effectively Xi as a leader swinging for the fence and I want to build a little bit on what Commissioners Scissors and Kamphausen said. You didn't answer it because we ran out of time the question I think they were both leading to and I know you've had some time to think about it.

In reading your testimony and listening to you, you know, you list the five Is and they're a little bit general, very honestly. But my question is if we have an advantage right now in technology and I think what you're saying is if we don't step it up, they're just simply going to put all their efforts into it and they're betting the house and you don't know whether or not in your mind whether they can get there. But if they do, we lose. And if they don't, we win. It's kind of a zero-sum game the way I think you described it. And in a zero-sum game, that's not acceptable, obviously, from our side.

So if you had to pick the next thing we should be doing, whether it's one of your five Is or something more narrow, what would you suggest we be doing immediately?

MR. BLANCHETTE: Thank you. This is a tough audience on specificity of recommendations here today. It's funny, I thought I had a good set of recommendations in the sense that what I was actually trying to push was the idea of shifting our time horizons. That, to me, was the big recommendation.

So and frankly, I've read a lot of USCC testimony recommendations and a lot of them are generic, but I appreciate you focusing on mine being too generic.

COMMISSIONER BOROCHOFF: I'm not trying to pick on you. Just we want to make a good recommendation to the --

MR. BLANCHETTE: I hear you, I hear you. Except it's a public event so all my friends are watching.

Two things, a contextual remark and then let me answer the question. Naturally, my tendency is to not want to posit binary sort of success. And I think the problem with the competition metaphor and indeed I used it in a race, but we use competition all the time.

The problem is in most competitions you do have a binary zero-sum outcome. And we're in something -- rivalry -- we're in something else besides a competition because, of course, it's going to be very hard to judge winners and losers, especially with all the gradations that will be at work here.

I wish we had a better framework for discussing what this relationship with China looks like because if we're overly wedded to a competitive outcome, we're going to be looking for a finish line that we've pre-determined when in fact the finish line may not emerge for three or four years based on some new development that occurs. That's just a prefatory remark. But I don't want to fight the scenario, so I use the damn 100-dash race, so I'll continue on it.

I'm trying to build on some of the previous questions on where would we want to have a more offensive approach here. Critically for me, I don't want to slow China down because I think it's unethical to slow down the prosperity of 1.4 billion people. So we want to have a vision of what where China can succeed that we will accept. But the one that sort of I worry the most about and this is what the innovation policy, industrial policy, market interventions that are structured and strategic and forward looking to me is the most critical one is what we've seen with 5G is we under invested and now we're in the worse possible position of where -- it's like my yard out back. I haven't mowed yet and I haven't weeded, so the problem has become so extensive I'll spend seven times as much time and effort getting it up to speed.

So that to me is where if I had to have a fundamental rethink of how we think about markets, our capitalist economy, and where we're going to spend money it would be significantly more sums of funds on emerging technologies that we think will underline the global infrastructure of the future and being far less -- I used to work at the Cato Institute, so I used to be pretty libertarian, but far less libertarian in terms of how we think about government intervention in markets where we find critical gaps there.

Now, the final thing, I think following from that you then do see some other necessary requirements is if we're going to be innovating the best technology in America, we need the best tech talent in America. And so that's where my second very close follow up is. I think we need a radically more liberal immigration system. All the national security concerns that come from immigration pale in comparison over the long run, so the massive, massive benefits we get. So that kind of one-two punch of radical immigration reform with a kind of pretty robust innovation slash industrial policy focused on next generation emerging technologies would be my more concrete slash vague recommendation.

COMMISSIONER BOROCHOFF: Love that answer. Thank you.

COMMISSIONER WESSEL: Chairman or Chairwoman Bartholomew, we'll go to you and then --

COMMISSIONER TALENT: She's not -- this is Jim. She's not -- but she asked me to ask a question for her if that's okay with you.

COMMISSIONER WESSEL: I was going to have you ask right after Carolyn if that's okay.

COMMISSIONER TALENT: I'm sorry. I thought it was Robin Cleveland. I'm sorry.

CHAIRMAN BARTHOLOMEW: That's all right, Jim. if you want --

COMMISSIONER TALENT: Robin has left the room.

(Simultaneous speaking.)

CHAIRMAN BARTHOLOMEW: That's fine.

COMMISSIONER TALENT: I will yield. Mike's got us all so nervous because he's cracking the whip on time.

CHAIRMAN BARTHOLOMEW: Just remember that Mike is often the one who takes more time, so we put it in context and perspective.

COMMISSIONER WESSEL: And I've taken no time this panel. Go on, Madam Chair.

CHAIRMAN BARTHOLOMEW: I guess that's some of what I'm grappling with, sort of again, again which is the bigger context.

And some of what is going to be unfair is, Jude, I'm looking at the quotes that you have taken from other people, so it would have been fairer for me to have asked Loren this question when he was on the first panel. But this idea of this Soviet-style outcome, right, of Sputnik in the midst of mediocrity, when you're spending an enormous amount of money, right, it's like throwing spaghetti at the wall, right, and you don't know what is going -- what's going to work and what's not. And in technology, it's not necessarily quantity, right? I mean a new -- an innovation, like an iPhone or something that transforms things could be that one Sputnik that could change things.

So I grapple with the -- does inefficiency matter? I guess really is what I'm asking. There's the inefficient use of capital really matter when they are throwing so much at this?

And then also its second-tier status, right? I mean the problem with analysis like that is it just presumes that everything else is static and while we are here focused on what the United States needs to do, there are circumstances. If we've learned anything from this pandemic, it should be that there are circumstances with global implications. So that's it.

And Dr. Chen, I'd like for you to talk a little bit more about what you see as the connection between the rise of techno-nationalism and the deterioration of U.S.-China relations.

And I think Senator Talent sort of made some reference to this, but this has been going on before, right? I mean the decoupling that China has been doing, has been engaging in, and the dual circulations of the -- what was the phrase that Matt used this morning, the offense of decoupling Made in China 2025. And so I'm hesitant about linking the rise of techno-nationalism to actions of the United States because then it puts the onus on us. So if you could address that.

But first questions first, and of course, I've taken half the time.

MR. BLANCHETTE: And you've asked me to be a stand-in for Barry Naughton and Loren Brandt which is pretty big shoes to fill. So let me -- just a 45 second answer on this and I think this is the real, this is the struggle we're in is is my gut sense is the United States is in a much, much better position than China. We're winning the race. And I think our institutional foundation is much more solid. Our allocation of capital is much more strategic. It's better.

But mixing those two quotes together of the is it going to be an occasional Sputnik-style victory in a sea of mediocrity, and then Barry's idea of if Xi loses this bet, does he basically spend a generation's capital in a mis-allocated or direction that then undermines China's long-term growth potential.

I think what they're trying to get at there which I very much buy is as we -- if we think that -- and I think this is the case, structurally, China is in this now lower, slowing growth period which is not going to -- again, unless they get this massive productivity boost. But a Sputnik doesn't get you a massive sort of total factor productivity boost for the entire economy, right?

And that's what they're going to need. They're basically going to need to get enough technological boost that they can spread over the economy such that you have more holistic TFP growth, rather than these little spikes. Otherwise, your growth trajectory is pretty much fixed for a generation.

And so what that means to me following on from that is China has not had to deal with a lot of scarcity for a while and that has enabled this model where the spaghetti on the wall model where you can throw globs of capital in an attempt to get some of these Sputniks.

Four or five, six years from now, China is going to have far less capital to be able to throw at these things. And so I think that's just the structural reality there. But, and this is where my final thought is, you're right though. Some of these Sputniks could have massive, massive implications for the United States and as the previous commissioner said, even when China fails and we have massive over capacity, it kicks us in the teeth which is why we cannot afford to say you know what, let's just watch the system spiral into inefficiency.

We've got to make sure that our offensive game and our own foundation of prosperity and technological innovation remains cutting edge here because we just don't know what some of these Sputniks will produce or how they will impact U.S. interests.

CHAIRMAN BARTHOLOMEW: We don't know that. We also don't know that the capital is going to slow down when you look at FDI, for example, right? I mean that's another unknown. But might --- can Dr. Chen answer this question quickly or do you want me to have her do it in writing?

DR. CHEN: I can be quick.

COMMISSIONER WESSEL: Go ahead.

DR. CHEN: I can just say quickly. Actually, to give an example, so when we say Made in China 2025, there's a lot of things involved like advanced materials and machinery, and so it reflects internally China's debate into whether we really want to only focus on the cutting-edge core technology, such as chip making, or want to broaden our horizons, because we can catch up on technology in broader ways.

So 2025 actually reflects a broader approach, it's a broader approach way. However, why this is a Sputnik moment, as Jude mentioned, and as I also think so, is that after the 2018-2019, you know, the banning of chip making --- chip to Huawei and to ZTE, suddenly, there's a turn to core technology such as chip making. So before that, we couldn't imagine that a lot of the local governments are racing with each other to make chips. That would not have happened before that critical moment. That's just to give a more concrete example.

CHAIRMAN BARTHOLOMEW: Thank you.

COMMISSIONER WESSEL: Senator Talent on behalf of Commissioner Cleveland.

COMMISSIONER TALENT: Thank you, Mr. Chairman. I really appreciate the way you've managed this panel here.

So Vice Chair wanted to ask the two of you to give us your views on what is the best way to distinguished between state firms and quote unquote private firms in China. What is the analytically most useful way, what criteria are we to use in considering the Chinese economy in that respect?

MR. BLANCHETTE: Oh, gosh, that is -- I should say the Freeman Chair with the now sanctioned MERICS have been working on a report which we're hoping to have come out some time to create a framework for making precisely these distinctions or delineations or at least understanding state and quote private on a spectrum such that the governments like the United States can better interpret or at least calibrate the risk.

I'm going to have to leave it there because honestly we think about this a lot and it is well-nigh impossible now under the Xi Administration to utilize any of the previous heuristics or frameworks to make that disctinction. And indeed, Xi Jinping has given us a great case study in this in Alibaba under Jack Ma.

And of course, I think it is de facto the case that the vast majority of Chinese enterprises which are legally defined as private are almost certainly focused on commercial transactions, but the point of the party-state apparatus and reforms under Xi Jinping, including strengthening the role of party cells, inserting the party into corporate governance structures is all about the potentiality of reaching in and intervening or exploiting of firms if you need to. And that's the real problematic part for us.

I think we have to come up with some sort of framework to do this because it would be a massive cost to the United States if we were to start treating every Chinese corporate entity as an SOE. It would make it hard for us to prioritize and determine where we really think the rank order high risks are. But right now, the traditional metrics just don't cut it and I think especially when you start wading into the grafting on of the party to the private sector, we just don't have that capability.

So hopefully Freeman Chair and MERICS will have something for you some time soon.

COMMISSIONER TALENT: Thank you. Doctor, do you have any comments?

DR. CHEN: So I think the standard way, of course, is looking at the shareholding like who has the majority of shareholding. I'm sure that's not what you're asking because everyone can just dig out those data and see the shareholding of the SOEs and private firms.

But I typically look at several things in the behavior of private firms because they previously don't have pre-existing ties with the government or networks, they actually spend a lot of effort cultivating the networking ties. So you see a firm working really hard to cultivate good relationship with the government that probably is a private firm. But those SOEs, they just automatically have it. They don't have to spend a lot of effort doing that.

You know even for Huawei, when Huawei was actually was just the beginning business, they actually got their state bank loans rejected. They wanted to have state bank loans and they were rejected. And of course later, when they tried to prove themselves, then that worked better.

And also the outcomes. Of course, there is more like a post-op way to tell the difference is in general, that private firms are much more competitive than SOEs which means that if you want to worry about the rise of China, then the rise of private firms probably is more worrisome than the rise of state-owned enterprises. It's not about the size and how big and large they are and whether they're a global Fortunate 500, but SOEs tend to be like a fat person but without much lean actual muscle, right, just a pure fat person, whereas private firms are getting more and more competitive. That's my view.

COMMISSIONER TALENT: Thank you.

COMMISSIONER WESSEL: Thank you to both our panelists. Thank you to our commissioners for their resilience and we will break for half an hour with a little -- since we'll be getting started if people need a couple more minutes that's fine and we'll be starting with opening comments by Robin at that time.

So we stand adjourned for half an hour.

(Whereupon, the above-entitled matter went off the record at 12:45 p.m. and resumed at 1:20 p.m.)

PANEL III INTRODUCTION BY VICE CHAIRMAN ROBIN CLEVELAND

VICE CHAIRMAN CLEVELAND: Welcome back to the afternoon panels. The third panel today will move from the general to the very specific.

We're going to look at cloud computing, synthetic biology, and new mobility, or transportation where the Chinese Communist Party has concentrated resources to enable growth and expansion of their global market positions.

First we'll hear from Nigel Cory, Associate Director of the Trade Policy -- for Trade Policy at the Information Technology and Innovation Foundation, where he writes on, guess what, technology.

Before ITIF, Mr. Cory was a researcher at the Center for Strategic and International Studies. And he's also served in Australia's Department of Foreign Affairs and Trade.

While Mr. Cory is a new face to the Commission, he testified before the Senate Finance Committee recently on their hearing on censorship as a non-tariff barrier to trade.

Next, we will welcome Dr. Jason Kelly, who I've just had a fascinating conversation with about biotechnology. He is the CEO of Ginkgo Bioworks.

And he'll talk about China's ambitions in the field of synthetic bio. Ginkgo is a synthetic bio company that programs cells for customers in chemical, pharmaceutical, food, and energy industries.

Dr. Kelly testified before the Senate Commerce -- Committee on Commerce, Science and Transportation on securing U.S. leadership in the bio economy.

Finally, we will welcome Dr. Joanna Moody, who will discuss new mobility in China. She is the research program manager for MIT's Energy Initiative and Mobility Systems Center.

She's also a researcher for the JTL Urban Mobility Lab, where she leads a study exploring short and medium term impacts of COVID on individual travel behavior and attitudes.

She's recently published research on transportation policy making in the Chinese Cities.

I encourage you all to keep to the seven minute oral testimony guidance, because we ask a lot of questions.

So, Mr. Cory, if you would proceed.

OPENING STATEMENT OF NIGEL CORY, ASSOCIATE DIRECTOR FOR TRADE POLICY, INFORMATION TECHNOLOGY AND INNOVATION FOUNDATION

MR. CORY: Great. Thank you. Good afternoon Commissioners. I greatly appreciate the opportunity to testify on China's restrictive cloud market and how it impacts U.S. firms, innovation, and economic development, and what the United States should do about it.

Let me start by saying that China's restrictive cloud market access has already cost the United States dearly. And it will cost it more for years, and if it becomes a model for other countries.

The United States needs to prioritize clear and comprehensive cloud and associated digital commerce back in association with China.

Thus far, the United States has relegated digital issues below agricultural and other interests. And while these other sectors, no doubt, face their own barriers, they're not central to the race for innovation advantage that is critical to the U.S. economic -- economic future and national security.

Stakes are high. If we fail to act, the U.S. could lose its edge in the global digital economy.

ITIF conservatively estimates, based on market share comparisons in China and the Asian Pacific, that Amazon and Microsoft's infrastructure as a service, which is a type of cloud service restricted in China, lost a combined $1.6 billion in foregone revenue over just a two-year period, from 2017 to 2018.

And this gig is only really the tip of the iceberg. Other cloud firms like Google, are not even in China.

And this estimate also doesn't take into account the full range of cloud and associated digital services that U.S. firms compete and quite often lead in.

So, as China's digital economy continues to rapidly grow, the losses to U.S. firms will also grow.

China forces U.S. cloud firms to set up joint ventures and licensing arrangements that involve the transfer of software and business and technical know-how to local partners who may well become their future competitors.

Even then, China only allows a few such licensing and joint venture arrangements. These and other market restrictions stop U.S. companies from directly competing with their main Chinese competitors such as Alibaba Cloud and Tencent Cloud.

These cloud, Chinese cloud firms can use their protected home market to become more competitive, safe in the knowledge that their U.S. competitors are restricted.

It also allows them to direct attention and finances to global expansion, knowing their home market is safe.

Their global expansion reveals a start lack of reciprocity in the Chin -- in that Chinese cloud firms do not face similar restrictions in the United States or elsewhere around the world. This is unacceptable.

The U.S. cloud firms stand to lose market shares in China and third country markets where Tencent and Alibaba are now competing.

Not only that, but they potentially stand to lose even greater market shares as other countries such as some in Europe and India view the China model of digital protectionism as a success they want to replicate, as they too want their own local champions.

Why should we care? Because these lost market shares in China and around the world is

worth billions of dollars in revenue that could support innovation and job creation within this critical sector of the U.S. economy.

U.S. cloud firms deserve special attention, because they are amongst the most innovative firms in the world.

In 2020 alone, Amazon invested over $40 billion in R&D. Alphabet invested just over $27 billion. And Microsoft invested $19 billion.

But, it's not only the total amount in R&D spending that we should be paying attention to, it's where they're directing the money, into cyber security, AI, 5G, 6G, mobility, and many other emerging digital technologies.

This investment in research and development places Alphabet, IBM, Intel, and Microsoft amongst the world's leading developers of valuable patents.

Now, at the moment, re -- U.S. cloud firms retain a competitive advantage over Chines firms in terms of global market share, research and development, and global operations.

But, China and Chinese firms are investing the time and money to improve their capabilities, their competitive position, and their global operations, as China and its cloud firms are gunning for the U.S.'s position as the leader of the global digital economy.

For example, in 2020, Huawei invested $20 billion in R&D, while Alibaba invested just over $7. And China continues to direct funding towards these firms and this sector in part to support their global expansion.

Alibaba Cloud and Tencent Cloud have set up data centers worldwide in countries such as Australia, Germany, India, Indonesia, Japan, Malaysia, Singapore, the UAE, the UK, and the United States itself.

China protects and supports its cloud competing companies at home and abroad, because it considers those competing services as strategic and central to its economic development and national security.

Cloud's also foundational to China's efforts to become self-sufficient and a world leader in a range of other strategic technologies such as AI, quantum computing, genetics and biotech, and advanced manufacturing.

Now, getting China to provide greater cloud market access will not be easy. Beyond the economic goals, Beijing sees digital economy restrictions as essential to achieving its most important goal, regime stability.

Nonetheless, getting clear and comprehensive access to China's digital economy is essential to helping U.S. cloud and digital firms retain their leading positions.

And if that's not possible, then the United States should look at policies to help limit the damage that China's digital protectionism has on U.S. firms by restricting market access at home and abroad.

However, here are recent signs of potential opportunities for the United States to finally make progress, as China has at least appeared willing to provide greater market access to its cloud market.

It's also pursuing domestic -- potential domestic digital reforms that may signal it can do more.

As a consequence, allow me to make four specific recommendations to the Commissioner, Congress, and the Biden Administration.

First, the United States should prioritize cloud and associated digital market access in negotiations with China, whatever the forum.

Second, the United States should stop pursuing misguided cyber security policies that

punish American cloud providers instead of the Chinese government and China-based actors for cyber threats that happen to come from China.

Third, Congress and the Biden Administration should practice reciprocity. If China does not adequately open up its cloud service markets to U.S. firms, the United States should explore how it can limit Chinese firms' access to the U.S. market, encourage allies to do the same as part of coordinated efforts to confront Chinese innovation mercantilism.

Fourth and finally, the United States should put China's cloud market restrictions into the proper broader context, and make it an integral part of a grand strategy for the global digital economy.

The U.S. lacks a coherent and comprehensive strategy to deal with the many and growing sort of international data and digital issues that face us. This needs to change.

Again, thank you for the opportunity to testify. And I look forward to your questions.

PREPARED STATEMENT OF NIGEL CORY, ASSOCIATE DIRECTOR FOR TRADE POLICY, INFORMATION TECHNOLOGY AND INNOVATION FOUNDATION

ITIF | INFORMATION TECHNOLOGY & INNOVATION FOUNDATION

Nigel Cory

Associate Director, Trade Policy

Information Technology and Innovation Foundation

Before the

United States-China Economic and Security Review Commission's

Panel on China's Cloud Market as Part of its Hearing "A Net Assessment of the Chinese Communist Party's Economic Ambitions, Plans, and Metrics of Future Success"

April 15, 2021

Table of Contents

The Information Technology and Innovation Foundation (ITIF) appreciates the United States-China Economic and Security Review Commission's invitation to provide a written submission regarding its panel on China's cloud computing sector as part its hearing on "A Net Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Future Success." The following written testimony builds on previous testimony before the U.S. Senate, the U.S. International Trade Commission, and other ITIF reporting about Chinese digital protectionism and industrial policy.[1]

OVERVIEW

It is vital that the United States prioritize getting greater access to China's cloud services market. The U.S. cloud service sector leads the world as it is the most innovative, investing tens of billions of dollars in research and development (R&D) annually, which leads to thousands of new patents. However, the U.S. cloud sector's leading position depends upon fair market access to global markets to earn the revenues to drive further R&D.

While it is not possible to calculate an exact figure, ITIF conservatively estimates (based on market-share comparisons) that Amazon and Microsoft's cloud services (delivered as Infrastructure as a Service or IaaS, which is restricted in China) lost a combined $1.6 billion in forgone revenue over the two-year period from 2017 to 2018. As the China market continues to rapidly grow, these losses will only grow. This estimate is based on these firms having full and fair market access. These (and other U.S. cloud firms) currently face significant restrictions in China, which forces them to set up joint ventures (JV) and licensing arrangements that involve transferring knowledge and know-how to local partners alongside other market restrictions that hold them back from directly competing with their Chinese competitors, such as Alibaba Cloud and Tencent Cloud. There is a stark lack of reciprocity in that Chinese cloud firms face no such restrictions in the United States. Frankly, this is an unacceptable and unsustainable situation.

My testimony focuses on three core issues: 1) How China's cloud market restrictions forced U.S. cloud firms to help build local competitors, while also protecting and allowing Alibaba Cloud, Tencent Cloud, and other local champions to seize market share and become more competitive in China, and increasingly, in markets around the world; 2) How U.S. cloud firms retain a competitive advantage over Chinese firms in terms of R&D and global operations, but that China and Chinese firms are investing growing amounts of money and efforts to improve their capabilities, competitive position, and global operations; and 3) that the United States needs to prioritize cloud sector issues given U.S. leadership in the sector and ensure that related trade, economic, and cyber and national security policies support—not undermine—the sector's ability to innovate and compete around the world.

The United States need to take a more targeted and strategic approach as China and its firms are gunning for the U.S.'s position as a leader of the digital economy. China considers cloud computing services as strategic and central to its economic development and national security. For example, in September 2020, China released the "Guiding Opinions on Expanding Investment in Strategic Emerging Industries and Cultivating Strengthened New Growth Points and Growth Poles," which laid out China's priorities for the development of strategic emerging industries, including cloud.[2] China's 14th Five Year Plan (14FYP), which covers China's development from 2021 to 2025, focused extensively on science, technology, and innovation. The 14FYP stated that China promises to make "technological self-reliance and self-strengthening a strategic pillar of national development."[3] Cloud computing services are foundational for many of the technologies the plan identified as strategic and central to technological self-reliance and national security, such as artificial intelligence (AI), quantum computing, genetics and biotechnology, and advanced clinical medicine.[4]

China's digital protectionism and focus on local cloud computing firms becomes even more problematic given the country's ability to guide huge amounts of financing (via direct financing and public procurement contracts) to local firms. For example, China's recent stimulus plan allocates $1.4 trillion over five years for many areas that involve cloud services, including digital infrastructure like 5G, smart cities, and Internet of Things applications for manufacturing.[5] On January 31, 2021, China's State Council issued an "Action Plan for Constructing a High-Standard Market System" (Action Plan), which directs authorities to expand investment in new infrastructure construction such as artificial intelligence, cloud computing, blockchain, and other new technology infrastructure as well as data centers, smart computing centers, and other computing power infrastructure.[6]

The United States is the world leader in cloud computing services. China's market restrictions divert significant sales revenues that supports innovation and job creation in the United States. The impact has been especially damaging given that many U.S. companies' market access has been denied during a critical, formative period of economic growth in China. The impact of China's market restrictions go beyond China. Chinese tech firms are taking advantage of open markets in other nations to expand globally. For example, Alibaba Cloud has set up data centers globally, including Australia, Germany, India, Indonesia, Japan, Malaysia, Singapore, the United Arab Emirates, the United Kingdom, the United States (in Virginia and Silicon Valley). Likewise, Tencent Cloud's global operations are growing rapidly.[7] U.S. cloud firms also stand to lose market share as other countries view the "China model" of digital protectionism as a success and one they want to replicate (such as in Europe and India), in part, because it has used restrictions to support local champions.

Getting China to provide greater cloud market access will not be easy. China sees digital economy restrictions as essential to achieving its most important goal—regime stability.[8] For the longest time, cloud market access was essentially deemed "off limits" from negotiations. This is why, thus far, the United States and other countries that support an open and rules-based global digital economy have been unsuccessful in negotiations with China to get it to open up its cloud market and its broader digital economy to more U.S. digital firms and their digital goods and services. However, there are some recent signs and opportunities for the United States to (again) seek greater cloud market access in China.

China has shown some potential signs that it might be willing to provide greater market access to U.S. cloud providers. My testimony makes three recommendations.

1. The United States should prioritize clear and comprehensive market access in cloud and associated digital services in each forum involving China. China's large and growing cloud market and digital economy makes it important that U.S. firms have fair market access in the future given global competition is only going to get fiercer with Tencent Cloud, Alibaba Cloud, and others expanding around the world. Even if China doesn't ultimately come to the table, the United States should remain committed to pursuing clear and meaningful market access as part of multilateral negotiations at the World Trade Organization (WTO) given the benefits this broader market access will provide the sector.
2. The United States should not pursue misguided and self-sabotaging national and cyber security orders that punish U.S. cloud providers for China's unwillingness to address China-based cyber threats and unwillingness to cooperate with U.S. law enforcement. U.S. cloud firms have no control over the actions of nation states and state-sponsored cyber threats, so should not be made responsible for the latter's response to U.S. government's requests for actions and cooperation. The United States should instead pursue updated Mutual Legal Assistance Treaties and CLOUD Act agreements with countries around the world and use other cybersecurity and cybercrime forums to pressure China to take greater action.

3. Congress and the Biden administration should embrace reciprocity. If China does not adequately open up its cloud services market to U.S. firms, the United States should limit their access to the U.S. market. The United States should also encourage allies to do the same as part of broader efforts to confront Chinese innovation mercantilism.[9] If China doesn't provide reciprocity digital economy market access, this would at least limit Alibaba Cloud and other's ability to use global markets to become more competitive.
4. Finally, the United States should put China's cloud market restrictions into the proper broader context in developing a "Grand Strategy for the Global Digital Economy." The U.S. lacks a coherent and comprehensive strategy to deal with the many international data and digital issues it faces. Its current approach is to address each issue individually and in an ad hoc way. The United States needs a broader strategy if it hopes to address the many interrelated trade, economic, human rights, and political issues raised by global digital issues and conflicts over them.

CHINA'S MARKET ACCESS RESTRICTIONS

Despite U.S. firms being world leaders in cloud services, China's discriminatory and restrictive market access and licensing regime means that there are very few U.S. cloud providers in China. For most U.S. cloud service firms, it's essentially closed. Given U.S. cloud firms can't provide these services on a cross-border basis (largely due to restrictive Chinese policies), the only option to access the Chinese market is to establish a contractual partnership with a Chinese partner (in order to get the necessary licenses), which includes handing over valuable technology, intellectual property, know-how, and branding.[10] U.S. cloud providers have no direct relationship with customers in China and no ability to independently develop their business, or those of their partners. Companies' efforts to build business thus inevitably builds up the Chinese partner, who may well become a future global competitor. This section analyzes the nature of China's cloud market restrictions.

This is exactly China's goal. As U.S. cloud firms have told USTR as part of its Special 301 investigations, China uses a restrictive, yet ambiguous, licensing process to benefit Chinese cloud computing businesses and pressure technology transfer. China first tacitly permits foreign investors to partner with licensed Chinese cloud service providers to gain market access, and then, once key technology and know-how had been injected into these partnerships, China resolved the regulatory ambiguities that had necessitated these arrangements in favor of the Chinese partner, resulting in the transfer of technology to the Chinese partner.[11] These are just some of the reasons why U.S. firms want greater, clearer market access (and not through JVs).

In major markets, including China, cloud computing services are typically offered through commercial presence in one of two ways. They are offered as an integrated service in which the owner and operator of a telecommunications network which offers cloud services over the network. However, U.S. firms are excluded from competing in China's basic telecommunications market, which is dominated by three state-owned enterprises (SOEs, see figure 1). Licenses are essentially impossible to get. The second approach is that firms offer cloud services as a stand-alone (valued added) computer service, with connectivity to the computing service site provided separately by telecommunications firms. Although China's WTO General Agreement on Trade in Services (GATS) commitments include services relevant to both approaches, neither one is currently open to foreign-invested companies.[12]

U.S. firms are most interested in the value-added telecommunication services (VATS) market, which includes cloud computing. However, this is where China uses restrictive and discriminatory licensing and JV requirements to control foreign competition and to force them to help local competitors. China blocks U.S. cloud service firms from directly participating in the three most common forms of cloud computing services: (IaaS); computer platform as a service (PaaS); and software as a service (SaaS).[13] A JV is a prerequisite for U.S. firms to even apply for a license to operate in the cloud service market. Ultimately, of the thousands of VATS licenses given out, only a small handful have gone to U.S. and foreign firms.

China's cloud market has become more restricted over time. In 2015, China released regulations for several services it considers VATS (see figure 1). By categorizing Internet-based services (e.g., cloud computing, big data, and other information services) as telecommunication services, and not as "computer and related services," it has much greater freedom to restrict market access to foreign tech firms. This is because China made commitments as part of its accession to the WTO in 2001 to provide nondiscriminatory treatment and market access to foreign firms in "computer and related services."[14] This category of Internet-based computer services includes email, voicemail, online information and database retrieval, electronic data interchange, enhanced facsimile services, code and protocol conversion, and online information and/or data processing.[15] Essentially, China's approach is a technical work-around to avoid its commitment to open its market for Internet-based computer services to foreign competition.

Figure 1: Classification catalogue of telecommunication services in China.

Basic Telecom (A1/A2)		Value-Added Telecommunication Services (B1/B2)	
Service	Key Requirements and General Foreign Market Access	Service	Key requirements & General Market Access
A1 Fixed-line telecommunications Cellular telecommunications Satellite services 1 Telecom data 1 IP calls	Strict licensing requirement & less than 49 percent foreign equity. In reality, its effectively closed to foreign firms.	B1 Internet data centers and services such as PaaS and IaaS. Content delivery networks (CDNs) Domestic IP-Virtual Private Network Services Internet service providers (ISPs)	Largely closed. Less than 50 percent foreign investment joint ventures can apply for a license. However, foreign firms have generally only received 5 percent of licenses. SaaS is completely off limits.
A2 Trunk communication Wireless paging Satellite services 2 Telecom data 2 Network access infrastructure services Domestic telecommunication infrastructure services Internet hosting	Strict licensing requirement & less than 49 percent foreign equity. In reality, its effectively closed to foreign firms.	B2 Online data transaction and processing, including e-commerce. Domestic multi-party communication Storage and transfer Call center services Information services	Relatively open. Foreign firms can own 100 percent if providing e-commerce, domestic multi-party communication, storage and transfer, and call center services. Otherwise, same as above.

China then introduced a requirement for telecom and Internet Service Providers (ISPs) to apply for licenses for each subcategory of VATS services, raising the potential for government agencies to discriminate against foreign firms.[16] For example, China's new subcategory, "Internet-based resources collaboration services," means that providers of cloud computing application services including IaaS and PaaS have to apply for multiple licenses, given some firms and services cross over into multiple categories. As SaaS is considered too

close to information services, which China is extremely sensitive to for censorship reasons, it is essentially closed and considered separately as part of its service and licensing requirements.

In 2016, China made another set of significant changes to its licensing and regulatory regime that further discriminated and restricted U.S. technology firms involved in cloud computing, big data, and other information services. In October 2016, the Ministry of Industry and Information Technology released the "Notice on Regulating Business Behaviors in the Cloud Service Market," which outlined how foreign cloud companies are forbidden from working via local partnerships in any capacity beyond "technical assistance." It is not specified what is allowed under "technical assistance," but based on current practice, it means that U.S. firms are only allowed to license their goods (software and hardware) to their (forced) local partners and show them how to use them. The notice further specifies several activities that cloud service providers cannot perform, such as sign contracts directly with end users. In March 2017, 50 U.S. lawmakers complained about these new rules in a letter to China's ambassador to the United States, stating that the change would force U.S. companies to essentially transfer ownership and operations of their cloud systems to Chinese partners (which is essentially what it did).[17] USTR's 2018 broad-ranging investigation into China's acts, policies, and practices related to technology transfers, intellectual property, and innovation noted, "According to numerous submissions in this investigation, an important example of how ambiguity in China's administrative licensing process is used to pressure technology transfer arises in the field of cloud computing."[18]

This mercantilist approach to cloud computing is consistent with China's ongoing efforts to develop a local cloud-computing sector that uses indigenously developed technology. China's ambitions in the sector started as part of the country's *National Medium and Long-Term Plan (MLP) for Science and Technology Development (2006-2020)*. Building on this in 2010, China identified cloud computing as one of 11 strategic emerging industries that would receive special attention and funding, all in pursuit of the goal of expanding access to cloud resources in China, developing indigenous cloud-computing technology, and creating an internationally competitive Chinese cloud-computing sector. The Ministry of Science and Technology's *12th Five-Year Plan (2011-2015)* paid particular attention to cloud computing, where the aim became to develop a cloud-computing standard based on indigenously developed technology.[19] And as noted the sector was highlighted again in the most-recent *14th Five-Year Plan*. These policies, taken together, show China's efforts to use mercantilist policies at home to support the development of "local champions," who, ideally for China, will eventually become more innovative and competitive and able to compete in overseas markets—against the very tech firms that are unable to compete in China.

U.S. FIRMS IN CHINA: TRYING TO MAKE THE MOST OF ITS RESTRICTIVE MARKET

China's discriminatory licensing process and restrictive JV requirements keep many leading U.S. cloud firms out, and of those few it lets in, it strictly controls how they operate. As of 2009, although there were over 20,000 local companies licensed to provide VATS in China, only 30 or so licenses were issued to foreign companies, including five U.S. companies.[20] More recent industry estimates state that only around 5 percent of VATS licenses go to foreign firms. As USTR notes, although not explicitly stated in rule or policy, China appears to apply an economic needs test to new entrants in this sector to avoid "unhealthy competition."[21] By that, they mean fair competition. This section analyzes the role of China's growing cloud market in the global market and the operations of some of the few U.S. cloud service providers in China.

The global nature of cloud computing and China's large and growing digital economy means that forgoing China's market is simply not a commercially viable option for U.S. cloud firms. Furthermore, many of their multinational customers demand globally available services. This is why a few large U.S. firms have run the gauntlet and setup operations in China, all within the confines of its strict conditions. For example, Microsoft has partnered with 21Vianet (in 2014), SAP with China Telecom, and IBM with a group of local companies.[22]

China's market restrictions have forced U.S. cloud service firms to use a few different models to enter and compete in China, each with their own advantages and disadvantages (in terms of capital intensity, compliance burden, and the range of services they're able to offer). Furthermore, of the few U.S. firms that do operate in China, they essentially have to develop separate local services and infrastructure to their global operations. U.S. firms operate their China data center services (such as IaaS and PaaS) separately from their global cloud services.[23] Either way, U.S. firms are severely restricted in what they can do, often being constrained to arrangements whereby they license their products to their local partners, who set up and run the data centers and cloud services and manage relations with end users.

China has broad data localization requirements that make it illegal, or uncertain and very difficult, for U.S. cloud firms to transfer data out of China.[24] It also prohibits them from providing many cross-border cloud services. It also creates technical and operational issues for U.S. cloud firms, such as being able to seamlessly transfer data in and out as part of software updates, debugging, technical upgrades, and other cross-border services. China would need to provide broad digital market access to make it meaningful for U.S. cloud firms given the critical role of value-added services that U.S. firms deploy alongside their cloud services, whether this is consumer-facing services (such as email) or enterprise-facing (such as virtual private networks and data analytic services).

Generally, China's market is broken down into three components for U.S. firms to target: domestic firms, multinational companies, and Chinese firms expanding into overseas markets. Basically, U.S. cloud firms are competing to accelerate the globalization of Chinese firms, while empowering foreign multinationals in terms of their cloud needs in China. U.S. firms are more competitive in these two categories given they have larger global operations for these firms to use, but Chinese firms are rapidly expanding global operations (so this advantage will shrink).

In 2014, Microsoft launched its Azure cloud services in a partnership with 21Vianet, which was the first international public cloud service to become generally available in China. Microsoft plans to expand its partnership, effectively doubling its cloud computing capacity in China.[25] Microsoft Azure's partnership is not a JV, but a licensing agreement, with Shanghai Blue Cloud Technology Co., Ltd., which is wholly owned by 21Vianet. This licensing model is reportedly what the Chinese government prefers, as it gives the local partner even greater control over data center operations. For Microsoft, it provides a local partner to then sell and service a broad range of software (especially its Office 365 portfolio) and to compete in the otherwise excluded SaaS market. In 2018, Microsoft's Office 365 (which is a type of SaaS) became a leader in China's SaaS market.[26] Whereas Microsoft Azure is IaaS. However, even with this model, Microsoft is limited in what it can do. 21Vianet independently operates, provides, and manages the delivery of Microsoft cloud services. It also provides subscription and billing services, as well as support.[27] However, indicative of China's huge market potential, even with these restrictions, Microsoft has reported growth of over 100 percent in some quarters. Also indicative of the critical role that cloud market access plays in allowing firms to offer a broader range of services, Microsoft has over 17,000 local IT system integrators that use its services.

Amazon Web Services (AWS) has had a tortured experience in China. For example, in April 2019, Amazon shut its Chinese e-commerce marketplace.[28] In January 2021, a Beijing court ruled that AWS cannot use its AWS logo in China as it belonged to a Chinese company.[29] Furthermore, China forced Amazon to sell part of its China operations to its local partner to comply with new laws (below).

However, despite very restrictive access, AWS remains engaged and is expanding services to seize as much market share as it can. AWS has data centers in Ningxia, Beijing, and Hong Kong. China is the only country outside of the United States with three AWS regions. AWS partners with Beijing Sinnet Technology Co. to operate the AWS China cloud-computing service in the Beijing region. In November 2017, AWS sold the hardware for its cloud computing operation to Sinnet for $300 million, reportedly to meet Chinese

regulations which forbid foreign companies from owning or operating certain technology for the provision of cloud services.[30] Amazon made the sale in advance of Ministry of Industry and Information Technology (MIIT) plans to force firms to apply for a new operating license by the end of 2017. Since 2017, AWS has also partnered with Ningxia Western Cloud Data Technology Co (NWCD) to operate data centers in Ningxia.[31] Similar to Microsoft, AWS provides technology, guidance, and expertise to NWCD and Sinnet, while NWCD and Sinnet operate and provide AWS Cloud services to local customers.[32]

What this means is that AWS China operates apart from AWS's global regions. AWS China uses local management console and account systems for billing and support charges, which use their own authentication for access to AWS services in China. AWS customers need to access AWS services in mainland China and Hong Kong using respective portals, which are not the same as those they'd use to access AWS services elsewhere around the world. Furthermore, globally, AWS has more than 175 fully functional services for its customers to use; however, many are not available in the China region.[33] Even within China, some service offerings differ. While AWS services are generally available in both the Beijing and Ningxia regions, some services are only available in one of the two regions. For example, AWS IoT Analytics is limited to businesses in the Beijing region.

AWS's operations in China continues to expand and evolve to grow market share. In 2019, AWS added a new Asia-Pacific region in Hong Kong. In March 2021, AWS announced that it is expanding its partnership with NWCD to provide 130 percent more cloud capacity and that it'll open a third cloud zone as part of its Beijing-based operations.[34] AWS is also aiming to close the gap in service offerings and in offering new services. For example, it launched AWS Marketplace China in 2020, with more than 200 third-party software offerings, which is another critical part of the competition, in terms of who else is using AWS services. Similarly, AWS is expanding its Partner Program (who are specialist third parties that use AWS to build solutions and services for customers) through strategic partnerships with well-known domestic and foreign IT providers, such as KPMG, Capgemini, Deloitte, Digital China, Ultrapower Software, and Futong. It has also designated 43 local partners as AWS Competent, which shows they are especially adept at using AWS services.

Like other U.S. cloud firms in China, AWS is targeting Chinese firms expanding into overseas markets, such as CIMC, Globalegrow, Cheetah Mobile, Midea, OnePlus, and Huya. For example, it only took AWS five days to complete the global deployment and migration of all of OnePlus's overseas shopping sites onto a global system to support its overseas businesses.[35] As another example, AWS only recently announced that it will provide global cloud services for Chinese tech firm Huami (a wearable computing device vendor with operations in 70 countries and regions).

In 2015, Oracle (the largest enterprise software company in the world) partnered with Tencent to provide its SaaS, PaaS, and IaaS services.[36] Oracle provides the technology that powers its data centers, while Tencent Cloud provides service for consumers. Oracle has operated in China for about two decades, owns 14 branches, five R&D centers, and has nearly 5,000 employees in the country. Oracle's Asia Pacific arm accounts for about 16 percent of the company's total revenues. In 2019, Oracle closed its R&D center in China.[37]

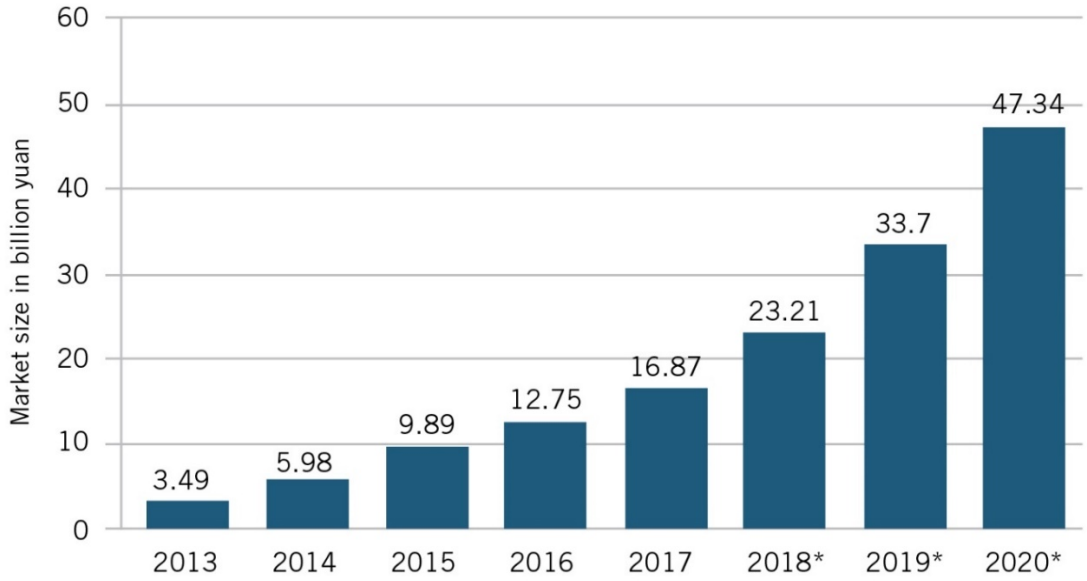
Google Cloud does not operate in mainland China. In mid-2020, Google reportedly considered a new initiative (called "isolated regions") that would have allowed it to try and re-enter China. Google considered allowing third parties to control and manage its cloud services, such as via a locally owned company or a government agency (which it does not currently do).[38] Google considered the change in operations in no small part due to China's market restrictions (as well as those in Europe). This follows reported talks between Google and a Chinese firm in 2017 about the potential to setup a partnership to provide cloud services in China.

CHINA'S CLOUD VS. THE GLOBAL CLOUD

China is the world's second-largest cloud services market. COVID-19 only accelerated its rapid growth as China directed economic stimulus spending into supporting digital adoption. This section analyzes the growth of China's cloud market and competition between Chinese and U.S. cloud firms in China and globally for market share.

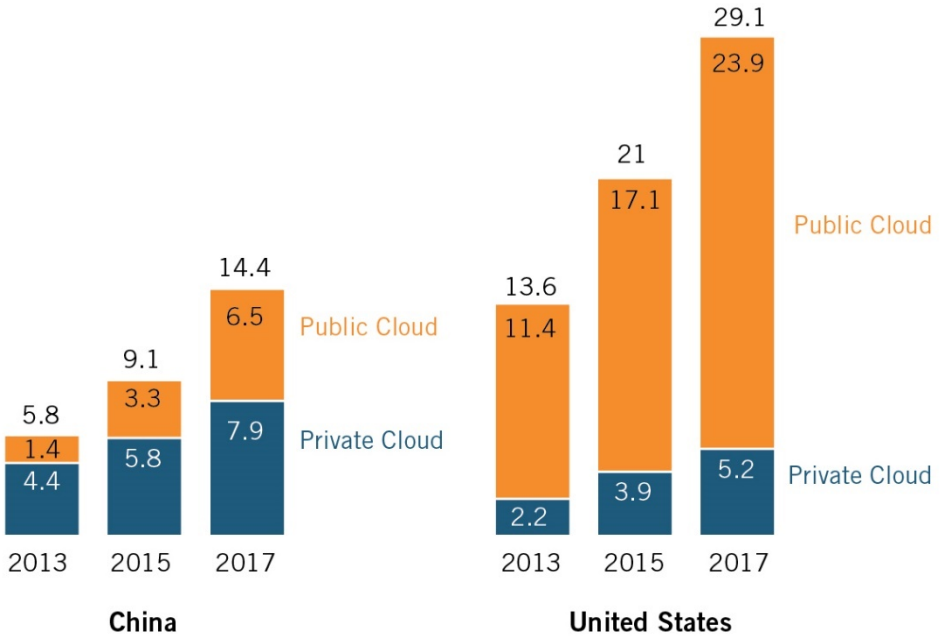
China's cloud services market is worth tens of billions of dollars and is growing rapidly. [39] For example, China's SaaS market alone grew 13-fold from an estimated 3.5 billion yuan in 2013 (nearly $500 million) to 47.3 billion yuan (nearly $6.7 billion) in 2020 (see figure 2).[40] Total cloud spending was worth an estimated $5 billion in just the third quarter of 2020.[41] As figure 2 shows, China's cloud market is growing rapidly. In the first quarter of 2020, China's cloud infrastructure spending increased 67 percent year on year to $3.9 billion, maintaining its No. 2 position behind the United States, according to data from Canalys.[42] China's spending accounted for 12.5 percent of the world's total ($34.6 billion) investment on cloud infrastructure in the first quarter of 2020 compared to 10 percent in the same quarter in 2019.[43] In the same time period, International Data Corporation (another commercial market analysis firm) reported that China' s SaaS market segment grew 57.6 percent year-over-year, while the PaaS segment expanded 64.6 percent. The sum of these two markets increased by 58.7 percent year-over-year.[44]

Figure 2: China's software-as-a-service (SaaS) cloud market (billion yuan, 2013-2017).[45]



China's cloud market retains enormous growth opportunities. Chinese firms spent around 14 percent of their total IT budget on cloud services in 2017—more than double the amount spent in 2013. However, even with this growth, China still lags behind global peers in terms of cloud expenditure. In the United States, for instance, cloud spending accounted for around 29 percent of the total IT budget in 2017, up from around 14 percent in 2013 (figure 3). This is indicative of the enormous growth potential that remains.

Figure 3: China vs. U.S. cloud expenditures (percent of total IT budget)[46]



The absence of U.S. firms has allowed local Chinese firms to grow and seize the majority of China's domestic cloud market. China's cloud market is dominated by local providers, such as Alibaba Cloud, Tencent, JD Cloud, Huawei, and Baidu, as well as niche players like ChinaC, ChinaCache, ChinaNetCenter, Kingsoft Cloud, Qingcloud, Qihoo 360 Technology, Qiniu and UCloud, among others. In China, in the first half of 2020, Alibaba Cloud, Tencent Cloud, Huawei Cloud, and China Telecom together held around 44, 14, and 14 percent market share, respectively, according to Canalys. Amazon was the fifth-biggest cloud provider with around 7 percent, which alongside other foreign firms, make up around 20 percent of the market.[47]

Indicative of the importance of the cloud sector to Chinese tech firms, Alibaba's revenue from cloud operations grew 50 percent during the quarter ended December 2020 to $2.47 billion, making up around 7 percent of the company's quarterly revenue. Indicative of the market opportunity, Chinese firms (often supported by government policy) are investing huge amounts in new data centers. For example, in May 2020, Tencent Cloud stated it plans to invest $70 billion in digital infrastructure to expand its cloud computing, AI, blockchain and cybersecurity capabilities over the next five years. Similarly, in April 2020, Alibaba Cloud stated it planned to invest around $29 billion over the next three years on cloud infrastructure.[48]

The main saving grace for U.S. cloud firms is that the U.S. IaaS and PaaS market remains significantly larger than China's and it is also growing quickly (20+ percent a year).[49] The global public cloud services market grew 6.3 percent in 2020 to $257.9 billion, up from $242.7 billion in 2019 (figure 4).[50] SaaS remains the largest market segment and is forecast to grow to $104.7 billion in 2020 due to more firms shifting from on-premises license software to subscription-based SaaS models, in conjunction with the increased need for new software collaboration tools during COVID-19. The second-largest market segment is cloud infrastructure as a service (IaaS), which is forecast to grow 13.4 percent to $50.4 billion in 2020.[51] Indicative of the pace of growth, between 2018 and 2019, global public IaaS and PaaS markets doubled in size (see figure 4).[52] But whereas U.S. firms can obviously compete for growing demand for cloud services at home and most other countries around the world, it can't in China, which represents a large part of the global market.

Figure 4: Worldwide public cloud service revenue and forecast (millions of U.S. dollars)[53]

	2019	2020	2021	2022
Cloud Application Infrastructure Services (PaaS)	37,512	43,498	57,337	72,022
Cloud Application Services (SaaS)	102,064	104,672	120,990	140,629
Cloud System Infrastructure Services (IaaS)	44,457	50,393	64,294	80,980

On a global basis, Amazon's worldwide market share of the public cloud has held relatively steady at around 38-40 percent, while Microsoft, Google, and Alibaba have all steadily gained market share (see figure 5).[54] These four leading providers generally account for around 70 percent of the worldwide market for IaaS and PaaS. These leading firms are followed by Salesforce, IBM, Oracle, Tencent, and a large group of companies with minor market shares (see figure 6). The rest of the market is comprised of hosted and managed private cloud services, where IBM is the market leader alongside companies like Rackspace and OVH.[55] (See the next section for a competitive analysis of Alibaba Cloud and Tencent Cloud).

Figure 5: Global public cloud services—market share trends (Public IaaS and PaaS).[56]

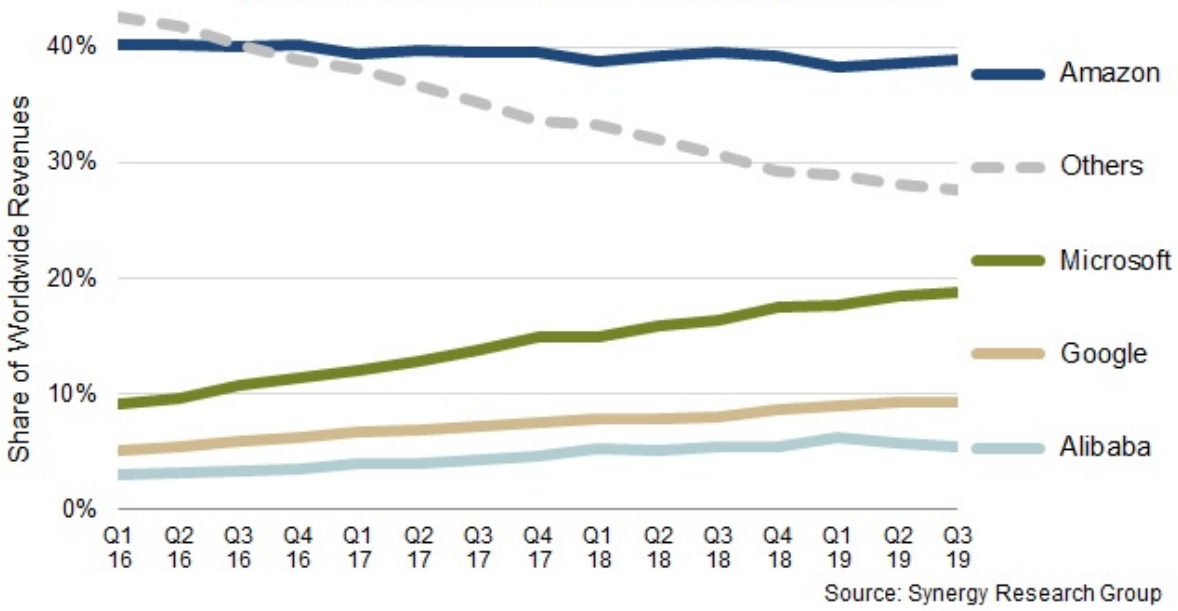
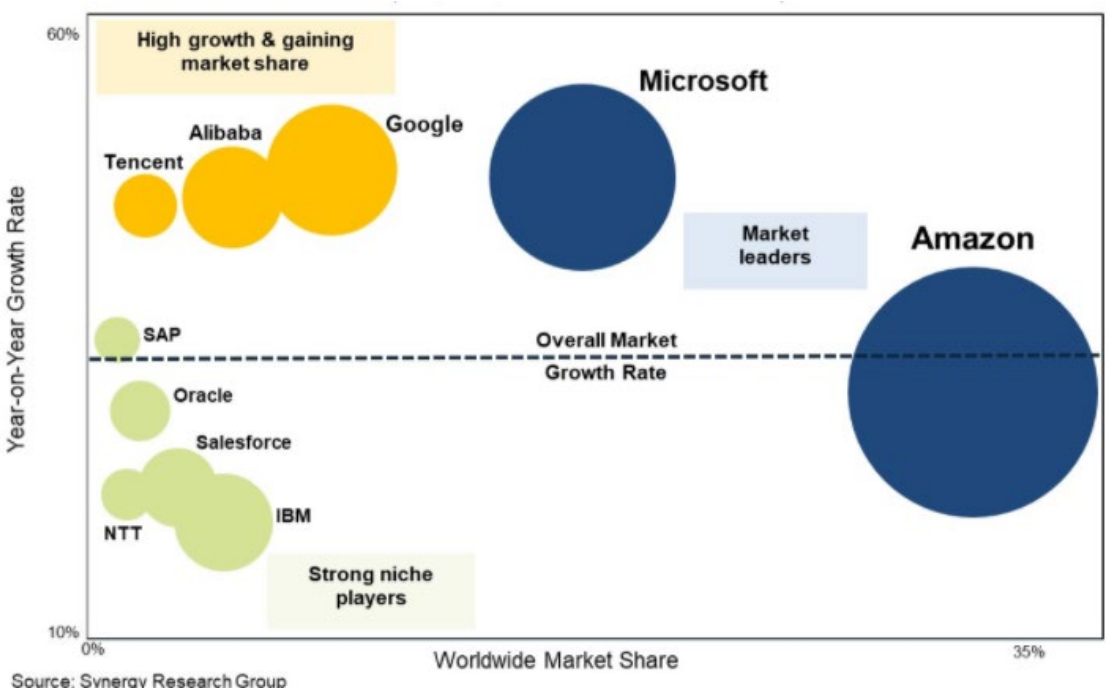


Figure 6: Global cloud provider's competitive positioning (IaaS, PaaS, hosted private cloud, third quarter, 2020)[57]



COMPARING CAPABILITIES AND GLOBAL COVERAGE: ALIBABA AND TENCENT LAG BEHIND U.S. FIRMS, BUT A PROTECTED HOME MARKET HELPS THEM CATCH UP

Alibaba Cloud and Tencent Cloud lag behind AWS, Microsoft, and Google in size, capabilities, and global coverage, but they are taking advantage of open global markets to rapidly expand (see figure 6 above). The lack of reciprocal market access in China is brought into stark contrast as these firms continue to expand in the United States and elsewhere around the world.

For global cloud service firms, it is not enough to provide basic services at home. The basis for competition is global and around providing a comprehensive, integrated, and cutting-edge suite of artificial intelligence, cybersecurity, and other value-added services. Gartner's (a global research and advisory firm) evaluation of cloud providers (covering PaaS, functions as a service (FaaS), database PaaS (dbPaaS), and application developer PaaS (adPaaS)) provides a comprehensive assessment of competitive position in the global cloud market (figure 7). It shows that AWS leads the world, followed by Microsoft, Google, and Alibaba Cloud.[58]

Figure 7: "Magic quadrants" for cloud infrastructure and platform services: leaders, challengers, and niche players[59]

AWS has a commanding lead across many of the IaaS and PaaS market's critical dimensions, including total market share and service capabilities (as shown in figure 6 and 7). AWS has a growing portfolio of products and services with sought-after features. Its offerings are also backed by a well-established partner program.[60] AWS also has the expertise and resources to vertically integrate and deliver a comprehensive set of services to customers on a global basis. AWS also provides many Chinese firms expanding overseas with services. Similarly, Microsoft Azure offers a complete end-to-end set of solutions related to a broad range of workloads and applications, such as via partnerships with Oracle, SAP, and VMware, plus the ability to integrate use of its Office software. Google's big data and data science capabilities and open-source contributions, such as Kubernetes and TensorFlow, differentiate it.[61]

Alibaba is the world's fourth-biggest cloud computing service.[62] However, Alibaba remains a mostly China-focused cloud provider, but this is changing as it has been rapidly growing its operations around the world, especially in the Asia-Pacific and North America. At home, Alibaba Cloud leverages its parent company's dominance in e-commerce operations to get more firms to use the full suite of Alibaba services.

Alibaba Cloud's international business is headquartered in Singapore. Alibaba Cloud's operations are in the United States, Germany, Australia, Indonesia, Japan, India, Malaysia, Singapore, the United Arab Emirates, and the United Kingdom.[63] Part of its competitive advantage is that Alibaba Cloud leverages its ability to allow customers to use Alibaba Cloud to also access Alibaba's e-commerce operations in China. However, indicative of the gap between China and the global market, Alibaba Cloud's international offering does not have the full capabilities of it offers in China, nor do they offer the full range of features that its major global competitors offer.[64] However, Alibaba Cloud's expansion faces some geopolitical headwinds given concerns about Chinese technology firms and alleged Chinese government access to data, such as those raised in India.[65]

Tencent Cloud has advantages in cloud gaming and live streaming, as well as its strong ecosystem transformation capabilities offered by its WeChat and applets (mini programs that allow users to enjoy basic

functions of some apps on the WeChat interface). However, it is mainly focused on China and serving multinationals in China and Chinese multinationals expanding overseas. However, even this is enough to make it a major play globally. Tencent Cloud now has larger IaaS market share on a worldwide basis than IBM and Oracle, and it has the technical acumen to be a formidable challenger to Alibaba Cloud.

Tencent Cloud data centers are located in Australia, Brazil, Canada, China, India, Japan, the Netherlands, Russia, Singapore, South Korea, Thailand, and the United States.[66] Tencent Cloud has strong synergies between its digital service ecosystem and its cloud services, in terms of integrated gaming, social networking, and digital e-commerce services for foreign and Chinese firms. However, Tencent Cloud has a nascent presence among international enterprises, with most of its overseas cloud resources consumed by gaming customers. Indicative of this, outside of China, Tencent Cloud has no managed service providers ecosystem (data center administration), no support for Oracle, limited migration tooling or services, and no marketplace of third party-certified applications.[67]

The broader lack of reciprocal digital and e-commerce market access between China and the rest of the world provides Alibaba, Tencent, and other Chinese tech firms with a broader competitive advantage over their U.S. competitors than that which they derive from cloud-specific restrictions. Their e-commerce, payments, communication, and other services can expand globally (largely unimpeded), often in parallel with, or in some cases ahead of, their cloud operations. China's broader digital protectionism means that these firms can develop their own leading services at home in a protected digital market and use this home base to expand globally.

For example, while most famous for its messaging app, WeChat, Tencent is the world's largest video gaming company. It is leveraging its own cloud services as part of this business. Tencent earned nearly $74 billion in 2020, with gaming representing about one-third. It has 140 games and gaming assets across mobile, PC, consoles, e-sports, and live streaming. This is significant as China's gaming market was worth nearly $40 billion in 2020, which was even larger than the U.S. market (worth around $37 billion).[68] Yet the vast majority of U.S. video gaming companies, titles, and associated firms (like Amazon's video streaming service Twitch) are blocked from, or only have limited access to, China's video game and digital content markets.[69] Meanwhile, Tencent is free to setup a live-streaming service (called Trovo Live) to compete with Twitch in the United States.[70]

Where U.S. and Chinese Cloud Firms Go Head-to-Head in Asia (ex-China), Chinese Firms Differentiate Themselves in Key Ways

Thus far, the most intense U.S.-China rivalry in cloud markets is in India and South East Asia. Alibaba Cloud and others are going head-to-head with U.S. firms in a way that they obviously do not at home.[71] As part of this direct competition for customers and contracts in new and emerging markets, China's cloud providers are seeking competitive advantage by differentiating themselves on key cloud market policies that are opposed by U.S. cloud firms. U.S. and Chinese firms are also taking different approaches in their competition across digital services (e-commerce, social media, search, payments, and others).[72] This section analyzes key differences in how they are competing in cloud services.

First, Chinese cloud firms are not opposing data localization and expansive government access to data frameworks. Rather, Alibaba Cloud and others see their willingness to abide by these requirements as a competitive advantage, as U.S. and other foreign cloud firms often actively oppose such measures. For example, Alex Li (general manager, Alibaba Cloud India) said the company, which has set up data centers in India, sees a big opportunity in the Indian government's push toward data localization.[73] Simon Hu (President, Alibaba Cloud) made similar comments, stating ""We need to respect laws on data security and

privacy. It is the most fundamental one. We insist on localization of data. Indian data should be stored in India. That is our principal."[74]

Many government officials and agencies in the region (especially law enforcement and national security agencies) prioritize control over data, so Alibaba Cloud and other's sale strategy of giving local governments what they want, in terms of local storage and control, can be very effective. In their head-to-head competition in South East Asia, some U.S. cloud firms state that they are not generally losing contracts to Chinese firms on price or services, but their willingness to abide by government requests for data can be a critical differentiator, especially if the contract is for cloud services to manage public or government data and services.

In contrast, U.S. firms oppose data localization as it creates duplicative costs and undermines global service capabilities, such as cybersecurity protections and data analytics.[75] U.S. cloud firms also tend to have sophisticated legal compliance and IT operations to ensure that they follow local data protection laws and data access laws, but only those strictly within the law and those that do not infringe upon other countries' laws and sovereignty. Many U.S. cloud firms also publish transparency reports about government requests for data to show how they manage these requests and protect user data.[76] Chinese cloud firms do not provide similar transparency reports. Chinese cloud firms face growing scrutiny over their data management practices and accusations that they provide data to the Chinese government.[77]

Second, part of Chinese cloud firms' value proposition to customers is that they provide access to China as part of a seamless service between many countries in Asia and China, whereas (due to restrictions) many of their U.S. competitors cannot do the same. While Alibaba Cloud and others do not have the same global capabilities as their U.S. competitors, they have better access and services in China, which is where many business customers are focused.

Third, Chinese cloud companies also benefit from China's broader diplomatic, trade, and economic engagement with countries in the region, such as via the ASEAN-China strategic partnership, the Belt and Road Initiative, and the Digital Silk Road (DSR).[78] As to the latter, for years, DSR has been less an identifiable set of projects as much as it was a brand for virtually any telecommunications or data-related business operations or product sales by China-based tech firms around the world.[79] DSR is all-encompassing term applied by China's public and private sector leaders to telecommunications and other data and connectivity projects in countries that are nominally part of the BRI. Projects self-brand as part of the DSR to score political—and perhaps financial—support from Beijing, while the state is not too involved in day-to-day operations, although it can and does intervene to advance its strategic objectives. However, it seems clear that in the future Beijing will invest resources to help its domestic tech giants pursue commercial business opportunities and be involved at all levels of the digital infrastructure build along the DSR, including cloud services.[80] It is important to note that Chinese cloud firms would be expanding globally anyhow, but that they will self-brand as DSR or formally join DSR initiatives if it suits their interests.[81]

CHINA'S RESTRICTIVE CLOUD MARKET UNDERMINES U.S. INNOVATION AND COMPETITIVENESS

What is at stake in pushing for fair cloud market access in China is U.S. cloud sector's ability to earn the revenue that drives ever-greater R&D and business operations in the United States, and globally. Not only are U.S. firms losing out on market access and revenue due to China's protectionism, but they are also losing market share and revenue in third-country markets as Chinese firms use their protected home market to expand globally and other countries or regions (such as Europe) seek to emulate China's approach. U.S. cloud firms are in an ongoing race for innovation advantage as their Chinese competitors also commit ever-growing amounts of money and effort to fund the R&D that will define their respective competitive positions in the future.

U.S. policymakers need to support U.S. cloud firms as their innovative capabilities help drive America's long-term economic growth. For instance, at least half of America's economic growth can be attributed to scientific and technological innovation.[82] However, such innovation does not fall like manna from heaven. Rather, innovation is a product of complex national innovation systems, supported by a thoughtful and comprehensive set of innovation-enabling public policies that collectively impact the capacity and ability of both private and public actors to effectively innovate.

The U.S. cloud sector can be characterized as an innovative industry, which exhibits a few specific characteristics. First, the rapid and regular development of new processes, products, or services—many of them disruptive in nature—is critical to their competitive advantage. Their success depends not on making a particular good or service cheaper, but on creating the next-generation product. Second, the marginal cost of selling the next product or service is significantly below the average cost of producing it in innovation-based industries. The digital content and services industry is perhaps the most extreme example of this. In some cases, the first version of a service costs hundreds of millions of dollars to create, while additional digital copies are produced at virtually no cost. Finally, innovation industries depend more on intellectual property—particularly on science- and technology-based IP—than other industries. For example, software depends on source codes.

Chinese digital protectionism undermines the three key factors needed to maximize innovation in the U.S. cloud sector:

1. Ensuring the largest possible markets: For innovation industries with high fixed costs in design and development, but lower marginal costs of production, large markets are critical because they enable firms to cover those fixed costs—so unit costs can be lower and revenues for reinvestment in the next generation of innovation higher. This is why firms in most innovation industries, like cloud services, are global.

2. Limiting nonmarket-based competition: Large markets enable firms to sell more. But if larger markets come with larger numbers of competitors, total sales per firm can remain the same, or even fall. Conventional wisdom holds that this competition is good for innovation. However, many studies have demonstrated that innovation and competition can be modeled according to an inverted "U" relationship, with both too much and too little competition producing less innovation.[83] Chinese industrial policy has allowed less competitive firms to enter and grow thanks to protectionism. Not only this, but China supports their global expansion.

3. Ensuring strong intellectual property protections: Firms in innovation-based industries depend on intangible capital, much of it intellectual property. Strong intellectual property protections are needed to enable inventors to realize economic gains from their inventions— further giving them the ability to reinvest those profits into the next generation of innovative activities. However, if competitors are able to enter into or remain in a market because they obtain an innovator's intellectual property for less than the fair market price (through either theft or coerced transfer), they are able to siphon off sales that would otherwise go to innovators.

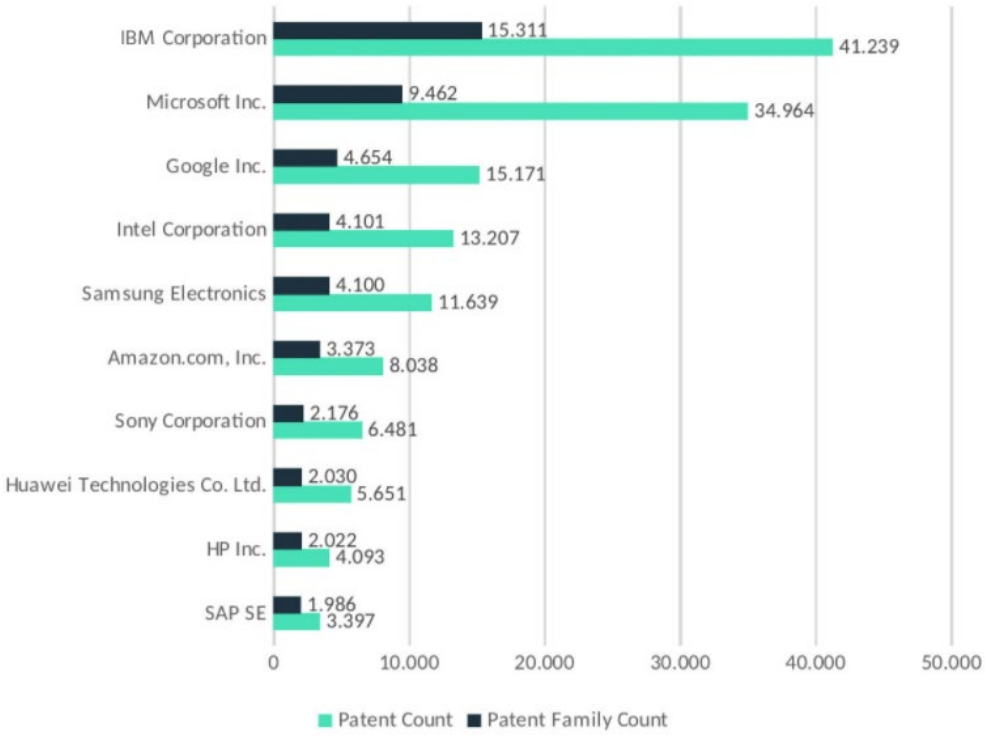
U.S. cloud firms deserve attention as they are among the most innovative in the world. Google, Amazon, Microsoft, and others invest more in R&D than nearly all other firms. In 2020, Amazon invested $40.4 billion, Alphabet (Google's parent company) invested $27.3 billion, Microsoft invested $19.3 billion, Apple invested $18.8 billion, IBM invested $6.3 billion, and Oracle invested $6 billion.[84] It is not only the total amounts of R&D that's important to consider, but also where they were directing it, in targeting cybersecurity, cloud computing, AI, analytics, 5G and 6G, and mobility.

For example, Google just announced plans to invest over $7 billion in new operations and data centers across the United States. and create at least 10,000 new full-time (Google) jobs in America in 2021.[85] Google will expand data centers in Nebraska, South Carolina, Virginia, Nevada, and Texas. Google will it establish its newest Cloud engineering site in Durham, North Carolina. Google's 2020 U.S. Economic Impact Report outlines how its services (such as Google Search, Google Play, YouTube, and Google advertising tools) helped provide $426 billion of economic activity for more than 2 million American businesses, nonprofits, publishers, creators, and developers.[86]

But Chinese cloud firms are spending more on R&D to close the technological gap with U.S. competitors. In 2020, Huawei invested $20 billion in R&D, while Alibaba invested $7.4 billion.[87] China's top 100 Internet companies have increased their R&D investments by $21.9 billion in 2019, which is a 45 percent increase in R&D spending compared to 2017.[88] Huawei boosted its R&D expenditures from $12 billion in 2018 to $20 billion in 2020. Huawei's R&D investments now account for approximately 20 percent of the telecommunications giant's overall revenue.[89]

The U.S. cloud sector's world-leading innovation is also clear in terms of intellectual property (figure 8).[90] Alphabet, IBM, Intel, Microsoft, and Apple are among the world's leading developers of valuable patents.[91] For example, in 2018, IBM led U.S. companies in patents, with engineers, researchers, scientists, and designers racking up a record 9,100 patents (the 26th year in a row that it led U.S. firms). Of those, more than 2,000 were related to cloud computing. Other areas of patenting activity include AI, blockchain, quantum computing, and security.[92]

Figure 8: Top owners of cloud computing patents (2010-2018, global, IPlytics analysis)[93]



U.S. cloud firms' global operations and research network support all this R&D spending and patenting. Market access is one driver of where U.S. firms setup AI R&D labs, but it's far from the only one. For example, in 2019, AWS established an IoT labs in Shenzhen (and Taiwan). It also operates an AI R&D lab in Shanghai. However, research shows that U.S. tech firm's global research operations still greatly benefit R&D in the United States. A Center for Security and Emerging Technology (CSET) report shows that Amazon, Apple, Facebook, Google, IBM, and Microsoft have AI R&D labs and staff around the world.[94] For the four companies where CSET could find information on labs—Facebook, Google, IBM, and Microsoft—they found 62 labs conducting AI R&D. While most of these labs (68 percent) were located outside of the United States (with 10 percent in China, with six labs), 68 percent of AI staff at these companies are in the United States.[95]

Global R&D networks are also necessary to access local talent. A Microsoft Research representative told CSET, "some of the people we are hiring today in China and India are the exact same people we would normally be hiring in Redmond, Boston, or NYC, but today they are not able to get visas to immigrate to the U.S."[96] This is indicative of the need for the U.S. immigration system to make it easy for high-skilled workers to migrate and work in the United States.[97] But it also shows how global research and market operations benefit R&D in the United States.

ESTIMATING THE (SIGNIFICANT) COST OF CHINA'S CLOUD MARKET RESTRICTIONS

China's cloud market restrictions cost U.S. cloud firms hundreds of millions of dollars of lost revenues each year that they could otherwise reinvest in staff, R&D, and expanding their U.S. and global operations.

There have been few attempts to quantify the trade impact of China's digital protectionism, in part because any estimate is fraught with difficulties and assumptions. For example, China's digital ecosystem—with key "super apps" providing a single portal for a range of integrated services—has evolved in a way that is very different to that of the United States. This evolution has largely taken place since some cloud firms are completely blocked in China (such as Google), while others have been heavily constrained (such as AWS and

Microsoft). So, it's impossible to know how market share would be divided if Google, AWS, and other U.S. cloud firms could enter and compete on fair terms. In many regards, China is one of the most competitive places for consumer services and technology. So, the factors that affect a U.S. firm's market share are beyond the impact that protectionism has on U.S. firms' market access and operations.

To develop an estimate of the economic impact of China's digital protectionism on U.S. cloud firms, ITIF chose the Asia Pacific region as a comparator for estimating revenues and market share for two cloud service providers, Amazon and Microsoft. (See appendix A for data). We focused on Infrastructure as a Service and used the Asia Pacific region as the comparator. It's easier to do a direct comparison for IaaS as it is a neutral service platform and is not affected by different cultural and design preferences. As noted, IaaS is a form of cloud computing that provides virtualized computing resources over the Internet. IaaS is highly scalable and allows businesses to purchase resources on-demand and as-needed instead of having to buy hardware outright. AWS Cisco Metacloud, DigitalOcean, Google Cloud, Microsoft Azure, and Rackspace are popular IaaS providers around the world.

Just using a simple direct estimation, if Amazon and Microsoft had the market share in China for IaaS that they do in the Asia Pacific region overall, they would have made $516 million and $140 million more, respectively, in 2017 and 2018 (appendix A).[98] Of course, China makes up half of the region's spending on IaaS, so just using its market shares in the rest of Asia Pacific, suggests that these two firms they would have earned $1.03 billion and $571 million more, respectively.[99]

U.S. CAPITAL SUPPORTS CHINA'S DIGITAL INDUSTRIAL POLICY

Just as Chinese firms are benefiting from U.S. know-how and licensing through forced joint ventures and licensing arrangements, many are benefiting from unfettered access to U.S. capital markets and venture capital. Chinese cloud service firms are using international and U.S. capital to fund their domestic and global expansion. In this way, U.S. investors are seeking direct exposure to the Chinese cloud market when they otherwise might do so through investments in AWS, Microsoft, Google, and others.

For example:

- In December 2019, GDS (a leading developer and operator of data centers in China) raised approximately $277 from a public offering via American depositary shares (ADS, which are shares of a non-U.S. company that is held by a U.S. depositary bank and is available for purchase by U.S. investors).[100]
- In August 2020, 21Vianet raised $391 million via an ADS offering. Blackstone Investment also bought $150 million in shares via a private placement in June 2020.
- In September 2020, ChinaData (another hyperscale data center operator in China and elsewhere around the world) listed on the NASDAQ exchange, raising $540 million.[101] ChinaData was actually formed via various acquisitions and mergers by Bain Capital.[102]
- In May 2020, GLP (via Prologis, a San Francisco-based real estate investment fund) invested $230 million in a hyperscale data center in Zhangjiakou, Heibei Province.

U.S. investment funds are funding Chinese data centers and cloud companies to gain exposure to China's large and fast ground digital economy. Their underlying rationale is the same as U.S. cloud firms that want to—but can't—enter and compete on fair and level terms in China. In an alternative scenario of fair market access, U.S. cloud firms would be raising or deploying their own capital to expand their operations in China and U.S. investors would be able to gain exposure through them. But with market restrictions, U.S. investors

are basically providing the capital to support China's efforts to build the capacity and capabilities of local cloud firms who ultimately end up competing with U.S. firms there (and increasingly abroad).

CLOUD SERVICES IN CHINA: RECENT INTERNATIONAL AND DOMESTIC DEVELOPMENTS

Recent U.S.-China, EU-China, and WTO trade negotiations show how various countries are trying (but thus far failing) to gain greater cloud market access in China. China is also considering domestic reforms that may impact U.S. cloud market access. This section analyzes recent developments before summing up the possibility as to whether China is willing to consider meaningful concession on cloud market access.

Trade Negotiations

Phase 1 U.S.-China Trade Deal: In Play, But Cloud Market Access Did Not Make the Final Cut

China engaged in serious and detailed negotiations about cloud market access in U.S. China "Phase 1" negotiations, where it was reportedly willing to make some serious concessions. Ultimately, the final deal included some interesting, but ultimately limited, commitments on cloud market services. Phase 2 was supposed to address cloud market and other cyber and digital market issues, but such negotiations seem unlikely.

For a while, cloud computing, data handling, and other technology issues were at the forefront of negotiations. USTR was pushing for outcomes on cloud market access and China was reportedly willing to make serious concessions. For example, in March 2019, Chinese Premier Li Keqiang reportedly proposed a trial liberalization project, saying that foreign cloud companies could operate without a domestic partner in free-trade zones.[103] China also offered to issue more licenses for U.S. firms to operate data centers and to lift the 50 percent equity cap for foreign-owned cloud-service providers.[104] China saw this as a sweetened offer after U.S. negotiators rejected an earlier proposal as inadequate. However, U.S. negotiators, technology companies, and industry groups panned this proposal, viewing it as weak and unrealistic.[105] Ultimately, China did not make any further substantive cloud and digital economy market access offers or commitments as part of Phase 1 negotiations. It's hard to know whether this was due to internal opposition (by the Ministry of Public Security and others) to commitments China's trade officials made or whether it didn't stack up alongside other negotiated outcomes.

Interestingly, China agreed to purchase U.S. cloud services as part of the deal's broader purchase targets. Cloud services were one of four services sectors that China agreed to purchase additional service exports worth $12.8 billion in year 1, $25.1 billion in year 2, and $37.9 billion in year 3. However, the deal did not break down these additional purchases into the four categories (so we do not know what the specific target for cloud was supposed to be if there was one). The deal notes that these purchases included both the cross-border supply of cloud services (known in trade law as mode 1) and the supply of services through a commercial presence (known as mode 3).[106] Furthermore, the Phase 1 deal further breaks down the sub-categories of cloud services (using U.S. government classification schedules) in specifying that the purchases involve data hosting, processing, and related services, telecommunication services, computer services, and information services.[107] It's also unclear how China would reach these purchase targets, such as directing government agencies or state-owned firms to use U.S. cloud services.

U.S. cloud firms also benefited from other parts of the Phase 1 agreement (if these are implemented fully and consistently), such as prohibiting forced technology transfers and on basic intellectual property protections for software. As to the former, China agreed that "Neither Party shall require or pressure persons of the other Party to transfer technology to its persons in relation to acquisitions, joint ventures, or other investment transactions."[108] On administrative and licensing requirements and processes, China agreed that "Neither Party shall adopt or maintain administrative and licensing requirements and processes that require or pressure technology transfer from persons of the other Party to its persons.[109]

U.S. firms, and traditionally the U.S. government, are averse to managed trade and specified trade purchase targets. U.S. cloud firms are reluctant to push China to fulfil its purchase commitments (or to ask the U.S. government to apply pressure on China) as this outcome does not provide the long-term and meaningful market access they need to compete on fair and level terms in China. Short-term government-mandated purchases do not change the fundamental competitive disadvantages that U.S. firms face in China.

U.S.-China trade talks are always going to be complicated and involve many issues and stakeholders competing for attention. But given the U.S. cloud sector's leading position in the global market and position as one of the country's most innovative, it seems amiss not to prioritize cloud and digital issues, especially given China's large and fast-growing digital economy. The opportunity cost of being kept out only grows. Should another opportunity arise, the United States should prioritize cloud and digital market access.

The EU-China Comprehensive Agreement on Investment: Locking in Existing Cloud Market Access

The cloud-related provisions in the China-EU Comprehensive Agreement on Investment (CAI) largely locks the same restrictive market access arrangements faced by U.S. firms.[110] Various EU officials have portrayed it as new and meaningful, but while it may mean some changes for specific EU firms, it doesn't ultimately change China's restrictive JV and licensing arrangements for foreign cloud firms.[111] Even if the EU did manage to negotiate new market access, as per WTO rules, any expanded market access offered by China to the EU in services sectors must be made available to other countries on a most-favored nation (MFN) basis.

After seven years of negotiations, the European Commission concluded CAI talks in December 2020.[112] CAI is pending ratification in the European Parliament and it's far from certain that it'll approve the deal given concerns about China's human rights record and other issues. Even if approved, it's unlikely to come into effect for several years. However, it's still useful for U.S. policymakers to consider CAI as it happened recently, it makes China's restrictions clear and binding, and it takes into consideration China's approach to using free and special trade zones.

Some European government and industry officials compare CAI's cloud commitments to those provided in China's trade agreements with Hong Kong and Macau and in the still nascent plans for special/digital free trade zones (see the section below on China's domestic digital economy deliberations). However, these special zones are still in development and it is far from clear what market access and operations they will allow for cloud services. It is hard to judge whether some of the analysis and public announcements on CAI are simply standard public relations efforts to (over)sell a new trade and investment agreement, reflect the fact that some people misunderstand cloud market access requirements and developments in China, or that China was (informally) banning EU cloud firms from even trying to set up cloud service JVs on the mainland.

Value-added telecommunications services like cloud services are somewhat more open (but still very restricted) in Hong Kong and Macau under China's Closer Economic Partnership Arrangements with these territories (CEPA). Under CEPA, China allows less than 50 percent foreign ownership for domestic IP-VPN services, 100 percent foreign ownership of certain Internet access services, and firms to own less than 50 percent of cloud service firms (in the Internet data center service category) and content distribution networks. Licenses are also somewhat easy to get. Some European and Japanese firms reportedly setup subsidiaries in these areas to get B1/B2 value-added telecommunication service licenses (which are otherwise hard or near impossible to get on the mainland, see figure 1), which use to build up their business with Chinese customers, thus indirectly accessing the mainland China market. For example, BT (British Telecoms) was reportedly able to get a B1 and B2 license for value-added telecommunication services in CEPA. China apparently did not like this as it was only supposed to be for firms from Hong Kong and Macau. Some European government and industry officials view these more liberal market access arrangements as China's way to evaluate new settings in considering whether to extend these nationally or internationally, which they think China did in CAI.

CAI allows EU investors to own 50 percent cloud service JVs, which apparently covers IaaS and PaaS.[113] SaaS remains completely off limits. China also explicitly caps foreign ownership in a range of other computer services at 50 percent. Essentially, China agreed to (again) bind market access to its computer services market at existing levels (thus making current market access legally enforceable via CAI). Some EU analysis seems to interpret China's commitment in CAI to reaffirm its WTO General Agreement on Trade in Services (GATS) commitments on computer services as meaningful (when they should have been providing this all along) and that somehow EU firms will not need a license in certain computer service sub sectors (unless they are expecting China to revise requirements for foreign firms in some sectors as part of legal scrubbing).[114] Otherwise, CAI still has the same foreign equity caps and does nothing to stop them from using discriminatory and restrictive licensing where they see fit.[115]

Overall, this establishes parity with market access currently available to U.S. cloud firms. CAI essentially extends the CEPA level of market opening nationally and means that EU cloud firms will not have to go through subsidiaries in Hong Kong and Macau. But EU firms will still need to go through the discriminatory and selective licensing process on the mainland (which CAI did not change).

China did include a "technology neutrality" clause, which ensures that equity caps imposed on value-added telecom services will not be applied to other services, such as financial, logistic, and medical services, if these are offered online. Basically, this commitment ensures that China does not (again) use a discriminatory interpretation of service trade categorizations to allow it to discriminate against foreign tech firms and their digital products.

Overall, CAI falls well short of anything that looks like reciprocal market access or even new and meaningful market access. Chinese negotiators (reportedly) did consider the possibility of allowing firms to own greater than 50 percent of cloud JVs, but ultimately settled on market access equivalent to CEPA and what it provides U.S. firms. If it comes into effect, it may provide some greater certainty for EU firms (if this was uncertain before) and an easier tool for enforcement. While it does show that China is willing to negotiate on cloud market issues, it does not represent an ambitious outcome given it essentially clarifies the status quo and the commitments China made when it joined the WTO some two decades ago.

WTO E-commerce Negotiations: A Critical Forum to Push for Broad Cloud Market Access

The United States should push for cloud and digital market access, and rules to prohibit data localization and protect the free flow of data flow, as part of ambitious e-commerce negotiations at the WTO.

In 2018, 70-odd WTO members-initiated negotiations on e-commerce as part of a much-needed effort to modernize the WTO's woefully outdated trade rules.[116] Negotiations do not involve the full WTO membership, only a sub-set of countries that are interested in being part of this e-commerce agreement. This includes the United States and many other supporters of digital free trade, such as Australia, Canada, Chile, Japan, New Zealand, Singapore, and the United Kingdom. But it also includes digital protectionists like China (and Russia).

It was surprising that China even joined negotiations. Thus far, China has not made substantive or enforceable commitments on e-commerce or digital trade as part of its trade agreements. Only in the recent Regional Comprehensive Economic Partnership (RCEP) did it agree to provisions relating to data flows for the first time in a trade agreement, but even then, these provisions are not binding so are only of symbolic (not economic) value.[117] China tends to see e-commerce through the lens of traditional trade, where e-commerce platforms sell physical goods that need facilitation through customs, while the United States and many other nations see it much more broadly, encompassing both purely digital products and the digitally enabled delivery of goods and services.

China has reportedly shown some (tentative) signs that it may be willing to change its position and make commitments on data flows and cloud market access as part of ongoing negotiations. A (2016) joint non-paper by China-Pakistan on the WTO's ecommerce initiative is indicative of its traditional approach, in that it does not mention cloud services and data flows and states that "discussions at this stage should not lead to new market access commitments including tariff reductions."[118] So the baseline for improvement is pretty low given China often frames its position as one where it refuses to negotiate on digital issues as they're central to its conceptualization of national sovereignty and are thus off limits.

China has reportedly engaged in a generally productive and constructive manner through the various small group and associated negotiating groups. China is watching, learning about other countries' proposals, and then selectively engaging (which was also its approach on e-commerce and data-related issues in RCEP negotiations). Where China has put forward proposals, they are reportedly still far from ambitious and far from what the United States and others would accept.

China's proposals represent a noticeable, even if subtle shift in policy (even if it may not be clear as its proposal is framed and drafted in a way that is very different to what the United States uses in its trade agreements). This shift is encouraging to see. However, an ambitious final agreement that includes China is far from a given. It is a matter of seeing if China is willing to join a genuinely ambitious agreement that is much closer to U.S. digital trade objectives, which includes binding and commercially significant commitments on data flows, cloud market access, and associated digital services and activities.

The United States needs to ensure cloud market access is part of the end agreement given cloud's critical role in supporting global digital free trade. This is one of the points made in a joint statement by a global coalition of business and tech associations.[119] As part of negotiations, the United States reportedly asked for market access commitments in digital service sectors (including on cloud services), that countries update service trade classifications so that they apply to modern (digital) trade, and that countries allow for the cross-border supply of digital services. This is in addition to proposals prohibiting data localization and forced technology transfers and supporting the cross-border transfer of data. Many other countries also want to pursue similar market access and classification outcomes, as seen in a joint (2017) non-paper at the WTO by Canada, Chile, Colombia, Côte d'Ivoire, the European Union, the Republic of Korea, Mexico, the Republic of Moldova, Montenegro, Paraguay, Singapore, and Turkey.[120]

Many countries support the United States' efforts to use WTO e-commerce negotiations to build an open, rules-based global digital economy. Like the United States, many other countries have enacted new, binding rules on digital trade. China's involvement provides some hope that perhaps, finally, it is willing to work with its trading partners on new digital trade rules. As negotiations continue and China gets a clearer sense of what the final agreement looks like and what it means for it, it may decide to engage more directly in negotiations. This would be a win-win-win for the United States, China, and the global digital economy if China were to join an ambitious new ecommerce agreement.

While it would be great for China to be involved in a new global e-commerce agreement, its involvement should absolutely not come at the cost of an ambitious outcome. U.S. negotiators should not accept any final agreement that does not include commitments on cloud market access, alongside other critical provisions prohibiting data localization and allowing the cross-border flow of data.[121] Any e-commerce agreement that does not protect data flows and provide cloud services market access is one that ultimately fails to support e-commerce.

Domestic Digital Economy Reforms

China Debates Domestic Reforms: Control and Protectionism vs. Greater Competition, Digital Trade, and Connectivity to Support the Global Expansion of Local Champions

U.S. trade negotiations will not force China to make policy changes it was not already prepared to make. U.S. success in achieving greater cloud, and broader digital economy, market access in China depends in large part upon China's willingness to open up on its own accord. This leads to a central question for U.S. policymakers: do recent domestic debates and trade negotiations mean that China (in the right context) is genuinely willing to not only allow greater cloud market access, but also to address broader digital market barriers (such as on data localization and data flows), that together amount to new and meaningful market access for U.S. firms? This section analyzes recent domestic policy changes around data governance, digital trade, and data flows to help potentially answer this question.

Some Chinese officials recognize that they need to create a digital economy that is (somewhat) more open to foreign firms, data, and digital services. These officials recognize that their local tech champions need to be able to connect local and global digital operations for them to be more competitive against AWS, Google, and others. Alibaba, Tencent, and others support their efforts as they clearly recognize the benefits. These officials also recognize that for China to retain its central role in many global production networks, that modern multinationals in China need digital connectivity (and if they want these firms to stop encouraging their home governments from targeting China). However, these officials and firms face off against powerful opponents within China's government that support ongoing protectionism and who prioritize local control over data and digital services for political and social purposes.

China's debate about domestic data governance, industrial policy, and greater integration and engagement in global digital trade is opaque and hard to follow. U.S. firms are involved in some discussions and are provided some opportunities to provide feedback on draft laws and regulations, but their access and influence remains relatively limited. Chinese multinationals are involved in many data and digital policy debates, alongside trade, commerce, and data privacy and protection officials of the Cyberspace Administration of China (CAC)—and powerful Ministry of Public Security (MPS) officials.

However, MPS's overriding concerns about retaining control over data and digital services for political purposes and CAC's interest in censoring and blocking sensitive content makes it hard for other officials and firms to push for changes that would allow greater U.S. digital market access and better connections between China's Internet and the global one. This debate has played out during efforts to reform and implement China's Cybersecurity Law and its draft Data Security Law (which are both very restrictive in requiring extensive restrictions on data and foreign digital services) and the draft Personal Information Protection Law (which could potentially allow U.S. firms to transfer Chinese personal data, see below).[122]

Given the generally restrictive nature of China's Cybersecurity law, its Draft Data Security Law, and others, those Chinese government officials, agencies, and firms that support protectionism and control seem to have the upper hand. However, the fact that many of these laws have not been fully implemented years after they were introduced, that the draft PIPL provides a potential framework for data transfers, and that China is experimenting with more liberal digital free trade zones indicates that the debate is not over. There's still a chance for those Chinese officials, agencies, and firms that want a more open and competitive digital economy to have a significant and lasting impact on how China governs its digital economy.

China's recent draft Personal Information Protection Law (PIPL) provides some hope that those Chinese officials and firms that support greater data flows and digital engagement are having an impact. It signals that China (maybe) willing to shift (somewhat) away from the forced data localization principles outlined in the sweeping cybersecurity law enacted in 2017 (which mandates a broad local storage requirement for personal

data and important data).[123] For the first time, PIPL lays specific ground rules for the outbound flow of personal data. It would allow personal data transfers out of China when sufficient levels of protection guaranteed by contracts or certified by designated agencies are present.

China's Digital- and Cloud-Friendly Free Trade Zones: Signal of Meaningful Reform or Insignificant Pilot Project?

China is creating new digital friendly free trade zones (FTZs) that would provide better market access and operating conditions for U.S. cloud firms. In September 2020, President Xi Jinping delivered a speech about the global digitalization of services trade, during which he announced the creation of a new FTZ in Beijing, which will focus on science and technology services.[124] In 2020, China started enacting regulatory changes to bring digital FTZs to life. In 2020, China's State Council (the highest executive and administrative body in China's government) approved the plan to "Comprehensively Deepen the Pilot Program of Innovative Development of Trade in Services" and China's Ministry of Commerce (MOFCOM) released the "General Plan for Comprehensively Deepening the Pilot Program of Innovative Development of Trade in Services."[125] Similarly, on November 11, 2020, Liu Liehong, Vice Minister of China's Ministry of Industry and Information Technology (MIIT), said in a speech that MIIT will open China's value-added telecommunications services (VATS) market, including data centers, cloud services and other services, and the first step will be pilot open VATS in the Shanghai and Hainan free trade zones.

MOFCOM's implementation plan calls for streamlined administration and greater service market access (including in emerging service industries) in these FTZs in Beijing, Tianjin, Shanghai, Chongqing, and elsewhere.[126] MOFCOM has also stated that it will eventually eliminate the equity cap on foreign investments in VATS (and other service sectors). The MOFCOM notice (below) liberalizes some of China's service trade catalogue and potentially opens the door to somewhat easier data flows, but all under the careful supervision of Chinese government agencies (see figure 9).[127] Chinese authorities are reportedly still considering how companies would be able to transfer data outside of FTZs. They have noted that regulations would likely require "self-review" for compliance, which would be based on the Cybersecurity Law. The notice states it's a three-year trial, however, there are no reports that these FTZs have been implemented.

Figure 9: China's Ministry of Commerce: Data-related service sector liberalizations for free trade zones [translated][128]

75	In pilot areas where conditions permit, a dedicated Internet data channel will be opened.	MIIT formulates policy guarantee measures; qualified pilot regions are responsible for promotion.
76	Explore the classified supervision model of cross-border data flows, and launch a pilot program for the safe management of cross-border data transmissions.	The Cyberspace Administration of China guides and formulates policy guarantee measures; pilot areas such as Beijing, Shanghai, Hainan, and Xiong'an New District are responsible for the promotion
77	Exploring and optimizing the services for scientific research institutions to access international academic frontier websites (natural sciences) in eligible pilot areas.	The Cyberspace Administration of China and other support and guidance, the Ministry of Science and Technology, etc. formulate policy guarantee measures; pilot areas such as Beijing, Shanghai, Hainan, and Xiong'an New District are responsible for the promotion
78	Actively carry out research on issues related to the digital business environment, and establish a dynamic tracking mechanism for the digital business environment at home and abroad.	The Cyberspace Administration of China, the Ministry of Finance, the Ministry of Commerce, and other relevant departments proceed according to the division of responsibilities

79	Support the creation of the Guangdong-Hong Kong-Macao Greater Bay Area, Beijing-Tianjin-Hebei, and Yangtze River Delta Big Data Technology National Engineering Laboratory, and promote the construction of big data center projects. Explore the establishment of a data flow mechanism for Guangdong, Hong Kong, Macao, Beijing-Tianjin-Hebei, and the Yangtze River Delta.	Support and guidance from the Development and Reform Commission, Cyberspace Administration of China, Ministry of Industry and Information Technology, Hong Kong and Macao Affairs Office; pilot areas such as Beijing, Tianjin, Shanghai, Hainan, Shenzhen, Shijiazhuang, Nanjing, Hangzhou, Hefei, Guangzhou, Suzhou, and Xiong'an New District Responsible for promotion

Details from specific new FTZs build on these overarching plans:

- Beijing: The official work plan for the Beijing FTZ includes commitments about establishing an open digital economy and services market access, the "orderly flow of data," and the ability for firms to engage in digital trade.[129]
- Lingang: The Lingang New Area pilot FTZ (near Shanghai) will focus on information and communication technologies, which will target firms involved in cloud computing, 5G networks, edge computing, cross-border e-commerce, and pilot cases of offshore data centers and data service outsourcing. The Lingang New Area will explore international Internet access supervision models, such as building a cross-border data security assessment system and creating a whitelist authentication scheme for firms to directly access the (presumable global) Internet. Overall, it aims to "promote the cross-border flow of data under the premise of safety/security."[130]
- Hainan: On June 1, 2020, China released its plan for the new Hainan FTZ. Similar to other zones, the Hainan FTZ will open basic telecommunications service and VATS, gradually remove restrictions on foreign equity caps, carry out international Internet data exchange pilot projects, build international submarine optical cables and landing points, and set up international communication gateways.[131]
- Shenzhen: In October 2020, China's implementation plan for Shenzhen's new FTZ included safe and orderly opening of basic telecommunication services and VATS services, removing the equity cap on foreign investments, and granting Shenzhen the authority to approve foreign-invested telecommunications enterprises.[132]

Digital FTZs may represent a genuine, good-faith attempt by Chinese officials to pilot and test arrangements for a more open digital economy and easier data transfers. Historically, special trade zones have played an important role in economic reforms in China as it uses them to test and understand new policies before releasing nationally. China may want to use these digital friendly FTZs to see if they can build a digital framework that allows local and foreign firms to benefit from greater data transfers and digital trade, while providing MPS and others with some ability to maintain (restrained) oversight and control over data and digital activity.

Digital friendly FTZ may represent an incremental move towards greater digital economy market access, however, they fall far short of what U.S. negotiators should demand. While FTZs may have been useful and attractive to foreign firms (who largely wanted access to cheap labor for manufacturing) twenty years ago, having small geographic enclaves for U.S. cloud and digital service providers may not attractive, nor operationally feasible. These firms need to operate across cloud and digital service sectors and be able to access customers wherever they are in China and elsewhere around the world and transfer their and other non-personal data seamlessly (and not have to get prior approval or be under continuous observation for data transfers). Also, China has a poor track-record of not following through on commitments to open markets and allow freer trade in its FTZs.

Summary: China May Be Willing to Make Concessions, But Would it Provide Substantive Market Access? And at What Cost?

Foreign trade officials and industry representatives disagree as to whether China is genuinely willing to provide meaningful market access to U.S. and foreign cloud providers in bilateral and multilateral negotiations. Some see its approach to negotiations with the United States, Europe, and at the WTO as a ploy, simply for public posturing so that they are seen as a constructive negotiating and trade partner. That's much like Chinese President Xi's hollow remarks about free trade and protectionism at the World Economic Forum in 2017.[133] Or that it is simply a way for China to try and get what they want elsewhere in negotiations (all of which is normal for trade negotiations). Either way, the United States should prioritize and push for clear, meaningful, binding, and enforceable cloud market access in China.

Even if China is willing to make concessions in Phase 2 or other talks, these may come at the cost of concessions that the United States and others are unwilling to make. For example, China could use cloud market access as a bargaining chip with the United States (and Europe) for the removal of restrictions on Huawei. It would also be hard, if not impossible, for the United States and others to make these types of tradeoffs within the context of WTO talks. Furthermore, meaningful market access for U.S. cloud firms would be difficult to achieve given it would require China to provide broader digital market access, such as removing data localization requirements and allowing easy data flows, among other issues.

China's digital FTZs are still a long way from U.S. demands for reciprocal cloud market access. One of the few ways China would use digital FTZs was as part of a negotiated transition arrangement with the United States, whereby China commits to provide clear, broad digital market access within a set period, but that it can use these FTZs and a specific period of time to test and determine how it will adapt its regulatory framework. But that the end goal is never in doubt and it can't use the interim transition period to delay the final outcome or use it to find other ways to deny market access to U.S. cloud providers.

However, the pessimistic alternative is that China will try and make the case to the United States and others that digital FTZs are a substantive change (they are not) and that they are moving in the right direction and to give them time. However, it has been 20 years since China joined the WTO and U.S. firms have missed out on a long period of major growth in China's digital economy. In the meantime, Chinese firms enjoy open digital markets around the world. Reciprocity should be the central benchmark to judge China's proposals, not whether their proposal represents increment change from China's baseline of digital protectionism.

RECOMMENDATIONS

The United States would be ill-served to simply wait and hope China realizes the futility of its approach to digital protectionism or accept proposals for some form of digital FTZs. The United States should prioritize and push for ambitious and meaningful digital market access as the cost of being kept out only grows as its digital economy continues to grow.

There are several key recommendations that the United States-China Economic and Security Review Commission can make in calling for action in Congress and the Biden administration. As part of its broader review of U.S.-China policy, the Biden administration has an opportunity to not only prioritize and develop a clear ask as to what meaningful cloud and digital market access looks like in China and how to ensure U.S. cloud providers are not inadvertently caught up in new supply chain and cybersecurity restrictions. It also has a chance to change the status quo in closing access to the U.S. (and potentially other markets) in an effort to create reciprocity and leverage for negotiations. But more importantly, the Biden administration has an opportunity to develop a grand digital strategy to ensure the United States has a clear, comprehensive, and whole-of-government plan to address digital trade, misinformation, cyberattacks, data privacy, and other data and digital issues around the world.

In addition to the below, ITIF has called for a broader range of institutional and policy changes to better respond to Chinese innovation mercantilism, such as in the reports *Constructive, Alliance-Backed Confrontation: How the Trump Administration Can Stop Chinese Innovation Mercantilism* and *Why and How to Mount a Strong, Trilateral Response to China's Innovation Mercantilism.*[134] Of course, it would be ideal if the Biden administration's response to China's cloud market access restrictions fit neatly into the administration's broader China trade, economic, and national security strategy, which hopefully will evince a commitment to dramatically rolling back China's unrepentant and extensive embrace of innovation mercantilist policies.

Ensure Cloud Market Access is Prioritized and Meaningful in Bilateral and WTO Negotiations

The U.S. cloud sector's global leadership, and role as one of the U.S.'s most-innovative sectors, depends upon access to global markets, talent, and data. Chinese digital protectionism has a global impact on U.S. trade and innovation. U.S.-China and EU-China trade negotiations show that China is somewhat willing to discuss cloud service market access, which for the longest time, had been viewed as off-limits from negotiations.[135] In both bilateral and WTO-related negotiations, the United States should prioritize cloud and digital market access and push China to provide meaningful access to its cloud market and digital economy.

The goal: China should provide U.S. cloud service providers with full and nondiscriminatory market access and grant necessary approvals for U.S. companies to provide cloud services in China, without the need to enter a JV or local partnership to seek a license.

Specific U.S. asks/outcomes should include:

- Remove foreign equity caps for foreign cloud service providers, so U.S. providers could operate as wholly foreign owned entities. This would involve China revising relevant measures, including MIIT's Telecommunications Catalogue.
- Allow foreign cloud service providers to enter and setup operations in China—not just special or free trade zones.
    - For example, during U.S.-China trade talks, China proposed allowing operations for foreign cloud-service providers in a free-trade zone, possibly in the southern city of Guiyang, which is a center for big data. It'd require U.S. firms to shift existing operations (which is expensive and duplicative) and a "trial" does not provide the certainty that the type of investment required to setup a data center would be worth it.
- Provide U.S. firms with clear and ready access to all necessary licenses in China including those relevant to cloud-related operations, hardware, software, facilities, and infrastructure. Access to licenses would be for all cloud services, including SaaS, IaaS, and PaaS, and related computer services. China should provide prompt written decisions on all applications for licenses, including reasons that an application has been denied and a right to appeal the denial.
- Commit to provide transparent, objective, and non-discriminatory auditing and certification processes for cloud and other Internet service providers as it relates to cybersecurity and other cloud-related regulations. U.S. firms are fearful of how they can fall afoul of onerous, but vague, audits, such as those under China's multi-level protection scheme.[136]
- Ensure U.S. cloud service providers can use U.S. company brand names and trademarks when providing services in China.
- Provide the U.S. government and U.S. cloud service providers with early and continuing guidance as to ongoing implementation of China's Cybersecurity Law and other major data-related legislations

and the development of new data-related laws and regulations (such as its evolving cryptography regulatory framework and development and use of local standards and technical requirements).

- Require China to allow cross-border transfers of data for business purposes on a transparent and non-discriminatory basis, including the movement, processing, transfer, and storage of personal data. Cross-border data flows are a central part of global cloud services. Forced data localization is a discriminatory measure that favors Chinese cloud providers.
    - This would require China to revise data localization and overly strict requirements for cross-border data flows in the Cross-border Data Transfer Measures and Critical Information Infrastructure regulation, the draft Personal Information Protection Law (PIPL), and the Cybersecurity Law.

U.S. Cloud Firms in China Should Not Be Sacrificed in a Misguided Effort to Respond to China-based Cyberthreats

International cyberattacks taking advantage of scofflaw countries that don't want to, or can't, address this illegal activity is a real and growing problem for the United States. However, it is misguided and counterproductive to punish U.S. cloud firms and force them out of China if China-based cyberthreats happen to use their services in China or in other countries. U.S. cloud firms have no control over the actions of nation states and state-sponsored cyber threats, so should not be made responsible for their response to U.S. government's requests for actions and cooperation on cyberthreats. Forcing U.S. cloud firms out of China would only help China in ceding market share to local firms and would not change China's approach to cross-border law enforcement cooperation. U.S. cloud firms also stand to lose business elsewhere around the world as customers seek to avoid the specter of U.S. government surveillance of them and their activities and the potential for the U.S. government to suddenly interrupt their supply chains by suddenly stopping their ability to use Chinese and U.S. cloud service providers.

In December 2020, former U.S. President Trump signed a last-minute executive order that would let the government restrict the international operations of U.S. cloud computing companies in an effort to protect against foreign cyberattacks. The executive order provides the U.S. government 120 days to consult on how to increase information sharing among cloud providers themselves, as well as with the government, to "deter the abuse of US IaaS products." After 240 days, a report and recommendations will be presented to the U.S. president. The executive order allows the U.S. Department of Commerce to prohibit U.S. cloud providers from partnering with foreign cloud companies that supposedly offer safe haven to hackers and give the Commerce secretary the ability to ban those foreign providers from operating in the United States. Although the executive order uses the infrastructure as a service (IaaS) term, the order explains the definition also includes other cloud services.[137] The draft order is reportedly designed to deter malicious foreign actors from using cloud service providers to quickly and anonymously conduct cyberattacks.[138] Similar to other executive orders targeting Chinese firms WeChat and TikTok, the Department of Commerce would bar U.S. firms from conducting business transactions with certain foreigners using their cloud services. It would also require U.S. cloud firms to verify the identity of people using their services and to retain certain customer and use details every time their services are used, such as names, physical and email addresses, national identification numbers, means and sources of payment, phone numbers, and IP addresses.[139] Media reports quoted an anonymous official stating that "it's [the executive order] there also as a leverage point in bilateral relations." "To know that that is there when you're dealing with a country and trying to get them to participate in a mutual legal assistance treaty or law enforcement efforts or information-sharing efforts, it's a useful tool to have there." The individual continued by nothing that "getting China to take seriously and follow up, investigate, and prosecute their own cybercrime in their own borders is a continuously challenging issue."[140]

U.S. cloud providers should not be used as a bargaining chip in trying to get China to address international cyberthreats. The United States needs to take a far more nuanced and targeted approach to restrictions on the Chinese government and Chinese companies involved in cross-border cyber-attacks. The U.S. government's frustration with China and outdated mechanisms for managing cross-border law enforcement requests for data (such as mutual legal assistance agreements) is understandable, but targeting U.S. cloud firms for inaction by their host countries isn't going to change that.

To improve the international exchanges of data for law enforcement purposes, the United States should instead expand its pursuit of CLOUD Act agreements and efforts in the G7 and OECD to build new principles and frameworks to account for legitimate concerns about government requests for data.[141] China is unlikely to join these efforts, but it may reconsider in the long term as building a new global framework will put China's unwillingness to cooperate with international law enforcement activities into stark contrast. But, in general, U.S. policymakers need to be focused on contesting the unreasonable mandates the Chinese government imposes on U.S. firms operating in China, not on the actions U.S. firms are compelled to undertake, when they would otherwise not, thanks to the dictates of a Communist regime.

From a trade and competition perspective, the executive order is misguided, as forcing U.S. cloud firms to exit China because of cybersecurity threats would simply support China's digital industrial goals in ceding more market share to Chinese cloud companies. There should be no doubt that it is in America's long-term economic and security interests for U.S. companies to sell as many goods and services to China as possible. Every dollar's worth of digital and physical exports from the United States to China is a dollar that Chinese firms do not make—and it is a dollar American firms can use to reinvest in R&D and support employment in the United States. America should be encouraging, rather than berating, U.S. firms to engage in the Chinese market (not including, obviously, selling directly to the Chinese military), for America is locked in a critical competition for global technology leadership with China. Walking away from the China market only gives China a leg up in that competition. Chinese firms would use those revenues to continue innovating and expanding into markets all around the world, ultimately taking market share and jobs from American technology companies.

The executive order is already having an impact on U.S. cloud providers outside of China. The lack of debate, transparency, and details around the executive order creates uncertainty for U.S. cloud providers and their customers. As per other executive orders targeting China and the U.S. ICT supply chain, customers don't want to face the situation where the U.S. government interrupts their supply chains by suddenly, and arbitrarily, stopping their ability to use Chinese and U.S. cloud service providers. Also, the need to verify customers and retain data about them and their use of U.S. cloud services is enough to spook U.S. cloud services customers around the world who are already sensitive to concerns about U.S. government surveillance following the Snowden revelations. Ironically, these customers may turn to Alibaba Cloud and Tencent (and to European providers) to ensure they can avoid this risk.

Focus on Reciprocity: Block Access to the United States' (and Hopefully Trading Partner's) Cloud Markets

The Biden administration should insist upon reciprocity: restrict Chinese cloud firm's access to the United States market unless China takes steps to open its market within a specified time frame. The United States should also encourage its likeminded trading partners to block access as part of their broader, collective response to China's innovation mercantilism. It would create negotiating leverage and would limit the extent to which Chinese cloud firms could use open global markets to improve their ability to compete with their U.S. and foreign cloud service providers.

The continuing lack of reciprocity in U.S-China cloud markets is unacceptable. Allowing China and its leading cloud firms to have it all their own way—not only do Chinese local champions have a protected home market, but U.S. firms are forced to help local ones, while Chinese firms are free to access the U.S. market (and other global markets) unimpeded—is grossly unfair. More to the point, it's fundamentally inconsistent with the commitments China has made to its international trading partners as a member of the World Trade Organization.[142] Reciprocity, national treatment, and non-discrimination are the most essential and fundamental obligations of WTO membership, yet China continues to unrepentantly flaunt these responsibilities. China's failure to meet the standard for reciprocity is one of a number of failures to meet its WTO obligations that would justify the United States bringing a non-violation nullification and impairment case against China. As ITIF (and others, such as Jennifer Hillman) have written, the non-violation clause (Article XXIII of GATT) "provides a legal cause of action against measures that do not violate the treaty but that nevertheless upset the reasonable expectations of the parties and can be aimed at policies that might otherwise be beyond the reach of the GATT/WTO agreements."[143] In the case of cloud computing services, it's clear that U.S. firms are being denied the benefits of reasonably expected market access. Moreover, as Hillman notes, "there are some commitments that could form the basis for a violation claim [against China], including a lack of reciprocity."[144] In short, the United States would certainly be justified in bringing a WTO case against China for its cloud market access restrictions.

However, more broadly, as ITIF has written, it's time for U.S. economic and trade policy with China to move toward a results-oriented approach that holds China to specific goals, such as significantly reducing its global current account surplus, reducing its forced technology transfer and IP theft, and opening up its digital markets.[145] If China is not going to let U.S. cloud firms compete equitably in the Chinese market, then the Biden administration and Congress need to start blocking access to Chinese cloud firms competing in the U.S. market (and the same for another markets, digital or otherwise.) For instance, this is the intent of recent legislation S. 2826, "The Global Economic Security Strategy Act of 2019" introduced by U.S. Senators Marco Rubio (R-FL), Todd Young (R-IN), Jeff Merkley (D-OR), and Chris Coons (D-DE).[146]

Especially in today's digital economy, where cloud services lie at the heart of competition across sectors and at the heart of research into current and emerging digital technologies. This unfair situation will continue to erode the U.S.'s (hard fought) leading position in the sector, especially as China's digital economy makes up a growing portion of the global one.

It was disappointing, but not surprising, to see that the Biden administration's recently released Trade Agenda and 2020 Annual Report does not mention China's cloud market restrictions, given they are still in the early days of figuring out how to grapple with a broad and complex bilateral relationship. The Biden administration deserves time to develop its own China strategy. Thankfully, it already has all the evidence it needs. The United States' (2018) Special 301 investigation into China's technology transfer, intellectual property, and innovation policies was comprehensive and showed that China's cloud market access restrictions are unreasonable and discriminate against U.S. firms and their services.[147] Biden's Trade Agenda does refer to USTR's 2018 Special 301 investigation and USTR's 2020 National Trade Estimate report (and its fact sheet on digital trade), which detail China's cloud market restrictions.[148] However, none of these reports outline a course of action. More evidence and ideas from this hearing and others like it will hopefully highlight the importance of the issue and generate ideas to address it (alongside the many other pressing issues in the U.S.-China relationship).

The United States needs to create leverage if it wants to change the status quo in the coming years. Current WTO trade rules are largely redundant. USTR has not been confident that it would stand a good chance of success in a WTO dispute case given how China enacted its restrictions and the outdated nature of WTO trade rules (negotiated and enacted in the pre-Internet era of the 1980s and 1990s). Indicative of this, is the fact that the WTO dispute that USTR launched against China following the Special 301 investigation targeted

China's restrictive licensing regime and its forced tech transfers, but not those in the cloud sector.[149] Potential future trade rules at WTO e-commerce talks may be useful, but such a scenario is hypothetical. China may not even be party to the final agreement.

The Biden administration should take up the case of cloud market access and look at ways to create reciprocity by blocking market access at home (and other markets) to limit the extent to which Chinese cloud firms can use open global markets to help them catch up to U.S. (and foreign) cloud providers. It will not be as easy as raising tariffs given it is a non-tariff related issue and given U.S. trade obligations. The Biden administration's Trade Agenda states that strong trade enforcement is essential to its trade strategy and that it will bring trade cases against trade partners for unfair trade practices. It states that it will shy away from unilateral action, but that it may be necessary in some instances.[150] In the case of China's cloud market restrictions, it is most definitely necessary.

The United States needs to lead the charge, but it needs to work with likeminded allies to create a substantial incentive for China to open its digital markets. Or if China does not open up, it at least limits the damage from unfair competition from Chinese cloud and tech firms. Overall, working with allies is clearly the right strategy to address Chinese innovation mercantilism.[151] As home to the world's leading cloud sector, no other country is more significantly impacted than the United States. However, while Alibaba Cloud and Tencent Cloud have datacenters in the United States, they do not have significant market share, so blocking them does not make up for the significant market share that U.S. and other foreign firms would have in an open Chinese market. However, if the United States and its allies all block access to Chinese companies in sectors where there is clearly a lack of reciprocal market access, it increases the costs of China's lack of market openness. It limits Tencent Cloud and Alibaba Cloud's ability to seize market share, thus slowing their ability to (unfairly) leverage the lack of reciprocity to become more competitive in the global cloud market.

The United States Should Develop a Grand Strategy for the Global Digital Economy

China is ahead of the United States and many others in terms of grand strategy in terms of advocating for its digital and ICT firms and associated projects as part of its BRI and the Digital Silk Road initiatives. China's targeting of U.S. cloud providers is merely one part of its broader digital protectionism strategy. The United States needs to put this issue alongside the many others it needs to address both specifically, but also holistically, as part of a grand strategy for the global digital economy. A worthwhile next step would be for the U.S. Congress and the United States-China Economic and Security Review Commission to hold hearings about the need for a U.S. grand strategy for the global digital economy and what it should entail.

The rise of the digital economy over the last two decades has further deepened and widened global integration as the Internet and related technologies have allowed firms to more easily attain global reach, while at the same time linking the world more closely in a web of information. But there is also a large countervailing force: an autocratic, non-democratic country—China—that is threatening to wrest global leadership in these technologies, with attendant social, political, economic, and security implications.[152] Against this backdrop, the key question today is how a world, extremely diverse in income levels, cultures, and types of government, will deal with global technologies and global firms. This is a particularly important question now. However, the digital world is rife with strife: There is conflict over cyberattacks, Internet blocking, and cross-border data flows; over attitudes and policies toward leading information technology and Internet firms; and over technology leadership and competitiveness.

In this world, the United States—as the global IT and digital leader—has struggled to articulate and advocate for a coherent and strategic response. All too often, U.S. thinking about privacy, tech platforms, national security, and Internet and artificial intelligence (AI) governance is siloed and bifurcated. During the Clinton and second Bush administrations, U.S. policymakers believed that the rest of the world would emulate what

was obviously the superior U.S. digital policy system, and they worked toward that end. But China's success in IT and digital industries, coupled with a questioning of the desirability of a U.S.-style light-touch digital regulation and the rise of U.S. "big tech" companies, has meant that the United States can no longer rely principally on persuasion to convince others of the economic and innovation advantages of its approach.

For example, USTR's recently released *2020 Trade Policy Agenda and 2019 Annual Report* details individual digital provisions that relate to digital trade, but without a broader context or strategy to address them as part of the growing trend toward "digital sovereignty" in China, Europe, India, and elsewhere around the world.[153] USTR and other U.S. government agencies (such as the Department of Commerce) need to ensure that U.S. trade policy addresses the individual elements as part of a holistic and broader global digital economy agenda.

For the past decade or so, a major part of the U.S. challenge in discussing, advocating, and negotiating internationally in this area is that U.S. officials do not have an easy-to-translate model of digital governance and associated set of talking points. What does the United States want (besides everything), and what are its major priorities—open markets, human rights, the freedom to innovate, privacy, national security, jobs, a more economically integrated world, a more peaceful world? For many years, U.S. officials believed in and advocated for open markets, international trade, less regulation, greater economic integration, and the rule of law because they thought those would benefit both the United States and the world. That basic framing may have worked before China became a systemic competitor/adversary, Russia and several other states became systemic bad actors, and the EU and many developing states embraced digital protectionism.

The United States needs to move away from an idealistic view of digital international relations to a new doctrine of "digital realpolitik." The new doctrine needs to move away from the idealist's dream of a harmonized, values-based global Internet, as this is clearly not going to happen. It also needs to move away from principally unilateral action. The priority should be advancing U.S. interests by spreading the U.S. digital innovation policy system and constraining digital adversaries, especially China. This will entail working with allies when possible—and pressuring them when necessary. This means that shaping the global IT and digital economy in ways that are in U.S. interests is one of the most important challenges facing U.S. foreign and economic policy going forward. As such, going forward, the United States needs a revised and clear set of principles that together articulate a new doctrine of digital realpolitik to orient its global digital policy, such as those outlined in ITIF's report "A U.S. Grand Strategy for the Global Digital Economy."[154]

APPPENDIX A: ESTIMATING THE COST OF RESTRICTIONS ON U.S. CLOUD SERVICES

This table summarize the results estimating the revenues of U.S. cloud companies in China in different scenarios and provide estimates of cumulative losses.[155] It is drawn from recent U.S. senate testimony on "censorship as a non-tariff barrier," which also considered search services.[156] The high and low assumptions for each are different. For the cloud scenario, the estimate assumes cloud companies receive the market share equivalent to the average in the Asia Pacific region including China, and then receiving the market share equivalent to the regional average excluding China.

Estimates of Google Ad Revenue in China ($B)

	Real Market Share	Static 2010 Market Share	South Korean Market Share
2013	$0.53	$2.07	$3.41
2014	$0.53	$3.14	$4.56
2015	$0.22	$4.23	$6.49
2016	$0.29	$4.55	$8.24
2017	$0.27	$5.89	$10.46
2018	$0.35	$7.12	$13.20
2019	$0.61	$8.29	$17.77

Estimates of Cloud Revenue in China ($B)

		Real Market Share	Asia Pacific Market Share	Rest of Asia Pacific Market Share
Amazon				
	2017	$0.14	$0.30	$0.46
	2018	$0.61	$0.97	$1.33
Microsoft				
	2017	$0.13	$0.19	$0.24
	2018	$0.33	$0.70	$1.08

Lost Cloud and Search Revenue in China ($B)

Company	Low Estimate	High Estimate
Google (2013-19)	$32.49	$61.33
Amazon (2017-18)	$0.52	$1.03
Microsoft (2017-18)	$0.43	$0.86

For cloud services: Amazon's and Microsoft's Infrastructure as a Service (IaaS) market shares in China are compared to their market shares in the overall Asia Pacific region, estimating the revenues each company would earn if they held their regional market share within China. Additionally, the Chinese market is subtracted from the Asia Pacific region to estimate the market share each company holds in the rest of the region, which are once again substituted for the Chinese market shares.

Asia Pacific IaaS Market Share

	Amazon	Microsoft
2017	11.2%	7.0%
2018	11.0%	8.0%

China IaaS Revenue ($B)

2017	2.68
2018	8.78

Est. Revenue / Asia Pacific Share Revenue

	Est. Revenue: Amazon	Est. Revenue: Microsoft	Asia Pacific Share Revenue: Amazon	Asia Pacific Share Revenue: Microsoft
	0.14	0.13	0.30	0.19
	0.61	0.33	0.97	0.70
Total	0.75	0.46	1.27	0.89

China IaaS Market Share

	Amazon	Microsoft
2017	5.4%	5.0%
2018 H1	6.9%	3.7%

2017 and 2018 Difference

Amazon	0.52
Microsoft	0.14
Total	0.66

Non CN Asia Pacific Market Share

	Amazon	Microsoft
2017	17.0%	9.0%
2018	15.1%	12.3%

Est. Revenue / Asia Pacific Share Revenue

	Est. Revenue: Amazon	Est. Revenue: Microsoft	Asia Pacific Share Revenue: Amazon	Asia Pacific Share Revenue: Microsoft
	0.14	0.13	0.46	0.24
	0.61	0.33	1.33	1.08
Total	0.75	0.46	1.78	1.32

2017 and 2018 Difference

Amazon	1.03
Microsoft	0.57
Total	1.60

ENDNOTES

1. Nigel Cory, "Testimony to the U.S. Senate Subcommittee on Trade Regarding Censorship as a Non-Tariff Barrier to Trade" (ITIF, June 30, 2020), https://itif.org/publications/2020/06/30/testimony-us-senate-subcommittee-trade-regarding-censorship-non-tariff; Nigel Cory, "Comments to the U.S. International Trade Commission on the Critical Role of Data in the Global Economy" (ITIF, April 21, 2017), https://itif.org/publications/2017/04/21/comments-us-international-trade-commission-critical-role-data-global-economy; Nigel Cory, "Surveying the Damage: Why We Must Accurately Measure Cross-Border Data Flows and Digital Trade Barriers" (ITIF, January 27, 2020), https://itif.org/publications/2020/01/27/surveying-damage-why-we-must-accurately-measure-cross-border-data-flows-and; Nigel Cory, "The Ten Worst Digital Protectionism and Innovation Mercantilist Policies of 2018" (ITIF, January, 2019), http://www2.itif.org/2019-worst-mercantilist-policies.pdf?_ga=2.171925856.1180134359.1617056243-1235678492.1612995001; Nigel Cory, "The Worst Innovation Mercantilist Policies of 2016" (ITIF, January, 2017), http://www2.itif.org/2017-worst-innovation-mercantilist-policies.pdf.
2. "Translation: New Chinese Ambitions for 'Strategic Emerging Industries, (Center for Security and Emerging Technologies and DigiChina, September 29, 2020), https://cset.georgetown.edu/research/new-chinese-ambitions-for-strategic-emerging-industries-translated/.
3. "Beijing updates 'Made in China 2025' for leaner, meaner times," *South Asian Monitor,* March 23, 2021, https://southasianmonitor.net/en/world-news/beijing-updates-made-in-china-2025-for-leaner-meaner-times.
4. Ibid.
5. Karen M. Sutter and Michael D. Sutherland, "China's 14th Five-Year Plan: A First Look" (U.S. Congressional Research Service, January 5, 2021), https://crsreports.congress.gov/product/pdf/IF/IF11684.
6. Alan Price, Timothy Brightbill, and Adam Teslik, "China Action Plan Targets Enhancement of Digital Economy," Wiley law firm blog post, February 3, 2021, https://www.wiley.law/alert-China-Action-Plan-Targets-Enhancement-of-Digital-Economy; [translation] "The General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the "Action Plan for Building a High Standard Market System," Chinese government website, January 31, 2021, http://www.gov.cn/zhengce/2021-01/31/content_5583936.htm.
7. "Regions and Availability Zones," Tencent Cloud website, https://intl.cloud.tencent.com/global-infrastructure.
8. For example: Chinese President Xi Jinping's speech to the National Propaganda and Ideology Work Conference, August 2013, "Western anti-China forces have constantly and vainly tried to exploit the Internet to "topple China"…Whether we can stand our ground and win this battle over the Internet has a direct bearing on our country's ideological and political security." Quote taken from: James Griffiths, *The Great Firewall of China: How to Build and Control an Alternative Version of the Internet* (London: Zed Books, 2019).
9. Nigel Cory and Robert D. Atkinson, "Why and How to Mount a Strong, Trilateral Response to China's Innovation Mercantilism" (ITIF, January 13, 2020), https://itif.org/publications/2020/01/13/why-and-how-mount-strong-trilateral-response-chinas-innovation-mercantilism.
10. For example, in 2017, China's regulator issued a circular, entitled "On Cleaning up and Regulating Internet Access Services Market", which prohibits Chinese telecommunication operators from offering consumers leased lines or virtual private network (VPN) connections reaching overseas data centers, which could restrict a key access mechanism companies use to connect to foreign cloud computing service suppliers and related resources.
11. United States Trade Representative (USTR), *China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974* (Washington, DC: USTR, March 22, 2018), https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF
12. Ibid.
13. Industry discussions; Ibid.
14. World Trade Organization Council for Trade in Services, "Computer and Related Services Background Note by the Secretariat S/C/W/45" (Geneva: World Trade Organization, July 14, 1998), https://www.wto.org/english/tratop_e/serv_e/w45.doc.

15. Stephen J. Ezell and Robert D. Atkinson, "False Promises: The Yawning Gap between China's WTO Commitments and Practices" (Information Technology and Innovation Foundation, September 2015), http://www2.itif.org/2015-false-promises-china.pdf.
16. For example: Telecommunications Regulations of the People's Republic of China, art. 7 and the Telecommunications Services Catalogue, attached as the Annex (State Council Order No. 291, issued Sept. 25, 2000 and amended on July 29, 2014 and Feb. 6, 2016), which lists IDC under the VATS operator license.
17. William Mauldin, "U.S. Lawmakers Complain About China's Cloud Computing Restrictions," *Wall Street Journal,* March 23, 2017, https://www.wsj.com/articles/BL-WB-67850.
18. USTR, *China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974*.
19. Leigh Ann Ragland et al., "Red Cloud Rising: Cloud Computing in China" (Washington, DC: U.S. Economic and Security Commission, September 5, 2013), http://origin.www.uscc.gov/sites/default/files/Research/DGI_Red%20Cloud%20Rising_2014.pdf; United States Information Technology Office (USITO), "USITO Brief: Ministry of Science and Technology 12th Five Year Plan" (Washington, DC: USITO, August 5, 2011), http://www.semiconductors.org/clientuploads/directory/DocumentSIA/USITO%20Brief%20Ministry%20of%20Science%20and%20Technology%2012th%20Five%20Year%20Plan.pdf.
20. United States Trade Representative, *2013 National Trade Estimate China* (Washington, DC: United States Trade Representative, 2014), https://ustr.gov/sites/default/files/2013%20NTE%20China%20Final.pdf; Hogan Lovells, "Third Party Payment Licenses in China - Are They Within the Grasp of Foreign Investors?" (London: Hogan Lovells, June 2014), http://www.hoganlovells.com/files/Uploads/Documents/14.06_Corporate_China_Alert_-_Third_Party_Payment_Licences_in_China_-_Are_They_within_The_Grasp_of_Foreign_Investors_SHALIB01_1093411.pdf.
21. USTR, *China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation under Section 301 of the Trade Act of 1974*.
22. IBM, "Made in IBM Labs: IBM to Build First Cloud Computing Center in China," news release, February 1, 2008, http://www-03.ibm.com/press/us/en/pressrelease/23426.wss; Rebecca Blumenstein, "Microsoft's Partner Strategy in China," *The Wall Street Journal,* June 8, 2016, http://www.wsj.com/articles/microsofts-partner-strategy-in-china-1465421401; SAP, "SAP and China Telecom Expand Strategic Partnership to Provide SAP Cloud Portfolio in China," news release, November 20, 2013, http://news.sap.com/sap-and-china-telecom-expand-strategic-partnership-to-provide-sap-cloud-portfolio-in-china/; "Azure China Data Centers," Microsoft website, July 20, 2020, https://docs.microsoft.com/en-us/azure/china/overview-datacenter.
23. "Cross-border connectivity and interoperability," Microsoft website, July 20, 2020, https://docs.microsoft.com/en-us/azure/china/overview-connectivity-and-interoperability.
24. Nigel Cory, "Why China Should Be Disqualified From Participating in WTO Negotiations on Digital Trade Rules" (ITIF, May 9, 2019), https://itif.org/publications/2019/05/09/why-china-should-be-disqualified-participating-wto-negotiations-digital; Nigel Cory, "Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?" (ITIF, May 1, 2017), https://itif.org/publications/2017/05/01/cross-border-data-flows-where-are-barriers-and-what-do-they-cost.
25. Omar Khan, "New Azure region coming to China in 2022," Microsoft blog post, March 4, 2021, https://azure.microsoft.com/en-us/blog/new-azure-region-coming-to-china-in-2022/.
26. "Microsoft and 21Vianet reinforce long-term cooperation on cloud services in China," Microsoft blog post, March 14, 2018, https://azure.microsoft.com/en-au/blog/microsoft-and-21vianet-reinforce-long-term-cooperation-on-cloud-services-in-china/.
27. "Apply to sell in Microsoft national clouds as part of the CSP program," Microsoft website, May 5, 2020, https://docs.microsoft.com/en-us/partner-center/csp-national-clouds-overview.
28. "Amazon to close Chinese domestic marketplace business in major e-commerce setback," *South China Morning Post,* April 18, 2019, https://www.scmp.com/news/world/united-states-canada/article/3006643/amazon-close-chinese-online-store-major-e-commerce.

29. Yang Jie, "Amazon Banned From Using AWS Logo in China Trademark Ruling," *Wall Street Journal,* January 5, 2021, https://www.wsj.com/articles/amazon-banned-from-using-aws-logo-in-china-trademark-ruling-11609841232.

30. Yang Jie and Liza Lin, "Amazon Sells Hardware to Cloud Partner in China," *Wall Street Journal,* November 14, 2017, https://www.wsj.com/articles/amazon-to-sell-its-china-cloud-computing-business-1510628802?mod=article_inline.

31. Indicative of the restrictive licensing requirements, AWS's website of its partnership with NWCD states that it is a cloud service provider with the Internet Data Center Services license (a B1 category service in figure 1) and the Internet Resource Collaboration Services license. "Ningxia Western Cloud Data Technology Co.Ltd.," AWS website, https://partners.amazonaws.com/partners/0010L00001rCaF1QAK/Ningxia%20Western%20Cloud%20Data%20Technology%20Co.Ltd.

32. "Amazon Web Services (AWS) and Ningxia Western Cloud Data Technology Co. Ltd (NWCD) Announce a Second AWS Region in China, Now Available to Customers," press release, December 11, 2017, https://www.businesswire.com/news/home/20171211006337/en/Amazon-Web-Services-AWS-and-Ningxia-Western-Cloud-Data-Technology-Co.-Ltd-NWCD-Announce-a-Second-AWS-Region-in-China-Now-Available-to-Customers.

33. Agatha Poon, "AWS China hopes to benefit from China's 'dual circulation' strategy" (industry report, 451 Research, February 26, 2021), https://d1.awsstatic.com/analyst-reports/451-AWS-China-dual-circulation-strategy.pdf?trk=ar_card.

34. Zhu Shenshen, "Amazon expanding cloud services in China to meet booming demand," *Shanghai Daily,* march 26, 2021, https://www.shine.cn/biz/company/2103266544/.

35. Poon, "AWS China hopes to benefit from China's 'dual circulation' strategy."

36. John Foley, "Oracle, Tencent Reach Agreement To Advance Cloud Services In China," *Forbes,* November 13, 2015, https://www.forbes.com/sites/oracle/2015/11/13/oracle-tencent-reach-agreement-to-advance-cloud-services-in-china/?sh=26513f2e138c.

37. Cyrus Lee, "Oracle closes China's R&D centre and axes nearly 1,000 employees: Report," *ZDNet,* May 8, 2019, https://www.zdnet.com/article/oracle-said-to-close-chinas-r-d-center-axing-nearly-1000-employees/.

38. "Google scraps cloud initiative in China and other 'sensitive markets'," *South China Morning Post,* July 9, 2020, https://www.scmp.com/news/world/united-states-canada/article/3092416/google-scraps-cloud-initiative-china-and-other.

39. Yoko Kubota and Lingling Wei, "China Sweetens Its Cloud-Computing Offer in U.S. Trade Talks," *Wall Street Journal,* April 11, 2019, https://www.wsj.com/articles/china-sweetens-its-cloud-offer-in-u-s-trade-talks-11554976562?mod=article_inline.

40. "Market size of software-as-a-service (SaaS) cloud market in China from 2013 to 2020," Statista, https://www.statista.com/statistics/1029285/china-software-as-a-service-market-size/.

41. Celia Chen, "AWS made cloud computing services mainstream, but it still hasn't cracked China," *South China Morning Post,* February 3, 2021, https://sg.news.yahoo.com/aws-made-cloud-computing-services-123818013.html.

42. Minghe Hu, "Cloud computing adoption accelerates in China as economy recovers from coronavirus pandemic," *South China Morning Post,* June 16, 2020, https://www.scmp.com/tech/big-tech/article/3089225/cloud-computing-adoption-accelerates-china-economy-recovers.

43. Ibid.

44. "IDC: China's Public Cloud Service Market Tops USD 3.92 Billion," press release, July 24, 2020, https://equalocean.com/briefing/20200724230002731.

45. "Market size of software-as-a-service (SaaS) cloud market in China from 2013 to 2020," Statista, https://www.statista.com/statistics/1029285/china-software-as-a-service-market-size/

46. Cloud computing budget spending divided by overall enterprise software, service, and IT infrastructure spending. Hari Kannan and Christopher Thomas, "Public cloud in China: Big challenges, big upside" (McKinsey & Company report, July 6, 2018), https://www.mckinsey.com/industries/technology-media-and-telecommunications/our-insights/public-cloud-in-china-big-challenges-big-upside.

47. Yang Jie, "Amazon Banned From Using AWS Logo in China Trademark Ruling," *Wall Street Journal,* January 5, 2021, https://www.wsj.com/articles/amazon-banned-from-using-aws-logo-in-china-trademark-ruling-11609841232; Karen Chiu, "Huawei looks to cloud services in 2021 as US sanctions strangle smartphone business," *South China Morning Post,* January 3, 2021, https://www.scmp.com/tech/tech-leaders-and-founders/article/3116243/huawei-looks-cloud-services-2021-us-sanctions; Celia Chen, "AWS made cloud computing services mainstream, but it still hasn't cracked China," *South China Morning Post,* February 3, 2021, https://sg.news.yahoo.com/aws-made-cloud-computing-services-123818013.html.
48. Minghe Hu, "Cloud computing adoption accelerates in China as economy recovers from coronavirus pandemic," *South China Morning Post,* June 16, 2020, https://www.scmp.com/tech/big-tech/article/3089225/cloud-computing-adoption-accelerates-china-economy-recovers.
49. Jeff Zhang, "Alibaba Cloud Intelligence - Strong Growth Driven by Digital Transformation and Core Technologies" (presentation, 2020 investor day), https://alibabagroup.com/en/ir/presentations/Investor_Day_2020_AlibabaCloud.pdf.
50. "Gartner Forecasts Worldwide Public Cloud Revenue to Grow 6.3% in 2020," press release, July 23, 2020, https://www.gartner.com/en/newsroom/press-releases/2020-07-23-gartner-forecasts-worldwide-public-cloud-revenue-to-grow-6point3-percent-in-2020.
51. Ibid.
52. "Amazon, Microsoft, Google and Alibaba Strengthen their Grip on the Public Cloud Market" (Synergy Research Group Report, October 29, 2019), https://www.srgresearch.com/articles/amazon-microsoft-google-and-alibaba-strengthen-their-grip-public-cloud-market.
53. "Gartner Forecasts Worldwide Public Cloud Revenue to Grow 6.3% in 2020."
54. "Amazon, Microsoft, Google and Alibaba Strengthen their Grip on the Public Cloud Market."
55. Ibid.
56. Ibid.
57. "Cloud Market Growth Rate Nudges Up as Amazon and Microsoft Solidify Leadership" (Synergy Research Group Report, October 29, 2019), https://www.srgresearch.com/articles/cloud-market-growth-rate-nudges-amazon-and-microsoft-solidify-leadership.
58. Raj Bala, Bob Gill, Dennis Smith, David Wright, and Kevin Ji, "Magic Quadrant for Cloud Infrastructure and Platform Services" (Gartner report, September 1, 2020), https://www.gartner.com/doc/reprints?id=1-242R58F3&ct=200902&st=sb.
59. Ibid.
60. Poon, "AWS China hopes to benefit from China's 'dual circulation' strategy."
61. Bala et al, "Magic Quadrant for Cloud Infrastructure and Platform Services."
62. In the quarter ended September. Jane Zhang and Minghe Hu, "Alibaba says its cloud computing business holds tremendous potential as China picks up pace on digitalisation drive," *South China Morning Post,* February 3, 2021, https://www.scmp.com/tech/big-tech/article/3120289/alibaba-says-its-cloud-computing-business-holds-tremendous-potential.
63. "Alibaba Cloud's Global Infrastructure," Alibaba website, https://www.alibabacloud.com/global-locations.
64. Bala et al, "Magic Quadrant for Cloud Infrastructure and Platform Services."
65. Larry Dignan, "Alibaba Cloud nears profitability as customers move from IaaS into AI, data analytics workloads," *ZDNet,* October 1, 2020, https://www.zdnet.com/article/alibaba-cloud-nears-profitability-as-customers-move-from-iaas-into-ai-data-analytics-workloads/.
66. "Tencent Cloud Global Infrastructure," Tencent Cloud website, https://intl.cloud.tencent.com/global-infrastructure.
67. Bala et al, "Magic Quadrant for Cloud Infrastructure and Platform Services."
68. Hannah Reale, "Tencent's Game," *The Wire China,* March 28, 2021, https://www.thewirechina.com/2021/03/28/tencents-game/.
69. Nigel Cory, "Testimony to the U.S. Senate Subcommittee on Trade Regarding Censorship as a Non-Tariff Barrier to Trade" (ITIF, June 30, 2020), https://itif.org/publications/2020/06/30/testimony-us-senate-subcommittee-

trade-regarding-censorship-non-tariff; James Griffith, "China just blocked Amazon's streaming service Twitch," *CNN Business,* September 21, 2018, https://money.cnn.com/2018/09/21/technology/twitch-china-blocked-amazon/index.html#:~:text=The%20world's%20most%20popular%20service,iOS%20App%20Store%20in%20China.

70. Zheping Huang and Vlad Savov, "Tencent's Twitch Streaming Rival Is Hiding in Plain Sight," *Bloomberg,* June 26, 2020, https://www.bloomberg.com/news/articles/2020-06-26/tencent-tests-livestreaming-rival-to-amazon-s-twitch-in-the-u-s.

71. Sharmila Ganapathy-Wallace, "Alibaba Cloud trains its sights on Southeast Asia," *Digital News Asia,* September 28, 2017, https://www.digitalnewsasia.com/digital-economy/alibaba-cloud-trains-its-sights-southeast-asia.

72. For further details on the depth and breadth of this competition, see: "Chinese and US tech giants go at it in emerging markets," *The Economist,* July 7, 2018, https://www.economist.com/business/2018/07/07/chinese-and-us-tech-giants-go-at-it-in-emerging-markets; Aradhana Aravindan, "Singapore slings? Taking on Alibaba, Amazon launches Prime Now in the city state," *Reuters,* July 27, 2017, https://www.reuters.com/article/us-amazon-singapore-idUSKBN1AC03K; Resty Woro Yuniar, "Can China's Alipay, WeChat cash in as Indonesia embraces QR codes?," *South China Morning Post,* December 31, 2018, https://www.scmp.com/week-asia/economics/article/2179906/can-chinas-alipay-wechat-cash-indonesia-embraces-qr-codes; "Here's How Chinese Tech Giants Including Tencent And Ant Financial Are Plowing Into Southeast Asia" (CB Insights Research Brief, August 16, 2017), https://www.cbinsights.com/research/alibaba-tencent-ant-southeast-asia/.

73. Surabhi Agarwal, "Alibaba cloud sees a bright lining in data localization," *The Economic Times,* November 1, 2018, https://economictimes.indiatimes.com/tech/internet/alibaba-cloud-sees-a-bright-lining-in-data-localisation/articleshow/66454149.cms?from=mdr.

74. R. Dinakaran, "Alibaba ready to comply with Govt policy on data localization," *Business Line,* September 19, 2018, https://www.thehindubusinessline.com/info-tech/alibaba-ready-to-comply-with-govt-policy-on-data-localisation/article24987381.ece; Mugdha Variyar, "Alibaba backs data localisation in India; looks to grow its cloud presence," *The Economic Times,* September 19, 2018, https://economictimes.indiatimes.com/internet/alibaba-backs-data-localisation-in-india/articleshow/65869783.cms.

75. Nigel Cory, "Cross-Border Data Flows: Where Are the Barriers, and What Do They Cost?" (ITIF, May 1, 2017), https://itif.org/publications/2017/05/01/cross-border-data-flows-where-are-barriers-and-what-do-they-cost; Nigel Cory and Ellysse Dick, "How to Build Back Better the Transatlantic Data Relationship" (ITIF, March 25, 2021), https://itif.org/publications/2021/03/25/how-build-back-better-transatlantic-data-relationship.

76. Isedua Oribhabor and Peter Micek, "The what, why, and who of transparency reporting," Access Now blog post, April 2, 2020, https://www.accessnow.org/the-what-why-and-who-of-transparency-reporting/.

77. "Alibaba Cloud denies report on data theft of Indian users," *ETCIO.com,* September 18, 2020, https://cio.economictimes.indiatimes.com/news/digital-security/alibaba-cloud-denies-report-on-data-theft-of-indian-users/78183045.

78. "Zhang Gaoli Attends and Addresses the Opening Ceremony of China-ASEAN Expo," Ministry of Foreign Affairs of the People's Republic of China, September, 13, 2017, https://www.fmprc.gov.cn/mfa_eng/zxxx_662805/t1493010.shtml.

79. Robert Greene and Paul Triolo, "Will China Control the Global Internet Via its Digital Silk Road?" (Carnegie Endowment for International Peace, May 8, 2020), https://carnegieendowment.org/2020/05/08/will-china-control-global-internet-via-its-digital-silk-road-pub-81857; "The Digital Silk Road: Expanding China's Digital Footprint" (Eurasia Group report, April 8, 2020), https://www.eurasiagroup.net/files/upload/Digital-Silk-Road-Expanding-China-Digital-Footprint-1.pdf.

80. Greene and Triolo, "Will China Control the Global Internet Via its Digital Silk Road?"

81. Ibid.

82. Executive Office of the President National Science and Technology Council Advanced Manufacturing National Program Office, "National Network for Manufacturing Innovation Program: Annual Report" (Executive Office of the President, February 2016), https://www.manufacturing.gov/files/2016/02/2015- NNMI-Annual-Report.pdf.

83. For a review of studies, see Michelle A. Wein and Stephen J. Ezell, "How to Craft an Innovation Maximizing T-TIP Agreement" (ITIF, October 2013), http://www2.itif.org/2013-innovation-maximizing-ttip-agreement.pdf.

84. Laura DiDio, "The Critical Role of High-Tech R&D in the COVID-19 Era," *Tech News World,* January 12, 2021, https://www.technewsworld.com/story/86977.html.

85. Sundar Pichai, "Investing in America in 2021," Google blog post, March 18, 2021, https://blog.google/inside-google/company-announcements/investing-america-2021/.

86. "Google Economic Impact," https://economicimpact.google.com/.

87. DiDio, "The Critical Role of High-Tech R&D in the COVID-19 Era."

88. "China issues 2020 list of top 500 enterprises," *China Daily,* September 28, 2020, https://www.chinadaily.com.cn/a/202009/28/WS5f71991ea31024ad0ba7c659.html.

89. DiDio, "The Critical Role of High-Tech R&D in the COVID-19 Era."

90. "Recent patent trends in cloud computing," IPlytics blog post, November 22, 2018, https://www.iplytics.com/general/recent-patent-trends-cloud-computing/.

91. Louis Columbus, "The Most Innovative Tech Companies Based On Patent Analytics," Blog post, A Passion for Research, December 22, 2019, https://softwarestrategiesblog.com/2019/12/22/the-most-innovative-tech-companies-based-on-patent-analytics/.

92. Matthew Wilson, "Cloud computing patents a major part of another record-breaking year for IBM," IBM, blog post, January 8, 2019, https://www.ibm.com/blogs/cloud-computing/2019/01/08/cloud-patents-ibm-2018/.

93. "Recent patent trends in cloud computing," IPlytics blog post.

94. Roxanne Heston and Remco Zwetsloot, "Mapping U.S. Multinationals' Global AI R&D Activity" (CSET, December, 2020), https://cset.georgetown.edu/research/mapping-u-s-multinationals-global-ai-rd-activity/.

95. Ibid.

96. Ibid.

97. Robert D. Atkinson, "Limiting L-1 Visas: How to Harm America's Business Climate and Kill Jobs," Innovation Files blog post, June 18, 2020, https://itif.org/publications/2020/06/18/limiting-l-1-visas-how-harm-americas-business-climate-and-kill-jobs; Adams Nager, "Worried About Foreign H-1B Hirers? Award More Visas!," Innovation Files blog post, March 31, 2016, https://itif.org/publications/2016/03/31/worried-about-foreign-h-1b-hirers-award-more-visas.

98. For cloud services: Amazon's and Microsoft's Infrastructure as a Service (IaaS) market shares in China are compared to their market shares in the overall Asia Pacific region, estimating the revenues each company would earn if they held their regional market share within China. Additionally, the Chinese market is subtracted from the Asia Pacific region to estimate the market share each company holds in the rest of the region, which are once again substituted for the Chinese market shares; China Internet Watch, "Alibaba Cloud owns 43% China's public cloud market in 2018," February 12, 2019, https://www.chinainternetwatch.com/28150/public-cloud-h1-2018/;; China Internet Watch, "China public cloud (IaaS) to reach US$6.21 bn in 2018; Amazon fastest growth," October 10, 2018, https://www.chinainternetwatch.com/26900/public-cloud-iaas-2018/; Business Wire, "Alibaba Cloud Ranked First in Asia Pacific(*) by Gartner Market Share: IT Services in IaaS and IUS," April 24, 2019, https://www.businesswire.com/news/home/20190424005371/en/; IDC, "New IDC Forecast Reveals Asia/Pacific* Spending on Public Cloud Services to Reach USD 76.1 Billion by 2023," August 7, 2019, https://www.idc.com/getdoc.jsp?containerId=prAP45431219.

99. The tables in the appendix summarize the results estimating the revenues of U.S. cloud companies in China in different scenarios and provide estimates of cumulative losses. The high and low assumptions for each are different. For cloud, we assume cloud companies receive the market share equivalent to the average in the Asia Pacific region including China, and then receiving the market share equivalent to the regional average excluding China.

100. Industry source; "GDS American Depository Shares notice," https://investors.gds-services.com/node/8261/html.

101. Peter Judge, "ChinData IPO raises $540m, values company at $4.9bn," *Data Center Dynamics*, October 1, 2020, https://www.datacenterdynamics.com/en/news/chindata-ipo-raises-540m-values-company-49bn/.

102. Bain Capital acquired Xiamen Qinhaui Techology and merged it with their existing company Bridge Data Centres to form ChinData.

103. Yoko Kubota and Lingling Wei, "China Sweetens Its Cloud-Computing Offer in U.S. Trade Talks," *Wall Street Journal,* April 11, 2019, https://www.wsj.com/articles/china-sweetens-its-cloud-offer-in-u-s-trade-talks-11554976562?mod=article_inline.

104. Ibid.

105. Ibid.

106. See page 6-3. "Economic and Trade Agreement Between the Government of the United States of America and the Government of the People's Republic of China," USTR website, https://ustr.gov/sites/default/files/files/agreements/phase%20one%20agreement/Economic_And_Trade_Agreement_Between_The_United_States_And_China_Text.pdf.

107. Ibid. See page 6-23. Each of these categories are taken form the U.S. Department of Commerce's Bureau of Economic Analysis (BEA) table 2.3 on "U.S. trade in services, by country of affiliation and by type of service, with one exception. The BEA category for data hosting, processing, and related services is from BEA table 4.1 on "U.S. services supplied to foreign persons by U.S. multinational enterprises through their majority-owned foreign affiliates, by industry of affiliate and by country of affiliate."

108. Ibid.

109. Ibid.

110. "EU-China Comprehensive Agreement on Investment," presentation, European Commission, Directorate General for Trade, January 21, 2021, https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159480.pdf; "EU-China Comprehensive Agreement on Investment: Negotiations: Schedule of China," https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159483.pdf.

111. Mainly, that China committing to allowing 50 percent equity caps is new (it isn't). This is what foreign cloud providers are already subject to. Furthermore, the deal does nothing about the use of restrictive and selective licensing arrangements.

112. "Key elements of the EU-China Comprehensive Agreement on Investment," press release, December 30, 2020, https://ec.europa.eu/commission/presscorner/detail/en/ip_20_2542.

113. For specific language, see Annex I, Entry 12(3). 2. In the case of an EU investor investing in internet data center service (including content delivery network service), the shareholding percentage of foreign investors may not exceed 50%. 3. In the case of an EU investor investing in international communication facility service, satellite communication service, cluster communication service, network access facilities service, network trusteeship service, domestic communication facilities service, fixed communication service, cellular mobile communication service, data communication service or IP telephone service, the shareholding percentage of foreign investors may not exceed 49% (the foregoing services may be provided on the basis of facilities). In the case of an EU investor investing in online data processing and transaction processing services (E-commerce not included), domestic internet virtual private network services and code and protocol conversion services, the shareholding percentage of foreign investors may not exceed. "EU-China Comprehensive Agreement on Investment: Negotiations: Schedule of China," https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159483.pdf.

114. Ibid. China's committed to update its special measures for market access of foreign investments (its negative list). Negotiators' Note: Before signature of the Agreement and during the legal scrubbing China will update the reference to Special Administrative Measures for Market Access of Foreign Investment (Negative List) (2019 Edition) in this Schedule in the light of its latest edition.

115. "EU-China Comprehensive Agreement on Investment: Negotiations: Schedule of China," https://trade.ec.europa.eu/doclib/docs/2021/march/tradoc_159483.pdf.

116. "(WT/MIN(17)/60) Joint Statement on E-commerce," World Trade Organization, December 13, 2017, https://docs.wto.org/dol2fe/Pages/SS/directdoc.aspx?filename=q:/WT/MIN17/60.pdf&Open=True.

117. [Twitter thread] "@nigelcory: RCEP is China's first argmt with data flow rules, but it's largely symbolic & meaningless. Less than GATS - not enforceable. Must be read with China's restrictive, control-focused approach to data gov & natsec. Thread on EU/WTO/ASEAN/CPTPP/USMCA/DEPA 1/9," November 17, 2020, https://twitter.com/nigelcory/status/1328357984573984768.

118. Communication from the People's Republic of China and Pakistan, "(JOB/GC/110/Rev.1, JOB/CTG/2/Rev.1) Work Programme on Electronic Commerce Aiming at the 11th Ministerial Conference," November 16, 2016.

119. "Business and Tech Groups Release Priorities for WTO E-Commerce Meetings," press release, IT Industry Council, July 16, 2018, https://www.itic.org/news-events/news-releases/business-and-tech-groups-release-priorities-for-wto-e-commerce-meetings.

120. Communication from Canada, Chile, Colombia, Côte d'Ivoire, the European Union, the Republic of Korea, Mexico, the Republic of Moldova, Montenegro, Paraguay, Singapore and Turkey, "Work Programme on Electronic Commerce: Trade Policy, the WTO, and the Digital Economy," World Trade Organization, August 1, 2016, https://docs.wto.org/dol2fe/Pages/FE_Search/FE_S_S009-DP.aspx?language=E&CatalogueIdList=236954,236782,233802&CurrentCatalogueIdIndex=1&FullTextHash=371857150&HasEnglishRecord=True&HasFrenchRecord=True&HasSpanishRecord=True.

121. Cory, "Why China Should Be Disqualified From Participating in WTO Negotiations on Digital Trade Rules."

122. Samm Sacks, Mingli Shi, and Graham Webster, "The Evolution of China's Data Governance Regime: A Timeline," DigiChina blog post, February 8, 2019, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/china-data-governance-regime-timeline/; Samm Sacks, Qiheng Chen, and Graham Webster, "Five Important Takeaways From China's Draft Data Security Law," DigiChina blog post, July 9, 2020, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/five-important-take-aways-chinas-draft-data-security-law/; Mingli Shi, "China's Draft Privacy Law Both Builds On and Complicates Its Data Governance," DigiChina, December 14, 2020, https://www.newamerica.org/cybersecurity-initiative/digichina/blog/chinas-draft-privacy-law-both-builds-on-and-complicates-its-data-governance/.

123. The cybersecurity law targets critical information infrastructure (CII) operators. The lack of a clear definition for CII operators means that it has been interpreted as a broad data localization requirement.

124. "Xi Jinping delivers a speech at the 2020 China International Trade in Services Fair Global Service Trade Summit," Xinhua, September 4, 2020, http://www.xinhuanet.com/politics/leaders/2020-09/04/c_1126454690.htm.

125. Translated.

126. [translated] China's Ministry of Commerce, "General Plan for Comprehensively Deepening the Pilot Program of Innovative Development of Trade in Services," December 31, 2020, http://images.mofcom.gov.cn/fms/202008/20200814092010526.pdf.

127. [Translated] China's Ministry of Commerce, "Comprehensively deepen pilot projects, specific measures, and division of responsibilities for the innovative development of trade in services," August 20, 2020, http://images.mofcom.gov.cn/fms/202008/20200814092010665.pdf.

128. Ibid.

129. [Translated] "State Council on Deepening the New Round of Service Industries in Beijing, expand opening up, comprehensive pilot projects, building national service industry, expand opening up the comprehensive demonstration zone work plan," September 7, 2020, http://www.gov.cn/zhengce/content/2020-09/07/content_5541291.htm.

130. [Translated] Zhu Kai, "Shanghai port to accelerate the creation of a new generation of information and communication hub," *Securities Times*, April 21, 2020, https://m.hexun.com/economy/2020-04-21/201091874.html.

131. [Translated] "The Central Committee of the Communist Party of China and the State Council issued the "Overall Plan for the Construction of Hainan Free Trade Port,"" China's Ministry of Justice, June 1, 2020, http://www.moj.gov.cn/news/content/2020-06/01/xxtt_3249859.html.

132. [Translated]: "The General Office of the Central Committee of the Communist Party of China and the General Office of the State Council issued the "Implementation Plan for the Pilot Comprehensive Reform of Building a Pilot Demonstration Zone of Socialism with Chinese Characteristics in Shenzhen (2020-2025)," October 11, 2020, http://www.gov.cn/zhengce/2020-10/11/content_5550408.htm.

133. "Full Text: Xi Jinping's keynote speech at the World Economic Forum," April 6, 2017, http://www.china.org.cn/node_7247529/content_40569136.htm.

134. Cory and Atkinson, "Why and How to Mount a Strong, Trilateral Response to China's Innovation Mercantilism"; Nigel Cory, Robert D. Atkinson, and Stephen Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation" (The Information Technology and Innovation Foundation, March, 2017), http://www2.itif.org/2017-stopping-china-mercantilism.pdf.

135. Lingling Wei and Bob Davis, "U.S. Trade Negotiators Take Aim at China's Cybersecurity Law," *Wall Street Journal,* March 29, 2019, https://www.wsj.com/articles/u-s-trade-negotiators-take-aim-at-chinas-cybersecurity-law-11553867916?mod=article_inline.

136. The multi-level protection scheme (MLPS) is a security certification regime that the Chinese government established in 2007. In 2018, China's Ministry of Public Security (MPS) released a draft of a new version (referred to as MLPS 2.0). The draft regulation updates the original MLPS regime based on the new principles set out in the 2017 Cybersecurity Law. MLPS ranks from 1 to 5 all information and communications technology systems based on their importance to national security, with Level 5 deemed the most sensitive.

137. "The term [IaaS] means any product or service offered to a consumer, including complimentary or 'trial' offerings, that provides processing, storage, networks, or other fundamental computing resources, and with which the consumer is able to deploy and run software that is not predefined, including operating systems and applications," Chris Duckett, "Trump decrees American cloud providers need to maintain records on foreign clients," *ZDNet,* January 20, 2021, https://www.zdnet.com/article/trump-decrees-american-cloud-providers-need-to-maintain-records-on-foreign-clients/.

138. Steve Overly and Eric Geller, "White House drafts executive order that could restrict global cloud computing companies," *Politico,* December 4, 2020, https://www.scmp.com/news/world/united-states-canada/article/3112722/white-house-drafts-executive-order-could-restrict.

139. Richi Jennings, "Trump Hates Cloud, Because China Cyber?" Security Boulevard blog post, January 21, 2021, https://securityboulevard.com/2021/01/trump-hates-cloud-because-china-cyber/; Duckett, "Trump decrees American cloud providers need to maintain records on foreign clients."

140. Overly and Geller, "White House drafts executive order that could restrict global cloud computing companies."

141. See: Nigel Cory, Robert D. Atkinson, and Daniel Castro, "Principles and Policies for "Data Free Flow With Trust" (ITIF, May 27, 2019), https://itif.org/publications/2019/05/27/principles-and-policies-data-free-flow-trust.

142. Ralph Ossa, "A New Trade Theory of GATT/WTO Negotiations," WTO Working Paper, February 2, 2009, https://www.wto.org/english/res_e/reser_e/ersd200908_e.pdf.

143. Stephen J. Ezell, "Tariffs Won't Stop China's Mercantilism. Here Are 10 Alternatives," *Real Clear Policy*, April 23, 2018, https://www.realclearpolicy.com/articles/2018/04/23/tariffs_wont_stop_chinas_mercantilism_here_are_10_alternatives_110605.html; Jennifer Hillman, "Testimony Before the U.S.-China Economic and Review Security Commission: Hearing on U.S. Tools to Address Chinese Market Distortions," June 8, 2018, 10, https://www.uscc.gov/sites/default/files/Hillman%20Testimony%20US%20China%20Comm%20w%20Appendix%20A.pdf?mod=article_inline.

144. Hillman, "Hearing on U.S. Tools to Address Chinese Market Distortions," 6.

145. Atkinson, Cory, and Ezell, "Stopping China's Mercantilism: A Doctrine of Constructive, Alliance-Backed Confrontation," 4.

146. Senator Marco Rubio, "Rubio, Young, Merkley, Coons Legislation Calls for Global Economic Security Strategy," news release, November 12, 2019, https://www.rubio.senate.gov/public/index.cfm/2019/11/rubio-young-merkley-coons-legislation-calls-for-global-economic-security-strategy; Congress.gov, "S. 2826: The Global Economic Security Strategy of 2019 Act," https://www.congress.gov/116/bills/s2826/BILLS-116s2826is.pdf.

147. United States Trade Representative (USTR), *Section 301 Report into China's Acts, Policies, and Practices Related to Technology Transfer, Intellectual Property, and Innovation* (Washington, D.C: USTR, March 22, 2018), https://ustr.gov/sites/default/files/Section%20301%20FINAL.PDF.

148. United States Trade Representative (USTR), *2021 Trade Policy Agenda and 2020 Annual Report of the President of the United States* (Washington, D.C: USTR, March, 2021), https://ustr.gov/sites/default/files/files/reports/2021/2021%20Trade%20Agenda/Online%20PDF%202021%20Trade%20Policy%20Agenda%20and%202020%20Annual%20Report.pdf; United States Trade Representative, Fact Sheet on the 2020 National Trade Estimate: Strong, Binding Rules to Advance Digital Trade," March 2020, https://ustr.gov/about-us/policy-offices/press-office/fact-sheets/2020/march/fact-sheet-2020-national-trade-estimate-strong-binding-rules-advance-digital-trade.

149. USTR's WTO dispute about China's restrictive licensing regime and its forced tech transfers did not target China's use of licenses in the cloud sector. In 2018 USTR initiated a WTO dispute settlement in regards to some of China's restrictive licensing regime, but not those used in the cloud sector, but ultimately it decided to suspend

it in June 2019. China—Certain Measures Concerning the Protection of Intellectual Property Rights (DS542), https://www.wto.org/english/tratop_e/dispu_e/cases_e/ds542_e.htm.

150. United States Trade Representative, *2021 Trade Policy Agenda and 2020 Annual Report of the President of the United States* (Washington, D.C: USTR, March, 2021), https://ustr.gov/sites/default/files/files/reports/2021/2021%20Trade%20Agenda/Online%20PDF%202021%20Trade%20Policy%20Agenda%20and%202020%20Annual%20Report.pdf.

151. Cory and Robert D. Atkinson, "Why and How to Mount a Strong, Trilateral Response to China's Innovation Mercantilism."

152. See Albert Hirschman, *National Power and the Structure of Foreign Trade* (Los Angeles, CA: University of California Press, 1945).

153. United States Trade Representative (USTR), *2020 Trade Policy Agenda and 2019 Annual Report* (Washington, D.C: USTR, February 28, 2020), https://ustr.gov/sites/default/files/2020_Trade_Policy_Agenda_and_2019_Annual_Report.pdf.

154. Robert Atkinson, "A U.S. Grand Strategy for the Global Digital Economy" (ITIF, January 19, 2021), https://itif.org/publications/2021/01/19/us-grand-strategy-global-digital-economy.

155. China Internet Watch, "Alibaba Cloud owns 43% China's public cloud market in 2018," February 12, 2019, https://www.chinainternetwatch.com/28150/public-cloud-h1-2018/; China Internet Watch, "China public cloud (IaaS) to reach US$6.21 bn in 2018; Amazon fastest growth," October 10, 2018, https://www.chinainternetwatch.com/26900/public-cloud-iaas-2018/; Business Wire, "Alibaba Cloud Ranked First in Asia Pacific(*) by Gartner Market Share: IT Services in IaaS and IUS," April 24, 2019, https://www.businesswire.com/news/home/20190424005371/en/; IDC, "New IDC Forecast Reveals Asia/Pacific* Spending on Public Cloud Services to Reach USD 76.1 Billion by 2023," August 7, 2019, https://www.idc.com/getdoc.jsp?containerId=prAP45431219.

156. Nigel Cory, "Testimony to the U.S. Senate Subcommittee on Trade Regarding Censorship as a Non-Tariff Barrier to Trade" (ITIF, June 30, 2020), https://itif.org/publications/2020/06/30/testimony-us-senate-subcommittee-trade-regarding-censorship-non-tariff.

OPENING STATEMENT OF JASON KELLY, CO-FOUNDER AND CEO, GINKGO BIOWORKS

VICE CHAIRMAN CLEVELAND: Thank you very much. Dr. Kelly?

DR. KELLY: Hi there. I'm Jason Kelly.

VICE CHAIRMAN CLEVELAND: If you could turn your microphone on.

DR. KELLY: All right Commissioners. So, I'm Jason Kelly. I'm one of the cofounders and the CEO at Ginkgo Bioworks.

We're here today to talk about synthetic biology. Which unlike cloud computing, I think, is a less well-known technical area.

So, I'll give you a little bit of an introduction to the technology before moving in on what I think are some of the key strategic implications as we scale up here in the U.S.

So, the idea behind synthetic biology is we can program cells like we program computers, because they run on digital code in the form of DNA.

And As, Ts, Cs, and Gs, not zeros and ones, but you can read it with technology DNA sequencing. Like you might have heard of the Human Genome Project, that sort of technology.

And you can write it with DNA synthesis or DNA printing. And the idea is if you can read and write code, and you have a machine that will run it, that's programming.

And so the analogy I'll ask you to lean on is to think of it like programming computers. And think of how the technology played out in the computing industry where you had horizontal technology platforms, operating systems, programming languages, processors, that cut across all markets.

And you also had an enormous centralization of that technology. And the reason was, the code was common.

In other words, you didn't use different code, different tools to program for medicine or agriculture, right. You used the same tools, you know, media and finance for programming computers.

And so the same thing we believe will happen in synthetic biology. You're going to have a common set of horizontal platform tools to program biology, and a small number of companies and technologies that consolidate that.

And that, those winners in that space are happening right now. And so we'll talk a little bit about the technologies to read and write DNA, and why that's happening.

But, I wanted to land that idea. So, let me give you an example of what you would program a cell to do. So, I'll start in the consumer sector.

So, have you ever had an Impossible Burger by any chance? Like a, like a -- oh yeah. So, it's a veggie -- I'm not a vegetarian, right.

So, if you bite into an Impossible Burger, it's a veggie burger that bleeds. Okay, interesting. There's not a lot of blood in plants.

And so what Impossible has done, they've taken the gene for hemoglobin. So they've read the DNA in cows and other animals.

They found the part of the code that encodes for hemoglobin. They go on a computer, they type ATCGGG. They hit print.

Out comes that piece of DNA, just as ordered. You open the genome of a yeast cell, like a brewer's yeast, like you'd use to make beer. You put that heme in, gene.

And then when you brew it up, instead of beer coming out, hemoglobin comes out. And you add that back into a veggie burger, and suddenly it smells right, it tastes right, it doesn't taste

quite like cardboard, and it's the Impossible Whopper at Burger King now.

That is a consumer facing program enabled by synthetic biology. The other example, I probably don't need to give you much background on this one, would be the mRNA vaccines that are getting put in your arms right now.

Okay, that is a piece of code that your cells are reading, executing, making a little protein and showing it's your immune system so that if COVID shows up, your immune system is ready for it.

Okay. That is another example. But, I'll point out the tools that support both those applications are the same. Okay?

And so, one of the things I want to put on your radar around DNA reading for example, is the leading company in this space, a company called Illumina, out in San Diego. They're sort of the market champion.

There's a company in China called Beijing Genomics. And Beijing Genomics actually acquired a company called Complete Genomics here in the U.S., I guess back in 2012 after getting a substantial loan, about a $1.5 billion loan from the Chinese government to support that acquisition.

And they've been stood up as essentially a national champion in the area of genomics, okay. And again, I think it's a recognition of how key it is to be able to read the DNA code out in the world.

Much less well understood, is what's happening with DNA writing. And so as I was mentioned, you can go on that computer and hit ATCG, you hit print.

The leading company in this space, a company called Twist Bioscience is out in California. You are seeing a lot of investment happening in this area, and the costs are falling.

So, if you look at the cost to read a human genome, that went from $100 million for the first human genome back in 2000. You can get machines today at Illumina that will read a human genome for $300 to $400.

Beijing Genomics just announced, in a paper earlier last year, that said they can read a human genome for $100. So, you've seen a million fold cost reduction in this technology that's far faster then you've seen even in the improvement rate of computers.

On the writing side, we've gone from probably, back when I was in grad school, you were paying, you know, at the beginning maybe like $10 per letter of DNA.

Today it's sort of a pennies per letter of DNA. Okay. And so we are seeing exponential improvement in these technologies.

The last technology I'll put on your radar is what we call foundries. And the idea here is, if you were writing computer code, you would put new code into a computer and a debugger would pop up.

It would tell you kind of what's broken in your code. And you'd make some changes, and do it again.

So, when you engineer cells, similarly we need to debug that code. So, we need to test the cells and see, hey, I made a change to the genome. What's the effect of that change?

And that's being done in these highly automated facilities now. Like we have one at Ginkgo Bioworks up in Boston, about 200 thousand square feet of robotics doing the kind of work I did back when I was doing my PhD at MIT, except now it all happens in an automated setting.

And the important distinction, is automation drives scale effects. So, the more of that work that happens in one place, the less expensive it gets. Scale effects drive centralization.

And so, all of these technologies, reading, and writing DNA and debugging the code, are all in this modern era of biotechnology, really in the last ten years, are now subject to substantial scale effects that are going to lead to consolidation in those industries and important tech platforms, like we saw in computers.

Except, computers move information. It's a programmable machine that moves bits. And so what did it impact? You know, it impacted media, and finance, and communications.

Cells are programmable machines. They don't move bits. They move atoms. And so if you think about the technologies, the markets that are going to be impacted by our ability to program cells by computer, it's all the physical goods markets.

It's food, it's medicine, it's building materials. It's all the stuff around us. In my opinion, it's far more impactful.

DNA code will be more important to the United States then computer code. And so we should be very thoughtful about how we approach this.

And so, I'd like to give a couple of recommendations. Number one, I think we need to be very careful that the technology providers in the U.S. can serve the entire globe.

In other words, scale matters here. So, we should be careful not to wi -- hold the technology back.

Secondly, we're in a unique moment with COVID-19 where global bio-security can be built out in the next 12 months. In other words, there's lots of countries still living with this.

The U.S. should be pushing our technology out to the world to help other countries get out from under this pandemic. That is an enormous opportunity to drive scale on the U.S. technology platforms in synthetic biology. We should not miss it.

And then finally, I think the U.S. needs to lead, like we did back in semiconductors, where the U.S. government in the '50s supported the technology through, you know, our investment in defense and otherwise, on pushing it. That needs to happen in synthetic biology as well.

There are opportunities for national programs like the Human Genome Project back in 2000, which set us on the track to have Illumina and the leading technology today. We need to do similar things for writing DNA.

So, thank you very much for your time, and appreciate questions.

PREPARED STATEMENT OF JASON KELLY, CO-FOUNDER AND CEO, GINKGO BIOWORKS

Testimony of Jason Kelly
Co-Founder and CEO of Ginkgo Bioworks, Inc.

Before the

U.S.-China Economic and Security Review Commission
Hearing on "An Assessment of the CCP's Economic Ambitions, Plans and Metrics of Success"
Panel IV: Policies and Planning for Emerging Industries: New Mobility, Cloud Computing, and Synthetic Biology
April 15, 2021

Vice Chairman Cleveland, Commissioner Wessel, members of the commission, thank you for inviting me to speak here today on the strategic importance of synthetic biology to the economy and to international competition.

I am the Co-Founder and CEO of Ginkgo Bioworks, a Boston-based cell programming company with over 500 employees that is currently valued at over $4 billion. Ginkgo was founded in 2008, when three of my PhD classmates, one professor, and I left MIT with the mission of making biology easier to engineer. We have dedicated our professional lives and nearly $1B of private capital investment towards building the infrastructure, automation, software, and knowledge that today allows us to program cells like we program computers. Our products and customers span the entire economy, from microbial fertilizers with Bayer Crop Science to new antibiotics with Roche to sustainable materials with Genomatica. We believe that there are endless possibilities for biotechnologies to positively impact all aspects of the economy. Now is the time for sustained investment and strong leadership to ensure the growth of a robust and inclusive bioeconomy that benefits the public interest.

COVID has exemplified the importance of investment in the bioeconomy. At the beginning of the pandemic, Ginkgo donated $25M worth of access to our platform to partners working to make vaccines, therapeutics, and diagnostics. Our two biggest initiatives were around nucleic acid vaccine manufacturing, where we partnered with Moderna and others to optimize the production of key raw materials, and testing. We pivoted much of our platform capacity to the development of low cost, highly-scalable COVID-19 testing which we implemented in classrooms across the country to help enable K-12 schools from rural Massachusetts to Baltimore to Milwaukee reopen and stay open.

All of Ginkgo's COVID-19 responses are unprecedented in our company's history. Nonetheless, we have been able to contribute to ending this pandemic precisely because the powerful synthetic biology platform we have created was designed to support *all* bioeconomy applications, in the same way that a cell phone or desktop computer can run any app. Unlike so many of our national resources constructed to respond to a single type of threat, our platform can be applied to a wide array of challenges we may face—in traditional "biology" or "medical" applications, and beyond.

Your questions about the role of synthetic biology in the global economy get at the heart of what I consider to be a critical issue for the United States. Whoever leads the bioeconomy will

not only have a huge advantage in making their supply chains robust and sustainable, but also will lead the world in pandemic prevention and response infrastructure.

Q1: Role of synthetic biology in China's future growth
China has recognized the transformative potential of synthetic biology, and is strategically investing in basic research, key technologies, and workforce development. In 2020, China spent twice as much as the US did on synthetic biology R&D.[1][2] Earlier this year, the Chinese State Development and Investment Corp (SDIC) made a huge investment in the private company BGI, formerly Beijing Genomics Institute, the most significant competitor to U.S.DNA sequencing companies.[3] Finally, for the last several years China has dedicated significant resources towards attracting foreign scientists to set up their laboratories in China, including through the Thousand Talents Plan.[4]

Q2: CCP's access to and collection of data around the globe
Genetic sequencing is a foundational technology of synthetic biology. Access to both human and non-human genetic data has large ethical and economic implications. The CCP and BGI have increased China's access to this information through the donation of equipment as a kind of extension of diplomacy.[5]

Q3: The significance of the CCP's efforts to collect non-human genetic data in the wake of COVID-19
Non-human genetic data is the raw material of the bioeconomy. DNA sequences from plants, animals, fungi, and bacteria are incredibly valuable for cell programming because they contain instructions on how to make an unimaginable number of molecules and structures. Biotech companies have been commercializing products based off of these wildtype sequences for decades, and we will see the number of these products grow exponentially as sequencing costs continue to fall and our DNA programming capabilities become more advanced.

Given the incredible value of DNA sequences, a multilateral system for equitable accessing and benefiting from these sequences is essential, rather than systems that enable individual countries to control and limit access to large resources. The US excels at developing open technical ecosystems that become international standards such as many of the technologies enabling personal computers, the internet, and mobile phones. We should take the lead in developing similar international standards for hosting and sharing non-human DNA sequences.

---

[1] https://www.cnbc.com/2021/03/01/chinas-spending-on-rd-hits-a-record-378-billion.html

[2] https://fas.org/sgp/crs/misc/R46341.pdf

[3] https://www.reuters.com/article/us-china-genomics-state/chinese-state-fund-invests-in-gene-firm-bgi-idUSKBN2AM0AT

[4] https://www.npr.org/sections/health-shots/2018/11/27/669645323/china-expands-research-funding-luring-u-s-scientists-and-students

[5] https://www.reuters.com/article/us-health-coronavirus-bgi-specialreport/special-report-covid-opens-new-doors-for-chinas-gene-giant-idUSKCN2511CE

Q4: The state's approach in directing this sector, and the implications for U.S. businesses and workers
U.S. businesses will be at a significant disadvantage if our government does not prioritize synthetic biology as thoroughly as China has. If we do not increase our R&D efforts, the timeline from idea to commercialization will continue to be too long and cause many businesses to fail despite having amazing potential. If we do not better support companies supplying core technologies, like DNA synthesis, it will be challenging for these businesses to remain in the U.S. Finally, if we do not make a concerted effort to increase the number of people trained in this field and compelled to remain in the country after their training, our industry will be limited by the size of our workforce.

Q5: The Commission is mandated to make policy recommendations to Congress based on its hearings and other research. What are your recommendations for Congressional action related to the topic of your testimony?
The U.S. has been put at a disadvantage by not prioritizing synthetic biology sufficiently in recent decades. If we hope to remain competitive in this space, our government needs to massively increase investment in R&D and support for workforce development initiatives, so that our commercial pipelines can be accelerated and more individuals from more backgrounds can support our growing industry. Critically, the federal government should also prioritize biologically-derived solutions for procurement whenever they are available to expand the market of our products. Most importantly, someone in our federal government needs to be responsible for the development of a national biotechnology strategy, similar to our efforts in cyber. Accountability and dedicated resources are required to address the issues I laid out here and to begin to properly accelerate U.S. capabilities.

When it comes to exponentially improving technologies like synthetic biology, even small lags in investment will cause huge differences in where you end up in a few years. Now is the time to secure our position as the leader of this transformative field.

Thank you for your time and for your continued leadership on these important issues. I look forward to your questions.

OPENING STATEMENT OF JOANNA MOODY, RESEARCH PROGRAM MANAGER, MIT ENERGY INITIATIVE MOBILITY SYSTEMS CENTER

VICE CHAIRMAN CLEVELAND: Thank you. Dr. Moody?

DR. MOODY: Thank you to the distinguished Commissioner and their capable staff for inviting me to testify on China's planning and innovation in the transportation sector.

I'm going to argue that China's system-focused approach, which connects its transportation policies to broader economic and societal goals, gives it a clear competitive advantage over the United States and our vehicle-focused approach.

In my written testimony I explored three mobility innovations, vehicle electrification, new business models in the sharing economy, and anatomic connectivity.

In these verbal remarks, I'm going to focus on vehicle electrification and only touch briefly on connectivity.

I'll start with some background on how China's vehicle market, incumbent transportation systems, and regulatory environment differ from those in the U.S.

China is now the world's largest market for new sales of light duty vehicles, which include passenger cars, SUVs and light trucks. Yet, motorization levels remain low.

China has around 200 vehicles for every 1,000 people. That is small compared to more than 800 vehicles per 1,000 people in the United States.

So in China, cities in particular, public transit is the backbone of multimodal transportation systems supported by walking, biking, and new mobility services like ride hailing.

Nationally, China's government has seen development of their domestic vehicle industry as an important contributor to economic growth.

When Chinese auto workers entered the global automotive market in the 1990s, the central government forced international companies to form joint ventures with its stated owned auto makers. This allowed Chinese firms to quickly improve their manufacturing and research and development capabilities.

But, recognizing that its automakers would still have trouble competing against global manufacturers of traditional gasoline and diesel-powered vehicles, China's government embraced vehicle electrification as the less competitive route to becoming a major player in the automotive market.

So, driven not by transportation or climate policies, but by industrial policy, China has quickly emerged as the world's largest consumer and producer of electric light duty vehicles.

In 2010, the Chinese government declared the electric vehicle or the industry as part of its national strategic emerging industries. And a decade of purchase subsidies, tax credits, and other government supports have continually shaped EV technology towards longer range, higher quality, battery electric vehicles.

China is also the largest producer and user of electric buses, with over 98 percent of the world's e-buses operating in China today.

Starting with the Ten Cities, One Thousand Vehicles demonstration program in 2009, China's national government has provided substantial subsidies for electric buses so that their municipal governments can purchase them at cost, on par, or even below those of diesel buses.

For U.S. transit agencies, an average diesel bus costs around $500,000 versus $750,000 for an electric bus. While the Federal Transit Administration's low or no emissions program can help local governments and agencies offset the difference, its budget is orders of magnitude lower then China's national investment in electrifying public transit.

China has also built out a substantial public charging network and set technology standards. Charging infrastructure is provided by government-owned utilities, which allows for centralized data collection.

In the U.S., state governments and auto makers have played a larger role in the development of charging infrastructure. With less coordination, we have ended up with conflicting standards for fast chargers and other issues that hamper both domestic and international competitiveness.

China's industrial policy around electric vehicles also addresses other parts of the value chain. For example, while much of the research and development that created the lithium ion battery took place in the U.S., China's bullish investments in battery production have given it a clear edge in the commercial market.

In early 2019, Chinese lithium ion batteries' cell manufacturing accounted for 73 percent of global capacity, with the U.S. in a far off second place with only 12 percent.

China also has a major foothold in the upstream extraction and processing of critical minerals like lithium and cobalt. This puts U.S. electric vehicle producers, who must import Chinese batteries at risk of price setting and supply chain disruptions.

Now, let me turn briefly to autonomous and connected vehicles before I close with some recommendations.

An autonomous vehicle has all of the necessary hardware and software onboard to navigate its environment and make its own driving decisions. It is the quintessential self-driving car.

Connected vehicles with or without autonomy, communicate with one another and with the transportation infrastructure. Most of the benefits for transportation system planning and operations such as greater coordination of traffic flows, are unlocked by connectivity.

This connectivity requires the common language across political jurisdictions and private sector providers that must be defined by clear national level standards and protocols for information exchange.

While U.S. innovation in this space has been driven by private sector investments in autonomous vehicle technologies, China has again, taken a more systems-focused approach.

Its recent national infrastructure plan focused heavily on digital infrastructure and information integration.

If fully implemented, this plan could go a long way in supporting China's multimodal domestic transportation system, and simultaneously catalyze the international market for its connected and autonomous vehicle technologies.

As the U.S. considers new infrastructure spending, we should think beyond physical infrastructure, like roads, highways, bridges and rails, and think into digital infrastructure, like 5G or 6G connectivity.

Congress can encourage private investment in these technologies with public sector leadership and standard setting from vehicle to infrastructure and vehicle to vehicle information exchange.

While not every aspect of China's system focused approach to transportation innovation will be appropriate to the U.S., we would benefit economically and environmentally from a more comprehensive approach to both vehicle electrification and connectivity.

When it comes to EV policy, the U.S. already has some key building blocks, including the corporate average fuel economy, or CAFE standards and a federal tax credit for EV purchases.

Holding domestic automakers to stricter fuel economy standards can encourage further innovation in vehicle and engine efficiency, which will help them remain competitive in the global vehicle market, and contribute to our climate goals.

In addition, the provision of public charging infrastructure could be better coordinated at the national level, in tandem with upgrades to the electricity grid.

In the U.S. bus electrification is low hanging fruit from the path towards achieving zero emission transportation. With guiding legislation, it could be achieved relatively quickly through subsidized procurement of e-buses and new charging and maintenance facilities.

This could go a long way in approving the efficiency and sustainability of public transit, which supports the economic vibrancy of our nation's cities.

Investing in clean bus technology could also help transform the U.S.'s nascent domestic e-bus manufacturing industry. This is just one example of how public policies and investments can stimulate the creation of quality jobs in the transportation sector, serving both domestic and international markets.

Finally, considering the broader electric vehicle value chain, building U.S. domestic industries in the material synthesis, battery cell and pack production, and battery repurposing and recycling, could help domestic job opportunities and catalyze clean energy and technology markets.

It could also go a long way in reducing risks for U.S. automakers and producers of other consumer technologies from China's control of the global battery market.

Thank you very much for your time and attention, and I look forward to answering your questions.

PREPARED STATEMENT OF JOANNA MOODY, RESEARCH PROGRAM MANAGER, MIT ENERGY INITIATIVE MOBILITY SYSTEMS CENTER

Testimony before the U.S.-China Economic and Security Review Commission

An Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Success
Policies and Planning for Emerging Industries: New Mobility, Cloud Computing, and Synthetic Biology
April 15, 2021

Joanna Moody, Ph.D.
Research Program Manager, Mobility Systems Center, MIT Energy Initiative

In this testimony, I will argue that China's current approach to transportation sector planning and innovation has a clear competitive advantage over the U.S. because of their systems-focused approach that connects the transportation sector with broader economic and societal goals, which differs from the vehicle-focused approach of the U.S. I will focus on what the U.S can learn from China's transportation policies to improve our own domestic transportation systems, but, where applicable, will also comment on the potential for these policies to keep U.S. companies competitive in the transportation industry globally. By way of illustration, I will compare and contrast how China and the U.S. have responded to three mobility innovations—electrification, new business models in the sharing economy, and autonomy and connectivity. The majority of this testimony will focus on electrification given the scale and pace of innovation in this space in China.

Background

In the past two decades, China's vehicle market has seen rapid growth and, in 2009, China overtook the U.S. as the world's largest light-duty vehicle (LDV)[i] market in terms of new sales.[1] Even with this large growth, the country's motorization level of 200 vehicles per thousand people remains very small compared with the number in the United States (more than 800). Therefore, it is expected that ownership and use of personal vehicles will continue to increase along with economic growth in China.[2]

Nationally, China's government continues to see promotion and development of their domestic vehicle industry as an important contributor to economic growth. Because state-owned Chinese original equipment manufacturers (OEMs) were late entrants to this globally competitive market, China's government put in place significant protections to allow domestic companies to grow and learn. In particular, starting in the mid-1990s, restrictions on foreign ownership of automotive companies and importation and sale of vehicles manufactured abroad forced international automakers to form joint ventures with China's state-owned OEMs in order to participate in the burgeoning Chinese car market. These partnerships—including between General Motors and Shanghai Automotive Industry Corporation (SAIC) and between Ford Motor Company and Changan Automobile—allowed Chinese OEMs to learn from established global players and quickly improve their manufacturing and research and development capabilities.

Recognizing that Chinese OEMs would still have trouble competing against incumbent vehicle manufacturers from the U.S. and elsewhere for market share for traditional gasoline- and diesel-

[i] Light-duty vehicles (LDVs) include passenger cars, SUVs, and light-trucks.

powered internal combustion engine vehicles (ICEVs), China's government embraced electric vehicles (EVs)[ii] as the less competitive route to becoming a major player in the global automotive market.[3] The Chinese government declared the EV industry as one of the national, strategic, emerging industries in 2010, and EVs featured prominently in its "Made in China, 2025" strategy plan.[4] Over the past decade, China's national government has played a crucial role in helping the Chinese EV market flourish. Interventions—including investments into start-up businesses, clear standards for battery technologies, targets for "new energy vehicle" (NEV)[iii] sales, the build-out of charging infrastructure networks, and consumer subsidies for EV purchase—have collectively helped to bolster business and consumer confidence and have fueled rapid EV uptake. In 2018, NEVs became the first segment of the automotive industry in China to see relaxations of foreign ownership restrictions, although further liberalization is expected to follow.[5]

While China's national government and its industrial policies have played the most crucial role in shaping vehicle electrification, city-level policies are also playing an increasing role in determining the size and composition of the country's vehicle fleet. While China is often seen as having a top-down, command-and-control political structure, with policy largely dictated by the national government, in recent years, transportation policymaking in China has been decentralized, with municipal/city governments being allowed to enact innovative policies that better respond to local conditions. This has led to heterogeneity in municipal-level transport policies that underscores the diversity of urban challenges and mobility issues facing different Chinese cities.[6]

For example, spurred on by issues of congestion and local air pollution, some of China's megacities are adopting restrictions on private car use and ownership.[7] Car ownership restrictions, in particular, limit growth in vehicle sales by rationing the number of new license plates in a city and allocating these licenses through lottery or auction. To date, six cities and one province have adopted these car ownership restriction policies. Shanghai was the first to adopt such a policy in 1994, followed by Beijing in 2011, Guangzhou in 2012, Tianjin and Hangzhou in 2014, Shenzhen in 2015, and the island province of Hainan in 2018. These city-level policies have meaningful impacts on the size and composition of the national vehicle fleet, since all but one of the policies exclusively apply to ICEVs and exempt the sale of NEVs.[8]

As China's rapidly growing megacities are restricting the sale and use of private cars, they are also investing heavily in alternatives. From 2012 to 2019, the number of cities in China with urban rail transit systems increased from 15 to 40 and operational mileage more than tripled.[9] These public transit systems operate as the backbone of multi-modal transportation systems that are supported by active travel (walking and biking) and new mobility services and technologies.

This background serves as important context for understanding how new mobility innovations are emerging in China, shaped by a different regulatory environment and interacting with different incumbent transportation systems.

[ii] Unless otherwise specified, throughout this testimony I use the term "electric vehicle" (EV) to include both plug-in hybrid electric vehicles (PHEVs) and battery electric vehicles (BEVs) in the light-duty vehicle sector.
[iii] "New energy vehicles" (NEVs) include electric vehicles (PHEVs and BEVs) as well as hydrogen fuel cell vehicles (HFCVs), although the vast majority in China's market are BEVs.

Electrification

As my first and primary example of how China's systems-oriented approach provides a competitive advantage, I will consider vehicle electrification. Around the world, governments are embracing vehicle electrification in response to growing recognition of the global climate crisis and the prominence of the transport sector in current and projected greenhouse gas emissions. With over a decade of national industrial policy fostering their domestic EV industry, China has solidly set itself up as the global leader in vehicle electrification and the lithium-ion battery supply chain.

Electrification of Light-Duty Vehicles

China has quickly emerged as one of the world's largest markets for electric LDVs. While EVs did not hit the Chinese market until 2012, two years after they were introduced to the U.S. market in 2010, phenomenal annual growth (at a rate of 45% for six consecutive years from 2012 to 2017) has bolstered China's EV market.[10] In 2018, new EV sales in China reached nearly 1.1 million and the total stock reached 2.3 million (accounting for almost half of the world's electric LDVs).[11] In 2018, EV sales in the U.S. numbered only 361,000, contributing to a total stock of 1.1 million.[10] See Figure 1 for comparison to ICEV sales and trends over time.

China's preeminence in the electrification of LDVs has been supported by a decade of national-level industrial policy (rather than climate or transportation policy). In 2010, China's national government declared the EV industry as one of seven national, strategic, and emerging industries and put in place a subsidy program for NEVs.[12] Under this program, the amount of subsidies that each vehicle receives depends on the vehicle's category, technology type, and vehicle efficiency performance. By tightening the qualifications for receiving the subsidy each year, China's government has been able to shape the production and consumption of EV technology towards longer-range, lithium-ion battery vehicles. For example, in 2019 the central government announced that it was eliminating purchase subsidies for vehicles that achieve electric ranges of less than 250 kilometers (compared with the 150km threshold previously needed to qualify).[10]

And as the number of EVs produced and sold increases, China's government is reducing the amount of subsidies.[13] These new policies reflect the government's shifting strategy, transitioning from monetary incentives for EV purchases to non-monetary forms of support such as a new "cap and trade" system for NEVs and restrictions that make it harder to set up factories to make ICEVs.[14] Since 2019, OEMs have received credits for each NEV produced, accounting for factors such as the type of vehicle, as well as its maximum speed, energy consumption, weight, and range. Regulators base credit targets for each OEM on its total production of LDVs. If a manufacturer does not reach the target, it must purchase credits from competitors that have a surplus or pay financial penalties.[15]

The U.S. government could learn from China's approach of heavy investment—in the form of purchase subsidies, tax breaks, and other incentives to encourage EV adoption—tied to technological standards to help push domestic EV manufacturing and consumption towards a more sustainable future. The U.S. already has some of the building blocks for a more

comprehensive EV policy, with its corporate average fuel economy (CAFE) standards and a federal tax credit for EV purchases.

China has also supported its EV market with the proactive build out of public charging infrastructure. While the majority of EV charging today happens at private level 1 or 2 (slow) chargers installed at homes or workplaces, the provision of publicly accessible charging infrastructure is critical for expanding the EV market. The Chinese central government promotes the development of EV charging networks as a matter of national policy, setting targets, providing funding, and mandating a single standard for fast charging (China GB/T).[16] In China, the role of government-owned utilities in providing public chargers is larger than in the U.S., especially along major long-distance driving corridors. This provides the often over-looked benefit of centralizing data collection on EV charging within the public sector, allowing for greater understanding of grid implications and opportunities for network optimization. Many provincial and local governments also contribute funding towards EV charging infrastructure, particularly in urban areas.

By 2018, China had installed around 111,000 Level 3 (fast) chargers—accounting for 78% of the world's public fast chargers—and 163,000 Level 2 (slow) chargers to achieve a ratio of 119 plugs per 1,000 EVs. In comparison, the U.S. had installed only 4,240 level 3 chargers and 50,250 level 2 chargers by the same year, for a ratio of only 48.5 plugs per 1,000 EVs.[17]

In the U.S., the federal government has played only a modest role in EV charging, with state governments and automakers playing a larger role in the development of EV charging networks. This has contributed to coordination issues such as conflicting EV fast charging standards in the U.S. market (CHAdeMO, SAE Combo, and Tesla) that hampers competitiveness in both the domestic and international markets. U.S. policy makers at the federal level could learn from the Chinese government's multi-year planning with respect to EV charging infrastructure, as well as China's investment in data collection on EV charging.[16]

Electrification of Public Transit Vehicles

China's leading role in the manufacture and consumption of electric vehicles goes well beyond LDVs. In particular, China is the largest producer and user of electric buses.[iv] In 2020, over 98% of the world's e-buses—primarily battery-electric buses, but also including some plug-in hybrid buses—operated in China. In 2017, China added around 100,000 e-buses to its municipal roads, which represented 22% of the bus sales in the domestic market and made up around 17% of the country's total bus fleet. In comparison, in 2017 there were around 360 electric buses deployed by various transit agencies throughout the U.S., making up only 0.5% to the total fleet of 70,000 buses.[18] And the divergence between China and the U.S. is growing, with the U.S. in 2019 having only 450 electric buses deployed in a fleet of 75,000 buses nationally.[19]

Domestic production and demand for e-buses in China has been strongly driven by the central government's industrial policy for vehicle electrification, in general, as well as national and regional subsidies that have brought initial capital costs of e-buses below that of traditional diesel buses. Since the "Ten Cities, One Thousand Vehicles" demonstration program in 2009, China's

[iv] China is the world's largest bus manufacturer considering all vehicle types, supplying nearly 50% of buses in the global market.

national government has provided substantial subsidies for electric bus purchases. Starting at around 500,000 RMB (around 73,000 USD) per vehicle in 2009,[20] these subsidies decreased over the past decade to 58,000 RMB (around 8,400 USD) in 2019 as domestic production and sales volumes increased.[21] Due to reduced subsidies and the COVID-19 pandemic, domestic demand for e-buses has slowed. But the numbers still suggest that China's national government spent around 3 billion RMB (or 450 million USD) in the year 2019 alone on new e-bus purchase subsidies to help defray upfront costs for public transit agencies. And that number does not account for additional government support, for example, in terms of tax exemptions and expenditures on charging infrastructure.

Further, municipal governments have played a critical role in the uptake of e-buses, particularly to meet growing demand for urban travel while maintaining municipal air quality targets. In fact, major cities, like Shanghai, Beijing, and Shenzhen, have stopped purchasing new internal combustion engine (ICE) municipal buses altogether (and are setting their sights on the taxi industry next).

While many public transit agencies in major cities in the U.S. have also made commitments to electrify their bus fleets, upfront costs of electric buses remain a significant hurdle. In the U.S., an average diesel transit bus costs around 500,000 USD compared to around 750,000 USD for an electric bus (although over the lifetime of an electric vehicle, savings in maintenance and fuel costs can be substantial).[22] The U.S. Federal Transit Administration (FTA) has established the Low or No Emission Program, which provides funding to state and local government agencies to purchase or lease zero- or low-emissions transit buses and related infrastructure. However, in 2019, the program's entire budget amounted to 85 million USD, which is only enough to offset the 250,000 USD difference in upfront purchase cost for 340 vehicles. This amount is orders of magnitude lower than the investments that China's national government is making in electrifying its public transit fleets. Electrifying public transit in addition to LDVs is an important opportunity for the U.S.to improve our domestic transportation system while meeting climate mitigation targets.

When it comes to the international market, e-buses are a significant area of growth. Spurred by interest in Latin America and Europe, China's export of electric buses is growing quickly. Chinese e-bus manufacturers, particularly BYD and Yutong, dominate the global market in terms of units sold, largely due to their lower upfront costs, but they face stiff competition from e-bus manufacturers based in the U.S. and Europe. With better federal government support for public transit agencies to purchase e-buses and their maintenance and charging infrastructure and with carefully crafted "Buy America" provisions, the U.S. could accelerate domestic production of e-buses—creating new jobs and expanding a forward-thinking, globally competitive U.S. transportation industry.

The Whole Battery Supply Chain

Finally, China's industrial policy around vehicle electrification goes well beyond vehicle manufacturing to address the other parts of the value chain, including the market for lithium-ion battery technologies. Lithium-ion battery technology is poised to displace lead-acid batteries in

the transportation and heavy equipment sectors. In early 2019, Chinese lithium-ion battery cell manufacturing accounted for 73% of global capacity, with the U.S. in a far-off second place with only 12% of global capacity (a share that is only projected to shrink as global capacity grows).[23] In the absence of sufficient domestic production of lithium-ion battery cells, U.S. electric vehicle (and battery) producers must rely on imports from Chinese manufacturers, putting the U.S. at risk of price-setting and supply chain disruptions. And China is not only controlling the world's production of lithium ion batteries, it also has a major foothold in the upstream extraction and processing of key materials (such as lithium and cobalt) needed for the most commercially-viable lithium-ion battery chemistries. In 2018, Chinese lithium production was 8,000 metric tons, third among all countries and nearly ten times U.S. lithium production. Further, Chinese lithium reserves in 2018 were one million metric tons, nearly 30 times U.S. levels.[23]

While much of the critical research and development that created the lithium-ion battery took place in the U.S., China's bullish investments in the commercialization of battery production and electric vehicle manufacturing have given it a clear edge. With such an advantage in both manufacturing costs and raw materials availability, it is unclear whether the U.S. can compete with China in the world market unless it invests now in supportive clean energy industries such as materials synthesis and battery cell and pack production. Further, as a growing number of lithium-ion batteries reach their end of useable life in vehicles, there is an opportunity for the U.S. to develop a globally competitive market for recycling materials or creating second-life uses in terms of energy storage.

New Mobility

For our next example of China's systems-approach providing a competitive edge, we consider the emergence of "new mobility" providers—private sector companies that provide innovative, on-demand mobility services enabled by improvements in information and communication technology. Prominent players include Uber (U.S.) and DiDi (China) in the ridehailing (or ride-sourcing) and micromobility (bike- or scooter-sharing) markets. I will start with a discussion of how these two companies, from the start, have embodied different approaches to the new mobility business that have significant implications for how well they support existing domestic transportation systems. Then I will briefly point to how these different approaches also provide China's DiDi a potential competitive edge in the highly dynamic international new mobility market.

DiDi was conceived in China's megacities, where private car ownership is still relatively low and walking, biking, and public/shared forms of transport serve the majority of trips. Around 2012, DiDi started as an app for traditional taxis that leveraged information technology to provide a more seamless experience for customers planning, booking, and paying for trips provided by multiple operators. As DiDi grew and diversified the types of services it offered—including starting its own chauffeured ride-hail service in 2015—it maintained its focus on providing a technology platform that could integrate different modes and service providers. It formed collaborative relationships with public transit agencies, incorporating information such as transit schedules directly on their app to help facilitate transfers for users. In 2018, DiDi launched an intermodal transportation recommendation function allowing users to search and book public transportation, online car-hailing and bike-sharing services in a single smartphone application.

This approach of multi-modal integration and collaboration with other service providers echoes the systems-approach to transportation policymaking employed by Chinese cities.

While Uber in the U.S. is also essentially a technology platform, from its inception it has primarily offered its own private chauffeured, on-demand car service in direct competition with traditional taxis and other incumbent modes. This has led to significantly more contentious rather than collaborative relationships with taxi and public transit operators and city governments more generally. While Uber and other players in the U.S. ridehailing market have since entered into individually-negotiated partnerships with certain public transit providers, early tensions have hampered the development of truly systems-oriented mobility technologies that can integrate planning, booking, and payment for multiple types of mobility services and provide real alternatives to private car ownership and use (a concept often referred to as "mobility-as-a-service").

As both of these companies expand into urban markets around the world, their different approaches have played out at scale. Uber was bullish in its expansion and, as a result, has experienced certain growing pains; its rapid and one-size-fits-all entrance into urban mobility markets worldwide often caused friction with city governments (each with its unique regulatory framework) and incumbent operators. DiDi's international expansion has been more methodical, often involving discussions with local policymakers and tailoring of the services provided in their app to the local context. While DiDi may not currently have the same market share as Uber in the global "new mobility" space, its collaborative, systems-oriented approach is likely to give it a competitive advantage, particularly in urban markets in the developing world where incumbent mobility services are provided by many small, private, independent operators.

Autonomy vs. Connectivity

Our final mobility innovation takes us further into the future. Significant advances in 5G communications, 3D imaging, AI, cloud computing, and other technologies may eventually enable the deployment of autonomous and/or connected vehicles. There is an important distinction between these two concepts.[24] An autonomous vehicle is one that has all of the necessary hardware and software on-board to navigate its environment and make its own driving decisions independently. This is the idea of the "self-driving" car. On the other hand, connected vehicles exchange driving information with other vehicles (potentially both automated and non-automated vehicles) and/or transportation infrastructure. Connected vehicle technology enables greater coordination of traffic flows and travel demands, which can unlock potential for cooperation that improves the efficiency of our transport networks.

Private sector innovation in the U.S. has focused on autonomous vehicle technology (e.g., Alphabet's Waymo). However, most of the benefits for transportation system planning and operations are unlocked when vehicles are connected to one another and to infrastructure—with or without autonomy.

While autonomy in the U.S. is likely to develop through private sector initiatives, ensuring connectivity will require active public sector engagement for several reasons. First, because private sector companies are advancing their own, proprietary software solutions, the public

sector has a critical role to play in proactively setting standards and protocols for information exchange so that vehicles and infrastructure are speaking a "common language." Second, because technological innovation and mobility networks extend beyond local or regional jurisdictions, the U.S. federal government has a critical role to play in ensuring that communication standards work across state lines. Third, because the public sector owns the transportation infrastructure on which (autonomous) vehicles operate and to which connected vehicles will need to connect, the public sector will need to invest in the design and installation of connectivity-ready infrastructure. Fourth, the public sector has an existing role in providing transit services that must be the critical focal point of multi-modal and sustainable urban mobility networks.

Here again, the U.S. could look to some of the actions of China's national government, which announced a major infrastructure plan as part of its post-COVID-19 relief package that focuses on digital rather than physical infrastructure and includes a new wave of government support for private sector participation.[25] China's investments in innovation, information, and integration infrastructure provides the critical building blocks for an efficient multi-modality, sustainable domestic transportation systems and are likely to catalyze China's autonomous and connected vehicle efforts in the international market.[26]

Recommendations

In summary, the U.S. and its vehicle-centric approach to transportation is at a distinct competitive disadvantage as it faces new mobility innovations, such as electrification, new business models in the sharing economy, and automation and connectivity. There is much that the U.S. can learn from China's more systems-oriented approach to transportation policymaking to improve our own domestic transportation systems and to keep U.S. companies competitive in the transportation sector globally. To fully realize the potential of these new mobility innovations, the public sector in the U.S. will have to embrace a culture shift, rethinking the way we prioritize and invest in transportation services and infrastructure, and the government will have to play a key role in shaping new mobility technologies to align with broader system goals of sustainability, equity, and efficiency.

Continue to strengthen fuel economy standards for LDVs. Even as electric vehicles take off, ICEVs and hybrid electric vehicles are likely to remain a significant segment of the vehicle fleet and vehicle sales (in the U.S. and globally) for the next few decades.[8] While U.S. automakers (with the exception of Tesla) are playing catch-up when it comes to the design and manufacture of BEVs, they still have a clear edge in research and development of vehicle and engine technology that can improve the energy-efficiency of ICEVs and hybrid vehicles. Some of these vehicle improvements, such as downsizing, light weighting using new composite materials, or friction reduction, can also help make BEVs more competitive in the consumer market.[27] The U.S. government can help encourage further innovation in vehicle and engine efficiency by continuing to strengthen fuel economy standards, holding domestic OEMs to stricter standards that will keep them competitive in the global vehicle market.

Extend EV tax credits and invest in public charging infrastructure. As U.S. domestic production and demand for LDVs recover from the COVID-19 pandemic, the federal government should

consider extending the federal EV tax credit system. EV purchases could be further encouraged by investing in domestic charging infrastructure networks. If charging infrastructure provision is considered in tandem with upgrades to electricity grids that can support a more renewable energy portfolio, these investments can help bolster domestic EV production and consumption while meeting other goals in the clean energy sector.

Invest much more in electrifying public transit. On a per-vehicle basis, changing from a diesel to a battery electric bus can save approximately 70 million grams of CO_2 per year, compared to 2 million from changing a passenger car from an ICEV to a BEV powered on the average U.S. grid (see Table 1). Public (and even school) bus electrification is a low-hanging fruit in the path towards achieving zero-emissions transportation because, with guiding legislation, it can be achieved relatively quickly through public procurement. Strong federal support in terms of e-bus purchase subsidies and new charging and maintenance facilities could go a long way in improving the efficiency and long-term financial and environmental sustainability of public transit, which supports the economic vibrancy of our nation's cities and provides quality jobs in the transportation sector. In addition to the benefits to our public transit systems, investing in clean bus technology could help transform nascent domestic e-bus manufacturing industry (e.g., Proterra) from already the largest North American supplier into a globally competitive company.[28]

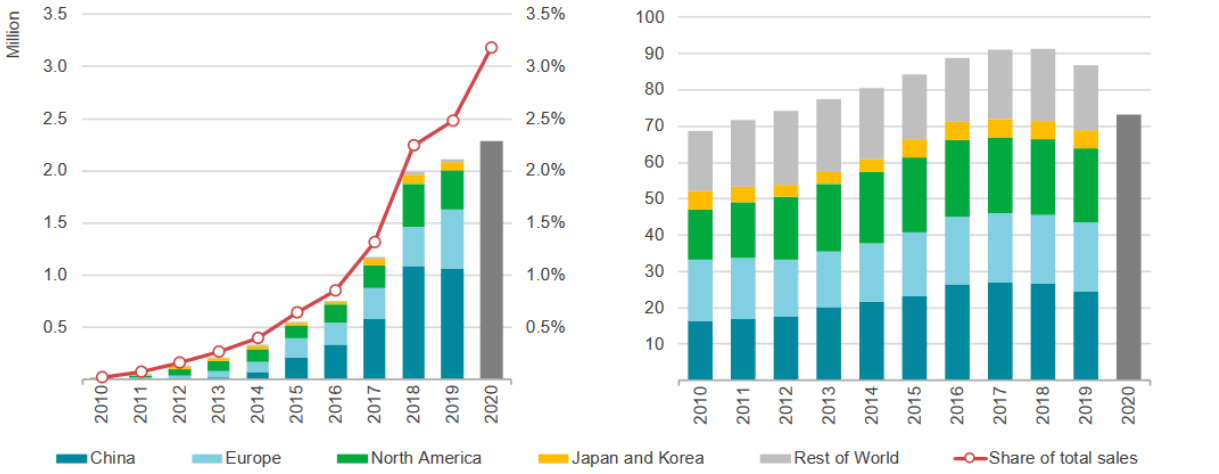
Build up domestic industries along the battery supply chain. Building U.S. domestic industries in materials synthesis, battery cell and pack production, and battery repurposing or recycling could help keep U.S. OEMs competitive in the global EV market; expand domestic job opportunities related to vehicle electrification; and potentially catalyze other clean energy businesses and domestic technology markets. Furthermore, while the U.S. remains a leader in research and development of new battery technologies, historical experience with lithium-ion batteries suggests that the U.S. national government could do more in terms of programming to support commercialization of battery technologies. For example, competitive research and development grants and national labs could support prototyping, creating a pathway from lab demonstration to large-scale manufacturing.

Support local and regional governments in efforts to integrate new mobility services into multi-modal, transit-centric mobility systems through sandbox programs and information-sharing protocols. The federal government can expand support provided to local and regional governments and transit agencies in the form of grant programs for pilot projects (such as the FTA's Mobility on Demand sandbox program) and research and development focused on the integration of new mobility with existing public transit services and the development of policies and technologies to govern that integration.

Take an active role in goal- and standard-setting for (autonomous and) connected vehicles. The federal government should embrace its multifaceted role in proactively shaping the development of connectivity between vehicles, across modes, and with infrastructure. Clear and consistent federal policy has a critical role to play in supporting and guiding private sector innovation in (autonomous and) connected vehicle technology. As the U.S. considers infrastructure spending as a form of economic stimulus in the wake of the COVID-19 pandemic, the U.S. could look to China's forward-thinking strategies of investing beyond physical infrastructure (e.g., roads,

highways, bridges, and rails) to consider digital infrastructure (e.g., 5G connectivity). In particular, U.S. federal government could bolster the Intelligent Transportation Systems Joint Program Office's ongoing efforts in developing protocols and standards for vehicle testing and safety, data- and information-sharing, and vehicle-to-vehicle and vehicle-to-infrastructure communications.

Figure 1. Global electric passenger light-duty vehicle sales and market share (left) and total light-duty vehicle sales (right)[29]



Notes: Includes passenger cars and passenger light trucks. Includes plug-in hybrids, battery EVs and fuel cell EVs. Share of total sales represents the total sales of EVs in countries listed in IEA *Global Electric Vehicle Outlook* as a percentage of total passenger car sales in those same countries. The 2020 estimates are based on the assumptions of a gradual global economic recovery and cautious consumer spending behaviour over the rest of 2020. This accounts for government measures in place at the time of writing, notably in China.

Sources: IEA (2020e); IEA (2020f); Marklines (2020).

Table 1. Comparison of potential emissions savings from electrifying a passenger car vs. a public bus in the U.S.

Statistic	Passenger car	Public bus
Annual miles traveled per vehicle[30]	11,467	43,647
Average vehicle occupancy factor[31]	1.7	10.7
Lifecycle emissions per distance (gCO_2-eq/mile)[6, 32]		
Internal combustion engine	(gas) 370	(diesel) 2,680
Natural gas	--	2,364
Hybrid electric	271	2,212
Battery electric (using average U.S. grid)	204	1,078
Fuel cell electric	267	--
Calculated annual emissions saved (gCO_2-eq) from switching a single vehicle from internal combustion engine to battery electric	2,000,000	70,000,000

[1] 2010. "China overtakes U.S. as world's biggest car market" *The Guardian,* January 8. https://www.theguardian.com/business/2010/jan/08/china-us-car-sales-overtakes

[2] Ma, Lin, Manhua Wu, XIujuan Tian, Guanheng Zheng, Qinchuan Du, and Tian Wu. 2019. "China's Provincial vehicle ownership forecast and analysis of the causes influencing the trend." *Sustainability*, 11: 3928. https://doi.org/10.3390/su11143928

[3] Felipe Munoz. 2020. *The race for EV leadership: Lessons learned from China*. White Paper. JATO: Oxford, UK. https://www.jato.com/the-race-for-ev-leadership-lessons-learned-from-china/

[4] Song, Zeyuan, Yingqi Liu, Hongwei Gao, and Suxiu Li. 2020. "The underlying reasons behind the development of public electric buses in China: The Beijing case." *Sustainability*, 12: 688-704. https://doi.org/10.3390/su12020688

[5] Schaub, Mark, and Atticus Zhao. 2020. "The impact of China's Removal of Foreign Ownership Restrictions in Auto Sector." *King&Wood Mallesons*, April 14. https://www.kwm.com/en/de/knowledge/insights/impact-of-china-removal-of-foreign-ownership-restrictions-in-auto-sector-20200414

[6] Moody, Joanna, Shenhao Wang, Jungwoo Chun, Xuenan Ni, and Jinhua Zhao. 2019. "Transportation policy profiles of Chinese city clusters: A mixed methods approach. *Transportation Research Interdisciplinary Perspectives,* 2. https://doi.org/10.1016/j.trip.2019.100053

[7] Wang, Shenhao, Joanna Moody, and Jinhua Zhao. 2020. "What prompts the adoption of car restriction policies among Chinese cities?" *International Journal of Sustainable Transport*. https://doi.org/10.1080/15568318.2020.1770905

[8] MIT Energy Initiative. 2019. *Insights into Future Mobility: A report from the Mobility of the Future study.* MIT Energy Initiative: Cambridge, MA. http://energy.mit.edu/insightsintofuturemobility

[9] 2020. "What investors want to know: Chinese urban rail transit companies." Special Report. *FitchRatings*, December 1. https://www.fitchratings.com/research/international-public-finance/what-investors-want-to-know-chinese-urban-rail-transit-companies-01-12-2020

[10] Jin, Ligzhi, and Hui He. 2019. *Comparison of the electric car market in China and the United States.* Working Paper 2019-10. International Council on Clean Transportation (ICCT): Washington, D.C.

[11] International Energy Agency (IEA). 2019. *Global EV Outlook 2019: Scaling-up the transition to electric mobility.* IEA: Paris, France.

[12] Gersdorf, Thomas, Russel Hensley, Patrick Hertzke, and Patrick Schaufuss. 2020. "Electric mobility after the crisis: Why an auto slowdown won't hurt EV demand." Automotive & Assembly. *McKinsey & Company*, September 16. https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/electric-mobility-after-the-crisis-why-an-auto-slowdown-wont-hurt-ev-demand

[13] Perkowski, Jack. 2018. "What China's shifting subsidies could mean for its electric vehicle industry. *Forbes*, July 13. https://www.forbes.com/sites/jackperkowski/2018/07/13/china-shifts-subsidies-for-electric-vehicles/?sh=5d3b1def5703

[14] McDonald, Tim. 2019. "China powers up electric car market." *BBC News,* January 11. https://www.bbc.com/news/business-46745472

[15] Gersdorf, Thomas, Patrick Hertzke, Patrick Schaufuss, and Stephanie Schenk. 2020. "McKinsey Electric Vehicle Index: Europe cushions a global plunge in EV sales." Automotive & Assembly. *McKinsey & Company, July 17.* https://www.mckinsey.com/industries/automotive-and-assembly/our-insights/mckinsey-electric-vehicle-index-europe-cushions-a-global-plunge-in-ev-sales

[16] Hove, Anders, and David Sandalow. 2019. *Electric vehicle charging in China and the United States*. Columbia Center on Global Energy Policy: New York, NY. https://energypolicy.columbia.edu/sites/default/files/file-uploads/EV_ChargingChina-CGEP_Report_Final.pdf

[17] International Energy Agency (IEA). 2019. *Global EV Outlook 2019: Scaling-up the transition to electric mobility.*

[18] O'Donovan, Aleksandra, James Firth, and Colin McKerracher. 2018. *Electric Buses in Cities*. Bloomberg New Energy Finance (BNEF): London, UK. https://assets.bbhub.io/professional/sites/24/2018/05/Electric-Buses-in-Cities-Report-BNEF-C40-Citi.pdf

[19] Bloomberg New Energy Finance (BNEF) 2020. *Electric Vehicle Outlook 2020.*

[20] Gong, Huiming, Michael Q. Wang, and Hewu Wang. 2013. "New energy vehicles in China: policies, demonstration, and progress" *Mitigation and Adaptation Strategies for Global Change* 18: 207-228. https://doi.org/10.1007/s11027-012-9358-6

[21] 2020. *China announced 2020-2022 subsidies for new energy vehicles.* Policy Update. International Council on Clean Transportation (ICCT): Washington, D.C.

[22] Horrox, James, and Matthew Casale. 2019. *Electric buses in America: Lessons from cities pioneering clean transportation*. U.S. PIRG Education Fund and Environment America Research & Policy Center. https://uspirg.org/sites/pirg/files/reports/ElectricBusesInAmerica/US_Electric_bus_scrn.pdf

[23] Rapier, Robert. 2019. "Why China is dominating Lithium-ion battery production" *Forbes*, August 4. https://www.forbes.com/sites/rrapier/2019/08/04/why-china-is-dominating-lithium-ion-battery-production/?sh=28f5fdb73786

[24] Kuhn, Andreas. 2018. "What's the difference between autonomous, automated, connected, and cooperative driving?" *ANDATA Artificial Intelligence Labs*. https://www.andata.at/en/answer/whats-the-difference-between-autonomous-automated-connected-and-cooperative-driving.html

[25] Wong, Dorcas. 2020. "How can foreign technology investors benefit from China's new infrastructure plan?" China Briefing. *Dezan Shira & Associates*, August 7. https://www.china-briefing.com/news/how-foreign-technology-investors-benefit-from-chinas-new-infrastructure-plan/

[26] Sun, Nikki. 2021. "China guides its self-driving startups into the fast lane: Shifts in the regulatory landscape are a boost for a key tech sector." Business Spotlight. *Nikkei Asia,* February 26. https://asia.nikkei.com/Business/Business-Spotlight/China-guides-its-self-driving-startups-into-the-fast-lane

[27] Heywood, John, and Don MacKenzie (ed.) 2015. *On the Road toward 2050: Potential for substantial reductions in light-duty vehicle energy use and greenhouse gas emissions*. MIT Energy Initiative: Cambridge, MA. https://energy.mit.edu/publication/on-the-road-toward-2050/

[28] Mazzocco, Ilaria. 2020. "Waiting for electric buses: Competition and complexity in the U.S. market." Energy. *Macro Polo*, December 21. https://macropolo.org/analysis/electric-buses-byd-proterra-competition-us-market/

[29] International Energy Agency (IEA). 2020. *World Energy Investment 2020*. IEA: Paris, France.

[30] Alternative Fuels Data Center. 2020. "Annual vehicle miles traveled by major vehicle category" https://afdc.energy.gov/data/widgets/10309

[31] U.S. Federal Highway Administration. 2018. "Average vehicle occupancy factors for computing travel time reliability measures and total peak hour excessive delay metrics" https://www.fhwa.dot.gov/tpm/guidance/avo_factors.pdf

[32] O'Dea, Jimmy. 2018. "Electric vs. diesel vs. natural gas: Which bus is best for the Climate? *Union of Concerned Scientists*, July 19. https://blog.ucsusa.org/jimmy-odea/electric-vs-diesel-vs-natural-gas-which-bus-is-best-for-the-climate?_ga=2.226102682.1843563386.1532023761-1843342382.1531829971

PANEL III QUESTION AND ANSWER

VICE CHAIRMAN CLEVELAND: Thank you. We'll turn first to Chairman Bartholomew for questions.

CHAIRMAN BARTHOLOMEW: I'm going to pass on this round. And might have something at the end.

VICE CHAIRMAN CLEVELAND: Okay. Commissioner Borochoff?

COMMISSIONER BOROCHOFF: Well, let me just say first of all, this is a difficult panel, because all three of you have things that I'd like to ask questions separately about. And I don't have much time to do it.

So, forgive me for that. I'm very interested in batteries and cloud and cloud technology.

But, I did notice that Mr. Cory and Dr. Kelly said something kind of similar that I want to ask about. I've been hearing about biotechnology because of where I live in Houston, since the early '90s.

And you know, as recently as less than a year ago, we've had some things happen there at our cancer center that are really exciting. You probably know about.

Both of you are really talking a little bit about a grand strategy. Dr. Kelly, you didn't use that exact terminology, but, I think you were saying the same thing.

Which is, we've got to come up with one plan, and encourage these industries, whether it's clouds or biotechnology. And clearly, biotechnology is understood by everybody.

So, here's my first question for you, and a quick one. I think your industry, while your company is large, there aren't that many players.

So, it's not a big industry. Is that correct?

DR. KELLY: Yeah. That's correct for synthetic biology.

COMMISSIONER BOROCHOFF: So, do you guys have a slate of legislation that you're actively trying to produce?

Or even -- and do you have an organization that represents your industry?

DR. KELLY: We have just recently formed an organization to represent the industry.

COMMISSIONER BOROCHOFF: Okay. Well, that's great to hear it. And I'd encourage you to move forward.

So, if you'd like to talk a little bit about what you would be asking directly from the Congress, because -- (audio interference)

COMMISSIONER WESSEL: The sound cut out?

PARTICIPANT: I can't hear anything either from the room.

CHAIRMAN BARTHOLOMEW: Me neither.

COMMISSIONER WESSEL: Nope.

CHAIRMAN BARTHOLOMEW: Nobody can. Let's find Jameson.

(Pause)

DR. KELLY: It's almost like oil reserves. Right? It is valuable -- it took billions of years to create that code. And each one of those pieces of DNA is a little kind of like piece of nanotechnology.

And the rules around how that data is collected and shared internationally, are not set at all right now. There is one treaty called the Convention for Biological diversity, the U.S. not a signatory of it.

It was -- it was meant to kind of control the exchange of biological materials. Like, you know, a plant from South America that might have medicinal properties or something.

It's going to be very important, in my opinion, in the coming era. Once we read the DNA of all this biology, who owns it?

Who collects value from it? How is that shared? In the U.S., look at like we did with the internet for example, we set a lot of the international standards, open standards, which benefits the United States, because we operate that way.

We should do the same thing when it comes to genomics. We should lead in this area. We should participate in that treaty. And we should set the international standards on how people exchange that nonhuman genetic code.

COMMISSIONER BOROCHOFF: I think I just have a little bit more time. So, Mr. Cory, in the area of the grand strategy, I thought you expressed pretty well what you had in mind.

But, specifically, what would you ask us to do as an organization? What would you ask us to recommend?

MR. CORY: I think it's -- thanks for the question, Commissioner. It's a matter of the Commission asking Congress and the Administration to think about these issues holistically, strategically.

Thus far, each of the agencies and each of the issues have been addressed one by one, without putting them into the broader picture.

And what this has meant in the grand scheme of things, is that the U.S. has really struggled to articulate its model for the global digital economy, in contrast to China's model and the European model.

And so, it's a matter of getting the relative, the respective agencies and representatives together across the government, to line up all of these issues across the board, and figure out how do you address them comprehensively, so that one's not played across the other.

So that overall, the United States stands the best chance of sort of leading to the rules, the norms, and the standards that have obviously led to the U.S. being a leader in the global digital economy, as opposed to the contracting one being proposed by and led by China.

COMMISSIONER BOROCHOFF: Thank you very much.

VICE CHAIRMAN CLEVELAND: Commissioner Fiedler?

COMMISSIONER BOROCHOFF: Yeah. I'm yielding the rest, so.

COMMISSIONER FIEDLER: I -- there are all sorts of advantages to cloud computing. There are all sorts of advantages to electric cars, connectivity. All sorts of uses of synthetic biology.

And then there are all sorts of dangers to each. Cloud computing, big data, authoritarian governments, connecting all the facial recognition is the primary example.

In China, you know, there's all sorts of good uses. And right now, it's being put to pretty dangerous and despicable uses.

Biotech, I mean, first of all, this is just a comment. I'm not sure I would ever want my data on a Chinese cloud.

And I could understand the Chinese not wanting their data on a U.S. cloud. Right, this is cyber security information, information security issues, national security issues.

Connectivity on cars leads me to be able to track people potentially in a way that we haven't done before. Now, all of that is perhaps less dangerous than the synthetic biology.

Which is, we have worldwide biological weapons treaties. But now we have a unique ability to create dangerous materials.

And so, then when the technology becomes universal and cheap, it's striking me as we're leading to a more dangerous world, until we can reach treaty -- I mean, treaties may or may not, I

mean, right, lots of people, the Syrians probably signed something a long time ago.

I'd like to talk about the dangers of some of this stuff, vis-a-vis the Chinese and the United States right now, and how we should behave with each other given the dangerous implications of all of this.

So, why don't we start with bio. You know, synthetic biotechnology.

DR. KELLY: Sure. Thank you. It's a great question. So, I'll start by saying, I think, in a strange way COVID-19 is a blessing in disguise here.

So, if you look at the history in cyber security, we sort of built out computers, we built out networks. And I remember in the early 2000s you had these viruses spread and take down banks and all this stuff.

And everyone was like, oh, we really need to improve our cyber security situation. Right? It kind of came along after a big build out.

We're just at the beginning of the tools, as you're talking about Commissioner, that can allow us to broadly engineer biology cheaply, where it's almost like programming personal computers. That's still in our future.

But COVID-19 is today. And it's unique, because biology, wild biology throws these things up at us that are the most malicious code we know right now.

It's not coming from a person. It's coming from nature. Let's build global biosecurity. Right?

What an opportunity. And by the way, biology doesn't respect borders. So, U.S. biosecurity is global biosecurity.

We should be pushing this out. We should take the opportunity of COVID-19 to make it so we're not susceptible to this type of impact from an infectious disease.

And that -- oh, I can tell you, so, I think we've learned a lot of lessons through this experience. Okay?

So, this has been my life the last year. So, one of the tools obviously is rapid vaccination.

So, if you look at what we've done with mRNA, we now have about a two-year window. So, if something new hit us tomorrow, two years from now the whole country would be vaccinated, we'd be out of it.

That's not great. Okay, that's a pretty brutal national security footing to be in. So, what do you do in those intervening two years?

We need dramatic improvements in our ability to surveil biology. In other words, we need to know what's going on.

What viruses are circulating the sewers in New York City? What's going on? What's spreading through airports?

We need to be able to monitor that like we monitor the weather. Right? Like we look for missiles, right?

You need that ability to monitor. We are flying blind. And so, if you have that technology, then you can do targeted public health interventions in the intervening two years before that vaccination is available and life isn't miserable like it's been in the last two years, you know, thank you very much.

And so, you know, that's -- those are the two twin things. It is, greatly improved surveillance technology to monitor biology plus rapid therapeutic vaccination.

COMMISSIONER FIEDLER: Okay. I'm just concerned about the rogue actor acting and spreading something.

DR. KELLY: Sure.

COMMISSIONER FIEDLER: And we're back. So, how do you protect the technology against misuse?

And what I'm hearing is, that's hard.

DR. KELLY: It's hard.

COMMISSIONER FIEDLER: Okay. And that's what scares the bejesus out of me. Okay?

So, no, I mean, connectivity, maybe I can create a firewall in a car so that my location is not disclosed. Cloud computing, okay, there's some way to protect the security of the cloud.

But synthetic biology, I mean, all the good uses, I'm fine. It's not the good uses that --

DR. KELLY: Yeah.

COMMISSIONER FIEDLER: We're experiencing now in a virus. And the rapidity with which change can happen that you just described, i.e., you know, we get this down, it's cheap.

I can reprogram the DNA. And I can make you -- while you ingest an Impossible Burger, I can make you more susceptible to a certain disease.

DR. KELLY: I don't know about that.

COMMISSIONER FIEDLER: Well, I -- well, you know --

DR. KELLY: But sure enough. Yeah, yeah, yeah, but you can imagine.

COMMISSIONER FIEDLER: You can imagine. Right?

DR. KELLY: Yeah. Yeah.

COMMISSIONER FIEDLER: So, this is much more serious in terms of the U.S.-China relationship, which we're charged with to determine.

DR. KELLY: Certainly.

COMMISSIONER FIEDLER: Than much -- than cloud computing, I'm sorry. I mean, I -- you put the three together.

So, but -- so, how do we protect ourselves against helping our adversaries develop misuse-ability?

DR. KELLY: Great question. I do think you're going to have a hard time, like the nature of biology is that it's everywhere. Right?

And so I think our regime has to be closer to how we think about cyber security, then say, how we think about like nuclear weapons or something. It needs to be a persuasive type of security.

And fortunately, it's going to basically be trumped up public health, you know, as far as I'm concerned. You're going to need to be just -- think of it this way, think how we approach human viruses.

We're like unpatched Microsoft Windows here. We're just breathing in stuff. No problem, I'll take it. You know, right?

Like our approach to actual human viruses pales in comparison to how we actually approach things like cyber security. And we have the technology now to approach it very differently.

You know, so it's a journey. I'm not going to pretend there's an easy solution.

COMMISSIONER FIEDLER: It's going to be a very difficult answer, I mean, you know, dynamic.

By the way, so when Microsoft came, or its association came before us years ago, and was whining about the stuff that hurt technology ten years after they entered China, --

DR. KELLY: Okay.

COMMISSIONER FIEDLER: And I said to them, I'm not sure I want the Chinese to stop

stealing it. And they said, -- somebody said to me why?

Well, I mean, because they're not getting the patches for the security, so we can hack their government organizations more effectively.

DR. KELLY: Yeah.

COMMISSIONER FIEDLER: So, I'm sorry, but you're useful to our national security, or the theft of your property.

DR. KELLY: Yeah.

COMMISSIONER FIEDLER: What do we do -- this is, this is a very -- I don't have any answers. I just had fears.

DR. KELLY: Yep. I think --

VICE CHAIRMAN CLEVELAND: Facing the fears doesn't necessarily mean that the field goes away. That's the --

COMMISSIONER FIEDLER: No, nothing goes away.

VICE CHAIRMAN CLEVELAND: Right. Right.

COMMISSIONER FIEDLER: It all goes. That's why we have to grapple with the -- I mean, biological warfare implications of this are huge.

VICE CHAIRMAN CLEVELAND: Right.

COMMISSIONER FIEDLER: Give an asymmetric power to an idiot nation. And I'm not even talking about the Chinese now.

VICE CHAIRMAN CLEVELAND: I think all right, your time's up.

COMMISSIONER FIEDLER: Yep.

VICE CHAIRMAN CLEVELAND: We have no answers for that question. But, if you'd like to add anything, feel free, okay.

Is Carte not here? Appears not to be. Okay. Commissioner Kamphausen?

COMMISSIONER KAMPHAUSEN: Thank you very much. Dr. Kelly, this has been fascinating. I have a number of questions.

I'm trying to read between the lines of your elegantly worded testimony, and maybe ask some more granular questions.

Is it the case, would you agree with the assertion that in the absence of the kind of international protocol that you've advocated for, that the quest to collect nonhuman genetic data is kind of a wild west scenario?

And if so, what are some of the implications of that?

DR. KELLY: Yeah. I -- so, I do think today it is -- it's like a race that hasn't quite started yet.

And so the rules haven't been set. And so it is very wild west. You know, it goes up in a variety of data bases.

You know, so the U.S. has a genetic data bank called GenBank. We share all of our DNA code publicly through GenBank.

But, the reality is that, in my opinion, there should be a large national program in the U.S. to go and essentially mine that oil well.

Do what we did for the Human Genome Project, where we sequenced one genome, the human genome, right, back in 2000. And sequence every genome we can get our hands on in the United States.

And then what we do with that data, will determine the international rules for sharing of genetic code. Because we will have the biggest database. And we will say, if you want to use our data, you follow our rules.

And I think we should start that project tomorrow.

COMMISSIONER KAMPHAUSEN: That's helpful. How would you characterize the Chinese approach, to the extent you have any sense of it?

DR. KELLY: So, a couple of things have happened there. So, there's a really nice Reuters article about Beijing Genomics' expansion in the context of COVID-19.

So, they built out labs, I think it was in 58 labs in 18 different countries, to basically push out their technology in the context of doing surveillance style COVID testing. But those labs are genomics labs.

And so they're also laying essentially the -- think of it like the fiber network. When we -- imagine when the internet got built out, of their technology to be doing that sequencing.

And importantly, then that data goes back to BGI cloud around -- around who's monitoring that nonhuman genome sequencing.

And so, so my view is, that's the, some of the first shots across the bow. But, I do think there is, I would emphasize it is early.

And so if the U.S. made a move of substance, we would lead. And I think again, the opportunity is such that if we lead in this, we can set open standards, and that's how we win, in my view.

COMMISSIONER KAMPHAUSEN: Thank you. That's really helpful. I guess the last question then is, do you have any reason -- or maybe the comparative question isn't one that necessarily you can answer, but -- but we get it out there and we can do some more thinking about as well.

Is there any reason for us to think that the Chinese approach to data in this space, right, nonhuman genetic data, that their approach to acquiring it and exploiting it, would be fundamentally different from how they do it in other -- in other fields?

Is there something unique to the data that compels them to a more open collaborative approach?

Or, is it -- is this another space for competition between competing systems?

DR. KELLY: I think it's an opportunity. I think you could set a collaborative standard to be honest.

The value of assets like this is in the scale. And so if the -- in other words, you don't actually know where the best version of a gene is going to come from.

So, to give you a little example. Like, you know, evolution invents something four hundred million years ago. And then it fans out across many organisms.

And that gene is present in all these little different copies across organisms all over the planet. And you sequence them. You read that DNA. And you try out to find out what's the best one.

And you don't actually know what country it's going to come from. And so the -- the -- it's not for sure that we have the best one here in the United States.

The best one might be in Brazil. It might be -- and the industrial value is in finding the best code assets.

And so if we had, with our peers had just -- you know, China doesn't have a lot of the world's biodiversity on a relative basis compared to the rest of the planet. They would kind of need to be a part of it.

You can't just have your own set. It's not an asset you build up. It's a one shot thing, right. You know, that there's just this much code on the planet.

And each nation's got a certain amount of it sitting there in workers. And if we can

aggregate a certain set, you've kind of got to play ball, or else you don't get access to the good stuff.

So, I think we could actually compel adherence to our game.

COMMISSIONER KAMPHAUSEN: Thank you.

VICE CHAIRMAN CLEVELAND: Very interesting. Yes, Dr. Scissors?

COMMISSIONER SCISSORS: Thanks. Dr. Moody, I understand -- this could be a yes or no question, we'll see.

I understand your testimony, both written and verbal, as saying the U.S. should mimic to a considerable extent, not perfectly and not entirely, China's subsidization of transport upgrades, and centralization of standards, and other decision making. So, I think that's right.

But, to clarify, you're saying, it's not just because there are potentially high ecological gains in this sector. And it's not just needed as a response to Chinese behavior.

In your view this is a superior policy for the U.S. in the conventional economic sense. For example, in enhancing global competitiveness.

And if you just want to say yes, that's fine. But, I just want to clarify that.

DR. MOODY: Yes.

COMMISSIONER SCISSORS: Thank you. That's all I -- that's all I wanted. And maybe I'll end up yielding back time. Who knows.

Mr. Cory, you called cloud computing a strategic and central sector. Is it really a live option to secure genuine and durable market access to China in a strategic and central sector? Hint, no.

How soon do we decide if it's working? Or as I expec -- obviously expect, not working?

And the reason I'm worried about this, and you know this very well, is I'm worried that we're going to try to do it. We're going to create yet more firms which are dependent on China revenue and squawk loudly against any change in U.S. policy.

So, I mean, could you reassure me in some way that we have an approach to try to get market access in a sector the Chinese themselves can see is -- will see as strategic?

And then, it's likely, history says, not going to work. How are we going to get out of that trap though we've created a bunch of American firms dependent on China revenue?

MR. CORY: Yeah, no, a good question Commissioner. I take your point.

I was trying to be, I suppose, as optimistic as possible in giving the Chinese the benefit of the doubt in recent negotiations with the U.S., EU, at the WTO, and then obviously the consideration of domestic reforms.

I'm as skeptical as you are, given how central all things digital are, to their conceptualization of national security. Which is essentially domestic politics and domestic control.

Yet -- and so, part of how I wanted to frame my testimony was to make a case that this is what the U.S. making a sort of maybe not a final concerted push, but giving it a, giving it the proper prioritization and making a proper concerted push to see if there was some better way to find a middle ground.

And it may not end up being completely free and open as Chinese firms get in the U.S. But, it would be genuinely meaningful in a way that it is not at the moment.

And that would, I think, in some ways would come from the reflection that the U.S.'s current approach has sort of run its course. In that U.S. most obviously has been complaining about this for a long time, but they've been hedging.

Worried about China retaliating elsewhere, but that if they -- looking at the longer game

they realize that the current status quo and being quiet about it doesn't -- it's not working.

It's not going to -- it's not going to play out well in the strategic long term. So, and that's why we, and I mean, I'm sure you're familiar with ITIFs on these things, like feel the need to sort of ratchet it up in terms of either crash or crash through.

And that hence my point about if we don't -- do make a considered push and it is that, it isn't successful, then to look at countermeasures to limit the damage.

Which, thus far, the United States hasn't really seriously sort of looked at to try and level the lack of reciprocity in another way.

COMMISSIONER SCISSORS: Thank you. Dr. Moody, I'm sorry that you're not getting as much time. But, I assure you, you are at no worse then, tied for the best, on clearest and most succinct answers. So, there's that as compensation.

I yield back my time.

VICE CHAIRMAN CLEVELAND: Well said. Well said. Commissioner Talent?

COMMISSIONER TALENT: Well, as it happens, I had a couple of questions for Dr. Moody. Although I don't think I'll probably put them as clearly as you did, Derek.

So, Dr. Moody, as I understood your testimony, it's your opinion is that Beijing decided to go into, heavily into the electric vehicle market, at least in large part, because they saw it as an opportunity to get ahead of -- of international competitors instead of trying to catch up in the traditional car market.

So, what I didn't get from your testimony is how that is working out for them? In other words, what has the impact been internationally in terms of their market share and the rest of it?

And also, how are they -- because they seem to be well advanced in the introduction of electric vehicles. You did -- there's a reference in your testimony to the grid and the effects on the grid.

But, can you go into that a little bit more? Is it putting additional burdens on the gird? How are they dealing with it? What are the implications of that?

DR. MOODY: Yeah, sure. Thank you for the questions. And so, two great points.

So, the first question is, how is it working out for them that they've sort of been bullish on commercializing electric vehicles?

COMMISSIONER TALENT: Yeah. In terms of the market share and that sort of thing.

DR. MOODY: Yeah. It's working out for them extremely well. They are the largest global producers of light duty or passenger vehicles in electric space.

And they're also the largest global producers of e-buses, so, commercial vehicles. So, the two largest exporters are both Chinese companies.

And so, they have a very large market share on the producer side, as well as a very robust market on the consumer side. Where most of the sales, the global sales, of new battery electric vehicles are being sold in China.

So, their own demand domestically, is also helping with that global production. But, they are very much set up as the preeminent electric vehicle manufacturers.

And as I included in my testimony, one of the really supporting and concerning pieces of that for the U.S. automakers, is the fact that China has an extremely strong foothold on the battery supply chain. And this is in battery production, so the actual production of the battery cells that are then put into packs.

But it's also on the raw materials and the extraction of those materials, and then the syntheses of those materials to get them battery ready. That entire supply chain, for critical lithium ion battery technology components, is really controlled by China.

And so that supply chain is a real vulnerability for U.S. companies, automakers in particular going for battery electric vehicles, but also consumer technol -- consumer products that use lithium ion batteries.

The next question was on effects on the grid. I'll just briefly say that this is an area where the fact that electric vehicle charging in particular has been developed by the state-owned utilities, has really meant that they could learn about, they can collect data from their chargers on how people charge their vehicles. And then optimize their grid, understand those network implications.

The fact that charging infrastructure is developed by state governments - a little bit more fragmented -or even private sector entities, means that that data doesn't necessarily go to grid providers in the United States.

And there is really less of this information flow that allows us to really understand the impacts of EV charging on the grid, and also optimize and build out for it.

COMMISSIONER TALENT: So, do we understand the impacts so far? And also, in the time remaining, does their control of the lithium battery supply chain in this context have implications outside of electric vehicles?

DR. MOODY: So, for the second point, absolutely. Lithium ion batteries are a large part of many consumer technologies. And so this goes well beyond the electric vehicle space.

So, I think that this is really a critical supply chain for a lot of new technology advancement in the United States now in electric vehicles.

And then in the question of, do we understand the impacts of broad EV charging? I think the question is not yet.

And that's because 80 percent of electric vehicle charging today is done on low level chargers at home.

But, as electric vehicles penetrate the greater amounts of the market where individuals may not have the ability to charge at home, as we get greater adoption, then we're going to see a greater need for that public charging infrastructure. And that's when we'll have greater demand.

COMMISSIONER TALENT: And my time is up, but just so that we don't right now, and I'm asking this in part for the record, so right now there isn't any data available about the extent to which, in China, EV use is stressing their grid or anything now.

We just don't know. It's premature. Is that correct?

DR. MOODY: They probably know. I don't.

COMMISSIONER TALENT: Okay. There the -- they haven't put it any place where the rest of us can find out yet. Okay. Thank you.

VICE CHAIRMAN CLEVELAND: Good answer. Commissioner Wessel?

COMMISSIONER WESSEL: Thank you. And Jim, I think we'll find that their digital currency may be stressing the grid more than the -- than EVs.

Thank you each of the witnesses for being here. I'll try and be as succinct in the question -- in seeking an answer as Derek was.

A couple of questions. First, Jason, is it possible to reverse engineer through a biosynthetic product? Produce product?

DR. KELLY: Yeah, great question. Yes, is the general answer. The -- often you would have an engineered cell that produces a product.

COMMISSIONER WESSEL: Right.

DR. KELLY: So, for example the hemoglobin in the Impossible Burger would be -- you couldn't necessarily reverse engineer the cell, unless you got your hands on it.

But, if you were to go to where they produce the heme, and find that yeast, you could read the genome and reverse engineer how it was done.

COMMISSIONER WESSEL: So, if you knew the vector, whether it's fungal, yeast, whatever it is, you might be able to reverse engineer. Is that right? Is that what you're saying?

DR. KELLY: That is what I'm saying. And also, I'll just mention one other thing, just to be clear about it.

COMMISSIONER WESSEL: Okay.

DR. KELLY: They self-replicate.

COMMISSIONER WESSEL: Right.

DR. KELLY: So, much like software is easy to copy, living organisms are easy to copy.

COMMISSIONER WESSEL: Okay. My understanding also is China is, you know, engaged in a massive biodiversity collection effort.

Somebody recently told me about the Chilean soapbark tree for example. I don't know if you know that issue.

But, I -- is that your understanding? And would -- you know, is that going to be a competitive advantage?

Or, based on your desire to have open, I guess, repositories of the genomic code, must it be solved in that way?

DR. KELLY: It is a concern of mine. And you are correct that they are -- they are reaching out internationally to sequence -- to offer sequencing services for that purpose.

I think it will be solved if we end up with a bigger DNA sequence database, we will get to set the rules. And so that, yes, my recommendation would be, like we did the Human Genome Project in 2000, we should do the American Genome Project now in 2021 and sequence every living organism in the United States that we can get our hands on.

And you know what? You've got Eric Lander in the cabinet. He's the guy that ran the Human Genome Project.

COMMISSIONER WESSEL: Exactly.

DR. KELLY: So, what better thing to do.

COMMISSIONER WESSEL: Are you concerned about what BGI and others are doing to collect genomic data here in the U.S.?

DR. KELLY: In terms of nonhuman, you're saying? So ---

COMMISSIONER WESSEL: In terms of human.

DR. KELLY: Human?

COMMISSIONER WESSEL: In terms of --

DR. KELLY: Thank you, yeah.

COMMISSIONER WESSEL: Whether 23 and Me, or any of the other, you know, genomic collection DNA testing.

DR. KELLY: Yeah, so my remarks up until now have been about nonhuman genome resources.

COMMISSIONER WESSEL: Right.

DR. KELLY: Human genetics is its own can of worms. I -- you know, honestly I think it gets a little bit overblown to be frank.

I think having the, those genetic sequences are mainly going to be valuable in the hunt for therapeutics. I think they're going to be more of a, primarily an industry asset rather then something more dramatically nefarious.

COMMISSIONER WESSEL: But that could be hundreds of billions of dollars.

DR. KELLY: Oh, yes. Without question. I think the value industrially is strong. I think like certain like defense location or things, I think that's often overblown when it comes to it.

COMMISSIONER WESSEL: Okay. Dr. Moody, looking at autonomous connected vehicles, you know, data appears to be sort of the, as they say, data is the new oil.

It would -- are you concerned about the collection of data by Chinese platforms in the U.S.?

DR. MOODY: So, I would say right now, I'm not as concerned. I do think that it is a huge risk to not set the standards and the protocols from the national government here that vehicles need to operate under when they're on our roads, if not global roads.

And so there's a lot of cyber security information exchange protections that the U.S. government could set standards and protocols allowing the private sector to continue to innovate on these technologies.

I think that's a really critical area where we need some central government leadership in this space. And that would absolutely apply and should apply to the automakers, whether -- or private mobility operators, whether they're Chinese or U.S. owned.

But, if in the absence of that standard, you put yourself at risk of the Chinese who are advancing in this information exchange, setting those rules.

COMMISSIONER WESSEL: Okay. If there's another round, I'll ask some more questions. Thank you.

VICE CHAIRMAN CLEVELAND: Commissioner Wong?

COMMISSIONER WONG: Well, thank you all for joining us today. It's really been a fascinating discussion across all of these new technologies.

I get -- my questions focus on the -- on Dr. Kelly's testimony. And particularly your idea regarding an open bank of genomic information.

I understand that argument. I understand the idea of the U.S. trying to drive more of an open source, if that's the right term, standard on the use of this information and collection of this information.

But, if I understand you correctly, you're saying that biodiversity is in a sense, a commodity or a competitive advantage of different nations versus other nations.

And if I'm correct, biodiversity as a comparative relative matter, is concentrated in the tropical band of the world. And when you look at the tropical band of the world, as a general matter, the countries that you see there, are what we would term the global south and not the global north.

So, my question is, if we set up a situation where we want to drive an open source, open bank format that is incentivized that basically you have access to this information, we all pool it, because then we have access to do new writing, new synthesis.

Does that really work for these countries? I mean, they -- I would imagine a global south country would not have a large infrastructure for synthesizing new genes, or the industrial backing or incentive to utilize this new technology for new uses and use cases.

Therefore, they have incentive not to share. But instead to monetize, license, use that in the same way that many countries in the global south sell their oil. Right?

How do we square that?

DR. KELLY: Awesome question. Yeah. So, I could not agree more actually. So, I think the U.S. -- I don't think it needs to be free.

I think the U.S. should set the rules by which benefit sharing happens back to the owners of the code. And I think this is actually the big opportunity. Right.

So, instead of aggregating it within the country that's sequencing it, to try to do that. So if I were going to sequence everything and then I'm going to aggregate that back and commercialize it.

In fact, I actually agree with you. I think it should be a benefit sharing regime. And the closest thing we have to that is this Convention on Biological Diversity that I mentioned earlier, that we are not a signatory to, to be clear.

And within that, there's a protocol called the Nagoya Protocol, which has to do with if you take a biological material from a country, often the canonical examples are biodiverse rich countries in the global south, where you would have a tree bark or something that was like a known medicinal thing that was then commercialized elsewhere, how do you return benefit?

My opinion, that was all, you know, nothing compared to the sequencing assets, which are -- the sequenced DNA assets which are dramatically more valuable then all those, the actual biological materials.

And so, I think you could set that up. I think we could set the rules. We could help define how benefit sharing does happen so that those countries could benefit.

And then -- and we should do that like we thought about building out the rules in information technology.

And I don't have the answer for how to do it. But, we want to set it. Right?

COMMISSIONER WONG: Can I ask you another question? And maybe this is beyond your expertise or your experience.

But, do you sense that in general, these countries that are biodiverse rich, are aware of what the treasure trove they're sitting on? And are -- therefore, are taking the right steps to protect their valuable natural resource at this point?

DR. KELLY: No. No, I would say you can look at ecosystems lost, as a very obvious example of how they are not. Right.

You know, so the -- one of the things I'm hopeful for, is there will be an overlap of interest. Where you can say, you will get benefits back for this code.

It's actually a reason to protect the biological diversity of the planet, which can also not give it away, and not give it away, but also protect it. You know, in other words, preserve it.

And so I think those things can overlap with each other, yes. And I think right now, countries would give it away. They don't realize.

Human code, they are actually aware of. So, that, countries are starting to keep an eye on their population genetics of the human genetics.

But, they haven't made this jump yet to realize that nonhuman genetic code is valuable, in my opinion. I think it's coming.

COMMISSIONER WONG: And this is fascinating. Absolutely fascinating stuff. So, thank you for coming again.

VICE CHAIRMAN CLEVELAND: Okay. I have a couple of questions for you, Dr. Kelly. You described the three areas of genetic work.

And I'm curious, you mentioned BGI. Is that the only space where they are proficient? Or are they good at the -- the --

DR. KELLY: The writing and plugging?

VICE CHAIRMAN CLEVELAND: Writing, yeah.

DR. KELLY: DNA reading is -- will be the strength. So, in genomics that's where they're not, I wouldn't say, quite a peer to Illumina. But, they're certainly on the march.

The writing of DNA code, the U.S. is currently leading, I would say. And in debugging

with like the laboratory automation, I'd say we're also leading.

VICE CHAIRMAN CLEVELAND: Because I don't under -- I profess no deep understanding of this. But, it seems hard as a technology.

And over time, it's evident whether it's semiconductors, or aircraft engines, there seems to be a real gap in the ability of the Chinese to develop or innovate on their own.

So, I guess what I'm curious about, is your sense of, will they continue to concentrate in one area? Or will they try to develop strength across the board?

DR. KELLY: They will try to develop strength across the board. And I would say if you look -- and I think that kind of, my view is, you know, as countries should, they're investing in advanced technology.

So, you know, in 2020 there was twice as much investment in China in synthetic bio logy than the U.S. actually. And so, I think they -- there is a sense that they pick an area where there is an opportunity where they can invest quite a lot.

And so I think that kind of, my view anyway is, they will absolutely move into those areas, yes.

VICE CHAIRMAN CLEVELAND: Setting standards is an important next step. And they should be U.S. standards.

How would you -- who would, and how would you implement those standards?

DR. KELLY: Right. So, I think it will happen based on becoming -- by achieving scale.

In other words, like if your platforms become bigger, then you are the one who gets to set a lot of those standards when it comes to-- when if you look at the history of technology, this has been very common.

So, I think that's our first priority, is to make sure we can serve the global market with U.S. technology, and there's no barriers to that. So, that U.S. companies can achieve bigger scale.

But then I think there are opportunities to take the lead on, like we did with internet protocols, that are more about, you know, estab -- you know, doing what the U.S. does. Right.

Going out, getting you know, other countries onboard. And setting some standards around the technology in a coordinated fashion.

Like we should do that just like we did with the internet standards when it comes to things like how code is trans -- you know, benefit sharing workings and how code is treated. Yeah.

VICE CHAIRMAN CLEVELAND: Are you envisioning a UN type organization? Or what is -- I mean, how --

DR. KELLY: Good question. I take a lesson from the internet standards community. I don't actually know how they pulled that off.

I know they did a good job of it, I guess I would say. And so, going back and looking at that history, I think maybe we try to copy those organizations.

VICE CHAIRMAN CLEVELAND: And the other point you made was surveillance. And so I'm interested in whether or not you think the WHO is charged with the responsibility?

And to invite you into a very sticky debate, --

DR. KELLY: Yep.

VICE CHAIRMAN CLEVELAND: Do you think that they are adequate to the task? That there ought to be, please don't say more resources.

But, I mean, what would that surveillance system look like to you?

DR. KELLY: Yeah. So, I think it would lean on this type of technology like DNA readings. So, being able to broadly look at what's happening out there in the world, and getting a

sense of new agents that are spreading around.

I think we just need to change our frame. Right. Like to answer your question, Commissioner, earlier about hey, this stuff could be dangerous, of course.

You know, right we know from infectious disease that's true. We should take the opportunity of COVID to massively upgrade our biosecurity capability.

We shouldn't even look at it like WHO. We should look at it like it is like U.S. cyber security national defense.

Like we should invest in biosecurity. Because we have a very obvious national security threat. Like, look at the last year and a half. It's not been fun for me, you know.

And so, so that -- and by the way, this could have been worse. Right? You know, so in the scheme of things.

And so, so, I think we need to treat it with a totally different footing. Far more aggressive in terms of our ability to monitor so that -- and by the way, it expands exponentially. So, if you get on it quick, you can stop it. Right.

If we had known exactly where it was back in January of last year, you could have just snuffed the thing out like it was nothing. And so surveillance equals biosecurity if it's good enough when it comes to -- when it comes to biology.

VICE CHAIRMAN CLEVELAND: And my last question is, we suggested last year that one of the national labs be focused exclusively on biotechnology, synthetic biology. Would you share the view that that should be the direction that we head?

DR. KELLY: I think that's a phenomenal idea.

VICE CHAIRMAN CLEVELAND: A very political idea, too, yeah. Okay. Thank you. Carolyn, did you want to ask any questions?

CHAIRMAN BARTHOLOMEW: Yeah. Thanks. Just to, on the, sort of the monitoring, right, the potential pandemic monitoring.

I think that there are epidemiologists who are advocating that we have essentially like an early warning net -- weather, you know, the severe weather system, that we have something here in the United States that would allow people to track and do early warning.

But, Dr. Moody, I appreciate the fact that you mentioned supply chain vulnerabilities, because I think when we think of R&D, we have a tendency just to think of the R&D part, and not necessarily what comes after the development of new technologies.

And I just wondered, both from Mr. Cory and for Dr. Kelly, are there -- are there vulnerabilities in the supply chain for whatever equipment it is that you use?

Dr. Kelly, I actually started thinking about this when you talked about the, your manufacturing facility being automated. Are there -- are there critical materials that you have concern about not being able to get access to?

DR. KELLY: Not at the mo -- no, not, I would say not, nothing, nothing at the moment that I'm super concerned about.

CHAIRMAN BARTHOLOMEW: Mr. Cory?

MR. CORY: It's an interesting question in that our supply chain security in the cloud sense is both obviously about the hardware and the software.

And obviously we've been through quite a roller coaster as it relates to us and ICT hardware, security, over the last few years. But then obviously with growing interests on the software side of things.

And so, on the hardware side of things, that's sort of developing in terms of like, how the U.S. government is going to pay closer attention to setting standards and certifications about how

it uses hardware for its own cloud security. China is doing much the same.

I should note that there were some U.S. firms that did not want to speak to me in advance of this as part of my research, because they're currently undergoing auditing by Chinese regulators under their multilevel protection scheme. Which is how they ascertain their own sort of cyber security, supply chain security as it relates to ICT and cloud security realm.

So, and then the bigger question, sort of related, is on data governance within the supply chain. How do you, how do you withdrawal sort of the security of the data that's central to the operation of the service?

And this is -- that's a whole other can of worms as to the contrasting approaches between the U.S. and China and elsewhere.

So, and I'm happy to answer any specific, more specific questions you have in that realm.

CHAIRMAN BARTHOLOMEW: No, that sounds great. If I have other questions, I'll submit them in writing. Thank you.

VICE CHAIRMAN CLEVELAND: And thanks. Commissioner Wessel, you said that you had another question?

COMMISSIONER WESSEL: Yes. I did, thank you. And I just saw your text, so thank you.

Nigel, if I could ask you a question, ITIF and much of the industry is against data localization, right?

MR. CORY: Yes. It is.

COMMISSIONER WESSEL: How do you square that with China's national security law? I'm a little concerned about China providing cloud services here in the U.S. with, you know, the mandate that any firm abide by Chinese law, isn't that just an open risk?

MR. CORY: It's a huge risk. And it was, if I could suggest another topic for a future hearing, it would be to explore the issues around how U.S. firms manage requests for data from foreign governments, because it's a massive issue.

And we're just seeing sort of greater concern grow around it with the new national security law in Hong Kong. Where obviously a lot of U.S. firms have operations above and beyond what they already have in China.

And there's a real lack of clarity and certainty about how China's framework with its national intelligence law, with its new draft data security law, how that's going to work.

And so, I think valid concerns in that we need to get greater clarity that Chinese firms that operate in the United States, are abiding by U.S. data privacy/date protection laws.

And that they aren't sort of susceptible to extraterritorial requests for data. Which is a growing issue.

It's also a growing issue as it relates to the extraterritorial application of censorship from China on U.S. firms for activities and speech they conduct outside of China.

And so together, they're two big issues that we really have not done near enough work on. Because they -- as I think what you get to, is like, they present a huge risk.

Is that we just don't know how it works. And whether we can trust the legal and administrative and technical sort of firewalls that Chinese firms may implement in U.S. operations.

As well as those implemented by U.S. firms in China. To ensure that each country respects each other's sort of sovereignty and the reach of their law.

COMMISSIONER WESSEL: I apologize, I appreciate the academic nature of your response. I've grown to learn not to trust China when it says it's not going to do certain things.

When you say give them the benefit of the doubt, I generally hear that they get the benefit, and we're the ones who pay the price.

So, and again, I, you know, I think your examination of this in terms of extraterritoriality, creates some problems. If the server holding U.S. data is in China, it's not necessary an extraterritorial grab of data, right?

MR. CORY: Well, it could.

COMMISSIONER WESSEL: I understand. It's just, you know, from a legal conflict of law issue, I think it's a problem.

Dr. Moody, let me ask you just one quick question as it relates to my earlier question about data.

You know, part of my fear is that, let's say we have an autonomous vehicle operating on a Chinese system, and somehow every car that is dropping people off at the CIA is able to transmit that data back to China. Those of us with clearances are not allowed to use Fitbits for the same reason.

Aren't we opening ourselves up to sort of a treasure trove of intelligence data for the Chinese?

DR. MOODY: I think without setting our own standards for how these vehicles need to communicate to other vehicles, and how these vehicles communicate to infrastructure, we are absolutely setting ourselves up for that risk.

And that's why I think that there is really the focus should be on connectivity and the protocols and standards for how these vehicles are going to communicate.

And that's really sharing of information. And there are different ways of doing that. Some is sharing queries for algorithms, as opposed to sharing data.

And so there are innovations in that space. But, I think that we as a country, and then particularly the federal government, has a huge role to play in helping to shape and roll out those standards to mitigate some of those risks that I think you have rightly identified.

COMMISSIONER WESSEL: My understanding is, there is little work being done on that, on those issues from a security related aspect here in the U.S.?

DR. MOODY: We definitely have a lot of innovation in cyber security. And that rolls into a lot of the private sector innovation in autonomous vehicle technology.

I think the differentiation here is that the public sector really has a role to play in the connectivity space because of the fragmentation of jurisdictions and private providers.

But, also in the fact that a lot of the infrastructure of -- that transportation systems run on, is publicly owned.

And there are, there's a joint office for, and I'm going to get the name wrong, there's a joint office looking at sort of mobility on demand and some of these more integrated information sharing. It's a joint program between the Federal Highway Administration and other organizations within the U.S. government.

That type of organization and the standard settings and protocols that they are sort of thinking about, I think that part really needs to be accelerated.

COMMISSIONER WESSEL: Thank you.

VICE CHAIRMAN CLEVELAND: Are you done, Mike? Yeah. Okay.

COMMISSIONER WESSEL: Thank you.

VICE CHAIRMAN CLEVELAND: I think it's worth noting that -- that the staff memo points out that Chinese autonomous vehicles are already operating in the United States with -- they're in California where Baidu has a fully autonomous testing permit from the State of

California.

Which, I think, makes the point that Dr. Moody is making, that there is no federal regulation of autonomous vehicles.

Commissioner Fiedler, you said you had another question?

COMMISSIONER FIEDLER: Yes. This is just a quick question. Jason, you're CEO of your company, so you certainly are probably up on investment in your company and in the industry.

The private equity investors, you have private equity investors?

DR. KELLY: Yeah. We raised just over $900 million since we opened the company.

COMMISSIONER FIEDLER: Are the private equity investors in the United States investing in you, for instance, also investing in your counterparts in China?

DR. KELLY: That's a good question. Yeah, I would say there's not a -- there's certainly large biotechs in China that receive investment.

I don't know about BGI specifically. It's a -- it's pretty overlapping with the state. You know, --

COMMISSIONER FIEDLER: Yeah. But, are the same people interested? I mean, it's a -- are the same people investing in the United States investing in China?

DR. KELLY: I would say that's frequently the case in the tech world, yeah.

COMMISSIONER FIEDLER: So that the race of whoever wins, they win. Right? I mean, --

DR. KELLY: I think it -- yeah, I mean, it's -- I would say that generally, there's not a lot of distinction among arms' length capital investors in terms of where they're putting the money.

COMMISSIONER FIEDLER: Yeah.

DR. KELLY: Yeah.

COMMISSIONER FIEDLER: Thank you.

VICE CHAIRMAN CLEVELAND: If there are no more questions from anybody, we'll wrap up and reconvene at -- in a few minutes.

I want to thank the witnesses. This has been fascinating. I have learned a great deal. Some of it alarming.

So, really appreciate your appearing. Thank you.

COMMISSIONER WESSEL: Thank you.

DR. KELLY: Thank you.

MR. CORY: Thanks.

(Whereupon, the above-entitled matter went off the record at 2:41 p.m. and resumed at 2:53 p.m.)

PANEL IV INTRODUCTION BY VICE CHAIRMAN ROBIN CLEVELAND

VICE CHAIRMAN CLEVELAND: Welcome back, the last panel of the day will offer a case study on the rapid expansion of the financial technology sector and its potential to serve as a platform for People's Bank of China digital currency.

The panel will discuss the global and domestic implications of China's first-mover status in developing a sovereign digital currency. None of the witnesses that we have today have testified before so we are delighted to have them here for the first time.

We'll kick off the discussion with Dr. Martin Chorzempa, who is a senior fellow at the Peterson Institute for International Economics, where he focuses on the role of technology in China's financial system.

Prior to PIIE, Mr. Chorzempa was a Fulbright Scholar in Germany, researching the Association of German Banks, and is a former Luce Scholar at Beijing University's China Center for Economic Research.

He's currently working on a book on fintech and his testimony will address the relationship between China's fintech companies and the government, as well as the effects of China's digital currency on domestic and international financial markets.

Next we will hear from Yaya Fanusie, adjunct senior fellow at the Center for New American Security.

Mr. Fanusie previously spent seven years at the CIA and in addition to the CNAS post he is the founder of Cryptocurrency AML Strategies, an advisory firm that helps financial institutions and technology companies address money-laundering and terrorist financing risks associated with digital assets.

He's the co-author of the recent report, China's Digital Currency, Adding Financial Data to Digital Authoritarianism. His testimony will address China's fintech strategy and potential challenges to U.S. leadership of the financial system.

Last but not least, to round out the day we will hear from Dr. Samantha Hoffman, Senior Analyst at Australia's Strategic Policy Institute Cyber Center.

Dr. Hoffman's research explores the domestic and global implications of the CCP's approach to state security. Prior to ASPI, she was a visiting fellow at the Mercator Institute for China Studies in Berlin.

Just last week she published a report with the National Endowment for Democracy titled Double-Edged Sword, China's Sharp Power Exploitation of Emerging Technologies.

And her testimony will address the geopolitical implications of China's digital currency.

So, Mr. Chorzempa, please?

OPENING STATEMENT OF MARTIN CHORZEMPA, SENIOR FELLOW, PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS

MR. CHORZEMPA: Vice Chairman Cleveland, Commissioner Wessel, honorable Commissioners, thank you for the opportunity to testify today about China's digital currency and digital payments.

I'm going to start by addressing the private sector initiatives that have really made China successful in financial technology, then move on to the Central Bank digital currency moves, and then finally discuss why I think China's digital currency isn't really a threat to the U.S. or the dollar in any near term.

So, we all probably know that China's the world leader in adoption of financial technology.

About 1 billion people in China use mobile wallets, they have left behind physical wallets and physical cash, and one of the main reasons for this is that the Chinese Government around 2013 gambled and said let's open up the financial sector to big tech so that it can compete with the banks and force a modernization that did not happen among banks that didn't really compete as much with each other.

I think they got a lot more than they bargained for. These companies became much more powerful and much bigger than they expected, and they've been catching up for a long time so there's currently a crack-down and a bit of a reversal.

I see that both as a politically motivated campaign, understanding that someone like Jack Ma could be too powerful in China, and that concerned regulators, that he has, for example, blocked regulations in the past against his company.

And secondly, due to real legitimate concerns about privacy, competition, and financial stability.

So, there's a mix of motivations there. One would expect that with such strong financial technology companies and all the abundant data and capital and expertise they have, they would have been extremely successful abroad and begun to eat into Visa and Master Card's market share in other countries.

But in fact, that hasn't happened at all. The only people that use Alipay or WeChat Pay outside of China are Chinese tourists, so even though it's accepted here, it really is not a tool that competes with any major U.S. financial institution. It runs on U.S. financial infrastructure that exists already.

I don't see this changing anytime soon. One reason for that is national security concerns around data.

Financial services are pretty carefully regulated in most countries and there are a lot of concerns, including in places like Indonesia. They've said you can only have Chinese tourists use Alipay, you can't go after Indonesian consumers.

Now, moving onto the government side where China is by far the closest of any major economy to launching a Central Bank digital currency called Digital Currency/Electronic Payments, DCEP, or the eCNY.

This is the main worry in the United States now, is this going to threaten the role of the dollar and many other concerns? Will it expand China's surveillance net abroad?

What is the eCNY? There's still a lot of that we don't know about this and there's a bit of a mismatch out of some Chinese officials saying this is almost ready and what I see as a still-robust debate about what this should actually look like.

For example, is it a liability of the Central Bank or is it not? That's the most fundamental question about what this thing is and it seems unresolved. So, I don't think this is coming out nationwide as a finalized product that soon.

It's more like a payment system than a new currency, it really doesn't look at all like Bitcoin or any other cryptocurrency. There's no blockchain, it's not decentralized, it has the same value as the renminbi so it's not going to be a speculative instrument to gain investment returns.

It's centrally controlled and monitored, the Central Bank will have a look at every single transaction if it wants. Cross-border elements are definitely some of the motivation for it but so far those are very much in the rudimentary stages.

When I see arguments that this will expand renminbi's international role, I usually see very little structure around how that would actually happen. One key fact that I think is often missed in discussions about digital currency is that most currency is already digital.

Even when you're paying with a credit card, yes, it's plastic but what that's doing is transmitting data and that's a digital payment. So, the idea that the renminbi because it's digital is going to be more competitive with other currencies because it's digital doesn't really make much sense.

Because it's a digital renminbi competing with another digital renminbi, which is Money in, say, an Alipay Wallet, or a bank account, which also then would compete with digital U.S. dollars, digital pounds, digital euros, and all of that.

So, what's new about it has to be some other element which makes it more efficient or faster or cheaper, something like that.

And these elements of digital currencies when we talk about Central Bank digital currencies are very much unproven, rather at a proof of concept stage internationally of could this work for cross-border payments?

It's not really even into the cost-benefit analysis for most countries, so it's very early stages. China has a lot of motivations for this including monetary sovereignty.

They were very spooked by two events, the first is in 2013 Bitcoin began to take off in China and there was a real concern that if Bitcoin took off they would lose the ability to implement monetary policy, capital controls, price stability, things that are actually legitimate for China's economic policy.

And then the second was the Facebook announcement that it was going to launch Libra, this global currency.

China was really concerned about the new global currency being something from a U.S. company linked closely to the U.S. dollar and really didn't want to have to, say, Libra-ize as its economy or choose to ban it and be isolated from the rest of global digital commerce.

There are many other motivations too, one is that they're uncomfortable with the big private companies dominating the financial sector and also controlling surveillance, which will be covered more by the other panelists.

So, some reasons to put the digital renminbi low on the U.S. list of priorities, because I just don’t think it's that much of a threat. The first is that renminbi internationalization has not really made much progress recently, and capital controls remain tight.

There's no sense that those will be removed. You can't really be a reserve currency if you reserve the right to flip the circuit-breaker and trap the money in China when it's needed most.

I don't really see that as a recipe for taking over the dollar with its open capital account. This is going to take many years and cautious trials to prove that Central Bank digital currency can really work better than the existing systems.

And to put this in context, it's taken 20 years to implement the last update to global payment standards, which is from SWIFT. So, it's not like China's going to set the new standards tomorrow and we have to be really worried about it.

And the Fed and other major Central Banks that are allied with the United States are already proposing standards of the bank for international settlements are on top of this issue and watching it closely.

I actually think it's going to be more difficult to internationalize a digital renminbi than the existing renminbi because if they have more control and more surveillance capability, that's going to scare away other users.

Also, there are no network effects, there's no other Central Bank digital currency except the Bahamas to connect to so it's not like it's going to be easier to transact.

They're starting more from scratch here and they have to build all the financial infrastructure around it, which includes financial institutions offering hedging instruments, liquidity in the FX markets, all of that.

It's going to be much more difficult so I just don't see this as a threat to the United States. Thank you.

PREPARED STATEMENT OF MARTIN CHORZEMPA, SENIOR FELLOW, PETERSON INSTITUTE FOR INTERNATIONAL ECONOMICS

Testimony before the US-China Economic and Security Review Commission

Panel 4: China's Pursuit of Leadership in Digital Currency

A Statement by

Martin Chorzempa

Senior Fellow, Peter G. Peterson Institute for International Economics

April 15, 2021

Introduction

Many in Washington are concerned about what China's leadership in fintech and pioneering efforts to launch a new form of the RMB, a central bank digital currency (CBDC), could mean for the US and the role of the US dollar. In her confirmation hearing, multiple senators prodded Treasury Secretary Janet Yellen on China's digital currency and her plans to keep the US dollar and financial system on top. She said the US "must be a leader" in fintech and digital assets and that, "Strategic competition with China is a defining feature of the 21st century." Yet, the Fed has not committed to launching its own digital currency to take on the Chinese one currently undergoing trials. Should the US be worried? My argument is that it should not, and that the Federal Reserve and Treasury have been right to proceed cautiously, with the idea of getting any digital currency plans "right" instead of "first."

China's fintech success has been impressive, but it remains mostly a domestic affair. Its fintech giants Ant Group and Tencent have achieved enormous valuations, but their attempts to gain users internationally other than Chinese tourists abroad have so far made little inroads, and national security concerns in jurisdictions around the world mean that this is not likely to change anytime soon.

Hype has far outpaced the reality in digital currencies, CBDCs, and China's digital RMB in particular. Cryptocurrencies like Bitcoin are booming, but these are mostly for speculation, as they are ill-suited to large volumes of payment transactions. We are still at an early stage in which the benefits of CBDCs have not yet been proven in practice, and the risks (cyber, operational, financial) are serious enough that most central banks will be hesitant to issue any until these can be resolved with a high degree of certainty. China's eCNY efforts have similarly yet to prove they will be any cheaper, more efficient, more private, or more convenient than the existing domestic and international payment systems. Therefore, it is unlikely to represent any more a threat to the dollar's international dominance than the current forms of RMB, at least over the short and medium term. Nothing is certain over the long term, however, so the

US should continue to carefully monitor China's CBDC efforts and other digital currency innovations and incorporate any useful lessons to ensure that dollars and the payments systems that carry them remain competitive long term.

Fintech in China

Financial technology, or "fintech" has propelled Chinese finance from a backward state all the way until 2013 into a world leader in digital finance. While Americans tend to still use plastic cards and billions of paper checks to pay, cash has all but disappeared in Chinese cities as mobile phone based quick response (QR) code payments displaced paper money and cards. The two dominant mobile payments apps, Alipay and WeChat Pay, affiliated with China's most successful e-commerce and social media/gaming companies, respectively, each boast around a billion users. These "super apps" combine immense bundles of financial and non-financial services that would take dozens of applications in the US to approach their functionality.

Chinese e-commerce and fintech companies have become some of the world's most valuable companies. Tencent, a dominant social media, chat, gaming, and fintech company, is worth over $800 billion. Alipay operator Ant Group, a financial technology company spun off from e-commerce giant Alibaba Group, was recently valued at over $300 billion, on par with top US financial companies like JP Morgan Chase and Mastercard before regulatory and political concerns domestically led authorities to cancel its deal.

China's leadership in fintech however, is not just about private firms. The government has joined in the financial innovation game, principally with its plans for a central bank digital currency (CBDC) that would operate both alongside and together with the existing digital wallets that have taken China by storm. China was one of the first countries to set a goal of launching a digital currency, and today it is one of the most advanced in its plans, certainly by far the most advanced of any major economy.

China's Fintech Giants and Its Government

In the early years, starting with Tencent's introduction of its "Q Coin" virtual currency in 2002, and Alipay's emergence a few years later, regulators paid little to no attention to financial technology innovations. China faced much more serious financial issues in the early 2000's, from bailing out and reforming a largely bankrupt banking sector to building China UnionPay, the first national retail payment system for debit cards. The relationship between financial technology and the government was benign neglect, as these challenges left little room for thinking about how to respond to then small-scale innovations in payments.

The capital for those early fintech innovations came not from government plans and subsidies doled out by far-seeing bureaucrats, but foreign investors like Goldman Sachs, Softbank and Naspers, who saw promise in Chinese technology companies. Regulators considered imposing rules for nonbank electronic payments in 2005, but instead waited for the market to develop on its own. The first rules and licenses only came in 2010 and 2011 after a series of scandals

involving money laundering and illegal activity at payments companies pressured regulators to clean up the messy market.

The era from 2013 onward represented an alignment of goals between Chinese technology companies and the government. Reformist leaders like People's Bank of China (PBOC) Governor Zhou Xiaochuan convinced the Party leadership to open areas of finance that were previously reserved for state-owned companies, including banking, lending, and investments, to privately owned companies, including Alibaba and Tencent. Governor Zhou had long believed that introducing new technology to China's banking sector would help it modernize and better support China's transition to a growth model more dependent on efficiency and innovation than state-directed investment and exports. In effect, the government let fintech boom not in spite of, but because of its ability to undermine financial repression that insulated banks from competition, giving financial consumers better service and more choice.

Financial technology companies were particularly well-suited to achieving the Party's goals for financial inclusion, especially lending to small-and medium-sized enterprises and rural people that would have difficulty accessing credit from big state-owned banks. Thus, regulators created an uneven playing field that left financial technology subject to significantly less regulation than the traditional state-backed financial sector (Zhou 2013). This policy decision was a critical ingredient to the boom in fintech that began around 2013 and accelerated in 2015, as big technology firms became financial conglomerates and thousands of fintech startups entered as online P2P lenders.

Starting in 2016, the relationship became more complicated. Fintech grew more quickly than the Chinese government anticipated, and problems emerged like Ponzi schemes in online P2P lending and gray market financing that helped inflate a stock market bubble. Since then, the government has tried to restore financial order and clamp down on risky activities while at the same time trying not to choke off the useful elements of fintech---innovation and competition that results in efficiency and inclusion gains (Chorzempa 2018).

Top fintech companies and their executives gained enormous political power, in some cases even blocking or neutering government regulations that would have stood in the way of expanding their business. In other cases, such as the government's attempt to combine credit data into a single repository, Ant and Tencent have refused to comply with requests to share valuable information (Yu 2021). In others, they have exploited regulatory arbitrage to avoid regulations. These cases make clear that the relationship of China's tech giants with the government are complex and evolving. They are not simply tools of the Party, rather they are enterprises with their own interests and allies at high levels of China's political system.

The future of these relationships is uncertain. Big technology firms have become so large and important that they are in the political crosshairs over issues of privacy, competition, and more across the world. China is no exception, and these issues are more urgent there because big technology companies play such a key role in finance, in addition to all the roles they play in the

West. In effect, big tech companies like Ant became so large and systemically important that they were operating financial infrastructure, the kind of business that is often heavily regulated like a utility. Even before Alibaba founder Jack Ma's November 2020 speech criticizing excessive regulation hit a nerve that contributed to the government cancelling Ant Group's IPO, stricter regulations around privacy, anti-monopoly, and financial risk were all in the works—justifiably so.

The context in China is also working towards more government oversight and less space for disruptive innovation for big fintech. General Secretary Xi Jinping has favored state-owned firms, like the banks that compete in some cases with fintech companies, and he has reined in many of China's powerful business tycoons with his campaigns against financial risk and corruption. I expect to see a realignment of political power away from big tech and policies that advantage state-owned banks, and after the government's assertion of power over Ant with a forced reorganization and delayed IPO, the space for Ant to refuse requests from agencies like the PBOC to share data have likely shrunk considerably.

Disappointing Expansion Abroad

Even in areas of fintech in which China is a world leader, such as mobile payments, an impressive domestic record has not extended to anything resembling global dominance. Payments is a two-sided market in which consumers and merchants both must be signed up to use a new payment method if it is to catch on. So far, Alipay and WeChat Pay have only succeeded on one side abroad: merchant acceptance. Before the pandemic at least, payment providers and retailers around the world clamored to accept Chinese digital wallets, primarily to facilitate spending from Chinese tourists on their networks and in their stores. Alipay is accepted in at least 56 markets, including many retail stores like Walgreens in the United States that allow you to scan a QR code to pay (Jing 2019).

On the other side of the payments market, use by consumers outside China, both Alipay and WeChat Pay have made limited efforts and achieved even less success. This reduces the concern that Chinese digital payments are expanding at the expense of the dollar or of US-based payments companies. Those using Chinese digital wallets abroad tend to be only Chinese tourists or some Chinese living abroad who were already users of those digital wallets in China, and there is no sign that this is changing anytime soon. It does not yet appear to be a route to displace the US dollar. I therefore view this kind of expansion as mostly internationalization to serve the domestic market of domestic users. Alipay or WeChat want to keep Chinese tourists on their apps outside the country, not their domestic rival's.

WeChat's attempts to catch on with users abroad have been a failure. It launched with great fanfare as a messaging service in India starting in 2012, which could have given it a user base for payments and other services, but the push failed and was wound down in 2018 (Shaikh 2018). Instead, US-Based WhatsApp has taken over as the dominant chat service all around the world. WeChat's attempts to launch a mobile wallet in South Africa starting in 2015 similarly failed and were shut down last year (Vermeulen 2020). It is, however, able to connect with

digital wallets from local providers abroad, including with Kenya's M-PESA to facilitate small merchant payments for Chinese goods more easily than today's expensive and slow remittance services. Kenyan users, however, pay or receive local currency (Dahir 2018).

Alipay has mostly avoided trying directly to gain users abroad. Instead, Ant Group partners with promising fintech wallets in other countries, supplying capital, technology, and expertise. As of 2019, it had done so with e-wallets in 10 markets, including PayTM in India and Kakaopay in Korea. Except for WorldFirst, a UK-based money transfer company it acquired in 2019, Ant is only a minority shareholder in the local digital wallets, which must comply with often strict local laws around data protection and localization. Therefore, it is unlikely that Ant can directly access sensitive data on individual users of these partner apps. Outside its investment in e-wallets, however, there have been cases in which Ant's international expansion would have led to the ability to collect data on Americans. The highest profile has been its attempted acquisition of MoneyGram, a US-based money transfer company often used by US military personnel abroad, which the Committee on Foreign Investment in the United States (CFIUS) blocked on national security grounds.

For now, despite long-term global ambitions, Chinese fintech companies are overwhelmingly domestically focused. Only .5% of Alipay's payments were international in the 12 months from June 2019-2020 (Ant Group 2020). National security concerns around sensitive data are likely to keep both Ant Group and WeChat Pay from receiving approval from many regulators abroad to serve retail users outside China outside businesses importing or exporting from China, and even if they did, security concerns can scare off many potential adopters—Indonesia, for example, has limited them to serving Chinese tourists, and one reason WeChat failed in India were concerns about Chinese firms snooping on private chats (Jakarta Post 2018). The authoritarian turn in China and increased data sharing that the government is demanding of Chinese fintech companies will only exacerbate these concerns, making it more difficult for them to expand abroad and compete more with US payment companies.

Of course, the future could be different. Chinese fintech giants could have learned useful lessons from earlier challenges that lead to more success in building an international user base and linking together mobile wallets to make global payments faster and cheaper, but US policymakers should keep in mind that despite immense scale at home, capital, and advanced technology, they have had less international success than one might expect.

What is "New" in Digital Currency

Turning now to China's sovereign digital currency, understanding how the PBOC's world-leading efforts would affect the domestic and international financial landscape requires acknowledging one key fact: that digital currency and digital payments are already dominant in the US, China, and most of the world. The only currency that is stuck in the analog world is cash, and the importance of providing a digital form of cash in every country is not self-evident. Even though they appear to be using plastic or paper, credit card payments are digital (magnetic strips and chips store and communicate data to POS machines), as are the systems in the US that turn

checks into digital instructions that order digital money to move between bank accounts. Therefore, what is new about what are commonly called "digital currencies" today, from cryptocurrencies like Bitcoin and Ethereum to "stablecoin" arrangements like Facebook-linked Libra[1] and proposed CBDCs is not that they are digital per se.

In the case of cryptocurrencies, the novel feature is use of blockchain technology to enable decentralized issuance, management, and payments. They use distributed ledger technology (DLT) to allow a large network to track and validate account balances and transactions, instead of relying on a centralized, trusted intermediary like a bank to verify that a consumer has the funds needed to make a payment. Central banks are concerned primarily with price stability, which requires them to guard against the kind of enormous volatility in value that is common to cryptocurrencies without central intermediaries.

The trade-offs of decentralization may make sense in some applications of blockchain, but for trusted central banks they make little sense. Blockchain-based cryptocurrencies have caught on as speculative investments, but they have so far had limited appeal as payment instruments or for central bank applications. One reason is that decentralization comes at a cost in terms of slow speed and the enormous electricity demands to secure the network. Bitcoin currently handles around three transactions per second, while Visa can handle at least 65,000 (Blockchain.com 2021 and Visa 2018), and Bitcoin miners currently use more electricity to secure the network and process transactions than some entire countries. Chinese Central Bank officials have publicly rejected the use of blockchain as a basis for DC/EP because it cannot handle the transaction volume they anticipate (Mu 2019).[2]

If currency and payments are already digital, and central banks are not embracing technologies like blockchain, it begs the question of what, if anything, is truly new in CBDCs. The answer is somewhat technical and considerably less exciting than the hype may seem to suggest: expanding access to digital central bank money beyond wholesale payments, often referred to as sort of digital cash (Bech and Garratt 2017).

Figure 1: Where CBDC Fits in the Currency Space

Central bank money, like cash, is a liability of the central bank, issued by the central bank. A deposit at one's local bank, even if it is in the same unit (dollar, euro, RMB), is by contrast commercial bank money, a claim on the commercial bank that provided the account. Retail payment instruments are universally accessible, available to normal consumers and businesses, while wholesale payments moving money between large institutions (generally banks) are mostly behind the scenes.

[1] Now called "Diem"

[2] Some central banks are exploring the possibility of CBDCs operating on so-called "permissioned blockchains" that are more centralized than cryptocurrencies but still use blockchain.

Currently, digital retail payment tools like credit cards, app- or online-based payments are based on commercial bank money, while wholesale institutions paying each other tend to pay in digital central bank money in the form of reserves that commercial banks keep in accounts at the central bank. When banks pay each other, they use those central bank reserves, a liability of the central bank in digital form that can be considered CBDC (Carstens 2021b). These, however, are only available to a limited set of intermediaries, generally banks (Sanford and Bufithis-Hurie 2018).[3] Central banks can always print money, so they cannot fail and are thus safer for settling payments, unlike private institutions, which could go bust while a payment is pending (CPMI 2003).

Central banks around the world are considering a wide variety of CBDC designs, but they tend to have in common creation of a somewhat cash-like digital payment instrument, called "retail" CBDC that would give wide access to hold and transact central bank money in digital form.[4] How impactful this will be is up for debate. In terms of safety compared to existing payment systems there would seem to be little difference for countries like the US and China that have robust regulation and government backstops for banks that ensure people do not lose funds if their financial institution fails, so the distinction for consumers may make little difference.

It is possible that CBDCs could be designed to support adding functions to money that would make the initiatives more promising, such as allowing programmable money to ensure, for example, that stimulus money is spent rather than saved or give new tools for monetary policy, but these do not necessarily require a new form of currency.[5]

Overview of China's Central Bank Digital Currency Plans

The People's Bank of China's first step towards its own new digital currency was in 2014, soon after a Bitcoin boom driven by Chinese demand for the cryptocurrency. Chinese policymakers, most notably pro-fintech PBOC governor Zhou Xiaochuan, hoped to control any risks that new cryptocurrencies could pose to China's financial system, like capital flight, cyber risks, and excessive speculation. They feared that if Bitcoin caught on in China, the government could lose control over the monetary system. They also hoped to leverage advances in payments technology for their own purposes, which led the PBOC to come out two years later with a "strategic goal" of launching a central bank digital currency "soon," though there was no timetable (Chorzempa 2021). Its stated motivations then included a mix of political goals, like reducing tax evasion and money laundering, with economic goals, like better management of money supply, financial inclusion, and cheaper and more efficient payments.

[3] Rules in the US limit such accounts to banks, while countries like the UK have expanded payments system access to nonbanks.

[4] There are also discussions about "wholesale" CBDC that would make central bank money available to a wider variety of institutions than current central bank accounts, but interest in such systems has flagged in recent years.

[5] One example of quasi "programmable money" that already exists in the US are Electronic Benefits Transfer (EBT) cards for recipients of government benefits, which can only be used in certain stores (National Conference of State Legislators 2019).

The project, soon dubbed "digital currency/electronic payments" or DC/EP, accelerated upon Facebook's announcement in 2019 that it would launch a global digital currency called Libra. Chinese officials and firms feared that an American firm with Facebook's global network could box China in and erode its monetary sovereignty, finding itself either isolated or forced to adopt a globally dominant digital currency linked to the USD. Wang Xin, head of research for the PBOC, made it clear that the PBOC sees itself in a race with the US on digital currency. He said, "We had an early start…but lots of work is needed to consolidate our lead." He warned that a successful Libra could reinforce a monetary system with "one boss, the Dollar, America," (Wang 2019). PBOC Digital Currency Research Head Mu Changchun said that as "a manifestation of our response to Libra," PBOC staff developing DC/EP project would be forced to work "996" (9am-9pm, six days per week) schedule to speed up the effort (Mu 2019), a sign of the seriousness with which it approached the task.

The PBOC took a major step forward when retail trials were announced in April 2020, which took the digital RMB to four major Chinese cities. Chinese residents of those areas could register for a lottery, whose winners received new so-called "eCNY" in a special test wallet they could use at select retailers. Since then, the pilot has expanded to many cities and thousands more retailers. It has also begun testing offline payment functionality, and it is cooperating with the Hong Kong Monetary Authority to trial cross-border uses. The PBOC has yet to announce any timetable for a national launch of eCNY, though at least a limited rollout before the Beijing Winter Olympics later this year is likely.

Domestic Implications of DC/EP

Predicting the implications of China's DC/EP project is a highly speculative endeavor because of the sheer number of unknowns that remain in the currency's design and interaction with the existing financial system. The PBOC has never issued a comprehensive white paper on the currency's design, which does not appear to be finalized. Therefore, what is known about the project outside the PBOC is what can be cobbled together from speeches from current and former PBOC officials, some of which are contradictory or vague on crucial details.

What is known is that the digital Yuan will have the same value as a regular digital or paper RMB. Like other central banks considering a CBDC, the central bank will not have individuals open accounts directly at the PBOC, even if eCNY ends up being a PBOC liability. Like with cash, it aims for a "two tiered" system in which the PBOC authorizes and supervises intermediaries, starting with banks, that enable people and businesses to buy, sell, and transact the eCNY (Chorzempa 2018). Unlike bank accounts, but like cash, it will not pay any interest on money held in eCNY wallets. There is debate in China as to whether the eCNY will be a liability of the central bank, and thus a CBDC at all.[6]

[6] Former PBOC Governor Zhou Xiaochuan said in a presentation at Peking University in December 2020 that eCNY would not be a liability of the PBOC and thus not a CBDC, which contradicted previous statements by Mu Changchun and Fan Yifei. It does not appear that this issue has been decided, as making it a central bank liability could risk people putting their money into the safer central bank money, leading to outflows from banks.

The PBOC is presenting its digital currency as having better privacy protections for users than the current systems run both by China UnionPay and the duopoly of Alipay and WeChat Pay, and there is some merit to its arguments. Officials have said the eCNY will have "controllable anonymity," which may seem to be a misnomer but gets at a tension in financial privacy that all central banks will have to deal with when designing a CBDC. It would be untenable for central banks to create fully anonymous digital money, which would violate know your customer (KYC) and anti-money laundering laws (AML).[7] Financial privacy around the world is limited by the desire for law enforcement agencies to track the flow of funds in criminal investigations, often requiring financial institutions to proactively report suspicious transactions to government authorities. Even Bitcoin is neither fully anonymous nor very private.

In China's case, the central bank will store the ledger of all account balances within the eCNY system and a record of all transactions that update that ledger, which might seem like a privacy nightmare. Yet, such a CBDC may not actually be that different from the status quo pre-eCNY, because transactions privacy from the government is already not likely very high. Payments firms must report a great deal of data to the PBOC, and they must also comply with law enforcement requests for data related to criminal investigations. Therefore, the privacy implications of this new currency may not be as important as some predict.

For any large transactions, there will be no privacy from the government, as users will have to link their bank account to the wallet, information that will be shared with the PBOC. There will, however, be a way to sign up for eCNY wallets with what may be a surprising amount of privacy. The PBOC says it will allow wallets with relatively low transaction and balance limits sufficient for day to day transactions without providing a bank account or real name, only a phone number. Only the telecom companies would know what individual is linked to that number, and they would be prohibited by law from sharing that with the PBOC, which would only be able to see money flows associated with a pseudonymous account number (Mu 2021). For such payments, eCNY's privacy is thus not as far off from Bitcoin as it may appear, as anyone can see every payment on the blockchain, just not the identity of the entity associated with it. If an account is flagged for criminal activity, law enforcement would have to request the user's identity information from the telecom company (Mu 2021).

Where the eCNY is designed to provide even more privacy is in dealing with merchants, including e-commerce companies. With the current payments system based on Alipay and WeChat, these firms harvest data on every transaction that occurs, which they can use for virtually any purpose, from credit scoring to targeted marketing. Such transactions can also reveal a user's personal information to the party they are paying. The disappearance of cash, which allows one to pay without providing any identification to a counterparty, has made

[7] Cash is of course mostly anonymous and often used for criminal activity, but it has in effect been grandfathered in, and its physical nature imposes frictions, like the need for armored cars to move large amounts and transacting in person, that would not exist for digital money.

financial privacy elusive. Mu Changchun says that eCNY will change that, using encryption that allows transactions without revealing identifying information to merchants (Mu 2021), similar to what Apple Pay does in the US.

Most consumers may not notice much of a difference in how they pay once the eCNY is rolled out, scanning the same type of QR codes as they have for years, possibly with the same digital wallets. Officials will be careful to ensure that the eCNY does not disintermediate the banking sector and threaten the interests of largely state-owned banks, and banks have emerged as the key agents intermediating the system between the central bank and retail payments. The tech companies and their payment methods are likely to be the most affected. One of the key motivators for the PBOC in developing the digital currency is to introduce a more public option alongside the private payment providers that puts pressure on them to lower fees, to open up what are currently walled gardens that do not interoperate, and to do better on privacy. eCNY wallets provided by banks, telecom companies, and others will compete more with Alipay and WeChat Pay, but both Alipay and WeChat will surely also support eCNY payments within their apps. They will, however, have to comply with stricter rules than they do today, such as limiting the use of the data gathered by the digital wallet for other purposes like lending or marketing.

A crucial remaining question is to what extent the eCNY will be successful in generating demand from consumers and merchants, which is not a given. It could prove a market flop, forcing the government to decide whether to let the system play a minor role, or to compel merchants to take it and pressuring Alipay and WeChat Pay to use it for their transactions. There are reasons to be skeptical that it will be a hit. Trading government monitoring for tech company monitoring will not in itself draw many users away from the digital wallets they have used for years or from much more anonymous cash, and the assurances of privacy may not be fully convincing to the Chinese public. The government will have a hard time equaling the convenience of well-established ecosystems of merchants and users that super apps have built and tied in with myriad other services. The benefits to inclusion of groups not currently able or willing to use digital financial services may be substantial if eCNY can be used with physical cards, no internet access, or non-smartphones. Nevertheless, the relatively small portion of people in China who are currently unbanked, non-users of Alipay and WeChat--primarily elderly individuals in remote areas often without internet access--will be difficult to integrate into a new digital system.

How will the eCNY affect the dollar?

As China's economy, its trade, and its financial markets grow, the RMB will inevitably play a greater role in the global financial system, and some of its gains will naturally come at the dollar's expense. The question today, however, is not whether the RMB will ever play an important role as a global currency, but whether a CBDC form of the currency will significantly change its competitive position in global finance and commerce. It is too early to tell, but I am skeptical.

So far, years of Chinese efforts to internationalize the RMB have borne limited fruit. Beijing has prioritized domestic financial stability, protected with capital controls, over making its currency freely usable in a way that would boost its use abroad. China appeared poised to make large gains when it made reforms to gain acceptance into the IMF's Special Drawing Rights (SDR) basket, but soon after, its currency underwent a surprise depreciation and tightening of capital controls that undermined its reputation. According to IMF data, the RMB has risen as a share of global foreign exchange reserves since 2016, but it has stagnated around 2% for the past few years. SWIFT data from the past few years do not suggest that the RMB is gaining as a share of global payments. The RMB is not gaining ground against the US dollar as of now.

Figure 2: RMB as a Share of Global Reserves

Those capital controls are not going away anytime soon. Since May of last year, abundant capital has flowed into China and caused its currency to appreciate, which theoretically would be an ideal opportunity to loosen capital controls. Influential Chinese economists like Huang Yiping, a former member of the PBOC's Monetary Policy Committee have made such suggestions in the past, but controls remained in place, and Huang has revised his views, saying late last year that "there may not be a best time to open up," (Huang 2020).

Even if the capital account remains closed, some argue that China will successfully use its leverage over countries dependent on Chinese Belt and Road (BRI) related lending to boost the RMB at the dollar's expense. Yet, Chinese sovereign lending is on the decline after many of its borrowers ran into financial problems (Acker and Brautigam 2021). Less promise of future lending reduces Beijing's leverage over other countries to dictate what currencies they use. In fact, China does not appear to have used its leverage to boost the RMB in the past, because the majority of BRI loans have been denominated in USD, not in RMB (Dollar 2020).

It is extremely difficult to gain ground on a currency as dominant as the US dollar. The IMF's Chief Economist Gita Gopinath and former Federal Reserve Governor Jeremy Stein recently found that at least over the medium term, "the renminbi would have a hard time gaining much traction in international banking and finance" compared to the dollar. Yet, in the long term, they warn that "if the gap between Chinese and U.S. shares in world exports widens far enough, we could eventually get to a point where a renminbi-dominant equilibrium becomes inevitable." (Gopinath and Stein 2020).

However, this is the landscape pre eCNY, and there is no doubt that Chinese policymakers aim to use a possible global transition to some new form of digital currency to internationalize the RMB sooner. If the eCNY is successful and catches on in China, should the US be worried about it overtaking the US dollar in international commerce and reserves, eroding advantages that the US gains from having the world's dominant currency?

Commentators in China and the US often link the digital RMB to internationalization (Fan 2018), but I have yet to see a comprehensive, convincing argument of how it will do so. Claims abound that the eCNY will be cheaper, faster, or have other advantages over the US dollar, which is

possible, but we simply have too little information about the eCNY to know how well it will work domestically, let alone how it would function in a much more complicated cross-border payment market that deals with multiple currencies, jurisdictions, regulations, and financial infrastructures.

BIS Managing Director Agustin Carstens, one of the world's foremost authorities on central banks and payments, does not believe that CBDCs will create a first mover advantage for reserve currency competition or geopolitics. He cautioned that "much of this rhetoric is overblown" and argued "It is unlikely that a digital currency will take off as a global reserve currency *owing to its digital nature alone*." [emphasis added] (Carstens 2021b). His remarks make sense when considering the context laid out earlier: digital money per se is not new, so it is not a game changer or even an advantage. The eCNY will need to have other advantages to do better than the already digital RMB against the already digital USD, Euro, Pound, and Yen. All these currencies are used more for global payments than the RMB, which currently has a share of 2.2% of global cross-border payments (SWIFT 2021).

Advocates of CBDC list a wide variety of benefits, from financial inclusion and cost savings to increased resilience and speed, but these and CBDCs in general remain largely theoretical ideas not yet proven in the real world. Unless they truly realize these benefits in practice, they will not live up to the hype and justify the cost and risk of launching them. There is good reason to tread cautiously, as one error in the code could be catastrophic, undermining faith in the currency by, for example, permitting users to spend the same digital money twice.

86% of central banks in the most recent BIS survey are exploring CBDC, but the Bahamas is the only country that has launched one (Boar and Wehrli 2021).[8] Central banks are increasingly open to the idea of launching a CBDC, but the share of central banks that told the BIS they were "likely" to launch a CBDC in the next six years barely increased in 2020 over 2019. It is an important leading indicator that hype has outpaced reality when a further year of serious global research with strong political pressure not to "fall behind" has not convinced more central banks that they should follow in China's footsteps with a commitment to launch a new form of digital money soon.

Cross-border payments could certainly use improvements, and many central banks have done proofs of concept and other experiments with hypothetical payments between CBDCs using distributed ledger technology that is so hyped up today. While they show some promise, a recent IMF review of these experiments warned about "immaturity and lack of interoperability. Very few projects have explicitly and rigorously assessed risks against international standards for large-value payments and securities settlement systems. Almost none of the projects involved a cost-benefit analysis, and no conclusions could be reached on whether DLT-based or

[8] The BIS study also mentions initiatives sometimes called CBDCs by Cambodia, the Marshall Islands, some West African countries, or Lithuania, but these do not fit the BIS definition of CBDC.

improved legacy systems could be the more efficient alternative in the future," (Ghiath et al 2020).

The latest mCBDC Bridge initiative between the PBOC, Hong Kong Monetary Authority, Bank of Thailand, and the Central Bank of the United Arab Emirates could show promise in linking together interoperable CBDCs to make payments better than current systems, but it is similarly at an early proof of concept stage among countries that do not yet have even domestic CBDCs. It is nowhere near the development of a functional payment arrangement on new payment rails, and in any case the lessons from the initiative will be shared among the membership of the BIS, which is managing the initiative through its Innovation Hub. Simply put, it is far too early to tell whether the eCNY will enjoy any advantages over the dollar based on its technology, or which technological direction will be the right one.

Two ways the eCNY will certainly internationalize are in retail payments, as former PBOC governor Zhou Xiaochuan has suggested (Zhou 2020). That would mean allowing users of eCNY wallets to make payments both while they are abroad and for purchases from foreign merchants, but how they would do so is not clear. It could involve wallet operators like Alipay and state banks signing deals abroad or have the PBOC make the connection.

China could also let foreigners visiting China open up eCNY wallets, just foreigners have for a few years been able to use Alipay and WeChat Pay with foreign credit cards. Such functionality with the eCNY will likely be at least available experimentally at the Winter Olympics in Beijing in 2022, but it is an open question whether those visitors will be able to keep their eCNY on their phones when they leave the country or use them anywhere outside of China. eCNY pilots thus far have used smart contracts to automatically return any unspent digital money upon the pilot's conclusion, and the same could be set to occur when a foreigner leaves China.

If it chooses to allow foreigners to use eCNY abroad or even go further and promote eCNY wallet use among foreigners, that would mean operating as a payment provider in foreign jurisdictions, requiring licenses and compliance with a host of local rules in a highly regulated space. If the eCNY is as good at enabling surveillance as its detractors suggest, foreign regulators are sure to resist letting their populaces adopt it even if it is cheaper or more efficient (Chorzempa 2021).

Contrary to the current worries in Washington, at least for the short and medium term, China may find it *harder* to internationalize the eCNY than the current form of the RMB. Payments and currency exhibit strong network effects, in which the value of a network is directly related to the number of other players involved in the network. Today, different areas of dominance for the dollar reinforce each other (Gopinath and Stein 2020). There is often a more liquid market to get funding or trade between any third currency and the USD than any other,

meaning it is often cheaper and easier to trade RMB to USD and then USD into a third currency than it is to trade directly.[9]

This liquidity in turn helps make low-cost hedging instruments available for that currency versus the USD that allow a firm to reduce currency risk by locking in a future exchange rate in today. This factor explains why so many BRI loans are in dollars—it is cheaper, less risky, and more convenient for both the Chinese lender and the overseas borrower to use USD. A digital RMB would have no existing network of CBDCs to plug into, except for the Bahamas, and therefore no network effects like those that exist with existing financial infrastructure. Any new trading venues or mechanisms for the digital RMB would need to start from scratch in building liquidity, availability of hedging instruments, and myriad other key financial infrastructures that would take many years to establish, solving problems far beyond technology. Decentralized finance (DeFi) is experimenting with replicating these types of mechanisms for the cryptocurrency world, but it is also in the early stages. For the near future, a country asked to use the digital RMB would be less likely to adopt it than the regular RMB.

The US Response to the Digital RMB

Despite all the headwinds and uncertainties just outlined, over the long term one cannot rule out domestic and international success for the eCNY, for example if many other countries end up adopting CBDCs in the coming decades, and if those end up being more efficiently interoperable with the eCNY than the forms of USD that exist at that point. Nevertheless, the US is not currently on a path of letting that happen passively.

The Federal Reserve has been more skeptical about CBDC than China, but it has long been paying close attention to China's efforts and their implications for the US. Federal Reserve Governor Brainard, the governor most specialized in fintech, noted last February that China was "moving ahead rapidly" on CBDC and that, "Given the dollar's important role, it is essential that we remain on the frontier of research and policy development regarding CBDC," (Brainard 2020a). When she announced in August 2020 that the Federal Reserve Bank of Boston and the Massachusetts Institute of Technology (MIT) Digital Currency Initiative (DCI) would collaborate on building and testing a "hypothetical digital currency," (Brainard 2020b) she also mentioned China, implicitly making the point that these US initiatives were linked to ensuring the US will maintain leadership in the next round of innovations in currency and payments. The initiative with MIT will give Fed policymakers deep insights into the trade-offs involved in designing and launching a CBDC. Still, US policymakers should be aware that China's further stage of development, piloting digital currency in regular citizens' digital wallets in real-world scenarios, will teach lessons that can only be learned in practice. It must therefore maintain exchanges with Chinese officials to learn from China's experience and encourage China to share its lessons with the broader financial community.

[9] This is called using the USD as a "vehicle currency."

It is possible that a first mover like China could set standards in the CBDC space, which could lead future CBDC adopters to ensure theirs are interoperable with the eCNY or adopt Chinese standards when developing their own. However, US policymakers and those in other advanced economies are aware of this issue and have already taken action to move eventual standards in directions compatible with the values and interests of the US and its allies. Last October, seven central banks and the BIS issued "foundational principles and core features" of central bank digital currencies aimed to shape how global CBDC efforts develop (Group of Central Banks and BIS 2020). Conspicuously, the People's Bank of China was not part of the group. Thus, the US has already taken a multilateral, coordinated approach with allies and is not ceding global standard setting to China by proceeding cautiously in its own CBDC research.

Another reason for Washington not to panic is that movement to new cross-border payments standards is a time-consuming process. The latest standard for data banks exchange to make cross-border payments, ISO 20022, was drafted by SWIFT in 2000, but it is due to be fully adopted at the end of next year—over 20 years later (Auer et al 2021). As the eCNY comes out in the next year or two, banks around the world will have just completed a costly and complex process to migrate their systems to the new standard, so it is hard to imagine that the appetite for switching to a new Chinese one would be high. SWIFT has also been improving other elements of the existing payments infrastructure to improve the experience of cross-border payments, which should make it less vulnerable to disruption.

Such a long process of new standard formation and implementation would give the US ample time to respond to any Chinese proposals for new standards that, for example, eschew SWIFT. China has worked to develop its own payment systems, such as its cross-border interbank payments system (CIPS), but even these have adopted SWIFT's standards for messaging instead of championing their own (SWIFT 2016), and the PBOC continues to work with SWIFT, including through a new joint venture. Despite talk of a SWIFT alternative in China, including with Russia, there is no Chinese initiative I am aware of that has gained any ground.

Recommendations

Firstly, independent of any considerations of competition with China, Congress should push the Federal Reserve and government agencies to improve our domestic payments environment in terms of cost, speed, and reliability. American retail payments cost many times more than they do in China, and the back end infrastructure that moves many of those payments here can take as long to move money as it did in 19th century London, when clerks had to physically deliver slips of paper to settle payments (Birch 2017). The Fed itself admits that "the U.S. retail payment system lags behind systems in other countries," (Federal Reserve 2021). Most central banks thinking about CBDCs, including China, are primarily focused on achieving domestic policy goals.

Nevertheless, it is premature for the Federal Reserve to commit to launching some new form of the dollar. Both digital dollars for retail and dollar CBDCs for wholesale payments already exist today, and there are ways to improve our payments systems and the dollar's competitiveness

internationally by upgrading existing payment systems in ways that are far less risky. Congress should, however, put pressure on the Fed to catch up to global standards of instant payments for retail, such as accelerating its FedNow initiative.

To spur payments innovation and the dollar's competitiveness, Congress should also consider legislation that would allow the Fed to expand access to payment accounts, as the Bank of England has done since 2017, which would allow more innovative payments companies access to the payment rails that underly the movement of money. Nonbank payment companies, including those that could make it easier to use the Dollar for cross-border payments than the cumbersome and expensive status quo of correspondent banking, could use such access to bring more competition that make payments with US dollars cheaper and faster, reducing the relative attractiveness of any new RMB systems.

Finally, Congress should discourage overuse of financial sanctions in a way that might convince not only pariah states like Venezuela and North Korea, but US allies like the European Union, to undergo the massive international effort, cost, and inefficiency involved in creating an alternative, sanctions-proof set of financial infrastructure and currency arrangements. My colleagues have found that US sanctions have historically only had even partial success at achieving the US' foreign policy goals (Hufbauer et al 2009). Overuse of sanctions would "weaken the international role of the dollar" (Schott 2021) and likely represent a much greater risk to the dollar's dominance than any new form of the already digital RMB.

References

Acker, Kevin and Deborah Brautigam. 2021. "Twenty Years of data on China's Africa lending." SAIS CARI Briefing Paper Number 4. http://www.sais-cari.org/

Auer, Raphael, Philipp Haene, and Henry Holden. 2021. "Multi-CBDC arrangements and the future of crossborder payments." BIS Papers No 115. March 2021. https://www.bis.org/publ/bppdf/bispap115.pdf

Ant Group. 2020. IPO prospectus. https://web.archive.org/web/20201101110153/https://www1.hkexnews.hk/app/sehk/2020/102484/documents/sehk20082500535.pdf

Bech, Morten and Rodney Garratt. 2017. "Central bank cryptocurrencies." BIS Quarterly Review. September 2017. https://www.bis.org/publ/qtrpdf/r_qt1709f.pdf

Birch, David. 2017. "Before Babylon, beyond Bitcoin: From money that we understand to money that understands us." London Publishing Partnership. August 8, 2017.

Blockchain.com. 2021. "Transaction rate per second." https://www.blockchain.com/charts/transactions-per-second

Boar, Condruta and Andreas Wehrli. 2021. “Ready, steady, go? – Results of the third BIS survey on central bank digital currency.” Bank for International Settlements. January 2021. https://www.bis.org/publ/bppdf/bispap114.pdf

Brainard, Lael. 2020a. “The digitalization of payments and currency: Some Issues for Consideration,” Speech at the Symposium on the Future of Payments, February 5, 2020. https://www.federalreserve.gov/newsevents/speech/brainard20200205a.htm.

Brainard, Lael. 2020b. “An update on digital currencies.” Speech at the Federal Reserve Board and Federal Reserve Bank of San Francisco's Innovation Office Hours, San Francisco, California. August 13, 2020. https://www.federalreserve.gov/newsevents/speech/brainard20200813a.htm

Carstens, Agustin. 2021a. “Digital currencies and the future of the monetary system.” Remarks at the Hoover Institution. January 27, 2021. https://www.bis.org/speeches/sp210127.pdf

Carstens, Agustin. 2021b. “Central bank digital currencies: putting a big idea into practice.” Remarks at the Peterson Institute for International Economics. March 31, 2021. https://www.bis.org/speeches/sp210331.pdf.

Chorzempa, Martin. 2018 “Beijing’s grip on internet finance is tightening.” Peterson Institute for International Economics China Economic Watch Blog. January 9, 2018. https://www.piie.com/blogs/china-economic-watch/beijings-grip-internet-finance-tightening.

Chorzempa, Martin 2021. “China, the United States, and central bank digital currencies: how important is it to be first?” China Economic Journal. January 5, 2021. https://doi.org/10.1080/17538963.2020.1870278

Committee on Payment and Settlement Systems. 2003. “The role of central bank money in payment systems.” Bank for International Settlements. August 2003. https://www.bis.org/cpmi/publ/d55.pdf

Dahir, Abdi Latif. “Kenya’s M-Pesa mobile money service now works with China’s WeChat Pay.” Quartz Africa. December 3, 2018. https://qz.com/africa/1482013/safaricoms-m-pesa-connects-with-chinas-wechat-pay/

Dollar, David. “Seven years into China’s Belt and Road.” Brookings Institution. October 1, 2020. https://www.brookings.edu/blog/order-from-chaos/2020/10/01/seven-years-into-chinas-belt-and-road/

Fan, Yifei, 2018, “Yicai Interview: some thoughts on central bank digital currencies.” https://www.yicai.com/news/5395409.html.

Federal Reserve Board of Governors. 2021. “FedNow Frequently Asked Questions.” March 22, 2021. https://www.federalreserve.gov/paymentsystems/fednow_faq.htm

Gopinath, Gita and Jeremy Stein. 2020. "Banking, Trade, and the Making of a Dominant Currency." *The Quarterly Journal of Economics*, Volume 136, Issue 2, May 2021, Pages 783–830, https://doi.org/10.1093/qje/qjaa036

Group of Central Banks (Bank of Canada, European Central Bank, Bank of Japan, Sveriges Riksbank, Swiss National Bank, Board of Governors of the Federal Reserve) and Bank for International Settlements. 2020. "Central bank digital currencies: foundational principles and core features." October 9, 2020. https://www.bis.org/publ/othp33.htm

Huang, Yiping. 2020. Remarks at the China International Financial Forum. https://mp.weixin.qq.com/s/9vGWq_hYC5GekCfxqquKIw

Hufbauer, Gary Clyde, Jeffrey Schott, Kimberly Ann Elliott, and Babara Oegg. 2009. "Economic Sanctions Reconsidered, 3rd edition. Peterson Institute for International Economics. https://www.piie.com/bookstore/economic-sanctions-reconsidered-3rd-edition-paper

Jing, Eric. 2019. "Ant Financial – A Global Leading TechFin Company." Alibaba Investor Day 2019. September 24, 2019. https://www.alibabagroup.com/en/ir/presentations/Investor_Day_2019_AntFinancial.pdf

Mu, Changchun. 2019. Remarks at the China Finance 40 Yichun Forum.

Mu Changchun 2021. "Will Digital RMB Violate Privacy? Latest Interpretation from the Head of China's Digital Currency Project" China Finance 40 Forum, April 1, 2021. http://www.cf40.com/en/news_detail/11729.html

National Conference of State Legislators. 2019. Restrictions on Use of Public Assistance Electronic Benefit Transfer (EBT) Cards." December 12, 2019. https://www.ncsl.org/research/human-services/ebt-electronic-benefit-transfer-card-restrictions-for-public-assistance.aspx

Powell, Jerome. 2020. "Remarks at the 2020 IMF Fall Meetings." Available at : https://www.cnbc.com/2020/10/19/watch-fed-chair-jerome-powell-speak-live-to-the-international-monetary-fund.html

Sanford, Barak and Daniel Bufithis-Hurie. 2018. "Growing demand by non-bank payment firms for direct access to U.S. settlement systems should make us reassess not only which firms are eligible for Federal Reserve master accounts but which should be granted U.S. bank charters and licenses." Banking Perspectives. November 25, 2018. https://www.bankingperspectives.com/should-non-bank-payment-firms-be-eligible-to-open-federal-reserve-bank-accounts/

Schott, Jeffrey. 2021. "Raising a Caution Flag on US Financial Sanctions against China." Peterson Institute for International Economics Policy Brief 21-1. January 2021. https://www.piie.com/sites/default/files/documents/pb21-1.pdf

Shaikh, Shadma. 2018. “How WeChat faded into the silence in India.” Factor Daily. October 8, 2018. https://archive.factordaily.com/how-wechat-faded-into-the-silence-in-india/

SWIFT 2016. “CIPS Accelerates the Internationalisation of the RMB.” SWIFT MI Forum. October 2016. https://www.swift.com/swift-resource/44986/download

SWIFT. 2021. RMB Tracker March 2021. https://www.swift.com/our-solutions/compliance-and-shared-services/business-intelligence/renminbi/rmb-tracker/rmb-tracker-document-centre.

Vermeulen, Jan. 2020. “WeChat Wallet in South Africa shuts down.” MyBroadband. June 12, 2020. https://mybroadband.co.za/news/banking/356029-wechat-wallet-in-south-africa-shuts-down.html

Visa. 2018. “Fact Sheet.” https://usa.visa.com/dam/VCOM/download/corporate/media/visanet-technology/aboutvisafactsheet.pdf

Wang, Xin. 2019. Speech at Peking University’s Institute of Digital Finance, July 8, 2019.

Yu, Sun. 2021. “Jack Ma’s Ant defies pressure from Beijing to share more customer data.” Financial Times. March 2, 2021. https://www.ft.com/content/1651bc67-4112-4ce5-bf7a-d4ad7039e7c7

Zhou, Xiaochuan. 2013. Interview with Caijing Magazine. December 2013

Zhou Xiaochuan 2020. Remarks in Chongqing. November 23, 2020. https://www.caixinglobal.com/2020-11-24/zhou-xiaochuan-suggests-china-and-singapores-digital-currency-cooperation-should-start-with-retail-101631926.html.

Figures and Tables

Figure 1

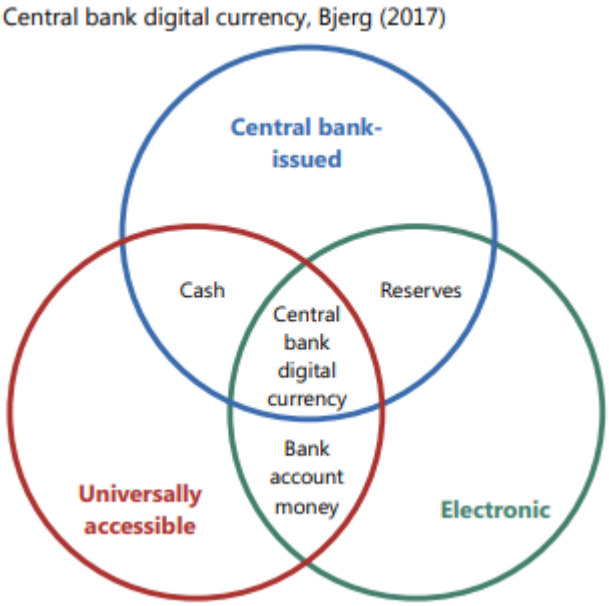
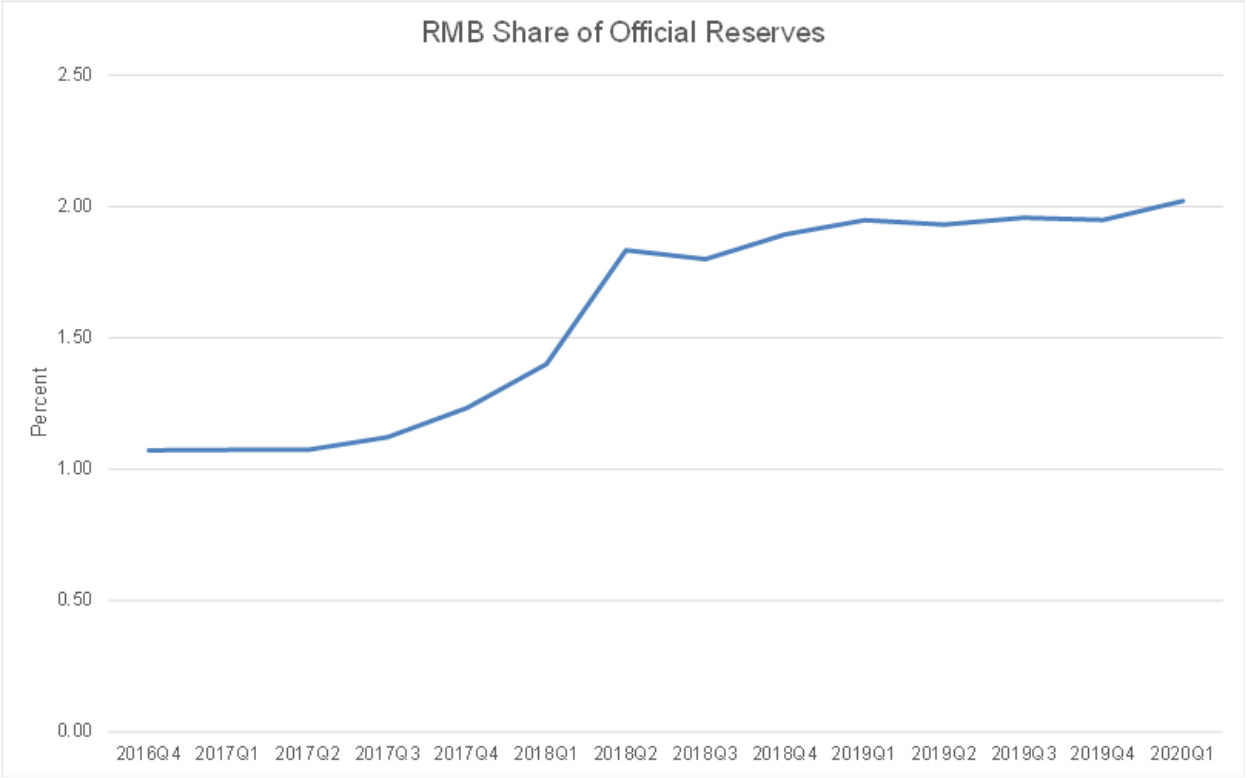


Figure 1

Source: Bech and Garratt 2017.

Figure 2: RMB as a Share of Global Reserves has Stagnated



Source: IMF COFER Database

OPENING STATEMENT OF YAYA FANUSIE, ADJUNCT SENIOR FELLOW, CENTER FOR A NEW AMERICAN SECURITY

VICE CHAIRMAN CLEVELAND: Thank you. Mr. Fanusie?

MR. FANUSIE: Thank you. Vice Chairman Cleveland, Commissioner Wessel, and distinguished Members and Staff of the Commission, it is an honor to participate in today's hearing.

Please allow me to add that although I do consulting with the private sector on financial tech issues, my comments today are from my personal opinion and not on behalf of any client.

So, Digital Currency/Electronic Payment, DCEP, the PBOC's state-based digital currency project is I'd say one component in China's long-term strategy to develop a fully digital economy and to lead the world towards a future driven by harnessing intelligent, dynamic data systems.

China's digital currency is as much about data as it is about money and I'm going to repeat that for emphasis. Hopefully it won't take up my time. China's digital currency is as much about data as it is about money, I might even say it's more about data.

China's current five-year plan mentions the word data over 60 times. So, the U.S. national security implications of the DCEP system really hinge mostly on how this new system gives China or gives the Chinese Government wider pools of data to collect, analyze, and exploit for China's economic and political benefit.

So, much attention is on the possible threat that DCEP will enable China to buffer against U.S. sanctions or create a valuable alternative to the U.S. dollar in global trade.

These are important risks to consider but they are dependent on a multitude of external factors unrelated to the technological success of China's digital currency.

I'd like to suggest that a more immediate consideration is how DCEP enhances China's ability to potentially conduct financial coercion against its adversaries.

A small glimpse of this risk occurred last month. In March, the biggest Chinese e-commerce platforms removed all clothing items from Swedish apparel firm H&M. This occurred months after the company would no longer use cotton from the Xinjiang region.

Removing H&M's digital presence was a clear form of economic retaliation against the clothing manufacturer. If you think about that, a fully launched DCEP system would enable the CCP to deploy similar economic retaliations more effectively.

The PBOC could probably prohibit DCEP funds to any merchant with the proverbial flip of a switch. I assess that China's broad fintech strategy here is not to immediately replace the U.S. position in today's global financial system, or at least that it won't be able to.

But the real point is to lead the creation of a new international economic infrastructure. This strategy goes beyond the digital renminbi, it manifests itself also in China's push for blockchain technology.

So, consider last year, China launched the Blockchain-based Service Network, the BSN. It's an effort to build a more dynamic Internet based on blockchain infrastructure and it's not a separate Internet per se that they're trying to build but a system built on top of the Internet through data centers that the Chinese Government owns around the world.

Recently, the BSN's Executive Director said we believe that in 20 to 30 years, all information systems will basically adopt a blockchain-based transmission technology, close quote.

So, this means that the BSN is a generational project and to promote the network's internationalization, BSN has partnered with several blockchain projects outside China,

including with U.S. and British firms to build on top of BSN infrastructure and develop and interoperability.

But China will still own this network. Recently, the BSN Secretary General said the BSN would build an Internet where China has independent, quote, independent intellectual property rights and China controls the rights to Internet access, close quote.

The digital renminbi is likely to be the fuel that powers BSN's future digital economy.

Whether the DCEP system eventually disrupt SWIFT or conventional correspondent would all depend on how much other nations and their companies engage the system as a means of doing business with China. And I think as Martin pointed out, there are a lot of constraints to that happening.

There's likely to be great commercial risk here. As the H&M incident shows, China may find strategic national importance in knowing which wallets belong to non-Chinese companies.

Foreign firms transacting in DCEP might end up handing over to the Chinese Government lots of real-time data that it could not access efficiently through conventional banking technology.

Before the CCP gives U.S. firms an ultimatum of the DCEP way or the highway, the private sector and American policymakers should take a step back and consider the trade-offs of participating in China's digital currency ecosystem.

The U.S. response must take or stress a decades-long view. China's fintech innovation has simply laid a technical foundation for its future economy.

U.S. policymakers need to prioritize the advancement of U.S. fintech infrastructure rather than just fintech applications. As a parallel concern, the U.S. must mount a strategy to shape fintech's evolution globally.

I recommend the following measures. One, warn the U.S. and international business community about the commercial risk to foreign companies using DCEP.

State, Treasury, and Commerce should amplify the following points. China's economic retaliation against H&M shows that any foreign company that crosses the CCP could quickly lose access to the Chinese market.

Using the digital renminbi increases the risk that DCEP may be more vulnerable -- increases this risk because DCEP may be more vulnerable to CCP intervention than traditional payment systems.

Two, elevate fintech as a critical emerging technology area requiring vigilance in U.S. advancement and standard-setting. Fintech should re-emphasize as part of the current legislative efforts to spur research and performance in critical technologies.

Various nations are exploring Central Bank digital currencies and if digital currency research lags in the U.S., it'll be easier for China to advance its model of digital authoritarianism around the world, or for the rest of the world.

And in order to address the privacy challenges that CBDC's raised, the U.S. should prioritize breakthroughs on techniques that will guard against illicit finance but also protect user privacy.

Three, decline the Chinese Communist Party's invitation to build its new Internet. When the BSN leadership recently described the project as international digital infrastructure where China controls the rights to Internet access, it revealed the CCP's geopolitical motivations.

And although BSN is separate from DCEP, it's only logical that the digital renminbi will become a preferred payment instrument in BSN applications. Blockchain developers in other countries should realize that if they help build the BSN, they are constructing the CCP's new

Internet ecosystem.

Answering the BSN's call for international partners may be a great market opportunity for some developers but it will go to building a world vulnerable to the particular sensibilities of the CCP.

Those who want to build a better, freer Internet should realize China's aspirations for the global digital economy run counter to this goal. Thank you for your time and allowing me to speak on this important topic.

I look forward to your questions later.

PREPARED STATEMENT OF YAYA FANUSIE, ADJUNCT SENIOR FELLOW, CENTER FOR A NEW AMERICAN SECURITY

United States Congress
U.S.-China Economic and Security Review Commission

Hearing
on
An Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Success
Panel IV: China's Pursuit of Leadership in Digital Currency

April 15, 2021
Virtual via Cisco WebEx

Statement of Yaya J. Fanusie
Adjunct Senior Fellow
Center for a New American Security
Chief Strategist
Cryptocurrency AML Strategies

Vice Chairman Cleveland, Commissioner Wessel, and distinguished members and staff of the U.S.-China Economic and Security Review Commission, it is an honor to participate in today's hearing. Please allow me to add that although I do consulting with the private sector on financial technology issues, my comments today are from my personal opinion and are not on behalf of any clients.

Digital Currency/Electronic Payment (DCEP), the People's Bank of China's state-based digital currency project is just one component of China's long-term strategy to develop a fully digital economy and lead the world toward a future driven by harnessing intelligent, dynamic data systems. In the short run, the digital renminbi is likely to only have a marginal impact on the global economy and I assess that it is unlikely to displace the dollar as the top international reserve currency or undermine the power of U.S. sanctions in the next few years. However, in the long run, DCEP and China's strategic approach to financial technology (fintech) is laying a technological foundation that could give China great economic advantage over the United States in the decades ahead.

In my statement, I will touch on China's broader fintech strategy as a way to contextualize DCEP, explain what makes this digital currency unique as a fintech phenomenon, suggest how DCEP may fit into China's blockchain technology efforts, and discuss what possible future scenarios could threaten the U.S.' status as global financial leader. I will end with some recommendations on how U.S. policymakers and private sector stakeholders should respond.

Digital Currency Is about Innovating with Data

China's digital currency is as much about data as it is about money. China's five-year plan, released in late 2020, lists cloud computing, big data, and internet of things as the top three focus areas for its digital economy.[1] The plan mentions data over 60 times. In fact, the U.S. national security implications of China's Digital Currency/Electronic Payment, or DCEP,[2] hinge mostly on how this new system gives the Chinese government wider pools of data to collect, analyze, and exploit for China's economic and political benefit.

Zhou Xiaochuan, the previous governor of the People's Bank of China (PBOC) commented in 2019 that the financial industry is mostly an "information industry."[3] Zhou noted that most of the money transactions financial institutions handle involve computerized processes. He explained that monetary policymaking, such as interest rate setting, relies on data analysis. And Zhou perhaps only half-jokingly described the trading floor of the Shanghai Stock Exchange as a museum piece rather than a necessity for actual securities transactions.

Consider how money moves in the world today. Economies function through the interaction amongst businesses, between consumers and those businesses, and with the central bank's provision of fiat currency and the government's regulatory oversight. Banking intermediaries are the basis for most of this activity. And all that facilitation runs on financial technology. This fintech comprises both hardware and software, and increasingly relies on the rails of the internet for people to interact with their financial accounts. This is true in China and around the world. As the internet has become more important to our daily living, our economic lives have become more driven by data, its capture, and its analysis. So, today, any institution seeking to improve performance is focused on harnessing and leveraging data, whether by analyzing it in aggregate or drilling down to understand the minute needs of a single customer or constituent. Most institutions want to use data to make their operations faster, more effective, and in some cases, more "intelligent." As financial activity operates increasingly through digital means, with physical cash interactions declining, fintech is a more important variable in the national equation for economic productivity and competition.

[1] (Authorized Release) Proposal of the Central Committee of the Chinese Communist Party on Drawing Up the 14th Five-Year Plan for National Economic and Social Development and Long-Range Objectives for 2030, Center for Security and Emerging Technology, December 1, 2020 (Revised December 7, 2020), https://cset.georgetown.edu/wp-content/uploads/t0237_5th_Plenum_Proposal_EN-1.pdf

[2] I will use the term "DCEP" to refer to the People's Bank of China's overall system for processing and managing its state-created digital currency and "digital renminbi" to refer to the digital banknote held by end users.

[3] "Zhou Xiaochuan. 'Zhongguo Jinrong' | Zhou Xiaochuan: cinxi keji yu jinrong zhengce de xianghu zuoyong [Zhou Xiaochuan, "China Finance|Zhou Xiaochuan: "Interaction of Information Technology and Financial Policy"]," Wechat public platform, China Finance, July 31, 2019, https://mp.weixin.qq.com/s/sNbUbT7Lv2T3PolBncxZsg.

The Chinese Communist Party (CCP) understands this. That is why the CCP unveiled a three-year Fintech Development Plan in August 2019.[4] The document is a high-level directive calling on China's financial industry to incorporate new technology as a way to drive financial growth.[5] But it also seeks to strengthen the state's role in shepherding that innovation and growth. One excerpt calls for "a reversal of the situation where key core technologies and products are controlled by others."[6] Those "others," I believe, refer to China's private financial firms, such as Tencent and Alipay, which manage most of China's digital payment infrastructure.[7] The plan also calls for expanding capabilities to leverage financial big data mining and analysis and to "promote the construction of a national integration data center."[8] The plan envisions innovation that connects government services with financial data and cloud computing to enable more internet-based financial architecture. It is quite telling that in the three-year fintech plan, "currency" is mentioned only twice. Similar to the recent five-year plan, "data" is mentioned 60 times, although the fintech document is much shorter. The word "money" is not mentioned at all.

The PBOC's deployment of a new, digital version of the renminbi must be understood as a measure within the CCP's overall push to manage more financial data. To understand how it fits in that strategy, one must first know how DCEP is distinct from China's current forms of digital payments.

Digital Renminbi Brings the Central Bank into Mobile Payments

It is helpful to think about the digital renminbi as a new variation on how Chinese financial institutions digitally hold and transfer the rights to Chinese currency on behalf of their customers. In conventional digital payments, the financial institutions, whether they are banks or mobile payment companies, settle transactions between themselves as they facilitate customer transfers. The key thing to understand is that, from a bank's point of view, the funds in your bank account are really the bank's liability (or obligation) to pay you. For example, when a customer, Alice, logs into her account at Bank A, she sees her account has 100 renminbi (RMB). This means that Bank A has an obligation to pay Alice 100 RMB. When Alice goes online to send money to Bob's business, who has an account at Bank B, she transmits the simple data of instruction to send Bob 100 RMB from Alice's account. This data of instruction is transmitted from Alice's bank to Bob's

[4] "Zhongguo Renming Yinhang Guanyu Yinfa 'Jinrong Keji (Fintech) Fazhan Guihua (2010-2021)' de tongzhi [The People's Bank of China Releases 'Fintech Development Plan 2019-2021']," Financial News, September 6, 2019, https://www.financialnews.com.cn/jg/zc/201909/t20190906_167509.html.
[5] "Chinese Central Bank Releases Fintech Development Plan for 2019-2021," China Banking News, August 23, 2019, https://www.chinabankingnews.com/2019/08/23/chinese-central-bank-releases-fintech-development-plan-for-2019-2021/.
[6] "The People's Bank of China Releases 'Fintech Development Plan 2019-2021'," p. 13.
[7] Aaron Klein, China's Digital Payments Revolution, Brookings Institution, April 2020, https://www.brookings.edu/research/chinas-digital-payments-revolution/.
[8] "The People's Bank of China Releases 'Fintech Development Plan 2019-2021'," p. 13.

bank. However, what gets transmitted over the internet is not 100 RMB, but rather the instruction between banks to transfer Bank A's liability of 100 RMB to Alice to Bank B, where it will be Bank B's new liability to Bob. But there is a separate process on the back end to handle the financial arrangement between banks, such as transferring assets to fund the liability Bank B is now receiving from Bank A. The asset transaction and the liability transaction are two different banking activities.

From the little we know about DCEP's technical infrastructure, it appears the digital renminbi will operate differently. In the DCEP system, the digital renminbi is created by the PBOC and provided to financial institutions who will disburse it through software wallets to users who have accounts at those institutions. Financial institutions will transfer a different type of liability on behalf of their customers. The digital renminbi is a liability with the central bank. Instead of Bank A transferring a liability it has with Alice, Bank A would transfer the liability the PBOC has with Alice. Technically, the PBOC liability was an asset for Bank A. In the transfer, Bank B would receive this new asset, but it would be designated as the PBOC's liability to Bob. There would be no need for a separate asset transaction to settle the digital instruction to transfer bank liabilities.

The Chinese Government Will Leverage User Data

This new model makes PBOC infrastructure central to digital payments. It makes a central bank product—the digital renminbi—relevant to commercial banking instead of the settlement process between financial firms. The banks and mobile payment companies still would facilitate transactions, but the central bank, and thus, the CCP, will be able to track and analyze data associated with the transfer of its liabilities and the financial firms' assets. This aligns with the 2019 Fintech Development Plan's directive to wrest control of critical financial infrastructure from private entities. The DCEP model puts greater financial data under the control of the Chinese government.

This type of transmission is advantageous to the Chinese government and its authoritarianism in many ways. With DCEP, the PBOC would be kept aware of each digital renminbi in circulation. In the conventional system, the banks and the payment companies are aware of the transactions of their customers, but no single entity has a full view of all digital transactions nation-wide. The PBOC appears aware of international scrutiny over its potential to undermine the privacy of its users by its data capture. Just a few weeks ago, the director of the bank's Digital Currency Research Institute publicly said that the central bank would not have direct access to the identities of its users.[9] He expressed that only financial institutions and telecommunications firms would know

[9] "Mu Changchun: Guanyu shuzi renminbi de 'kekong niming' de sikao [Mu Changchun: Some Thoughts on Digital Currency's "Controllable Anonymity]," Wechat Public Forum, April 1, 2021, https://mp.weixin.qq.com/s/L34OBXhANqxWDhRdZUeDoA.

the identities of DCEP wallet holders and that the government could only retrieve such information in cases of suspected criminal activity. This seems to be a recent change in policy because early designs of DCEP showed the opposite.

The previous director of the institute presented at a 2018 United Nations–sponsored technology conference, illustrating the PBOC's concept of "controllable anonymity." In his slide presentation, a graphic depicted the central bank with full access to all digital currency data, including the identity of users.[10] Though the PBOC now claims that personal information will be anonymized from the central bank, it may be relatively easy for it to unveil massive amounts of identities over time. The government plans to monitor all data and whenever it does learn the identities of wallet holders suspected of crime, it would then be able to track those wallets in perpetuity. Also, authorities could compel private companies to hand over identification information of future counterparties to those wallets, even though those parties may be merchants and other users unrelated to illicit activity. This process would enable the Chinese government to integrate more and more personal information with its ongoing big data analysis.

In the January 2021 CNAS report I coauthored with Emily Jin, we discussed in great detail how the PBOC's new capability to collect and analyze user financial data will likely strengthen the CCP's hand at disciplining party members and censoring public dissent.[11] I won't expound upon those details here, but it is clear that in the short term, DCEP's biggest impact will be on China's domestic environment. Let me turn here to what I believe are the long-run implications, including what it means for U.S. financial power.

Beijing Likely to Flex Greater Economic Coercion with DCEP

Much U.S. attention is on the possible threat that DCEP will enable China to buffer against U.S. sanctions or create a viable alternative to the U.S. dollar in global trade. These are important risks to consider, but they are very remote possibilities, dependent on a multitude of external factors unrelated to the technological success of China's digital currency. Much greater geopolitical and economic shifts would be needed to dislodge U.S. influence in global banking. I suggest that a more important consideration is how DCEP enhances China's ability to conduct financial coercion against its adversaries. A small glimpse of this risk occurred last month.

[10] Yao Qian, "Technical Aspects of CBDC in a Two-Tiered System," (slide presentation at the United Nations International Telecommunication Union Workshop on Standardizing Digital Fiat Currency and Its Applications, New York City, July 18–19, 2018), https://www.itu.int/en/ITU-T/Workshops-and-Seminars/20180718/Documents/Yao%20Qian.pdf.
[11] Yaya J. Fanusie and Emily Jin, China's Digital Currency: Adding Financial Data to Digital Authoritarianism, Center for a New American Security, January 26, 2021. https://www.cnas.org/publications/reports/chinas-digital-currency.

In late March 2021, the biggest Chinese e-commerce platforms removed all clothing items from Swedish apparel firm H&M.[12] This occurred days after a group connected to the CCP posted a September 2020 H&M press statement announcing the company would no longer use cotton from the Xinjiang Uyghur Autonomous Region.[13] Also in response, Chinese GPS mapping applications removed H&M store locations from their user interfaces.[14] China's leading ride-sharing app made H&M stores an invalid destination,[15] making the locations unsearchable.[16] This was a clear form of economic retaliation against the clothing manufacturer, most likely instigated by the Chinese Communist Party.

A fully launched DCEP system would enable the CCP to deploy similar economic retaliations more effectively. If the Chinese government requires all foreign merchants operating in the country to accept the digital renminbi as a matter of course, the PBOC could probably prohibit DCEP funds to any merchant with a proverbial flip of a switch. While H&M was the main victim in this recent retaliation, it would not be unthinkable in the future for the CCP to prohibit a range of foreign firms from transactions, perhaps by country or by sector. It might also be possible to place volume limits on DCEP transactions to firms as a way to throttle sanctions against them. Such fine-tuned economic statecraft is not possible under conventional banking infrastructure where the CCP does not have centralized access to digital payment instruments.

The PBOC describes the digital currency project as a "backup system"[17] for China's digital payments infrastructure. But for an authoritarian government, the potential of this system is too powerful to remain as just a backup. Nationally leveraging financial data in this way fits with the CCP's fintech development priorities.

While Chinese officials have publicly lamented U.S. influence in global banking and the dollar's preeminence,[18] I assess that China's broad fintech strategy is not to replace the U.S. position in today's global financial system, but to lead the creation of a new international economic

[12] Ben Westcott and Laura He, "H&M and Nike are Facing a Boycott in China over Xinjiang Cotton Statements," CNN Business, March 26, 2021. https://www.cnn.com/2021/03/25/business/hm-nike-xinjiang-cotton-boycott-intl-hnk/index.html.
[13] "H&M Group Statement on Due Diligence," H&M Group, https://hmgroup.com/sustainability/fair-and-equal/human-rights/h-m-group-statement-on-due-diligence/.
[14] Celia Chen and Iris Deng, "Meituan, Didi, Baidu, and China's Big Tech Erase H&M's Online Presence Amid Xinjiang Cotton Controversy," South China Morning Post, March 26, 2021, https://www.scmp.com/abacus/tech/article/3127117/meituan-didi-baidu-and-chinas-big-tech-erase-hms-online-presence-amid.
[15] Eva Xiao, "H&M is Erased from Chinese E-Commerce Over Xinjiang Stance," The Wall Street Journal, March 25, 2021, https://www.wsj.com/articles/h-m-is-erased-from-chinese-e-commerce-over-xinjiang-stance-11616695377.
[16] Josh Horwitz, "H&M Vanishes from Chinese-Ride Hailing App Didi after Xinjiang Backlash," Reuters, March 26, 2021, https://www.reuters.com/article/us-china-xinjiang-h-m/hm-vanishes-from-chinese-ride-hailing-app-didi-after-xinjiang-backlash-idUSKBN2BI1L3.
[17] Amanda Lee, "China Digital Currency to 'Provide Backup' for Alipay, Tencent's Wechat Pay if 'Something Happens' to Internet Giants," South China Morning Post, March 26, 2021. https://www.scmp.com/economy/china-economy/article/3127136/china-digital-currency-provide-backup-alipay-tencents-wechat.
[18] Jamil Anderlini, "China Calls for New Reserve Currency," Financial Times, March 23, 2009, https://www.ft.com/content/7851925a-17a2-11de-8c9d-0000779fd2ac.

infrastructure. This strategy goes beyond the digital renminbi. It manifests itself in China's push for blockchain technology.

DCEP to Eventually Overlap with China's Blockchain Efforts

Last year, China launched the Blockchain-based Service Network (BSN), an effort to build an international cloud computing network that can support distributed ledger technology applications.[19] Chinese state-owned tech firms are spearheading this national project, overseen by the CCP's macroeconomic planning agency. The BSN's organizers describe the network as a more dynamic internet, based on blockchain infrastructure.[20] It is not a separate internet per se, but a system built on top of the internet through data centers that China owns around the globe. BSN is not directly related to the PBOC or DCEP, but like the digital currency project, it supports a long-term plan to leverage new data architecture for financial growth.

Although the BSN's technological goal involves complex computer science, the gist is simple: to lead the next phase of the internet. At the Hong Kong Fintech Week event in November 2020, BSN executive director He Yifan summed up the vision during a panel session. He explained that the current internet operates with linear transmission, where data moves from one singular point to another.[21] Bitcoin's blockchain technology in 2008 enabled "broadcast transmission," where information relays across various nodes simultaneously, allowing for consensus around data authentication.[22] The BSN is an attempt to lay the infrastructure for new internet applications that would operate on data shared from various parties and systems in real time. Executive Director He said, "We believe that after 20 to 30 years, all information systems will basically adopt blockchain-based transmission technology."[23] This means that the BSN is a generational project.

The Chinese government aims for the BSN to give China strategic global leverage. The BSN is building infrastructure through 131 data centers located on every continent except Antarctica.[24] To promote the network's internationalization, BSN has partnered with several blockchain projects from outside China—including with U.S. and British firms[25]—to build on top of BSN

[19] Yaya J. Fanusie, "Don't Sleep on China's New Blockchain Internet," Lawfare, November 10, 2020. https://www.lawfareblog.com/dont-sleep-chinas-new-blockchain-internet.
[20] "BSN Introduction - BSN User Manual," Blockchain-based Service Network. https://web.archive.org/web/20201106152904/https://bsnbase.io/static/tmpFile/bzsc/1bsnintroduction/1-1.html.
[21] See 1 hour 39 minute mark, "How Blockchain Technology and BSN Support Fintech Development," *Youtube,* November 4, 2020, https://www.youtube.com/watch?v=k9Gtq-j__3U.
[22] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System," bitcoin.org, October 31, 2008, https://bitcoin.org/bitcoin.pdf.
[23] See 1 hour 41 minute mark, "How Blockchain Technology and BSN Support Fintech Development."
[24] See 16 minute mark, "How Blockchain Technology and BSN Support Fintech Development."
[25] ConsenSys, Press Release: ConsenSys Announces Partnership with China's Blockchain Services Network, January 25, 2021, https://consensys.net/blog/press-release/consensys-announces-partnership-with-chinas-blockchain-services-network/; EY, "EY announces extension of blockchain solution deployment in China on Ethereum and Financial Blockchain Shenzhen Consortium Blockchain Open Source platform in cooperation with Blockchain Service Network," EY.com, February 5, 2021, https://www.ey.com/en_gl/news/2021/02/ey-

infrastructure and develop interoperability with multiple blockchain platforms.[26] But China will still own the network. At the 2020 Hong Kong Fintech Week event, BSN secretary general Tan Min, who also is an executive with state-owned China Mobile, expressed that BSN would build an internet where China has "independent intellectual property rights and China controls the rights to internet access."[27]

The digital renminbi is likely to be the fuel that powers BSN's future digital economy. Although BSN promotional materials do not discuss China's state digital currency,[28] the project would appear to eventually require it. For example, Secretary General Tan described the BSN's potential impact on water utility payments. She explained that the current "linear transmission" process for Chinese citizens to pay their water bills involves several different business systems and financial firms, each only accessing its own siloed data, enabling potential fraud and disruption from any weak links in the process.[29] By contrast, Tan argued that blockchain's encrypted "broadcast transmission" mode would allow all parties to have access to authenticated data, streamlining the process and keeping it more secure. By law, BSN will not support independent cryptocurrencies like Bitcoin within China,[30] so it is logical to conclude that the payment instrument for such transactions will be the digital renminbi.

U.S. Must Prepare for Hard Choices Ahead

Whether the DCEP system eventually disrupts SWIFT or conventional correspondent banking will depend on how much other nations and their companies engage the system as a means of doing business with China. There are likely to be great commercial risks here. It is not clear if foreign individuals and companies using the DCEP system will have their private data anonymized as the PBOC claims will occur generally for users. As the H&M incident shows, China may find strategic national importance in knowing which wallets belong to non-Chinese users. Foreign firms transacting in DCEP might end up handing over to the Chinese government lots of real-time data that it could not access efficiently through conventional banking technology. It is quite plausible that the PBOC will know exactly how much money a foreign company holds in its digital renminbi wallets, as well as firms' daily, monthly, and annual spending patterns. The Chinese government would be able to identify companies' expenditure anomalies, their transaction counterparties, and how a foreign firm's activities compare to their Chinese rivals. The Chinese government would

announces-extension-of-blockchain-solution-deployment-in-china-on-ethereum-and-financial-blockchain-shenzhen-consortium-blockchain-open-source-platform-in-cooperation-with-blockchain-service-network.

[26] Anna Baydakova, "Inside China's Effort to Create a Blockchain It Can Control," CoinDesk, March 16, 2021, https://www.coindesk.com/china-to-create-it-can-control.

[27] See 24 minute mark, "How Blockchain Technology and BSN Support Fintech Development."

[28] BSN, "BSN Information Package," Medium.com, November 25, 2020, https://medium.com/bsnbase/bsn-information-package-b631be479e4.

[29] See 9 minute mark, "How Blockchain Technology and BSN Support Fintech Development."

[30] David Pan, China's BSN to 'Localize' 24 Public Blockchains by Making Them Permissioned, CoinDesk, September 16, 2020, https://www.coindesk.com/bsn-localized-chains.

gain great strategic insights from this data and could bestow competitive advantages to the Chinese private sector.

The Chinese government has not announced whether it will mandate foreign firms to use DCEP. But if it launches DCEP as a universal "backup system" for all digital payments in China, it is unlikely to give foreign firms much of a choice. Before the CCP gives U.S. firms an ultimatum of the DCEP way or the highway, the private sector and American policymakers should take a step back to consider the trade-offs of participating in China's digital currency ecosystem. The U.S. must develop an approach to engagement with China that best harmonizes America's long-term economic interests with our long-held values.

The U.S. response to the challenges from DCEP and China's broader fintech push must stress one particular: Taking a decades-long view. China's fintech innovation is simply laying a technical foundation for its future economy and is not well-positioned to displace U.S. financial power in the next few years. U.S. policymakers need to prioritize the advancement of U.S. fintech infrastructure, rather than just fintech applications. As a parallel concern, the U.S. must mount a strategy to shape fintech's evolution globally. I recommend the following measures for the U.S. to address these needs:

Warn the U.S. and international business community about the commercial risks to foreign companies using DCEP. The U.S. Department of State, the U.S. Department of Commerce, and the U.S. Department of the Treasury should amplify the following points: China's economic retaliation against H&M shows that any foreign company that acknowledges concerns about human rights issues in the country could end up in the Chinese Communist Party's crosshairs and quickly lose access to the Chinese market. Using digital renminbi increases this risk because DCEP may be more vulnerable to CCP intervention than traditional payment systems.

And even if foreign companies stay clear of China's hot-button political issues, using DCEP is likely to enhance the Chinese government's ability to collect firms' transaction data and monitor their business activities. The PBOC's assurances that it will only acquire user information for suspected criminal or terrorist activity should not be taken at face value. The CCP's fintech development plans call for a national data integration center. Even if DCEP's big data is anonymized, it would be quite easy for the Chinese government to de-anonymize some of the transactional data through the regulatory process and identify the wallets belonging to specific firms. Monitoring of foreign firms' transactions is likely to give the Chinese government insights that put foreign companies at a competitive disadvantage.

Elevate financial technology (fintech) as a critical emerging technology area requiring vigilance in U.S. advancement and standard setting. The legislative efforts to spur U.S. research and performance in technologies like 5G, AI, and robotics are important.[31] Fintech must be emphasized as part of those efforts. Various nations are exploring central bank digital currencies (CBDCs) and if digital currency research lags in the United States, it will be easier for China to advance its model of digital authoritarianism for the rest of the world.

In order to address the privacy challenges that CBDCs raise, U.S. researchers should prioritize breakthroughs on techniques that will guard against illicit finance, but also protect user privacy and prevent the government from unwarranted surveillance on users. U.S. policymakers should also develop an inter-agency working group to study these privacy challenges and propose appropriate technical architecture and regulatory policy that would protect 4th amendment rights if the U.S. decides to build a digital fiat currency.

Decline the Chinese Communist Party's invitation to help build its new internet. When the Secretary General of China's Blockchain-based Service Network (BSN) described the project as international digital infrastructure where "China controls the right to internet access," it revealed the CCP's geopolitical motivations for its blockchain efforts. Although BSN is currently separate from DCEP, it is only logical that the digital renminbi will become a preferred payment instrument in BSN applications. Blockchain developers in countries with democratic systems should realize that if they help build the BSN, they are constructing the Chinese Communist Party's new internet ecosystem.

This dynamic is not new. Some of today's U.S. blockchain entrepreneurs are following the precedent their Silicon Valley predecessors set in providing the cyber infrastructure of the 'Great Firewall of China' two decades ago.[32] But while that early 2000s' technology transfer empowered CCP's domestic control, the BSN aims to strengthen the Chinese government's global influence. Answering the BSN's call for international partners may be a great market opportunity for blockchain developers, but it will go to building a world vulnerable to the particular sensibilities of the CCP. Those who want to build a better, freer internet environment should realize that China's aspirations for the global digital economy run counter to this goal.

Thank you for your time and for allowing me to speak on this important topic today. I look forward to your questions.

[31] Maggie Miller, "Senators introduce bill creating technology partnerships to compete with China," thehill.com, March 4, 2021, https://thehill.com/policy/cybersecurity/541726-senators-introduce-bill-creating-technology-partnerships-to-compete-with?rl=1.
[32] Tina Rosenberg, "Building the Great Firewall of China, With Foreign Help," The New York Times, September 18, 2005, https://www.nytimes.com/2005/09/18/opinion/building-the-great-firewall-of-china-with-foreign-help.html.

OPENING STATEMENT OF SAMANTHA HOFFMAN, SENIOR ANALYST, AUSTRALIAN STRATEGIC POLICY INSTITUTE CYBER CENTER

VICE CHAIRMAN CLEVELAND: Thank you. Dr. Hoffman?

DR. HOFFMAN: Vice Chairman Cleveland, Commissioner Wessel, and honorable Commissioners, thank you so much for the opportunity to testify on this subject that I think is of emerging significance for the relationship between the United States and the PRC.

I will begin with a few key points. When attempting to understand the application of any emerging technology in the PRC, it's important to bear in mind that it will likely serve dual intents that are at times perhaps contradictory.

Frequently, these technologies are described in categorical black and white ways. They're described as either being Orwellian if one focuses on the coercive functions but this tends to fail to take into account the everyday problem-solving of that technology.

And others, on the other hand, might focus on the problem-solving and claim that course of applications of that technology are exaggerated in public discourse.

But I think that both views are misleading because the technologies in question are essentially always dual use in terms of the intent behind the design of an application.

So, in the Chinese Party State, everything is political and this is exceptionally clear under Xi Jinping. DCEP will contribute to macroeconomic problem-solving but the politics are also clearly embedded in DCEP's design and this political context will be a feature of its future use.

These features can't simply be removed if and when the technology is exported. DCEP, according to our research at ASBE, would offer no true anonymity as the PBOC will have both complete visibility over the current state use and the ability to confirm or deny any transaction.

There are design features that allow users to be more anonymous with more limits on transactions but because this would be linked to a phone, where increasingly effective implementation of real-name registration means that ultimately, individuals are traceable if their transactions initially appear anonymous.

Also, there are no limits on who has access to the information. The Central Commission for Disciplinary Inspection also has a keen interest in the technology, for instance.

Even though the implications are mostly domestic for now and will remain so for some time I believe, we're talking about something that's still very much a concept, to be clear.

But it's essential to act in anticipation of key shifts in global financial regulations, and advances in financial technology.

Policy response cannot continue to be ad hoc and reactive as they had been in the case of companies like Huawei, for instance. They're acting now to build a baseline understanding of the DCEP project.

Decisionmakers have an opportunity to anticipate challenges, build a consistent and coherent policy framework for managing them. To project future extra-territorial implications of DCEP, one must assume that the project would first succeed domestically and then be exported globally.

But there are channels where this might take place or where certain activities might suspect future uptake. China has a clear ambition to shake global technical and financial standards.

As Matt Johnson and John Garnaut highlighted in their contributions to the report, I did it with ASPI late last year, the China 2035 plan is on the horizon with DCEP.

And its related technology is likely an important component in China's push to establish a

comprehensive alternative to the dollar system, the liberalization of China's current account is not required for DCEP technology to potentially be exported to other countries.

China's ability to develop financial technologies that embed authoritarian norms in surveillance may affect global standards and essential infrastructure.

I was asked specifically to address the linkage between DCEP and China's social credit system. And I want to be clear that at this point, I have not found any publicly available authoritative sourcing that specifically addresses any link between the social credit system and DCEP.

So, at this point, what I'm about to say would be addressed and contained in my written testimony. It's based on my understanding of two systems and how they might in the future interact.

The PBOC is linked to the development of DCEP and to the development of the social credit system. The financial transactions data that DCEP generates could in the future be ingested into big data analysis platforms associated with the social credit system.

Functionally, if a link exists between DCEP and the social credit system, this doesn't necessarily imply that in the future all data generated through DCEP would in real time and automatically feed into or be reflected in any financial credit record.

Or another social credit link output because there are multiple outputs linked to the system. It does, however, mean that either real-time or non-real-time data could be ingested into credit platforms.

Such data could be processed into information that would support the generation of credit link outputs. We know that the three data centers are being established in association with DCEP so transaction data is already going to the data analysis platform.

Hypothetically, big data analysis could be used to streamline information that could go into a social credit link big data information center.

And that's about all we can say at the moment. More broadly, though, I think the more important issue to focus on is that technical assessments of risks associated with technologies like DCEP tend to be framed in ways that do not get to the core risks of how data is generated and might support Party State objectives or pools.

To appropriately deal with these kinds of risks, U.S. and others needs to apply a new framework for evaluating such technologies.

We cannot keep treating technology as neutral when it's intertwined with the ambitions of the Party State, which go beyond normal problem-solving to include the protection of the Party State's power.

Our previous ad hoc approaches to Huawei and TikTok were reactive, seeing as they already entered the market. While we've looked at the way that Beijing can exert power on companies or other aspects, we often forget about how it can exert power over the design of that particular technology.

And it's built into the standards of that technology's development. So, to more appropriately deal with these kinds of risks, the United States and others needs to apply a new framework to understanding the technologies.

And here are a few key issues that I think need to be addressed. The U.S. Government and others cannot stop the development of DCEP but they can research credible alternatives.

Governments can attempt to understand emerging technologies more proactively and seek better ways to regulate technology. I've run out of time, sorry. It's 5:00 a.m. in the morning here in Australia.

VICE CHAIRMAN CLEVELAND: Go ahead, finish.

DR. HOFFMAN: Thank you.

And then I would just like to say that right now conversations dealing with policy responses for dealing with risks associated with DCEP should be very surface level because the framework for our responses needs to be adjusted to meet the challenge.

So, I think the first issue is that we need to remember we aren't talking just about a financial technology, we're talking about the politics that are embedded in that technology. And any response will need to take into account that broader framework.

So, I think things that we could do in the short term, though, would be to establish a clear domestic authority for a financial technology regulation in the United States.

But this must take place over that aforementioned condition of a framework for better understanding the problem that includes the politics embedded in these financial technologies is part of that.

Early efforts to establish and coordinate norms would reduce any subsequent need to resort to blunt and arbitrary measures that are economically, socially, and diplomatically disruptive if the technology is successful in the future.

So, democracy should develop a set of standards and norms that also realize Beijing's willingness to adhere to the agreements when its political priorities lead in a different direction also has to be considered.

Finally, decisionmakers in liberal democracies must develop a clear strategy for detecting flaws and improving the existing financial system for global financial governance. And we're to improve the international coordination in improving those issues.

PREPARED STATEMENT OF SAMANTHA HOFFMAN, SENIOR ANALYST, AUSTRALIAN STRATEGIC POLICY INSTITUTE CYBER CENTER

Testimony before the U.S.-China Economic and Security Review Commission

Hearing on "An Assessment of the CCP's Economic Ambitions, Plans, and Metrics of Success," Panel Four on "China's Pursuit for Leadership in Digital Currency"

15 April 2021

China's Digital Currency Electronic Payment and Surveillance[1]

Written Testimony of Dr. Samantha Hoffman
Senior Analyst at The Australian Strategic Policy Institute

Core Assessments

Vice-Chairman Cleveland, Commissioner Wessel, and Honourable Commissioners thank you for the opportunity to testify on this subject of emerging significance in the relationship between the United States and the People's Republic of China. I will begin with a few key points:

[1] In the Chinese party-state, everything is political, and this is exceptionally clear under Xi Jinping. DCEP will contribute to macroeconomic problem solving, but politics are also clearly embedded in DCEP's design and this political context will be a feature of DCEP's future use. These features cannot be simply removed if and when the technology is exported. Governments must be prepared to mitigate the political risks by investing in research into and the development of credible alternatives to DCEP for all key highly traded currencies.

[2] DCEP will offer no true anonymity, as the PBoC will have both complete visibility over the currency's use and the ability to confirm or deny any transaction. Even though the implications are mostly domestic for now, it's essential to act in anticipation of key shifts in global financial regulation and advances in financial technology. Policy responses cannot continue to be ad hoc and reactive as they have been in the cases of companies like Huawei. By acting now to build a baseline analysis of the DCEP project, decision-makers have an opportunity to anticipate challenges and build a consistent and coherent policy framework for managing them.

[3] The PBoC is linked to both the development of DCEP and the development of the social credit system, but a link between the two is not yet clear. The financial

[1] In addition to new material, this testimony draws heavily on the Australian Strategic Policy Institute's October 2020 publication, "The flipside of China's central bank digital currency" https://www.aspi.org.au/report/flipside-chinas-central-bank-digital-currency, edited by Dr Samantha Hoffman, and co-authored by Dr Samantha Hoffman, John Garnaut, Kayla Izenman, Dr Matthew Johnson, Alexandra Pascoe, Fergus Ryan and Elise Thomas.

transactions data DCEP generates could, in future, be ingested into big data analysis platforms associated with the social credit system. More broadly, technical assessments of risks associated with technologies like DCEP tend to be framed in ways that do not get to the core risks of how the data it generates might support other Party-state objectives or tools. To appropriately deal with these kinds of risks, the United States and others need to apply a new framework for evaluating such technologies.

Evaluating DCEP

There is increasing interest in the development of central bank digital currencies across the globe. Interest in this emerging technology is driven by a wide range of policy motivations, and the People's Republic of China (PRC) is not the only state seeking to develop a central bank digital currency. That being said, the PRC is one of the most significant actors in this space because the People's Bank of China (PBoC) is likely years ahead of other central banks in its research and development into its 'Digital Currency / Electronic Payment' project known simply as DCEP.

There are always two sides to a coin: central bank digital currencies simultaneously offer opportunities and create a threat depending on the intent of any actor who has access to the bulk data they generate. The degree of potential benefit and threat largely depends on the intent of the actor responsible for designing and deploying the technology. On the positive side, a CBDC can increase authorities' ability to understand how the economy operates and respond to problems in ways that could be beneficial to all. On the negative side, in the hands of authoritarians, the data collected can augment capabilities to surveil society and their ability to wield political power, potentially even outside their own geographic borders. With technology like DCEP, normal design features like anti-money laundering or anti-terrorism financing are politicised by default of the PRC's political system, and where those very concepts are politicised.

This testimony draws heavily on an October 2020 report I co-authored and edited for ASPI's International Cyber Policy Centre, titled "The Flipside of China's Central Bank Digital Currency". The report involved several different authors who contributed chapters. Our intention at ASPI was to improve the baseline understanding of DCEP's mechanics and place the project in its political and bureaucratic context. As a starting point, we found that existing research on DCEP did not holistically weave together the three broad categories of analysis relevant to the technology's development: finance and economics, financial technology, and Chinese politics. And in fact, politics - arguably the most important element - was the largely ignored dimension of existing DCEP analysis even though Party-state security organs, namely the Central Commission for Discipline Inspection, will be major beneficiaries of the project. The analytical framework in which we should place any technological development in the PRC, ranging from DCEP to implementing more overtly coercive surveillance tools like facial

recognition systems, should always be holistic. The nature of the Chinese Communist Party-led political system of the PRC necessitates that politics be a core feature of such analysis.

When attempting to understand the application of an emerging technology in the PRC, it is important to bear in mind that it likely will serve dual intents that at times seem contradictory. Frequently these technologies are described in a categorical, black-and-white fashion: either they are coercive, or they are problem-solving. They are described as being Orwellian if one's focus is on the coercive functions, but this often fails to take into account the technology's everyday problem-solving functions. Others might focus on the problem-solving sides of a particular technology and claim that the coercive applications of that technology are exaggerated in public discourse. Both views are misleading because the technologies in question are essentially always in a sense "dual-use".

The exact same data derived from a particular technology system can be processed to support both everyday problem-solving tools and coercive tools simultaneously. In fact, most emerging technologies deployed to support governance in PRC, such as smart cities technologies, have this dual application. Bear in mind that just because the PRC uses technology to support its everyday problem-solving does not mean that such problem solving is not also inclusive of enhancing the Party's control, like any other government authoritarian regimes rely on delivering something – or the myth that they do like Mussolini and his trains – in order to gain and maintain, or just create, the illusion of popular support.[2]

Policy Objectives

DCEP is being built to meet the party-state's specific needs. These needs are strongly linked to universal economic development and financial risk management objectives, but they also bake in the political requirements of the Party-state leadership.

As background, DCEP is a central bank digital currency. It is not a private digital token; it is a fiat currency. DCEP is a general-purpose central bank digital currency for use by both the PBoC (the central bank) and the general public. DCEP is planned to replace M0 (cash in circulation) only. DCEP will have a two-tier operational design. The first tier is the PBoC, which will handle issuance. The second tier is inclusive of commercial banks and the likes of Alipay, which will handle distribution. Finally, and most important in the context of this testimony, although DCEP is being built with a characteristic of "controlled anonymity", it does not provide true anonymity because the PBoC will have oversight into end-to-end transaction flows, as well as a register of users and institutions.

[2] Brian Cathcart. "Rear Window: Making Italy work: Did Mussolini really get the trains running on time?" The Independent, 1994. https://www.independent.co.uk/voices/rear-window-making-italy-work-did-mussolini-really-get-the-trains-running-on-time-1367688.html.

In our ASPI report, "The Flipside of China's Central Bank Digital Currency", co-authors Matthew Johnson and John Garnaut assessed the multilayered policy objectives behind DCEP.[3] They argued that at the leadership level, DCEP is being driven by the financial 'risk management and 'supervision' imperatives of Chinese Communist Party (CCP) General Secretary Xi Jinping. They described how DCEP fits within a vision of 'economic work' that Xi Jinping has developed over the past five years, noting that it puts surveillance and supervision at the core.[4] Johnson and Garnaut elaborated that as well as improving the scrutiny, and visibility, of international capital flows, and reducing the costs of printing and maintaining the circulation of cash, PBoC officials say that the data collected through DCEP will be used to improve macroeconomic policymaking.[5] And, for this purpose, the data used would be anonymised. However, Johnson and Garnaut noted, Yao said the same data would also be used for law enforcement.[6] Johnson and Garnaut importantly highlighted the increasingly prominent involvement of the CCP's top political organ for imposing political discipline internally in both promotion and policy direction of DCEP. They noted that the CCDI has promoted DCEP's potential to 'solve' the problem of terrorist financing and combat financial crimes such as bribery and embezzlement.[7] The CCDI imposes party discipline through channels that exist above and outside the formal legal apparatus, and it has served as Xi's primary organisational weapon in his ongoing campaign to combat corruption, enforce ideological unity and purge the Party of potential rivals.[8]

In "The Flipside of China's Central Bank Digital Currency", I described how the PBoC's creation of a massive repository of financial transaction data could improve both the efficiency and visibility required for the PBoC and CCDI to effectively supervise and police financial transactions. DC/EP's political-discipline-linked policy drivers—anti-money-laundering, anti-terrorist financing and anti-tax evasion—are linked to the party-state's 'social governance' process (also called 'social management). Social governance describes how the CCP leadership attempts to shape, manage and control all of society, including the Party's own members,

[3] See Dr. Matthew Johnson and John Garnaut's Chapter "Drivers of the PRC's digital currency project" in "The flipside of China's central bank digital currency" https://www.aspi.org.au/report/flipside-chinas-central-bank-digital-currency,

[4] '中央经济工作会议在北京举' [The Central Economic Work Conference is held in Beijing], *Xinhua*, 21 December 2015, online.

[5] Wolfie Zhao, 'PBoC's digital currency chief departs to lead securities clearing house', *Coindesk*, 15 October 2018, online.

[6] '姚前: 中国法定数字货币原型构想' [Yao Qian: Prototype conception of China's legal digital currency], *China Finance*, issue 17, 2016, online. On the use of DC/EP in conjunction with big data and AI for prevention and targeting of illegal behaviour, including money laundering, terrorist financing, and tax evasion see also '范一飞：关于数字人民币M0定位的政策含义分析' [Fan Yifei: analysis on the policy implications of digital RMB position as M0], China Financial News Net/Financial Times via Yicai, 14 September 2020, online.

[7] '观察丨央行数字货币如何影响你我' [Observer: How does central bank digital currency affect you and me?], Central Commission for Discipline Inspection (CCDI) website, 7 June 2020, online. The article quoted the PBoC Digital Currency Research Institute head, Mu Changchun, to make the following points: DC/EP is a response to the impact of bitcoin and crypto-assets on China's currency and monetary sovereignty; anonymity would be provided for 'reasonable and legal' micropayments; DC/EP would be a tool to prevent asset loss and embezzlement; a real-name wallet would be required for any large transaction, and the PBoC's goal was to strike a balance between protecting personal privacy and preventing crime.

[8] In 2018, CCDI secretary Zhao Leji signalled his intentions to move into the financial system by dispatching permanent anti-corruption teams to banks, insurers and other state-owned financial conglomerates, likening the new policy to 'installing surveillance cameras' aimed at top institutional leadership. 'Anti-corruption teams to be installed at China's state banks and insurance companies, acting like "human surveillance cameras"', *South China Morning Post*, 6 November 2018, online.

through a process of co-option and coercion.[9] DCEP helps solve legitimate problems, but that problem solving also acts as a tool for enhancing control. For instance, a local PBoC official described 'anti-money laundering' as an 'important means to prevent and defuse financial risks and consolidate social governance.'[10] Similarly, an article by Deputy Governor of the PBoC Liu Guoqiang published in the *People's Daily* said:

> In recent years, the scope of anti-money laundering work has become increasingly diverse and has expanded to many areas such as anti-terrorist financing, anti-tax evasion and anti-corruption. Anti-money-laundering work has strengthening modern social governance as its goal through guiding and requiring anti-money-laundering agencies to effectively carry out customer identification, discovering and monitoring large-value transactions and suspicious transactions, timely capturing abnormal capital flows, and enhancing the standardisation and transparency of economic and financial transactions to weave a 'security net' for the whole society to protect normal economic and financial activities from infringement …[11]

More specifically, the connection of DCEP's policy drivers to social management is indicative of how DCEP would ultimately serve the Party's needs in practice. Through the PRC's global Operation Skynet, which seeks to 'track down fugitives suspected of economic crimes and confiscate their ill-gotten assets', the PBoC cooperates directly with the Ministry of Public Security because of the role of the PBoC as an anti-money-laundering authority.[12] Genuinely corrupt officials are certainly caught up in the campaign, but who gets accused of corruption is the result of a political decision linked to power politics. Likewise, the crime of 'terrorist financing' is defined by the Chinese party-state's version of 'terrorism', and it's been directly linked to the PRC's campaign against the Uyghurs in Xinjiang. For instance, in July 2020, Australian media reported on an Uyghur woman who has been arrested on charges of financing terrorism for sending money to her parents in Australia, who used it to purchase a house.[13]

These drivers can also be seen in conjunction with two others that Johnson and Garnaut highlighted in their chapter: competing with the US financial-led global financial system (and in particular combatting Libra) and competing globally. They described China's finance and banking officials have repeatedly expressed concern at the prospect of a supranational stablecoin, namely Facebook's Libra, which Chinese authorities perceive as being tied to the

[9] Samantha Hoffman, 'Programming China: the Communist Party's autonomic approach to managing state security', PhD thesis, University of Nottingham, 29 September 2017.

[10] '关于反洗钱工作 中国人民银行长春中心支行组织召开了这个会……' [Regarding anti-money-laundering work, the People's Bank of China Changchun Branch organised this meeting …], Jinlin Province Financial Supervision Administration, 29 April 2019, online.

[11] Liu Guoqiang, '人民日报：维护国家金融安全 全面推进反洗钱事业' [*People's Daily*: Maintain national financial security and comprehensively promote anti-money-laundering], *People's Daily*, 15 July 2019, online.

[12] Zhang Yan, 'Skynet launches new fugitive hunt', *China Daily*, 29 January 2019, online; '央行"天网行动"挖出洗钱四大秘密通道' [Central Bank 'Skynet Operation' found four secret channels for money laundering], *jrj.com.cn*, 8 November 2008, online.

[13] Lin Evlin, 'This Uighur woman sent money to her parents in Australia. China accuses her of financing terrorism', *SBS News*, 18 July 2020, online.

US dollar. They equate US digital currencies with US dollar hegemony and say that it reinforces the need to decouple the renminbi from the US-dollar-led global financial system.[14] In my research, I've noted how more broadly, the Party-state has described the concept of credit as being one politicised by powerful competitors, namely the US, as a potential threat.[15] For instance, leading international credit agencies—Moody's Investors Service, Standard & Poor's and Fitch have been described as having the capacity to "destroy a nation by downgrading their credit score, utilising the shock power of 'economic nukes'".[16] The problem has also been tied to the Belt and Road Initiative because participant countries accept the current international rating system, and a solution would be to increase the 'discourse power [that China's] credit agencies possess on the international credit evaluation stage'.[17]

Surveillance Features[18]

DC/EP does not create surveillance practices that didn't already exist. Rather, its digital nature and centralised supervision facilitate the aggregation and bulk analysis of user and financial data to more easily meet those objectives.

The PBoC's Digital Currency Research Institute director Mu Changchun has attempted to make assurances that DCEP will provide users with greater privacy than commercial payment systems.[19] But DCEP will offer no true anonymity, as the PBoC will have both complete visibility over the use of the currency, and the ability to confirm or deny any transaction. There are design features that allow users to be more anonymous with more limits on transactions. Though a basic account does not need to be bound to a bank account but rather to a phone number, the increasingly effective implementation of regulations like "real-name" registration to purchase a SIM card mean those individuals are ultimately traceable even if initially transactions appear anonymous.

PBoC officials will conduct monitoring using big data analytics that flag unusual activity that might indicate illegal activity (as defined in the PRC, not the definition of "terrorism" above). The PBoC might also seek to monitor more closely a specific subset of individuals and entities, just like domestic smart cities solutions for policing like the Police Geographic Information

[14] '中联部原副部长预警，积极应对六大外部环境恶化的准备' [Former deputy minister of the International Liaison Department gives a warning, (make) preparations for actively responding to six major deteriorations in the external environment], Chongyang Institute for Financial Studies, Renmin University of China, 29 June 2020, online; 中钞区块链技术研究院 [China Banknote Printing and Minting Corp. Blockchain Technology Research Institute]; '中共中央党校《学习时报》：积极谋划我国数字货币发展' [CCP Central Party School *Study Times*: Actively plan the development of China's digital currency], China Banknote Printing and Minting Corp. Blockchain Technology Research Institute, 16 August 2019, online.

[15] See, Samantha Hoffman, "Social credit: Technology-enhanced authoritarian control with global consequences," ASPI, 28 June 2018: https://www.aspi.org.au/report/social-credit .

[16] Zhengzhong Xu, Hongwei Du, '世界格局变迁中的战略主动权之争' ('The struggle for strategic initiative amid changing patterns of the world)', People's Forum, 16 April 2015, online

[17] '宁夏：抢抓发展机遇 打造"丝路信用之城"' ('Ningxia: Grab hold of developmental opportunities and construct the "Silk Road City of Credit"'), People's Daily Online (Ningxia Channel), 28 September 2016, online.

[18] See Samantha Hoffman's chapter "DC/EP and Surveillance" in "The flipside of China's central bank digital currency" https://www.aspi.org.au/report/flipside-chinas-central-bank-digital-currency,

[19] https://www.coindesk.com/peoples-bank-of-china-official-says-fully-anonymous-digital-yuan-not-feasible

Systems that feed into the "Sharp Eyes" and "Skynet" surveillance projects.[20] For instance, these systems seek to monitor in real-time particular lists of individuals considered "key personnel". Maya Wang's work for Human Rights Watch has described key personnel tracking systems, which focus on "seven categories" of people, included petitioners, those who "undermine stability," those who are involved in "terrorism," major criminals, those involved with drugs, wanted persons, and those with mental health problems who "tend to cause disturbances."[21] Chinese publications have described the "key personnel early warning system" as involving relationship mining algorithms applied to collected data to locate 'criminal' networks, including political dissidents.[22]

There are also no express limits on the information-access powers of the party-state's political security or law enforcement agencies, such as the Central Commission for Discipline Inspection (CCDI), which has a keen interest in the technology. While DCEP could enable more effective financial supervision and risk management that any government might seek to embed in a central bank digital currency, the PRC's authoritarian system embeds political objectives within economic governance and otherwise reasonable objectives. Terms such as 'anti-terrorist financing', for instance, take on a different definition in the PRC that is directed at the CCP's political opponents, as the previous section elaborated.

Yao Qian (the PBoC's primary patent author on DCEP) described DCEP as having an 'anonymous front end, real-name backend'.[23] There's an element of anonymity through a characteristic of DCEP called 'controlled anonymity', but true anonymity doesn't exist, as currency registration and traceability are built into DCEP's transaction process. That process, augmented by data mining and big-data analysis, provides the PBoC with the ability to have complete oversight over the use of the currency. That functionality is provided through DCEP's "three centres". These are an "Authentication Centre" for recording and managing the identities of institutional and individual users; a "Registration Centre" for recording users' ownership of digital currency and history of transactions; and a "Big Data Analytics Centre" for analysing how money is being used, transacted and stored, supporting tracking and surveillance using static and real-time data, providing data and analysis inputs for monetary policy, and flagging financial fraud.

The term 'controlled anonymity' within the operation of DCEP means that the PBoC has complete supervision over the digital currency but has afforded users some anonymity for their transactions and protection of their personal information from other third parties besides PBoC.

[20] See also my new paper for the National Endowment for Democracy, "Double-Edged Sword China's Sharp Power Exploitation of Emerging Technologies," National Endowment for Democracy, April 2021: https://www.ned.org/wp-content/uploads/2021/04/Double-Edged-Sword-Chinas-Sharp-Power-Exploitation-of-Emerging-Technologies-Hoffman-April-2021.pdf and Dahlia Peterson, "Designing Alternatives to China's Repressive Surveillance State," CSET Policy Brief, October 2020, https://cset.georgetown.edu/research/designing-alternatives-to-chinas-repressive-surveillance-state/

[21] Maya Wang, "China: Police 'Big Data' Systems Violate Privacy, Target Dissent," *Human Rights Watch*, 19 November 2017, online.

[22] Gong Chunqiang, "Design and Implementation of Key Personnel Early Warning System Based On Telecommunication Data," (2015) Shanghai Jiaotong University.

[23] '姚前：中国法定数字货币原型构想' [Yao Qian: Prototype conception of China's legal digital currency], *China Finance*, issue 17, 2016, online.

DCEP has been designed such that, even if commercial banks and merchants were to collude, users' purchase history couldn't be determined by them or any other third party, except, crucially, the currency issuer (the PBoC).[24] PBoC Deputy Governor Fan Yifei has explained that full anonymity won't be implemented through DCEP in order to discourage crimes such as tax evasion, terrorism financing and money laundering.[25] All central banks would need to ensure that their digital currency meets anti-money laundering and countering terrorism financing rules. Central bank digital currencies would allow for better digital records and traces, but it's been suggested in a report by the Bank of International Settlements that such gains may be minimal because the illicit activity is less likely to be conducted over a formal monetary system that's fully traceable.[26]

DCEP is designed so it can be used without the need for a bank account, but digital wallets have a grading system such that wallets that are loosely bound to a real-name account have transaction size limits. A user can attain the lowest grade of digital wallet—with the transaction limits—by registering their wallets with a mobile number only (of course, phone numbers are required to be registered to an individual's real name in the PRC). Users can access higher grade digital wallets by linking to an ID or bank card. Through the Agricultural Bank of China, for instance, users are encouraged to upgrade their digital wallets to a 'Level 2 digital wallet' by registering with their name and national ID details.[27] If a user registers in person at a counter, there are no restrictions on their digital wallet.[28]

The integration of DCEP into third-party applications does not make users' transactions on those applications more private, but the underlying digital currency system is designed to provide privacy from third parties (except, of course, the central bank). That being said, practicalities when implementing any payment system mean that in practice, there is little anonymity for the individual from any app because the app will already know the user, and when transacting will need the user to identify the recipient of the funds and the transaction amount. Therefore, the implementation of DCEP into mobile applications, such as DiDi Chuxing, BiliBili and Meituan Dianping, that are in partnership negotiations with PBoC.[29] It doesn't change the amount of information those apps, and by extension, their linked platforms, are able to collect on the user.

DC/EP and the Social Credit System

[24] Patent application 201610179712.3 'Digital Currency System', online.

[25] '范一飞：关于央行数字货币的几点考虑' [FAN Yifei, Several considerations about the central bank's digital currency], *China Business Network app*, 2018, online.

[26] Committee on Payments and Market Infrastructures and Markets Committee, 'Central bank digital currencies', Bank of International Settlements, 2018, online.

[27] Agricultural Bank of China DCEP test app manual. '重磅！央行数字货币DCEP在农行内测（附测试链接）' [Huge! The Central Bank's digital currency DCEP is tested internally in the Agricultural Bank of China (with test link)], *Sina Finance*, 15 April 2020, online.

[28] Mu Changchun, '科技金融前沿：Libra 与数字货币展望', [Frontiers of technology and finance: Libra and digital currency outlook], *DeDao App*, August 2019, online.

[29] Hu Yue, Denise Jia, 'Didi partners with Central Bank on digital currency trial', *Caixin*, 9 July 2020, online.

I have been asked to specifically address the potential linkage between DCEP and China's social credit system. My assessment is based on my research on both of these separate topics, but it should be noted that there is no publicly available authoritative sourcing that specifically addresses the link between the social credit system and DCEP. At this point, understanding of how the two systems might interact is at best extremely vague. Further research is required to better articulate how this potential future interaction would look in practice.

The People's Bank of China and the National Development and Reform Commission are the key central institutions responsible for the construction of the social credit system (though the actual system requires a whole of government approach).[30] It is logical to assume that financial transactions data derived from DCEP transactions might play into the social credit system given the PBoC's direct role in both. This is especially true if we take into account the disciplinary policy drivers behind DCEP, which, at least conceptually, are similar to the kinds of data that would indicate the trustworthiness or honesty of an individual or entity being evaluated using the social credit system.

According to PBoC data, the social credit system covered 1.1 billion individuals and over 60 million enterprises and organisations at the end of 2020.[31] The financial transactions data DCEP generates could, in future, be ingested into big data analysis platforms associated with the social credit system. DCEP would most likely support aspects of the social credit system related to the development and sharing of financial credit information. The PBoC's 'credit reference' system, covering financial credit data, is a core part of the social credit system. Even though this deals with financial information, it is neither completely separate nor completely distinct from the "social credit system" as a whole. The social credit system combines both social integrity and financial credit – these are distinct in some areas, but ultimately overlapping parts of the larger "social credit" construct.

Functionally, if a link exists between DCEP and the social credit system, this does not necessarily imply that in the future the data generated through DCEP would in real time and automatically feed into or be reflected in a financial credit record or other social credit-linked output directly. It does, however, mean that either real-time or non-real-time data could be ingested into credit platforms. Such data could be processed into information that would support the generation of social credit-linked outputs. We know there are already three data centres being established in association with DCEP, so transaction data is already going to a big data analysis platform. Hypothetically, the big data analysis centre would streamline the information that would feed into another platform like a social credit linked big data information centre. [32]

[30] '社会信用体系建设工作由发展改革委、人民银行牵头进行' [The construction of the social credit system is led by the National Development and Reform Commission and The People's Bank of China], *China Government Net*, 23 July 2014, online.

[31] 'China's social credit system covers 1.1 billion people by end 2020', *Global Times*, 26 January 2021, online.

[32] Based on research I've done on other systems, specifically some linked to smart cities, data from various cloud platforms like "public security" or "traffic" clouds is integrated into a larger pool of data and then processed for specific outputs.

For instance, streamlined information could include data specific to KYC, anti-money laundering and anti-terrorist financing requirements. An article published through the Development and Research Centre of the State Council in April 2020, for instance, suggested that the Authentication Centre and Big Data Analytics Centre of DCEP's "Three Centres" would "enhance the central government's ability to control the monetary system such as KYC, anti-money laundering, and anti-terrorist financing. It said that "the central bank's credit reference advantage and KYC and AML capabilities can be communicated to commercial banks through the combination of traditional accounts and digital currency wallets."[33]

Bear in mind the political implications of concepts like "anti-terrorist" financing as they affect the kinds of credit information the credit reference centre holds and shares. In 2014, deputy director of the PBoC Pan Gongsheng said that "establishing a credit information sharing mechanism was one of the important tasks to promote the construction of China's social credit system." Pan added:

> "Carrying out information collection cooperation is conducive to realizing the interconnection of credit information between government departments and credit institutions, helping credit institutions to effectively prevent credit risks, and reducing risks in the entire financial system. [Carrying out information collection cooperation] is conducive to establishing a joint disciplinary mechanism and improving the efficiency of administrative law enforcement by government agencies, realizing the coordinated supervision of untrustworthy behaviour. [Carrying out information collection cooperation] is conducive to enhancing the credit awareness of information subjects, forming a systemic arrangement of "[if one] keep one's promise, then [they will] be provided incentives; if [one] breaks one's promise, then [they will] be punished, improving the social credit environment and accelerating the construction of the social credit system."[34]

For as hypothetical as the above technical aspects of this system might appear, it is important to emphasise that technologies -- like social credit big data analysis platforms -- are being researched and developed to meet the needs that are typically set out in government standards documents. Dozens of companies' products are involved in social credit platforms across the PRC, making the implementation appear chaotic. Yet, there are also national standards being developed for the social credit system. The National Social Credit Standardisation Technical Committee, which held its inaugural meeting in 2016, oversees the research and development of standards. [35] Application of standards like these should be universal for any social credit big data platform that wins a contract no matter what company is involved. The current or future implementation of standardised database schema creates a trajectory whereby the seamless

[33]杨荣、陈翔：央行数字货币对商业银行的影响' [Yang Rong and Chen Xiang: The Impact of DCEP on Commercial Banks], *China Thinktanks, Development Research Center of the State Council*, 23 April 2020, online.

[34] '人民银行与环保部、税务总局等单位签署征信系统信息采集合作文件' [The People's Bank of China, the Ministry of Environmental Protection, the State Taxation Administration and other units signed a cooperation document on credit information collection], Credit Reference Center, The People's Bank of China, 11 December 2014, online.

[35] For example, '公共信用信息分类与编码规范' [Classification and coding specifications of public credit information], *National Public Service Platform For Standards Information*, 29 December 2018, online.

integration of information from across local platforms to national platforms is far more achievable than might meet the eye at a surface level evaluation of the sheer number of companies involved.

In a new report for the National Endowment for Democracy's Sharp Power series, I describe how standardisation of emerging technologies is taking place at the design level.[36] Contrary to arguments that fragmentation is a significant barrier to the success of the Party-state's tech-enhanced authoritarianism, there are strong indicators that the groundwork has been laid for seamless interoperability between smart cities systems to be achieved, and it is reasonable to assume the same is possible with social credit-linked platforms. Government and research institutes collaborate with companies to standardise equipment development and the requirements that companies must meet to successfully bid for a project. For instance, a 2016 document entitled "GA/T1334: Technical Requirements of Facial Recognition Application in Security and Face Image Extraction from Videos—Application Programming Interface of Facial Recognition in Security System" was drafted by over a dozen bodies, including research institutes, such as the Chinese Academy of Sciences, the National University of Defense Technology, and the First Research Institute of the Ministry of Public Security; tech companies, such as Hikvision and Dahua; and public security bureaus, such as the Shanxi Provincial Public Security Department and the Wuhan Public Security Bureau.[37] Documents like these are used as a basis for technical requirements in government procurement contracts. A new report by IPVM has separately made a very similar case using the same kinds of documents.[38]

Future extraterritorial implications?

To project future extraterritorial implications of DCEP, one must assume that the project will first succeed domestically and then be exported globally. There are channels through which this might take place or where certain activities might assist this future uptake. China has a clear ambition to shape global technological and financial standards. As Matt Johnson and John Garnaut highlighted in their contribution to the ASPI report, with China Standards 2035 on the horizon, DCEP and its related technologies are likely to be an important component in China's push to establish a comprehensive alternative to the dollar system. The liberalisation of China's current account is not required for the export of the DC/EP technology stack to other countries. China's ability to develop new financial technology that embeds authoritarian norms of control and surveillance may affect global standards and financial infrastructure well before the internationalisation of the renminbi is achieved.

[36] Samantha Hoffman, "Double-Edged Sword China's Sharp Power Exploitation of Emerging Technologies," National Endowment for Democracy, April 2021: https://www.ned.org/wp-content/uploads/2021/04/Double-Edged-Sword-Chinas-Sharp-Power-Exploitation-of-Emerging-Technologies-Hoffman-April-2021.pdf

[37] Full list: Tsinghua University, First Research Institute of the Ministry of Public Security, Hikvision, Institute of Automation, Chinese Academy of Sciences, National University of Defense Technology, Computing Institute of Chinese Academy of Sciences, Beijing Haixin Kejin High-Tech Co., Ltd., Guangzhou Pixel Data Technology Development Co., Shanghai Yinchen Intelligent Identification Technology Co., Ltd., Zhejiang Dahua, Shenzhen Zhongkong Biometrics Co., Ltd., Guangdong Boya Information Technology Co., Ltd., Sichuan Chuanda Zhisheng Co., Ltd., Shanxi Provincial Public Security Department, Jiangsu Provincial Public Security Department, and Wuhan Public Security Bureau.

[38] 'Dahua and Hikvision Co-Author Racial And Ethnic PRC Police Standards', *IPVM*, 30 March 2021, online.

Conceptually, the political motives for tools of power expansion are clear. As I highlighted in my contribution to the ASPI report, under Xi Jinping, the concept of social management has expanded to specifically include 'international social management.[39] Something to consider is the fact that Hong Kong's new state security law criminalises separatism, subversion, terrorism, and collusion in and support for any of those activities by anyone in the world, no matter where they are located.[40] This means that journalists, human rights advocacy groups, researchers or anyone else accused of undermining the party-state and advocating for Hong Kong democracy could be accused of those four types of crime. By extension, anyone financing those individuals or entities (such as funding a research group) could potentially be linked to the accusations. If DCEP is successfully rolled out and adopted in the distant future, then the world would have to be prepared to contend with a PRC in possession of information that would also allow it to enforce its definitions of the activities that it's monitoring (anti-corruption and anti-terrorism, for instance) globally, thus potentially allowing it to implement PRC standards and definitions of illegality beyond its borders with greater effectiveness.

Policy Responses

We cannot keep treating technology as neutral when it is intertwined with the ambitions of the Party-state, which go beyond normal problem-solving to include the protection and expansion of the Party's power. These ambitions cannot simply be removed or ignored when technology is researched and developed to meet those political needs.

Our previous ad hoc approaches to Huawei and Tik Tok were reactive, coming after they had already entered the market. Countries that have chosen to act against Huawei, Tik Tok, and other PRC-developed technology have done so in large part because of the ways Beijing can exert power over companies or companies that might comply with those demands. While these are solid arguments, they do not address the inevitable vulnerabilities in any software or hardware given the politics driving the development of PRC tech standards they meet or help establish or the intended problems the technologies are designed to solve (when the Party's problem-solving efforts often drive the R&D itself). The technology itself isn't agnostic, and technical assessments tend to be framed in ways that do not get to the core design risks that explain why.

Take, for instance, the issue of supply chain security. Often, conversation on supply chain security is focused on logistics or physical elements of the supply chain. When this is inclusive of risks to the digital supply chain, namely data security, cyber security experts tend to focus on the ways threat actors can exploit hardware and software vulnerabilities. They do not focus on how data harvesting through the supply chain as part of business activity is part of what the

[39] Liqun Wei, '党的十八大以来社会治理的新进展' [New progress of social governance since the 18th Party Congress], *Guangming Daily*, 7 August 2017, online. The author, Wei Liqun, is a former Director of the State Council Research Office and former Deputy Director of the National School of Administration.

[40] Dominic Meagher, 'Has Hong Kong's national security law created secret police with Chinese characteristics?', *The Strategist*, 14 July 2020, online.

Party-state uses or exploits to meet political needs that global bulk data collection and processing can support.[41]

To appropriately deal with these kinds of risks, the United States and others need to apply a new framework for evaluating such technologies as to their suitability that explicitly includes the actors who maintain control over their functioning and the data they collect. Below are some of the key issues that I think need to be addressed:

- The US government and others cannot stop the development of DCEP within the PRC and cannot change DCEP's policy drivers. Governments must be prepared to mitigate the political risks by investing in research into and developing credible alternatives to DCEP for all key highly traded currencies.

- Governments must attempt to understand emerging technologies more proactively and seek to develop better ways of regulating financial technology. When Congress investigates the risks associated with Financial Technology – and develops laws and regulations to address specific issues like data privacy – the assessment of risk needs to be more holistic and inclusive or varying political intent of different actors. It must be sophisticated enough to address those variations at a core level. Right now, conversations on policy responses for dealing with such risks are still very surface level because our framework of responses has not adjusted to meet the challenge.

- Beijing has repeatedly broken its agreements on issues large and small, ranging from intellectual property rights protections to the Sino-British Joint Declaration related to Hong Kong. Given this track record and the CCP's explicit ambitions for the use of DCEP and other technologies, the presumption should be that the party-state will exploit the technology's potential international reach. What concrete protections are embedded that prevent Beijing from misusing the access and data that it gains?

DCEP's rollout is likely to have notable ramifications for governments, investors and companies, including China's own tech champions. More analysis is needed before prescriptive policy solutions can be developed for the political and financial oversight challenges DCEP could create. At the same time, it's important to act in anticipation of key shifts in global financial regulation and advances in financial technology so that governments don't end up trying to reverse course when it's too late to deal with the systemic risks DCEP could create. Below are a few starting points:

- A clear domestic authority for financial technology regulation should be designated, but this must take place under the aforementioned condition that our framework for understanding the problem is also adjusted to meet political challenges embedded in financial technologies like DCEP.

[41] The GTCOM case study in my 2019 report Engineering Global Consent helps to illustrate this risk, see: Samantha Hoffman, 'Engineering Global Consent: The Chinese Communist Party's Data-Driven Power Expansion,' the Australian Strategic Policy Institute, 14 October 2019, online.

- Early efforts to establish and coordinate norms, rules and standards will reduce any subsequent need to resort to blunt and arbitrary measures that are economically, socially and diplomatically disruptive. Although democracies should develop a set of standards and norms, Beijing's willingness to adhere to those agreements when its political priorities lead in a different direction also has to be considered.

- Decision-makers in liberal democracies must develop a clear strategy for detecting flaws in and improving the existing system for global financial governance and work to improve international coordination among each other to achieve those strategic outcomes.

PANEL IV QUESTION AND ANSWER

VICE CHAIRMAN CLEVELAND: Thank you very much. We'll start the questions with Commissioner Wong.

COMMISSIONER WONG: Thank you to everyone for attending and sharing your insights and your wisdom.

My question, at the risk of not phrasing it so cogently since this is still a very new area and new technology to me at least, goes to Mr. Fanusie.

I understand the warning signs you see with the construction of BSN and the eventual and logical application of DCEP to that infrastructure that China's leading international partners to build out.

But just because China may have an intent to use BSN in combining it with its digital currency to effectuate certain strategic advantages doesn't necessarily mean that it will work.

And I'm really having a hard time understanding why in a situation where the attractiveness of blockchain technology and crypto is, from my understanding, instant settling and immediate convertibility between borders, where the advantage is decentralized authentication that is not dependent on a central authority, and a currency that is not dependent on a Central Bank willing to back the currency. Why people would accept the idea that BSN would only use digital renminbi, that eliminates a large part of those advantages?

I don't know, it's almost like they're taking blockchain and taking away all the advantages. So, why would anyone use that?

MR. FANUSIE: So, to clarify, the BSN effort is actually patterning itself on the Internet in China in that it won't just be the digital renminbi that is used on the BSN infrastructure, but within China that cryptocurrencies would not be allowed.

But they're actually developing, or the ideas is to develop infrastructure, that anyone actually could build permissionless cryptocurrencies using their blockchain cloud-computing network, but that just wouldn't be available for Chinese citizens within China.

So, if you are a blockchain developer in San Francisco in Silicon Valley, what they're actually doing is they're saying, hey, you know how there's been all that blockchain hype that all these startups had and it was so hard for your companies to be successful because you didn't have the infrastructure in Western countries?

We're going to build cloud infrastructure so now you, Western developer or Asian developer, you can come here and build your applications on our systems, on our data centers.

It will be cheaper than using Amazon, AWS, and so the idea is that the applications that are built in the future, and they're actually talking decades, 10, 20 years, that this is their opportunity, they feel, to build the infrastructure.

As someone who's actually followed a lot of the blockchain crypto stuff over the past few years, I'd say why haven't a lot of these projects been successful, these crypto companies or decentralized apps?

It's because they didn't really have infrastructure so you're building an idea of a blockchain app but you don't really have the infrastructure. Why would some other company join your blockchain?

So, I think what China is doing is they're saying, you know what, we'll take the next decade or so, we're going to build the cloud infrastructure so that it's going to be cheaper to build decentralized applications on our network.

And we'll ultimately own the key.

COMMISSIONER WONG: Thank you. My next question is a little off topic but I thought I'd ask it. I was privileged to join the conversation with Peter Thiel, where he said something somewhat controversial.

He said despite him being kind of a Bitcoin maximalist, he thinks at this point it might be good to think of Bitcoin as some sort of financial weapon wielded by the Chinese against the U.S. dollar.

I imagine he said that because of not just Bitcoin but crypto in general's threat to the status of the U.S. dollar as a reserve currency compromising our ability to have financial intelligence as well as the reach of our financial sanctions power.

I imagine that's what he meant. My question is do you agree with that and is that accurate that it would, despite being a threat to all fiat money around the world, it would be a particular threat to the U.S. but would benefit Beijing?

That's really to everybody.

MR. FANUSIE: I'll say it's overblown or overstated. I think there's a little bit too much emphasis there on Bitcoin's ability to rival national currencies, fiat currencies.

I think it's very much overblown. I'm getting an echo here. And I think he's referring to the mining power but you have to think again, let's say, yes, there is a lot of mining power that is in China but it's a permissionless system.

So, if there ever were a case where there was so much national security leverage there or a disadvantage, it's not like additional mining couldn't be built outside of China. So, that's my general stance.

MR. CHORZEMPA: Yes, I would totally agree with that. I think the characteristics that make Bitcoin attractive make it not really compete with fiat currencies.

Because you buy a Bitcoin, you don't know if it's going to be worth twice as much tomorrow or 20 percent less tomorrow, it's extremely volatile.

And I think some of the advantages it's talked about in terms of privacy are actually overstated because if you use a Bitcoin wallet and someone's eventually able to link you to that wallet, they can see every single transaction you've ever made.

And that's true of Chinese intelligence, of U.S. intelligence, I know Yaya's done a lot of work on this. So, I think Bitcoin is not as effective at sanctions-busting as it appears and doesn't really compete effectively with fiat currencies.

What's more likely to compete with fiat currencies are stablecoins in the future and it's less likely to compete with the U.S. dollar than it is to countries that don't really have anybody good stable currencies.

They would love to use, probably, regular U.S. dollars but you can't really get those in any of those places, and they're hoping that maybe they get digital versions of stablecoins more easily.

VICE CHAIRMAN CLEVELAND: Commissioner Wessel?

COMMISSIONER WESSEL: Thank you all and I hate to say every time I think I understand all of this I realize I don't, so I am learning every day and relearning every day.

What I heard, though, from each of you is frightening. I understand you may hedge the comments by saying you don't expect certain things.

But based on the fact that you say that you can't treat these as technology-neutral but must be guided by the political desires and plans of the CCP, shouldn't we be concerned not only with the development of this system within China, but its implications for all of our companies operating there or transacting with Chinese entities?

Samantha, do you want to start?

DR. HOFFMAN: Sure, so I think one thing I didn't touch on in my testimony which I think is quite important is that there are very political definitions to otherwise normal financial governance casts that DCEP would facilitate a party in undertaking.

So, for instance, I think the best example I can give is the concept of anti-terrorist financing and how that can be applied in the political form in the PRC.

There was a report late last year, middle of last year, about an Australian family whose daughter, a Uighur woman, they were a Uighur family, sent them money from Xinjiang to Australia to buy a house, I think in Melbourne, somewhere in Australia here.

And because of that transaction, that woman was accused of terrorist financing even though it was extremely clear that she was sending money for her parents to buy a house.

The point is that everything is political and can be used for a political reason because that's the nature of the system.

And technology itself, I think sometimes especially if you look at the debate around Huaweiand other emerging technologies in the PRC, there tends to be a focus on we can control its use.

But you forget that also at the design level those standards are baked in so in the NED paper that was mentioned in the introduction, I talked a little bit about how companies and PRC defense and public security agencies participate in the development of standards for technologies like facial recognition systems.

So, I think that all of that is just embedded in the technologies. So, should we be worried about the implications? Yes, but I also want to remind you the technology itself isn't creating something fundamentally new.

It creates, as Yaya highlighted in his presentation, the increased access to data and the ability to process that data and apply it. What's a concern with the actual system itself isn't new in that what the Party is doing, it's augmenting its existing form of authoritarianism.

So, the risk to the companies in some ways are the same, it's just with greater visibility the Party has the potential to expand its power more.

COMMISSIONER WESSEL: But an augmented tool could be more effective, more rapidly deployed, and more devastating in its impact potentially as well, correct?

DR. HOFFMAN: Potentially, yes.

COMMISSIONER WESSEL: Do either of the other two witnesses have comments there?

MR. FANUSIE: I'll just say briefly that if I think about what we should fear, the way I see it is what is our Achilles heel? And in the short term, DCEP is not much of a threat for all the reasons we've been talking about. But when I think about what should we be concerned about, the Achilles heel would be our own complacency in R&D, the idea of thinking, well, this thing, nobody's going to want this digital R&D so what does it mean?

And a lot of people who are doing CBDC research would even say this is just one model, it might not be the thing, but the thing is they're doing a lot of research, they're iterating, and they have this capacity to evolve. And the Achilles heel is if we're not able to be in the discussion when people are talking about standards, then we're at a disadvantage.

COMMISSIONER WESSEL: I think history has shown us that we believe the best and often suffer the worst so I'm all for getting ahead of this and again, scoping concerns and trying to respond to them or prepare for them early.

Thank you, Madam Chair?

VICE CHAIRMAN CLEVELAND: Commissioner Scissors?

COMMISSIONER SCISSORS: There we go, thank you.

I have a lot of comments, this is a fascinating topic for me so thanks everyone, and I'm going to have a question at the end for Martin. But if that doesn't take too long people can respond to my comments.

My first comment is that when I look at this from the financial perspective, which is what my area of expertise is, it's not digitization of currency, is that if we had non-negligible interest rates in the U.S., that would be a bigger step for protecting the supremacy of the dollar than digitization or fewer use of financial sanctions.

I know we're not supposed to talk about general U.S. policy but there's an incredibly simple thing to do to protect the dollar's supremacy in the next 10 years.

We may not do it, that's a different story. I agree with the multiple witnesses who said a big focus may be the biggest to the digital yuan is more domestic control, I think that's absolutely true.

I agree with both Mr. Fanusie and Mike about the risk to U.S. business.

We're going to see this risk rising a mile away and at some point I would like to the U.S. Government to say to U.S. business, those are the risks, don't come coming to us and say, oh, my God, I can't believe the Chinese cut us off just like that when we were using their digital currency. Too bad.

So, yes, there is a risk to U.S. businesses that's going to increase, I would like us not to address that risk. We have a lot of other risks to address.

Dr. Hoffman mentioned that the digital yuan is partly defensive, I agree, I don't want to put words in their mouth but there are Chinese officials who absolutely say this is defense against extended dollar dominance.

But the international face of Chinese monetary policy is to tether to the dollar and it hasn't changed at all in terms of that's the face of their monetary policy, is the dollar tether. Playing with the new technology, the Chinese are going to do that, that's not their problem.

Their problem is they're still terrified, actually more terrified since the capital outflow intensified in 2014 of financial instability. So, there's this giant constraint on them that hasn't changed and didn't change during the financial crisis, didn't change during the global financial crisis.

And again, I don't think this is internationally important. So, finally, I'll get to the natural question for Martin, and I agree with you, I want to you to stretch out five or ten years and just assume the following.

China five to ten years from now is hailed universally as outpacing the U.S. in further digitization of currency, and I agree with we've all already started that way.

But still nobody believes the Chinese are going to allow convertibility because they're afraid of capital flow outside of China.

So, in that situation which I just created, is there any threat from that change to the dollar as a reserve currency or any meaningful enhancement of the renminbi as a reserve currency?

MR. CHORZEMPA: Great question. I don’t think there is a threat to the U.S. dollar as reserve currency as a result.

I think it's important the Head of BIS, Augustin Carsons, recently poured a bunch of cold water on this, saying the hype is overrated and just because a currency is digital doesn't mean it's going to catch on.

It really has to prove that it's actually faster and more efficient in cross-border payments, but even that doesn't make it a reserve currency. I think it all really comes down to 01, if you

have those capital controls you can't really be a reserve currency.

And being a reserve currency is not just a free lunch, as you know it comes with a lot of responsibilities and costs. Anytime there's a global imbalance the U.S. ends up absorbing that imbalance, sometimes creating a lot of debt, other times could create unemployment.

It's actually a very risky thing so I don't really see that as a threat, and if I could address one of the things you were mentioning about the threat of surveillance on U.S. companies and coercion?

My question on all these things is always how much more control, how much more powerful of a tool is this than what exists now? My view is that if the Chinese Government wants to take out H&M, they can call up Alipay and WeChat Pay and say drop these guys from your wallet.

And that would be done and nobody could buy things at H&M, or they could do the same thing to their bank, call them up and say you need to drop this company.

So, I try to think would that be that much easier with a digital currency? Possibly. Would they be able to get much more access to the data, the banking data?

They would have the ledger all there, but my sense of how the system works right now is that all the payment companies and banks in China have to report a lot of this data to PBOC as it is.

So, I think they already have a database of all these payments and they're using it for all sorts of things purposes, and I just wonder how much more information and more control is going to be in the database?

They talk about it a lot domestically, this is going to give us more control, more ability to see how things are working, but I tend to think even their domestic rhetoric has gone a little too far on this and they think there are more benefits than there actually are.

COMMISSIONER SCISSORS: Thanks.

VICE CHAIRMAN CLEVELAND: Commissioner Fiedler?

COMMISSIONER FIEDLER: So, one of the implications of all that we've been discussing on digital currency in fintech to the Chinese ability as a state to enable the evasion of our sanctions, for instance with North Korea, with Iran, with Venezuela or anybody in the future, which is a significant thing currently in the United States's arsenal.

MR. FANUSIE: I can take a quick stab, I know others may want to talk about this. The short answer is in the short term I don't think the risk is very high for this to be groundbreaking for sanctions evasion, for enabling sanctions evasion.

And the key is because of how sanctions work. Sanctions are to pressure financial institutions, payment companies to remove services from designated individuals.

And as it stands, the U.S. influence, the U.S. dollar, access to the U.S. dollar, access to U.S. correspondent banking is still highly prized, highly influential.

So, if you're a, let's say, Chinese company that also offers the digital yuan, you're still impacted by the influence and the desire to have to access the U.S. market. So, I actually data it changes.

I'll give you an example, this is off country but the worst example of this or the best example is Venezuela. A few years ago Venezuela came up with its own cryptocurrency and it said outright this is going to be to help us evade sanctions, and it created this cryptocurrency.

Well, yes, they said that but guess what? The U.S., first of all, sanctioned that new cryptocurrency and said if you do any transactions with Petro, everything still applies.

And so that didn't change the game, I'll stop there, that's my initial reaction in terms of

immediately.

MR. CHORZEMPA: I would tend to fully agree with that and extend it even further to say even if you imagine a world in which the digital renminbi is, say, 50 percent of global payments, this still would apply because the sanctions are a really long arm.

You can sanction an entity but also any entity that deals with that entity, and you can continue that chain, is my understanding.

So, the Europeans tried really hard to develop a system that would be independent that would allow them to trade with Iran, and essentially, no companies were willing to deal with that because they didn't want to lose access to the U.S.

So, I just imagine that being a really far-off possibility, and the other element of this is that there's no deniability.

So, if the Bank of Kunlun is doing transactions with North Korea but not necessarily telling the Central Bank about them, hiding it away, that provides the Central Bank of China some deniability about it.

But if they controlled the ledger, they approve everyone that signs up to that system, it's going to be really hard for them to say, oh, we didn't know this was happening and it might actually about harder to evade sanctions.

COMMISSIONER FIEDLER: Thank you very much.

VICE CHAIRMAN CLEVELAND: Commissioner Borochoff?

COMMISSIONER BOROCHOFF: Well, recently I spent some time trying to understand cryptocurrency and blockchain and I thought I had mastered it to some extent.

And after reading your testimony and listening to you all and the other questions asked by the other Commissioners, I think I'm just going to say that I understand in general why we have a problem.

But I don't really have a question, I'm going to read about it some more and wait for the debrief and I want to say thank you to both of you, all three of you, you've just brought something to my attention that I really didn't understand.

And I'm glad to know about it, but I don't know enough about it to ask you another question. Thanks.

VICE CHAIRMAN CLEVELAND: Is Commissioner Bartholomew there?

CHAIRMAN BARTHOLOMEW: Yes, I am, thanks very much, thank you to all three of you for excellent testimony and being able to translate these complicated concepts into something we can understand.

Two questions from me, one is for my entire career I have been no fan of the Chinese authoritarian system.

And I understand the concerns of Sam and everybody in terms of what data the CCP would have access to or potentially have access to with the digital currency? And then I find myself saying and yet.

So, when the Burmese military did its coup, they apparently tried to transfer $1 billion out of the Federal Reserve Bank of New York and I have to believe it was not with trucks they were driving up to get the gold bullion out of there.

It would have been a lot of trucks but probably it was a digital transaction, and some people would say that was a political choice. I think it was the right decision by the administration but people would say that's political too.

So, I wondered if you could draw some distinctions between what you see as potential misuse by the CCP of data they would be harvesting from digital currency, and what other places

in the world might be doing?

That's one question, and the other is not a question as much as an observation. I came across a story yesterday, the headline of which Was State-Owned Assets in the Form of Crypto Embezzled by Executive of Chinese Blockchain Security Firm.

And I don't know, that just really struck me, right? Blockchain is supposed to be secure, secure, this just seems like a trifecta.

It was an executive of a firm that was supposed to be secure, their system was supposed to be secure, it was Chinese state-owned assets and this person embezzled it.

And I'm just trying to get a handle on all of that too and what it means for all of the underlying assumptions that we have about safety and security of digital assets, for example.

All right, anybody?

DR. HOFFMAN: I can start. So, on the politics question, I think that ultimately, we have to deal with the fact that we're talking about a system with opposing values.

Now, values in liberal democracies do vary so I think that's an important point we need to think about when we're talking about working with allies, what American values are, what EU values are.

They might be defined in very different ways, and in Australia as well. But ultimately, when you're talking about the Party State you're talking about a very different set of values that the Party is aiming to protect. And ultimately, it's not about China and China's future absent the Party and the Party's power, so that's the broad point.

Now, in terms of the politics and how the data that's collected might be used, first of all, one thing I've looked at in my research is that there's an argument there's so much data being collected and this creates complete invisibility for the Party State.

And then there's the opposite that says, well, actually, data collection is quite -- there's a lot of data collection and it's not possible to process that much data yet. Or the data is held in silos.

And I think they're both extremes but all of these arguments are a bit misleading because, for instance, with what I've noticed in my research looking at things like exposed databases it's actually the standardization of the way that database data is categorized for instance, it's already there to a large extent. So, that means that in the future data will be easier to integrate. And so the tools that can be generated from the processing of that data could then also be a little bit more realistic in the future.

So, for the Party State the tools could be things like normal financial regulation and I don't think we should underestimate the normal uses of the technology.

It can also be things that support -- the CCDI has a strong interest in the development of DCEP. It could be things like just having greater visibility and the ability to more efficiently implement whatever the political might be, anti-terrorist financing, anti-corruption, issues like that.

It's about efficiency and the potential for efficiency rather than creating something fundamentally new from what's already there.

CHAIRMAN BARTHOLOMEW: Martin or Yaya?

MR. CHORZEMPA: I'd be happy to take the second one.

I think it's important that Bitcoin has never been broken per se but if you lose your password or someone else has access to your password, your private key, it can be taken and disappear and you can never get it back.

And I think what's important to note is that a lot of these Chinese Government agencies

aren't actually that good at safeguarding their data and their assets.

There have been examples of Chinese officials who have had their identities stolen and then impersonated and lost lots of government funds. And often, when they're trying to put these data together they can't make much sense of the data because it's been generated by another institution.

Or often the data they have is actually on paper and they're trying to digitize it, it's full of errors. This process is often much messier than it tends to appear and so it's not surprising at all that someone lost crypto assets.

And also I know that Chinese officials often have been playing around with crypto assets themselves because many of them had a lot of assets they don't want the Chinese Government to know about and the discipline inspectors to know about.

So, they deal with that quite a bit outside of, you could say, their official capacity.

CHAIRMAN BARTHOLOMEW: Can you guys hear me?

This case gets even more bizarre, it was written up in Ping West because the guy who did the embezzlement took the crypto in order to short Bitcoin and then ended up losing it all.

Again, to me this case just encompasses all of these issues and weaknesses that we see in a system like this. Yaya, do you have anything to add?

MR. FANUSIE: I would just add that it's important to see crypto as now just another typology in the money-laundering process.

I would say it's here to stay so that's just one way to think about it, that now there's just another additional way for people to move illicit funds, corruption, bribery.

It's now becoming part of the mainstream in illicit finance, I'd say.

CHAIRMAN BARTHOLOMEW: Thanks very much to all of you.

VICE CHAIRMAN CLEVELAND: Can you talk a little bit about the relationship between the fintech companies, in particular Alipay and WeChat, and PBOC? And Yaya, as you said, this is as much about data as it is about money.

They have a billion users at this point, is this an effort, is digitization an effort, to somehow constrain or control or to be able to have access to the same information that Alipay and WeChat have?

MR. FANUSIE: Yes, I know Martin has done a lot of this, Samantha may want to comment. But I would say the way to see it is that for a while the Central Bank had been talking about these companies being too big to fail, that so much of the digital payments was happening through them.

And even, I believe, in the fintech development plan that came out a couple years ago, it said that there needed to be a wresting of control away from these private or other institutions that the retail payments are running through and running on.

So, I think the way to think about it is that the Central Bank or the CCP wants to have more central bank infrastructure in payments and this is a way to do it.

And I'm sure you could probably see it in the other things that have been happening like the financial holding companies and some of the joint ventures.

The idea is that the Central Bank, the Government wants to get into the payments game more than it has been.

MR. CHORZEMPA: I would tend to agree with that. Ali and Tencent have around 95 percent market share in the mobile payments market, there's really no one else playing much of a role.

And often, the PBOC has a point, which is that in many countries, when you're actually

moving money between bank accounts, that's usually done by the Central Bank or at an account in the Central Bank so they can make sure that's secure.

And increasingly, they've been talking about the DCEP project as a backup for if there was an issue with Alipay, which has in the past. They said there was a fiber optic cable that got cut during a construction project in Hangzhou and it went down.

That kind of thing happening now when the volumes are so much higher could be catastrophic, so they're very worried about this element of it.

And in terms of the data, I think to some extent they want to get more access to data but they also want to restrict Alipay's ability to use the data it gains from being this financial infrastructure for its other businesses, like credit scoring and providing personalized advertisements and all that.

So, one element of this, I can envision the DCEP being built into the Alipay wallet but then the rules around that being they can't use that data for other purposes.

I think you should take the PBOC very seriously when they say they want more financial privacy for consumers, both against the merchant that you're paying, so you can pay them without accidentally signing up for their loyalty program and getting emails and all that kind of thing, but also from these payment institutions.

I think that's really important and I think that PBOC actually will have some limitations on its ability to access the data. Again, national security demands for data is a different category but what I've seen in my research over the last years has been the PBOC endlessly frustrated about Alipay's unwillingness to share data they think they should be able to get access to.

And that's including after the cancellation of the IPO and the crackdown on these companies when they're under huge pressure to comply with the government. They're still resisting handing over some of the credit data that the PBOC wants.

VICE CHAIRMAN CLEVELAND: What do they want it for? Could you elaborate on that?

MR. CHORZEMPA: So, in the U.S., for example, credit data is very widely shared between financial institutions.

And the idea is if you borrowed from, say, JP Morgan a lot of money and you're in debt trouble and then you go to Bank of America and you want to borrow more, Bank of America can look you up and say you're way indebted to JP Morgan, we're not going to lend you any money.

But for a long time, Alipay didn't want to share its credit histories of people who borrowed with it with the government. Now the issue is more around do they get more granular data like each individual transaction?

I think there's a sense that they really want to get access to this data. They're like data is the new oil, they're really obsessed with this idea.

But there was a very interesting FT story a little while back that quoted somebody in the Central Bank that really saying something that jibes with my experience. They said the PBOC wants access to this data but it has no idea what to do with it.

They don't have the big-data expertise to actually do something with these individual granular borrowing transactions, whereas Alipay is now giving them the monthly summary of how much people borrowed, which is exactly what financial institutions in the U.S. share amongst each other.

And the PBOC wants more but they don't know what to do with it.

VICE CHAIRMAN CLEVELAND: We were talking just before the panel about what

happened between Jack Ma and federal regulators and I think it would actually be useful for the rest of Commission to learn a little bit about the IPO and what the nature of the relationship is between Alipay and regulators.

MR. CHORZEMPA: So, my view of this is a dam breaking, which is that Jack Ma has an immense amount of political influence and so do many of the other big tech companies in China.

And that has made it difficult in the past for many useful regulations you might want, in terms of competition and privacy and financial risk, to happen.

Because they can block a lot of this, or because if you're a mid-level official, you might want to take action against this company and you're worried that you might lose your job because of their political patrons taking you down.

So, then when Jack Ma gives this speech where he criticizes the regulators and says that China's system has all sorts of problems, it really hit a nerve.

And it also showed the rest of the bureaucracy that Jack Ma's political influence is not as strong as they might have thought. Because if his influence was so strong he wouldn't need to make this speech publicly, he could do it through private channels and, say, block regulation that was coming on microlending that would get in the way of expanding his business.

So, what we saw after that speech is a flood of regulations against Ant specifically, but also much the rest of the Internet sector. And these kinds of things are not drafted in a week, these kinds of things are the result of years of deliberation that was held back through this political influence.

And once that political dam broke, now all this is flowing out and we're going to have a really different sector going forward with a lot more government control, and some of it, honestly, for the better.

VICE CHAIRMAN CLEVELAND: I'll come back to that in a minute. Commissioner Scissors, are you there?

COMMISSIONER SCISSORS: Yes, I'm here, thank you.

So, I put these things in the three boxes, one is reserve currency where this is not an issue, the domestic changes where it is potentially an important issue, although I'm not sure that's important to American policymakers, or should be that important to American policymakers.

A couple of the witnesses brought up, and this is for anyone, talked about the ineffectiveness of sanctions.

It's certainly true that if we're willing to follow sanctions progressions seriously, digitization doesn't matter. We can go at the original, the network, we can go at anyone we want.

What we've seen in the case of North Korea, the U.S. knows who's supporting North Korea and violating sanctions and yet we sanction shell companies. And we're unwilling in most cases to sanction the actual parent behind it. We have the same thing on the table now, where I hope we don't make the same mistake in Hong Kong, where there are parent Chinese financial institutions that should be sanctioned but we might sanction some little Hong Kong subsidiary that was set up yesterday and will be gone tomorrow.

Can you guys think, and this is an unfair question but it would really help me if anybody had any thoughts, any of you, is there something about digitization that would constitute an escalation in sanctions?

So, we could get past any digitization of currency and sanction anyone we want. But is there something about this process that you can see that says before we were going to sanction this Chinese company, we were going to sanction Arenco about getting payments from Iran over the system.

But now we have to sanction the People's Bank and we won't do it.

Can you give me some insight into how that might work, where we technically can sanction whoever we want but we would be scared to because X innovation is going to move the locus of the sanctions to a major central government entity, for example?

And if nobody knows the answer to this, that's fine, it's just it came out of my listening to all of you so I was hoping you would help me understand a little better.

MR. FANUSIE: The only thing I can offer, and again, I know this is my mantra, is only looking several years, ten-plus years out. When you try to do the calculus, it's very difficult to think of the scenario in the next few years but I can point to one thing that maybe we should watch.

Which is that right now all this CBDC stuff, like what people have said, is experimental, different concepts, pilots and trials.

The big concern is that there will be a movement where there's more of a reliance on different system, maybe it's an inter-country CBDC system where perhaps the U.S. has less influence because maybe we're not at those discussions now, maybe we're not helping to design it.

And we have to know that in these conversations about CBDCs other countries, not just the rogue, adversary, sanctioned countries but other countries in Latin America, in Europe are saying things like we're relying on too much on the dollar.

So, we know that is an ongoing concern, so the issue is how do we deal with this sort of reality that people are experimenting, they're looking for alternative ways and alternative systems.

The technology by itself is not going to shut us out from sanctions but if a decade from now, 15, 20 years from now, there's a new system and it's totally out of our hands, and people can do cross-border trade and they're not going to through New York because these systems have developed, then that would be an issue but it's far off.

COMMISSIONER SCISSORS: Anyone else? thank you.

DR. HOFFMAN: Just to add very quickly to what Yaya's just said, I think also when we're talking about any emerging technology we always need to think about it in terms of trajectory. Lots of times where we're talking about China's capabilities, we'll focus on what's current, not what the trajectory is.

But it's moving fairly quickly and often times, too, and this is more broad than DCEP, when I'm looking at smart cities technologies, lots of times you have to remember that the tech itself isn't the most complicated part.

Lots of times it's the politics so it's the politics of local governments sharing information and things like that. So, it's not so much the technology itself or its ability to eventually achieve the intended outcomes.

So, we need to assume in our thinking that Party State can succeed in what it says it wants to succeed because often times it does, and then operate from that perspective.

COMMISSIONER SCISSORS: Thank you. Thank you, Madam Chair.

VICE CHAIRMAN CLEVELAND: No worries. Martin, did you want to add anything to that?

MR. CHORZEMPA: I would say I agree with Dr. Hoffman that the issues here are much more governance than technological and that includes generally in payments.

One of the things that makes these payments internationally so inefficient and costly today is the costly KYC AML regulations which require a lot of manual checks and all this.

It's very person-hour-intensive and the prospect of relaxing or changing these to allow the payments to be more efficient is very politically problematic in most countries, even though I think anyone who looks at these issues would tell you that the U.S. AML system is really broken and expensive and doesn't achieve what it wants, and it makes things very cumbersome but can't really be changed.

And the same is true, if we get enough countries around something that's an alternative to the dollar, that is a big threat to the U.S. dollar.

And I say the number-one way that we're going to get there is through overuse of U.S. sanctions.

That really creates an urgency among many other countries to say we're fed up with the dollar and all these restrictions and we want something independent of it. So, that's what I would caution.

VICE CHAIRMAN CLEVELAND: I have one final question on if Beijing were to decide to insist on the e-yuan in all of its BRI transactions, what would the implications be?

I understand now they use the dollar and I completely understand the reason why, but if in addition to the Olympics they decided to test in a broader context...

MR. CHORZEMPA: I think that would be very difficult.

They're already working with the UAE and Thailand and Hong Kong to create a system of multiple CBDCs that work together, but many of these countries that are in the BRI are not the most developed economy.

So, how would they manage to deal with this new form of currency? I think it would be really hard ask for them to do that and what do they do with this currency once they have it?

Who do they trade with and all that? It just seems like a really inefficient thing and that's not really going to be the spearhead, right, because these are not the most internationally integrated economies.

So, I generally tend to think that's not really going to be as much of a concern because their goal with these countries is more, yes, they might want to internationalize the renminbi but I don't think you start with Kyrgyzstan or some of these other places.

And what's important to note is what they're doing with the UAE and Thailand is under the aegis of the BIS. We're an international where the U.S. has the most, maybe, important voice in that institution.

So, all of the learning that occurs from that and the standards that develop, that's all going to be visible to the U.S. and be influenced by the United States.

So, I think the worries about the U.S. not being in the room in this is really misplaced because the Fed is all over these issues. Every time you see Governor Brainard talking about digital currency issues, she mentions what China is doing, mentions that we want to keep the U.S. on the frontier.

But we do have to do a lot more to be at the frontier, U.S. retail payments are as slow today as payments in London were in the 19th century when you had to have clerks moving papers around.

And that's possibly due to U.S. financial institutions not wanting to undergo costs and lost some of their monopoly-style profits that they gain from the way the system works now.

And we have to figure out whether we can improve that going forward.

VICE CHAIRMAN CLEVELAND: That reminded me, is there any effort separate from a digital currency to challenge the SWIFT or the CHIPS system?

MR. CHORZEMPA: Not that I'm aware of. So, China has CIPS which is an international

payment system but it actually uses SWIFT messaging standards. The new one is ISO 20022 because all the banks in the world have to be on the same data system and it's really hard to get everybody to agree to some new standard.

So, I actually see China in cooperation with SWIFT, kind of what Commissioner Scissors was saying, they want to be so tightly integrated that the U.S. would never actually pull the trigger on sanctions on Chinese major financial institutions because it would be so disastrous to the global economy.

I think there's just no scenario I can imagine in which the U.S. sanctions the PBOC. The global implications would be catastrophic.

VICE CHAIRMAN CLEVELAND: I can see some, Taiwan comes to mind.

MR. FANUSIE: Can I add a quick follow-up?

VICE CHAIRMAN CLEVELAND: Please.

MR. FANUSIE: Just on the issue of where are we, I would somewhat not beg to differ but I would maybe give a different take on the idea that the Fed is all over this.

Yes, there's research going on, we do have an effort, we are aware of it, but I would say that there is still an understanding that there could be a lot more research.

I wouldn't give the impression that the U.S. is just at the forefront of this, at least not as comprehensively as I think we should be in terms of research on digital currency, where we are.

Just for an example, the PBOC a couple weeks ago put out an open call, and it was an open call because think about it, they have been doing research for the past seven years and so they're reaching out to the private sector to get more input and more research, to propose research, on their digital currency, on smart contracts and a whole bunch of other elements that they're hoping to learn from.

I don't think we're at that space. I'm not saying that we need to duplicate exactly what they're doing, but just from talking to folks who are involved in CBDC research, I think researchers themselves think that the U.S. is behind, people that are actually involved with the research, that the U.S. should be doing more. So, I don't want to leave the impression that we're there and we're leading the CBDC research efforts, we're not.

VICE CHAIRMAN CLEVELAND: Anybody else have questions? I can't see....No, we're all good. I think that, well, we'll talk about it afterwards but I think the CHIPS system is something we would never want to use unless we absolutely had to.

But I do think it is a policy tool, in the event that China, the Party, were to make a catastrophic decision on Taiwan, I think that there are certain scenarios where access to our financial system may be a necessary policy tool. But let’s hope that scenario doesn’t develop.

I thank our witnesses, particularly getting up at 5:00 in the morning, I appreciate it, Dr. Hoffman, it's been excellent testimony, I think we probably feel a little more confused than we started so we’re going to have to do more work. That's not your fault, that’s on us, but really appreciated what we learned. And with that, we will come to a close, I think.

Thanks to the Staff, great job, complicated issues and a lot to think about. So, the next hearing is the 20th, is that right? Pardon me? Okay, so thank you very much.

(Whereupon, the above-entitled matter went off the record at 4:09 p.m.)

QUESTIONS FOR THE RECORD

Forthcoming after answers are submitted.

PUBLIC COMMENT SUBMITTED FOR THE RECORD

Submitted via email by Jean Public on April 5, 2021

china is an enemy of the usa. it is biding its time and building up the best millitary in the world for invasion of other countries. clearly theusa needs to take much more steps than they have taken. we are wide open for spyhing from china. we shoudl not be allowing any chinesestudents to come here. clearly they take over countries near them. and we are sure they itnend to take over more. their huge population means they need and want more land to take over to secure for their own citizenry. we need to regard this country as an enemy. why we are allowing any us businesses to go there is beond belief. this cmometen is for the public record.