

A photograph of Joe Biden and Xi Jinping standing side-by-side. Biden is on the left, wearing a dark suit and tie, looking towards the right. Xi Jinping is on the right, also in a dark suit and tie, looking towards the right. They are standing in front of a blurred background that appears to be an indoor setting with gold stanchions.

OCTOBER 2021

Degrees of Separation

*A Targeted Approach to U.S.-China
Decoupling – Final Report*

AUTHOR

Stephanie Segal

CONTRIBUTING AUTHORS

Matthew Reynolds

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A Report of the CSIS Economics Program

CSIS | CENTER FOR STRATEGIC &
INTERNATIONAL STUDIES

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Executive Summary

Work on *Degrees of Separation* began in the spring of 2020, just as Covid-19 was shutting down the global economy and redefining our perception of risk and understanding of interconnectedness. At that time, U.S.-China relations were described as at their “lowest point” since normalization.¹ Eighteen months and one U.S. administration later, we are still grappling with a deadly pandemic and struggling to balance the risks and benefits of engaging with China.

The interim report, published in February, concluded that wholesale decoupling of the U.S. and Chinese economies is neither feasible nor beneficial to advancing U.S. interests. But it also acknowledged the many areas of tension in the relationship and the failure of past bilateral engagement to adequately address these tensions, thereby requiring a different approach. This final report presents a framework for assessing specific economic activities as candidates for targeted decoupling, along with findings from three illustrative case studies designed to test it. The hope is that such a framework, which forces the identification of risks as well as U.S. objectives, can boost transparency and predictability, lessen regulatory uncertainty, and support engagement between the United States and China in areas that do not unacceptably compromise U.S. national security. A few cross-cutting themes emerged in designing and testing the framework:

Assessments of the costs and benefits of U.S.-China engagement are highly subjective. Naming the risk, identifying and prioritizing specific U.S. objectives, and assessing the impact of both engagement and restrictions are all subjective exercises. In general, many private sector and academic participants tend to favor closer engagement and see greater downsides to innovation from aggressively restricting activities. Professionals with national security backgrounds are far more circumspect. While everyone is entitled to an (educated) opinion, the final assessment should be grounded in an understanding of the risks and benefits of engagement, recognizing there will be trade-offs, along with an understanding

of U.S. objectives and their prioritization. A consistent approach will go some way toward securing meaningful coordination with allies and partners and will be a helpful guide for the private sector.

The study team struggled to agree on whether to assess U.S.-China economic engagement based on “overall benefit” to the United States or “net benefit” relative to China’s gains. The latter is particularly challenging because it depends not only on the innovation but how it is applied in each country context. Traditionally, the United States has engaged with China under the premise that Chinese economic growth also benefits the United States. That calculus changed under the last administration, evidenced by the imposition of tariffs and other measures that entailed economic costs on both sides. The study team ultimately decided that assessment of economic objectives will consider overall benefits within certain constraints, acknowledging there will be pressure to demonstrate net benefit to the United States.

Some degree of technological and data fragmentation is inevitable. The emergence of data as a driver of economic activity and innovation has fundamentally changed the perception of risk. Since the start of the *Degrees of Separation* project, it has become increasingly clear that policies in China and the United States will lead to greater technological and data fragmentation. The emphasis on standard setting and new initiatives to coordinate policies and positions with U.S. allies and partners that exclude China offer the clearest sign yet of a U.S. strategy to lead among like-minded countries and implicitly accept, if not urge, fragmentation. Importantly, while the report identifies a move toward fragmentation, supported in some instances by the illustrative case studies, “targeted decoupling” should not be confused with disengagement. On the contrary, when tensions rise, the case for engagement strengthens.

Ultimately, U.S. leadership hinges on smart offense. China (and others) will continue to innovate, based on an increasing reliance on domestic talent and capital. Defensive measures will be important in some instances, but the United States will only lead with a strong offense that leverages U.S. openness and alliances, especially when it comes to global talent.

A more comprehensive listing of the project’s findings, including those specific to each case study, can be found in the final section of this report. The authors are grateful for the opportunity to conduct this research, engage with counterparts inside and outside government, and openly share the results.

Introduction

The CSIS Economics Program launched *Degrees of Separation* last year to establish clearer objectives for U.S. engagement with China and to assess whether disengagement from specific economic activities can help in meeting such objectives.

The project's interim report, published in February 2021, provides a historical frame for U.S.-China engagement since the normalization of relations in the 1970s.² It notes that support for closer ties, economic and otherwise, in the bilateral relationship was grounded in the belief that such ties would advance U.S. objectives. The emergence of the United States as the world's lone superpower, along with reform and liberalization in China through the early part of this century, appeared to validate this approach, even as technology leakage and dislocations associated with China's increasing integration with the global economy were slow to be appreciated. While U.S. and Chinese political and security interests did not generally align during this period, it was not until China achieved the economic scale and technological and military capacity to visibly challenge the current system that a revised approach to China—one involving separation or decoupling of U.S. and Chinese activities—gained traction, at least among some analysts and as relates to certain activities, as necessary for achieving U.S. objectives.

As recognized in the interim report, restrictions on certain activities are warranted, but a wholesale decoupling is neither feasible nor advantageous to the United States. Where to draw that line is a major challenge for policymakers seeking to balance the benefits and risks of engagement with a strategic competitor. *Degrees of Separation* aims to bring a common analytical approach to these judgments, starting from a shared risk assessment and grounded in the achievement of U.S. objectives.

This second and final *Degrees of Separation* report is organized as follows: Section 1 presents the elements of a framework built around U.S. objectives that can be used to assess specific activities

as candidates for targeted decoupling. Section 2 briefly examines the range of views on Chinese motivations, recognizing the role such views play in the calibration of U.S. policy toward China. Section 3 articulates U.S. objectives in six priority areas relevant to U.S.-China relations: (1) geostrategy; (2) economics; (3) values-based; (4) global rules and norms; (5) global public goods; and (6) technology and innovation. Section 4 tests the framework looking at three areas at the heart of U.S.-China competition: artificial intelligence (AI); biotechnology; and capital markets integration and cross-border portfolio flows. Informed by the findings from these case studies, Section 5 summarizes key findings and draws lessons that can help manage both the U.S.-China bilateral relationship and the U.S. relationship with allies and partners going forward.

Framework

Policy actions designed to restrict economic engagement between the United States and China have increased in recent years alongside the deterioration in U.S.-China relations. Such actions include tightening of controls on technology transfer to China under reforms to U.S. investment screening and export control regimes as well as initiatives to guard against the theft of intellectual property, protect critical infrastructure, and ensure supply chain integrity. At the same time, the definition of national security has expanded to include economic security, widening the coverage of activities subject to national security reviews. The changing landscape has complicated activities for businesses, investors, researchers, and other actors who until recently had viewed continued engagement as a given.

The identification of China as a strategic competitor of the United States acknowledges the need to separate or “decouple” certain sensitive activities, but absent a process and criteria for making these judgements, decisions may appear ad hoc at best—or run counter to U.S. objectives at worst. *Degrees of Separation* introduces a framework to approach such assessments and support policy coherence and effectiveness. The framework consists of four basic components:

1. **Naming the risk** presented by U.S.-China engagement in sensitive activities;
2. **Identifying and prioritizing U.S. objectives**, specifically those affected by U.S.-China engagement;
3. **Assessing effectiveness** of restricting specific activities; and
4. **Adhering to the rule of law** as a condition to ensure any action taken is consistent with U.S. law and international obligations.

The goal in developing such a framework is to advance a consistent, analytical approach to deciding when restrictions are appropriate to advance U.S. objectives. Such an approach has the potential to

yield greater convergence—at a minimum, a common understanding of risks, objectives, and factors that are relevant to effectiveness—and enhance transparency and predictability for those affected by regulation and other official actions as a result. While complete transparency may not always be possible, the public should understand the basis for decisionmaking, including U.S. objectives and the rationale for restricting certain activities.

“Naming the risk” and “identifying and prioritizing U.S. objectives” are admittedly subjective exercises, informed by analysis and policy statements that reflect an official view of China and U.S.-China engagement. The “effectiveness” component of the framework is more objective—relying to a greater degree on sector-specific technical expertise—and can help protect the United States from taking actions that might otherwise impede achievement of U.S. objectives. In addition, the focus on specific activities, as opposed to entire sectors, is consistent with a targeted approach to U.S.-China decoupling.³

Components of the Framework

NAMING THE RISK

Naming the risk presented by a given activity will vary by point of view, but there are common starting points relevant to all activities evaluated under the framework. In particular, the National Security Strategy is a foundational document given its presidential authorship, relevance to the U.S. government as a whole, and attention to “all elements (political, economic, military and other) of national power of the United States.”⁴ In addition, the National Intelligence Council’s Global Trends report, published every four years, aims to “provide an analytic framework for policymakers early in each administration as they craft national security strategy and navigate an uncertain future.”⁵ Other relevant official documents include periodic issue-specific reports to Congress, for example, Reports on Human Rights Practices, Reports on Foreign Trade Barriers, and other strategic planning documents such as the National Defense Strategy (unclassified summary), the Director of National Intelligence Annual Threat Assessment, and State Department-authored Integrated Country Strategies.⁶

Ad hoc reviews, for example, the Biden administration’s 100-Day Supply Chain Reviews and Sectoral Supply Chain Assessments ordered by executive order, and focused analysis, such as special reports from the U.S.-China Economic and Security Review Commission, are also influential in articulating relevant risks.⁷ While the majority of references used to name the risk presented by a specific type of engagement are official documents, they are informed by a range of perspectives, including views from outside government.

IDENTIFYING AND PRIORITIZING U.S. OBJECTIVES

As detailed in the *Degrees of Separation* interim report, U.S.-China engagement was driven historically by various objectives, starting with geopolitical objectives and evolving over time to emphasize economic, technological, values-based, and “global” objectives such as global public goods and global rules and norms.⁸ The evolution reflects China’s rapid ascension, increased weight in the world, and, in the view of many policymakers and China experts, increased assertiveness on the global stage. To quote the economic historian Adam Tooze, “Whether you’re for or against, China shapes our common future.”⁹

As with risk assessment, and as detailed in Section 2, the identification of forward-looking U.S. objectives relies on official documents and statements from Biden administration officials along with specific policy actions. In evaluating a given activity, the framework calls for an assessment of how these objectives

are affected by U.S.-China engagement in that activity, and specifically whether engagement is *positive*, *negative*, *neutral*, or *ambiguous* in terms of advancing U.S. objectives. For those activities where U.S.-China engagement is positive or neutral for U.S. objectives, no further review is required. For activities assessed to be *negative* or *ambiguous*, potential restrictions will be reviewed for effectiveness.

The framework recognizes that certain objectives may be in conflict. For example, efforts to promote global public goods such as climate and pandemic response and preparedness may be at odds with protecting U.S. leadership in a given technology. Likewise, values-based objectives may conflict with geostrategic ones. Therefore, prioritization of objectives is a de facto reality when deciding a course of action. For case studies evaluated under the framework, objectives will be prioritized when they are at odds with one another.

Finally, an important question emerges when assessing activities against economic objectives: should the analysis measure “overall benefit” or “net (relative) benefit” from U.S.-China engagement in a given activity? Traditionally, the United States has engaged with China under the premise that Chinese economic growth also benefits the United States, with little focus on which country benefits “more” from that engagement. That calculus arguably changed under the last administration, evidenced by the imposition of tariffs and other measures that imposed economic costs on both sides. It is the study team’s assessment that economic objectives will prioritize overall benefits within certain constraints, acknowledging there will be pressure to demonstrate net benefit to the United States.

ASSESSING EFFECTIVENESS

While there is an obvious appeal to severing economic linkages with a strategic competitor, such separation—even when feasible—may not necessarily advance U.S. objectives. In this regard, even when engagement in a given activity is potentially *negative* or *ambiguous* for U.S. objectives, actions to restrict engagement should only be taken when they lead to a better outcome. This requires an “effectiveness check” with two main components:

Leadership: For a given activity, the framework calls for an assessment of leadership in that sector or industry and an understanding of the relative positions of the United States, China, and any significant third countries. Making such an assessment is necessary to avoid restricting an area where the United States does not lead, or where leadership is unclear, to avoid undermining U.S. innovation through isolation.

Allies and Partners: Notwithstanding China’s inward turn under President Xi, decades of “reform and opening” have transformed China into the world’s largest trading nation, the largest source of international students and foreign tourists, and, at least for 2020, the leading destination for foreign direct investment in the world. Roughly two-thirds of all countries, including U.S. allies Japan, Australia, and Korea, trade more with China than with the United States. Recent developments in China, including in the property and energy sectors, have revealed significant vulnerabilities in China’s economic model; however, areas of weakness should not be pretext for doubting the seriousness of China as an economic competitor to the United States. China’s economy is still expected to gain ground on the United States over the medium term and given current trends, could surpass the United States as the world’s largest economy in the next decade.¹⁰ As detailed in the interim *Degrees of Separation* report, even if the United States were to maintain its position as the world’s leading economy, China’s current scale and interconnectedness make a wholesale decoupling strategy nearly impossible to implement.

Against this backdrop, the Biden administration has declared the importance of working with allies and partners “to address common challenges, share costs, and widen the circle of cooperation.”¹¹ At the same time, officials have indicated they do not expect countries “to act against their interests.” What this balancing act looks like in practice for most countries will come down to the decisions on specific activities rather than major changes in their broad approaches to China, though there may be some exceptions.

ADHERING TO THE RULE OF LAW

Adhering to the rule of law is the final component in the framework. It is also the most straightforward and perhaps the most consequential. In brief, this component asks if an activity, or any action to restrict it, is in accordance with U.S. law and international obligations. The rule of law screen has important implications for predictability and the investment climate, and it plays a key role in differentiating the United States and other liberal democracies from China and other authoritarian regimes. It is not a coincidence that legal and regulatory uncertainty has been cited as a reason for significant cutbacks on new investments in China.¹² In some areas, such as data governance and ethical standards, the inclusion of the rule of law in the framework may highlight the need for new rules or multilateral mechanisms.

Process for Assessment

The Interim National Security Strategy Guidance calls for a modernization of both “national security institutions and processes,” and the proposed framework pertains to the latter.¹³ It is intended to complement existing mechanisms, including the Committee on Foreign Investment in the United States (CFIUS); the export control regime and End-User Review Committee; sanctions regimes; and more recent innovations, including the supply chain reviews and assessments already in use and designed to prevent economic engagement from compromising national security.

Of course, a framework is not a panacea, but the discipline of articulating specific risks, identifying U.S. objectives, and making a realistic assessment of U.S. and Chinese strengths and positions in the world would present a common starting point for analysis under existing mechanisms and can yield more coherent and effective policy. Importantly, the use of a framework can bring greater clarity and predictability to U.S. policy, something that is needed if companies, research institutions, and allies and partners are to work in common cause. Surely that is an important objective across all policy areas, and none more so than in the high-stakes arena of U.S.-China relations.

Chinese Motivations

The *Degrees of Separation* project does not aim to settle the debate surrounding China’s ambitions, motivations, and capabilities. Instead, to the greatest extent possible, the authors have endeavored to develop a framework that is agnostic on this front, focusing instead on U.S. objectives. Nevertheless, the questions surrounding China’s motivations, ambitions, and capabilities are inescapable as they inform risk assessments, U.S. objectives, and, ultimately, policy.

The Interim National Security Strategic Guidance identifies risks to U.S. economic, diplomatic, military, and technological leadership posed by China. In addition, there is a broader framing in which leadership in these areas translates ultimately to ideological leadership. President Joe Biden himself has advanced this framing, citing a competition between two systems, one democratic, the other autocratic, in which China under President Xi Jinping is “deadly earnest about becoming the most significant, consequential nation in the world.”¹⁴

China’s Motivations

While *Degrees of Separation* attempts to clarify U.S. objectives as they relate to economic engagement with China, neither the proposed framework nor the resulting recommendations can ignore the relevance of Chinese objectives and tactics in calibrating U.S. policy. China’s economic rise—fueled in no small part by the very policies of economic reform, opening, and engagement championed by the United States—has been fundamental to supporting China’s more muscular foreign policy. Whether it is the modernization of the People’s Liberation Army, the use of economic coercion against allies and partners of the United States, or the ambitious Belt and Road Initiative, it has become clear that China has discarded the old dictum of “hiding strength and biding time.” The key question now is, “to what end?”

CHINA'S MOTIVATIONS: GLOBAL OR REGIONAL? IDEOLOGICAL OR PRAGMATIC?

Some China scholars see global ambitions written in Beijing's recent turn. In his recent book, Rush Doshi argues that since 1989, China has deployed three grand strategies to first blunt U.S. power, then build strength, and now expand its power globally.¹⁵ Through the deployment of these distinct strategies, each developed in response to shifting perceptions of U.S. power and intentions, Beijing aims to first establish regional hegemony and then ultimately displace the United States as the global superpower. Peter Mattis, a senior advisor for global democratic resilience with the National Democratic Institute, comes to a similar conclusion about China's ambitions.¹⁶ Working from authoritative documents such as Party Congress work reports, Mattis places slogans such as "community of common destiny for mankind" and "a new type of international relations" in intellectual and political context to define the contours of China's ambitions as global in scale.

Other scholars are more conservative in their analysis of China's ambitions. While not ruling out a future bipolar distribution of power, Nadège Rolland, a senior fellow and China expert with the National Bureau of Asian Research, sees more evidence that Beijing seeks "partial hegemony" rather than a total displacement of the United States.¹⁷ A "partial hegemony" exercised over the "Global South"—defined broadly as the developing world—is sufficient to provide the Chinese Communist Party (CCP) with a sense of regime security in the face of the perceived existential threat posed by the U.S.-led international system. Echoing this view is Oriana Skylar Mastro, a center fellow at the Freeman Spogli Institute for International Studies at Stanford University.¹⁸ Mastro, an expert on Chinese military and security policy, argues that it is not in China's interest to replace the United States as the sole superpower, as that would constrain rather than expand its freedom of maneuver. Instead, according to this view, China wants dominance over its near abroad and sufficient strength to project its power internationally.

Still other scholars attribute China's actions less to global or regional ambitions and more to the CCP's goal of self-preservation, noting that China's economic growth is "indissoluble from the party's continued power," for Xi and his cohort.¹⁹ This view provides a pragmatic explanation for Xi's consolidation of power and nationalist rhetoric, which has corresponded with a slowing of China's economic growth. Since Deng declared it was glorious to become rich, the CCP has staked its legitimacy, in part, on sustained economic growth. As returns from capital investment slow, and as China seeks to avoid the middle-income trap, the CCP must make the difficult transition to a new economic growth model, one predicated on increasing consumer consumption and innovation.²⁰ As Beijing grows increasingly confident across most domains, injecting a greater amount of nationalism into the political arena may be a strategy to shore up CCP legitimacy in the face of strong economic and demographic headwinds.²¹

More sympathetic, and less ideological, analyses view China's rise as consistent with "the historical trend toward multipolarity."²² In this telling, China is simply doing what all great powers do: developing the economy, which in turn leads to greater military strength and demands for security commensurate with great power status. Still other scholars see China's recent assertive actions as not only a natural outgrowth of great power politics, but also a reaction to a hostile West which seeks to ensure China will not become "number one."²³

There are economic aspects to each of these interpretations; regardless of which view most accurately depicts China's "true" aspirations, analysts can objectively observe that under Xi Jinping, the CCP and state sector have reasserted themselves in China's economy in a drive to achieve technological leadership

and broader political goals. In recent years, China scholars have noted the emergence of “Party-state capitalism” or “CCP Inc.”²⁴ State capital has expanded beyond state-owned enterprises to private sector firms and interventions to stabilize financial markets.²⁵ Since 2015–16, China has launched a new wave of industrial policies under the banner of the “Innovation-driven Development Strategy,” with government industrial guidance funds proliferating as a major tool to steer development.²⁶

China’s 14th Five-Year Plan (2021–25) and Xi’s “New Development Paradigm” prioritize technological and material self-sufficiency in response to a “complex” and “turbulent” international environment.²⁷ Unlike the 13th Five-Year Plan (2016–20), the 14th no longer calls for expanding the service sector and instead seeks to maintain manufacturing’s share of China’s economy, likely reflecting Chinese leaders’ fixation on material self-sufficiency.²⁸ The CCP has called on private firms to help China break the U.S. “tech blockade.”²⁹ In 2021, Beijing has enacted a sweeping set of regulations aimed largely at digital technology firms, and Xi has pushed for “common prosperity,” most likely in an effort to rein in private national champions, redirect capital toward priority sectors, and shape China’s domestic political narrative by addressing rising income inequality ahead of Xi’s expected third term as general secretary of the CCP in 2022.³⁰



Chinese president Xi Jinping is applauded by delegates as he arrives at the opening of the National People’s Congress at the Great Hall of the People.

Source: Kevin Frayer/Getty Images

Implications for Degrees of Separation

While this report will not settle the debate, it is worth noting that the grander the perception of China’s ultimate ambitions—and more importantly of its capabilities—the more defensive the response,

pointing to a potentially dangerous moment in U.S.-China relations. Bilateral ties, most especially economic linkages, have long been thought to reduce the risk of miscalculation and escalation. That thinking, prevalent since the normalization of relations more than 40 years ago, is now being tested. The perception of a China bent on displacing the United States as the global superpower may alter the calculus in Washington as to whether economic growth, so fundamental to military strength, can ever truly be separated from national security concerns. By tying the assessment of engagement in specific economic activities to the achievement of U.S. objectives, the authors hope to provide an analytical framework to answer the question of whether the United States benefits from such engagement.

U.S. Objectives

Under the proposed framework, U.S. objectives are central to assessing the costs and benefits of a “targeted decoupling” strategy. The study team has developed notional U.S. objectives based on official documents, statements from senior administration officials, and specific policy actions. Building on analysis from the interim report, U.S. objectives are grouped into six main areas covering: (1) geostrategy; (2) economics; (3) values-based (human rights and civil society); (4) global rules and norms; (5) global public goods; and (6) technology and innovation. In evaluating a given activity, the framework is used to assess how these objectives are affected by U.S.-China engagement in that activity and whether engagement is *positive*, *negative*, *neutral*, or *ambiguous* in terms of advancing U.S. objectives. Some activities will call for the prioritization of objectives, as policy actions will likely entail trade-offs.

U.S. Objectives and Policy toward China

The Biden administration took the unusual step of issuing the Interim National Security Strategic Guidance (INSSG) in March 2021 to “convey President Biden’s vision for how America will engage with the world, and to provide guidance for departments and agencies to align their actions as the administration begins work on a National Security Strategy.”³¹ The INSSG outlines three core national security priorities, all of which are relevant to U.S.-China relations: (1) protecting the security of the American people, including from threats such as climate change, pandemics, and cyberattacks; (2) expanding economic prosperity and opportunity through equitable and inclusive growth; and (3) realizing and defending democratic values. The INSSG also singles out China as a unique challenge to U.S. national security given its capacity to use “economic, diplomatic, military, and technological power to mount a sustained challenge to a stable and open international system.”³²

President Biden himself has acknowledged a “growing rivalry with China.”³³ The INSSG, along with a series of official reports, briefings, speeches, and early policy actions, suggests a deeply skeptical view of China and the CCP. In line with the INSSG, which refers to “a more assertive and authoritarian China,” the Department of Defense calls China “the United States’ number one pacing challenge.”³⁴ William Burns, director of the Central Intelligence Agency, has referred to China as “an adversarial power,” intent on replacing the United States as the world’s most powerful and influential nation.³⁵ (For more detail, see Section 2 on Chinese motivations.)

At the same time, the administration has identified certain areas where U.S. objectives can only be advanced through engagement with China. In an October speech at CSIS, United States Trade Representative (USTR) Katherine Tai referred to the U.S-China relationship as “complex and competitive” and one of “profound consequence” for the entire world, noting that resolution of contentious issues will require direct engagement with China. To this end, the INSSG commits to conducting “practical, results-oriented diplomacy with Beijing and to working to reduce the risk of misperception and miscalculation,” and it welcomes “the Chinese government’s cooperation on issues such as climate change, global health security, arms control, and nonproliferation where our national fates are intertwined.”³⁶ The tension in the U.S. approach to China is perhaps unavoidable, but it also underscores the need for a more precise identification and prioritization of U.S. objectives and for mechanisms to evaluate and manage these tensions.

Table 1: Notional U.S. Objectives

AREA	OBJECTIVES
Geostrategic	<ul style="list-style-type: none"> Safeguard regional stability and prevent Chinese aggression, particularly toward Taiwan. Support non-proliferation. Cooperate on rogue states and the threat of terrorism. Enforce maritime norms. Deter conflicts in new frontiers, including outer space and the Arctic.
Economic	<ul style="list-style-type: none"> Pursue sustainable, equitable, and balanced growth. Ensure fairness in the economic relationship. Safeguard global financial stability. Enhance supply chain resilience.
Values-based	<ul style="list-style-type: none"> Protect human rights. Support democracy. Resist authoritarianism.
Global rules and norms	<ul style="list-style-type: none"> Enforce and update global trade rules. Establish normative technology standards. Accept fragmentation in data and other technical standards.

Global public goods	<p>Fight climate change.</p> <p>Strengthen global public health and pandemic preparedness.</p> <p>Support low-income countries and development.</p>
Technology & Innovation	<p>Maintain U.S. technological leadership and set technical standards.</p> <p>Maintain a military and intelligence-gathering advantage.</p> <p>Ensure supply chain integrity.</p> <p>Enforce intellectual property protection.</p>

Source: Author's original research and analysis.

GEOSTRATEGY

The normalization of the U.S.-China relationship in the 1970s was driven primarily by the strategic imperatives of the Cold War and the threat of the Soviet Union.³⁷ Although that shared concern no longer exists, a range of geostrategic objectives remain integral to U.S. regional and global leadership and relevant to U.S.-China engagement.

Key geostrategic objectives relevant to the U.S.-China relationship include:

- Safeguarding regional stability and preventing Chinese aggression, particularly toward Taiwan;
- Supporting non-proliferation;
- Cooperating on rogue states and the threat of terrorism;
- Enforcing maritime norms; and
- Deterring conflicts in new frontiers, including outer space and the Arctic.

Senior Biden administration officials have identified Afghanistan, Myanmar (Burma), and North Korea as potential areas for constructive engagement between the United States and China, noting the possible alignment of interests and China's importance in Asia. Even after a tense March 2021 meeting with his Chinese counterpart, Secretary of State Antony Blinken emphasized that “on Iran, on North Korea, on Afghanistan, on climate, our interests intersect.”³⁸

At the same time, “geopolitical competition” with China is a common theme echoed by the White House. Senior officials have described a change in Chinese behavior, citing Chinese actions in the South China Sea and across the Taiwan Strait, and elsewhere, that challenge the longstanding U.S. objective of maintaining regional security and preventing Chinese aggression, especially toward Taiwan.³⁹ Among geostrategic objectives, Taiwan and the broader topic of maritime navigation and the U.S.-led alliance system in Asia stand out as areas where U.S. and Chinese interests diverge. On the former, U.S. officials recently reiterated the U.S. commitment to Taiwan as “rock solid” and highlighted U.S. assistance to Taiwan “in maintaining a sufficient self-defense capability.”⁴⁰ On the latter, President Biden described the “enhanced security trilateral partnership between Australia, the United Kingdom and the United States” (AUKUS) as a new phase of trilateral security cooperation “to maneuver and defend against rapidly evolving threats.”⁴¹ Underscoring the fact that tensions over Taiwan and the broader issue of maritime shipping routes are not simply a bilateral issue, Group of Seven (G7) leaders highlighted “the importance of peace and stability across the Taiwan Strait” and encouraged the “peaceful resolution of cross-Strait issues.”⁴²

ECONOMICS

While economic and commercial considerations were not a central motivation for initial U.S. engagement with Beijing in the early 1970s, the normalization of relations between the United States and China beginning in the late 1970s created a climate conducive to economic integration in the decades that followed. With the collapse of the Soviet Union, economic rationale emerged as a dominant force for enhancing bilateral engagement, and one that continues today, notwithstanding escalating tensions. At the same time, the construct of “economic security as national security,” articulated in President Trump’s National Security Strategy and repeated in President Biden’s INSSG, challenges the traditional economic objectives of market reform, global integration, balanced growth, and market access associated with the U.S.-China relationship.

Key economic objectives relevant to the U.S.-China relationship include:

- Pursuing sustainable, equitable, and balanced growth;
- Ensuring fairness in the economic relationship;
- Safeguarding global financial stability; and
- Enhancing supply chain resilience.

For nearly four decades, up until the Trump administration, U.S. policy sought to empower economic reformers in Beijing by advocating for China’s greater participation in the global economy and using bilateral dialogues to encourage further liberalization and defuse tensions. While the approach succeeded in integrating China into the global trading system, fueling Chinese and global growth in the process, it failed to resolve fundamental differences with the United States on issues ranging from human rights to the role of the state (and the CCP) in the economy. Exacerbating these tensions, China has proven willing to use its economic power to advance a vision for Asia and the world that often conflicts with U.S. interests.

Citing the failure of engagement, President Trump launched a trade war with China in 2018 that quickly expanded to encompass technology and finance. Still, the Trump administration continued to engage with China, signing the Phase One trade deal in January 2020, which consisted of Chinese commitments for \$200 billion in U.S. goods purchases, further financial-sector opening, and intellectual property protections.⁴³ The agreement put further tariff escalation on hold but did not take on newly contentious aspects of U.S.-China economic engagement, for example, cross-border data flows, supply chain integration, cross-border investment, and joint investment in innovation. Where these areas of engagement had once been considered opportunities to create positive change in China, they are now commonly perceived as potential threats to U.S. national security and competitive advantage.

President Biden and senior administration officials frequently reference the deeply competitive nature of the economic relationship.⁴⁴ All four of the White House’s 100-Day Supply Chain Reviews—in semiconductor manufacturing and advanced packaging; large capacity batteries; critical minerals and materials; and pharmaceuticals and advanced pharmaceutical ingredients—name China for its aggressive use of measures “well outside globally accepted fair trading practices” to capture global market share in critical supply chains and explicitly recommend that supply chain resilience be incorporated into the U.S. trade policy approach toward China.⁴⁵ Along with keeping in place the Trump-era tariffs, the administration has also added new Chinese entities to the Commerce Department’s Entity List, citing their involvement in China’s “destabilizing military modernization efforts, and/or weapons of mass destruction (WMD) programs.”⁴⁶

Regarding cross-border financial flows, CFIUS reforms contributed to a sharp decline in Chinese direct investment in the United States. In 2020, bilateral FDI flows were at their lowest level since 2009, while two-way venture capital flows also declined. Amendments to a Trump-era executive order reframed prohibitions on U.S. investment in “Communist Chinese Military Companies” to “Chinese Military-Industrial Complex Companies,” maintaining the prohibition on U.S. investment in designated company securities.⁴⁷ President Biden’s pick to head the Securities and Exchange Commission (SEC), Gary Gensler, confirmed the agency’s intention to delist foreign companies from U.S. exchanges unless U.S. regulators are allowed to review the companies’ audit papers. Separately, the SEC announced a pause in allowing new listings of Chinese companies on U.S. exchanges until risks associated with the ownership structure—specifically the use of offshore shell companies, known as “Variable Interest Entities,” to work around Chinese prohibitions on foreign ownership—are better understood and comprehensively disclosed to investors.⁴⁸

Notwithstanding these recent actions, the broad themes of economic competition and links to national security, and the global pandemic, the current reality remains one of deep economic connection between the two economies and between each economy and the rest of the world. Bilateral trade between the United States and China expanded modestly in 2020 despite the pandemic and is on track to increase significantly in 2021.

Treasury Secretary Janet Yellen has called for maintaining economic integration in terms of trade, capital flows, and technology, where possible, while acknowledging the need to evaluate national security risks and take action when warranted.⁴⁹ Similarly, Commerce Secretary Gina Raimondo said that the administration needs to help U.S. businesses export to China, even as competition intensifies, stating that, “even with respect to China, we need to do business there, we need to export there,” a sentiment echoed by USTR Tai, who called ending trade with China an unrealistic outcome.⁵⁰

President Biden’s approach to economic issues acknowledges China’s centrality in the global economy while seeking to modify Chinese behavior through multilateral pressure. In his first address to a joint session of Congress, Biden outlined a foreign policy for the middle class, “making sure that every nation plays by the same rules in the global economy, including China.”⁵¹ Similarly, in his first press conference, he said Washington would “insist that China play by the international rules: fair competition, fair practices, fair trade” and work with allies to “hold China accountable.”⁵²

The U.S.-EU Trade and Technology Council (TTC), with its explicit focus on global trade challenges from non-market economy policies and practices, demonstrates a serious effort to develop a multilateral approach to dealing with China and held its first meeting in September 2021. However, even under optimistic assumptions, the TTC and other multilateral mechanisms will take time to deliver results. It is the study team’s assessment that economic objectives will prioritize overall economic benefit, while the maintenance of tariffs, new investment prohibitions, expanded export controls, and supply chain reviews, among other tools, could signal a break with the decades-old policy of economic engagement, or a continued engagement but with enhanced focus on enforcement, transparency, reciprocity, and net benefit to the United States.

VALUES-BASED (HUMAN RIGHTS AND CIVIL SOCIETY)

While a values-based agenda did not drive the initial opening with Beijing in the early 1970s, over the years Washington came to view bilateral engagement as a mechanism for building domestic support

in China for openness, human rights, and democratic choice. The souring in relations between the United States and China, exacerbated by the pandemic, has meant that efforts to promote values-based outcomes through bilateral engagement are more limited now than any time in the past 20 years.

Key values-based objectives relevant to the U.S.-China relationship include:

- Protecting human rights;
- Supporting democracy; and
- Resisting authoritarianism.

The Biden administration describes American values as a core strength that provides the United States with a comparative advantage over China and that serves as a predicate for U.S. policy toward China.⁵³ U.S. officials consistently highlight the threat to human rights and fundamental freedoms posed by a more assertive China. For its part, China describes U.S. efforts at values promotion as “a tool to pressure other countries and meddle in their affairs.”⁵⁴

The March 2021 meeting between Secretary of State Antony Blinken and National Security Advisor Jake Sullivan and their counterparts Yang Jiechi and Wang Yi featured public sparring over Tibet, Hong Kong, and Xinjiang, topics that Beijing views as off-limits for discussion.⁵⁵ The rhetoric on both sides leaves little reason to be optimistic, at least in the near term, on the prospects for direct bilateral engagement to advance U.S. values-based objectives. Rather, the Biden administration calls for “joining with likeminded allies and partners to revitalize democracy the world over.”⁵⁶

The focus on values has both translated to specific policy actions and served as a unifying theme with disparate partners. In March, the United States, in tandem with the European Union, United Kingdom, and Canada, imposed sanctions on Chinese officials connected to human rights abuses in Xinjiang.⁵⁷ In July, the United States updated an advisory on the “Risks and Considerations for Businesses and Individuals with Exposure to Entities Engaged in Forced Labor and other Human Rights Abuses linked to Xinjiang, China,” warning that “businesses and individuals that do not exit supply chains, ventures, and/or investments connected to Xinjiang could run a high risk of violating U.S. law.”⁵⁸ Values-based objectives can be seen in other areas of economic policy as well. For example, the 100-Day Supply Chain Review urges an approach to supply chain resilience that focuses on “building trade and investment partnerships with nations who share our values—valuing human dignity, worker rights, environmental protection, and democracy.”⁵⁹ The use of forced labor is also reported to have emerged as a “top item” in the Biden administration’s trade agenda.⁶⁰ Values-based objectives have also played a major role in ambitious strategic initiatives intended to increase multilateral pressure on China, including AUKUS; the Quad, consisting of Australia, India, Japan, and the United States; and the TTC.

An upcoming virtual Summit for Democracy is planned for December to further demonstrate broad cooperation among allies and partners centered on three themes: defending against authoritarianism, fighting corruption, and promoting respect for human rights.⁶¹ Less than one year into the Biden administration, values have emerged as a unifying theme with implications across a range of policy areas.

GLOBAL RULES AND NORMS

As U.S. policymakers sought to integrate China into the global economy, they also attempted to encourage compliance with global rules and incorporate China into existing global governance structures. The Trump administration largely abandoned that effort, citing the failure of multilateral

approaches to discipline China and the vulnerability of multilateral institutions to co-optation and coercion by China, and opted instead for unilateral action. Biden's election brought a renewed U.S. commitment to multilateral approaches, but one focused on building coalitions of "like-minded" countries to meet the challenges posed by China's state-directed model.

Key global rules and norms objectives relevant to the U.S.-China relationship include:

- Enforcing and updating global trade rules;
- Establishing normative technology standards; and
- Accepting fragmentation in data and other technical standards.

While the Biden administration has expressed support for the World Trade Organization, there is limited visibility on specific proposals and goals for the institution, and most experts are pessimistic, at least in the near term, about the prospects for reaching consensus on fundamental institutional reform.⁶² A 2020 CSIS Trade Commission report urged a "new trade compact" of advanced market economies committed to "principles of reciprocity, transparency, market-driven outcomes, and rule of law" to set a new agenda for emerging trade rules.⁶³ The seeds of such an approach can be seen in the U.S.-EU Summit statement, which includes a commitment to "stand together to protect our businesses and workers from unfair trade practices, in particular those posed by non-market economies that are undermining the world trading system," and is advanced by the creation of the EU-U.S. TTC (see below).⁶⁴

On technology standards, the Biden administration inherited intense domestic pressure for the United States to defend its lead in the area of technical norms and standards. For example, the National Security Commission on Artificial Intelligence, an independent commission established by the FY 2019 National Defense Authorization Act to advance the development of artificial intelligence and associated technologies to "comprehensively address the national security and defense needs of the United States," calls on the United States to "use diplomacy and leverage its global partnerships to advocate for establishing privacy-protecting technical standards and norms in international bodies, and . . . work with like-minded nations to ensure that other nations have an alternative to embracing China's technology and methods of social control and access to technologies that protect democratic values like privacy."⁶⁵

The commitment to promoting shared norms and forging new agreements on emerging technologies is similarly emphasized in the INSSG, which observes that such technologies "remain largely ungoverned by laws or norms designed to center rights and democratic values, foster cooperation, establish guardrails against misuse or malign action, and reduce uncertainty and manage the risk that competition will lead to conflict."⁶⁶ It calls for shaping "ethical and normative frameworks" and emerging technology standards to boost U.S. security, economic competitiveness, and values.⁶⁷

This emphasis on leadership in technology standards is also reflected in the TTC, which includes a working group on technology standards tasked with developing approaches for coordination and cooperation in critical and emerging technology standards, including AI and other emerging technologies.⁶⁸ Similarly, the Quad's critical and emerging technologies working group includes a technical standards workstream with explicit focus on advanced communications and AI.⁶⁹ While there is a long way to go from working group to actual standards, the emphasis on standard-setting work in settings that exclude China offers the clearest proof yet of a U.S. strategy to lead among like-minded countries and implicitly accept, if not urge, fragmentation in technology standards.⁷⁰

GLOBAL PUBLIC GOODS

The National Intelligence Council's *Global Trends 2040* report lists “climate change, disease, financial crises, and technology disruptions” among the shared global challenges that “often lack a direct human agent or perpetrator” and are likely to “manifest more frequently and intensely in almost every region and country.”⁷¹ The report conceives of solutions to these challenges as *global public goods*. Enlisting Chinese support for global public goods emerged as an objective of U.S.-China engagement in the last 20 years before faltering during the Trump administration. The Biden administration has reengaged Beijing in these efforts, most notably on climate change. Efforts on global public health—an obvious global public good amid a pandemic—have been more challenging, with the U.S. intelligence community’s “Unclassified Summary of Assessment on COVID-19 Origins” charging Beijing with hindering the global investigation into the disease’s origins.⁷²

Key global public goods objectives relevant to the U.S.-China relationship include:

- Fighting climate change;
- Strengthening global public health and pandemic preparedness; and
- Supporting low-income countries and development.

Climate remains an avenue for cooperation with Beijing. Special Presidential Envoy for Climate John Kerry visited Shanghai in April 2021 and signed the “U.S.-China Joint Statement Addressing the Climate Crisis” just one week before President Biden hosted a Leaders Summit on climate which included the participation of President Xi.⁷³ Kerry has since returned to China, making him an exception in terms of senior administration travel to China thus far in the Biden presidency. A collaborative approach to China on climate can be complimented with efforts to work with likeminded countries to apply pressure. As one example, Xi’s announcement at the United Nations General Assembly that China would end financing of coal-fired power projects abroad came shortly after an Organization for Economic Cooperation and Development (OECD) proposal to end official financing for unabated coal power which garnered the support of the United States, European Union, United Kingdom, Canada, and South Korea, among others.

While climate is generally thought of as an objective that argues in favor of U.S.-China engagement given the importance of China to reaching global emissions targets, there are also aspects of dealing with the climate crisis that push in the other direction. For example, the White House release of the 100-Day Supply Chain Reviews notes that the centrality of climate change to U.S. economic and national security means “we cannot afford to be agnostic to where these (decarbonization) technologies are manufactured and where the associated supply chains and inputs originate.”⁷⁴

Relations on global public health, the pandemic response, and future pandemic preparedness have taken a hit due to China’s initial handling of the outbreak, its lack of transparency related to Covid-19’s origins, and the willingness of the Trump administration to politicize the pandemic. Still, at the technical level, and in particular as it relates to future pandemic preparedness, there is a recognition that China has to be part of any credible strategy, but also that the international system as currently configured is poorly equipped to deal with the needed coordination.⁷⁵

Similarly, there is a recognition that China’s participation is essential to assisting low-income countries, not least due to China’s role as the largest official bilateral creditor to this group. Through Group of Twenty (G20) statements, both countries have committed to coordinate to end the Covid-19

pandemic and have agreed, in theory if not in practice, with multilateral proposals to deliver debt relief to low-income countries. However, these proposals have a mixed track record at best. Finally, both countries share the nominal goal of helping low-income countries develop, although they have conflicting visions of how to do so.⁷⁶

TECHNOLOGY AND INNOVATION

Until the Trump administration, Washington actively encouraged closer research and development cooperation between China and the United States. In January 2011, the Obama administration extended the U.S.-China Agreement on Cooperation in Science and Technology, renewing 32 years of bilateral cooperation and noting the achievements of prior collaboration.⁷⁷ The Trump administration deviated from this policy, only including a brief line on cooperation as part of the Phase One trade deal: “The Parties agree to carry out scientific and technological cooperation where appropriate.”⁷⁸ While the Biden administration has toned-down the Trump-era rhetoric linking Chinese-born scientists in the United States with espionage efforts, a return to prior levels of collaboration appears highly unlikely. The Department of Justice’s “China Initiative”—designed to identify and prosecute those involved in trade secret theft or economic espionage for the Chinese state—remains active, with 12 cases pursued so far this year.⁷⁹

Key technology and innovation objectives relevant to the U.S.-China relationship include:

- Maintaining technological leadership and setting technical standards;
- Maintaining a military and intelligence-gathering advantage;
- Ensuring supply chain integrity; and
- Enforcing intellectual property protection.

The INSSG identifies “a revolution in technology that poses both peril and promise,” noting a race to develop and deploy emerging technologies that could shape the economic and military balance among states. Similarly, the National Intelligence Council’s *Global Trends 2040* report describes a race for technological dominance that is “inextricably intertwined” with the broader U.S.-China rivalry.⁸⁰ Indeed, China continues to invest and reform policies to close the science and technology gap with the West, a goal described as “arguably China’s top strategic priority.”⁸¹ The INSSG also commits to “sustain America’s innovation edge” and calls for “resources for investments in the cutting-edge technologies and capabilities that will determine our military and national security advantage in the future.”⁸²

The Biden administration has advanced efforts on both the “offensive” and “defensive” sides of the technology race. On offense, it has announced its support for the U.S. Innovation and Competition Act, which would authorize more than \$250 billion in new spending to bolster U.S. competitiveness in key technologies, including semiconductor fabrication. If passed, it would follow on the National Artificial Intelligence Act of 2020, passed as part of the FY 2021 NDAA, which establishes the National AI Initiative to “ensure continued United States leadership in artificial intelligence research and development.”⁸³ Technology cooperation also features prominently in multilateral initiatives with the Quad, the European Union, and in AUKUS. On defense, the administration has continued many Trump-era policies designed to scrutinize U.S.-China technology linkages stemming from direct investment and U.S.-China integration in technology supply chains.

As highlighted by the ongoing work of the China Initiative, the United States continues to have concerns over Beijing's protection and outright theft of intellectual property (IP). In an April 2021 report, USTR recognized that Beijing recently amended several IP laws, but warned that they "fall short of the full range of fundamental changes needed to improve the IP landscape in China."⁸⁴ Still, the report notes that engagement with Beijing "has been demonstrating progress" in implementing IP commitments under the Phase One trade deal, and USTR Tai's comments this month make clear U.S. intentions to engage with China specifically to take stock of performance on Phase One commitments.

Prioritization

Biden administration officials have underscored the complex and multifaceted nature of U.S.-China engagement, highlighting the challenges in managing a relationship that is central to many administration objectives. The INSSG recognizes that "strategic competition does not, and should not, preclude working with China when it is in our national interest to do so."⁸⁵ Similarly, in his first major speech, Secretary of State Blinken outlined the U.S. posture toward China as "competitive when it should be, collaborative when it can be, and adversarial when it must be."⁸⁶ Implementing such an approach will require carefully managing conflicting priorities and a clash of objectives between U.S. stakeholders.

While difficult to assess which of objectives will have priority *ex ante*, it is possible to glean from official statements and administration documents which areas have the explicit focus of President Biden and his key advisers:

- Support for shared values has emerged as a central theme to contrast the United States and like-minded nations with China. Support for human rights and defense of democracy consistently appear in the Biden administration's foreign policy and are incorporated across policy areas and bilateral, regional, and plurilateral engagements.
- Similarly, technological leadership is portrayed as determinative to global leadership, while the intersection of technology with values makes these two areas mutually reinforcing. Not by accident, technology has been a dominant theme emerging from regional engagements that exclude China.
- However, values-based and technological objectives sit uncomfortably alongside the "existential risk" that is the climate crisis. This tension is clearly expressed in the Biden administration's first budget request, which identifies the climate crisis and the ambitions of an autocratic China as "the great challenges of our time."⁸⁷

These considerations will ultimately play out in practice as decisions to allow or restrict U.S.-China engagement in specific activities. The next section uses illustrative case studies to test the framework and its application in making such determinations.

Case Studies

To test the framework, the research team selected three case studies: research collaborations in artificial intelligence; biotechnology and human genomic data sharing; and capital market linkages and cross-border portfolio flows. Each area features in U.S.-China strategic competition and entails tradeoffs which must be assessed when determining whether engagement advances U.S. objectives.

Research Collaborations in Artificial Intelligence

Artificial intelligence (AI) describes a collection of technologies capable of solving problems and performing tasks without explicit human guidance.⁸⁸ While the origins of AI can be traced back to the 1950s, AI has been perceived as a strategic technology only in the last decade. The final report of the U.S. National Security Commission on Artificial Intelligence (NSCAI), a bipartisan commission charged with making recommendations to “advance the development of AI, machine learning, and associated technologies to comprehensively address the national security and defense needs of the United States,” characterizes AI technologies as “the most powerful tools in generations for expanding knowledge, increasing prosperity, and enriching the human experience.”⁸⁹

Extending far beyond national security and defense uses, AI technologies promise to drive disruption and value creation across nearly all industries in the decade ahead. AI’s potential to support technical improvements and innovations, leading to economy-wide productivity gains, makes it a general-purpose technology (GPT), a label that also explains why AI is so central to all aspects of U.S.-China competition.⁹⁰ As a GPT, AI has the potential to affect entire economic systems due to its broad applications and ability to influence the development of other emerging technologies.

APPLYING THE FRAMEWORK

Naming the Risk

Notwithstanding its focus on national security and defense, the NSCAI's final report provides a broad framing as to what is at stake regarding AI competition, recognizing AI as an inspiring technology that will be used "in the pursuit of power." As identified in Section 1, the national power of the United States has political, economic, military, and other aspects, all of which will be affected by AI.

- **Political:** AI has the potential to improve the human condition but can also empower authoritarian regimes, including through the export of surveillance technologies.
- **Economic:** AI is an economic engine on its own, with some analysts estimating the market value of AI technologies at nearly \$2 trillion.⁹¹ More significant is AI's role as a GPT, where the greatest effect will be in its application across a myriad of sectors, accelerating the pace of innovation and conveying first-mover advantage to the actor most adept at applying AI technologies.
- **Military and Intelligence Gathering:** AI will underpin next-generation weapons systems and warfighting capabilities and provide governments with enhanced abilities to gather and process data, conduct intelligence and surveillance operations, and act on program-generated analysis.⁹² China's Military-Civil Fusion strategy, which aims to convert civilian-use technology to military uses, poses a unique challenge in differentiating commercial activities from military and intelligence-related activities.
- **Other:** Potential flaws in AI models pose serious challenges to the technology's responsible and ethical use, and the misuse of AI applications, such as facial recognition and characterization, could violate basic human rights. U.S. government officials have noted China's high-tech surveillance against Uyghurs, Kazakhs, and other members of Muslim minority groups in the Xinjiang Uyghur Autonomous Region.⁹³

For the purposes of this case study, and to provide a hypothetical but tangible example to test the framework, this section narrows the focus to research collaborations in AI. Against a backdrop of increased signs of technology decoupling, AI research linkages may be more enduring given the open nature of various components of the AI stack, such as open-source software, public data sets, and the high degree of connectedness between U.S. and Chinese researchers in the AI ecosystem (see text box). The question this case study seeks to answer is whether U.S.-China engagement in research collaborations in AI is positive, negative, neutral, or ambiguous for achieving identified U.S. objectives. If research collaborations in AI are determined to be negative or ambiguous for achieving U.S. objectives, the study team will evaluate the potential effectiveness of restricting such collaborations.

IDENTIFYING AND PRIORITIZING U.S. OBJECTIVES

AI competition implicates all six areas of U.S. objectives under the framework: (1) geostrategic; (2) economic; (3) values-based; (4) global rules and norms; (5) global public goods; and (6) technology and innovation. Of these, the study team identifies seven objectives as the most affected by U.S.-China research collaborations (Figure 1).

Figure 1: Areas Impacted by U.S.-China Research Collaborations in AI

U.S. OBJECTIVES: FOCUS AREAS AND SPECIFIC GOALS	ASSESSMENT	RATIONALE
Technology and Innovation		
Maintaining U.S. technological leadership and setting technical standards	●	Leadership will depend on elements not uniquely controlled by one side or the other
Maintaining a military and intelligence-gathering advantage	●	Collaboration will reveal capabilities to partners
Economic		
Pursuing sustainable, equitable, and balanced growth	●	Productivity gains from technological advances will not be zero-sum
Global Rules and Norms		
Establishing normative technology standards	●	Agreement on normative standards is a condition of research collaboration
Accepting fragmentation in data and other technical standards	●	Collaborations require interoperability and entail sharing of data and results
Values-Based		
Protecting human rights	●	Use of research findings and application of technology advances will be determinative
Resisting authoritarianism	●	Use of research findings and application of technology advances will be determinative

Impact of Research Collaborations on U.S. Objectives ● Positive ● Negative ○ Neutral ● Ambiguous

Source: Author's original research and analysis.

Assessment

Research collaboration in AI was chosen as a case study precisely because it represents a strategic area where U.S. and Chinese actors are already highly interconnected. As expected, the assessment indicates there are both benefits and downsides to collaboration in terms of advancing U.S. objectives. The authors judge U.S.-China engagement in AI research collaborations as positive for the economic objective of balanced growth, where the economies of both the United States and China will benefit from the research collaborations.⁹⁴ Such collaborations are also judged to be positive for establishing normative standards to address ethical issues around AI.⁹⁵ On the other hand, U.S.-China engagement in AI research collaborations appears negative for the technology and innovation objective of maintaining a military and intelligence-gathering advantage, as well as for the objective of accepting fragmentation in data and other technical standards. The fact that research collaboration is assessed to advance the goal of establishing normative technology standards but does not support fragmentation presents a possible tension: in theory, it is possible to strive for common normative standards for AI, for example, in the area of AI ethics, independent of technical or data standards; in practice, however, a project's development will require collecting and processing data, defining technical requirements, and ensuring regulatory compliance such that any single project will entail both normative and technical standards.

The remaining values-based objectives of protecting human rights and resisting authoritarianism as well as maintaining U.S. technological leadership in AI are assessed to be ambiguously affected by research collaborations. For the former, collaborations can help advance certain standards, for example, on an AI system's data security and privacy, but they might also support an innovation with an eventual application outside of the control of the researchers themselves. For the latter, U.S. participants benefit from access to Chinese data and China's deep pool of AI talent, and the collaboration itself provides insight into the technological capabilities inside China. Chinese participants will similarly benefit from U.S.-side contributions, including data, world-class U.S.-based talent, and insight into cutting-edge research. In brief, research collaborations benefit both sides, but the "net impact" of such collaboration—whether the United States or China gains more than the other—will depend on how innovations are applied.

As anticipated, the assessment of the impact of research collaborations on individual objectives ranges from positive to negative, while the prioritization of values-based and technology and innovation objectives yields an ambiguous overall assessment. Therefore, the next step in the framework calls for consideration of restrictions based on their likely effectiveness.

ASSESSING EFFECTIVENESS OF RESTRICTIONS

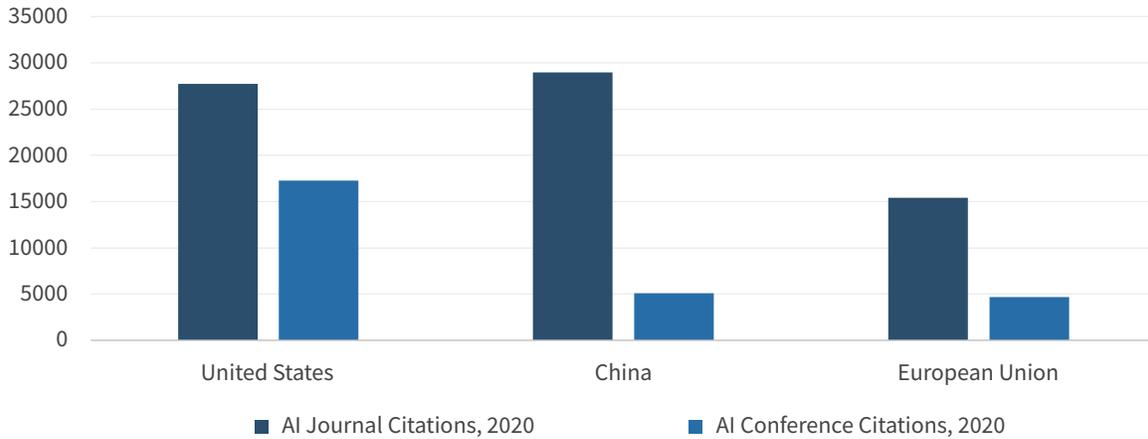
The fact that AI is "dual-use, often open-source, and diffusing rapidly" makes it particularly challenging to control in the conventional sense. Experts have warned that efforts to control certain aspects of the AI ecosystem could be ineffective and therefore counterproductive to U.S. leadership in AI.⁹⁶ Similarly, the acting undersecretary for industry and security at the Bureau of Industry and Security for the U.S. Department of Commerce indicated that unilateral controls could harm U.S. technological innovation and leadership if unilateral controls are "backfilled" by other countries.⁹⁷ Therefore, an assessment of the likely effectiveness of restrictions is necessary to avoid inadvertently undermining U.S. objectives. The framework looks to leadership in AI and the views of U.S. allies and partners regarding AI competition as key inputs into this assessment.

Leadership

Controls are generally intended to protect a lead. When leadership is contested, such controls are potentially self-defeating, as they risk lowering visibility into the gains of competitors. Dozens of countries have implemented national AI strategies in recent years, but leadership in AI innovation is primarily a contest between the United States and China, followed by the European Union. In the 2021 update, *Who is Winning the AI Race: China, the EU or the United States?*, Daniel Castro and Michael McLaughlin of the Center for Data Innovation assess the United States still has a substantial overall lead in AI, with China closing the gap in some areas and Europe lagging behind.

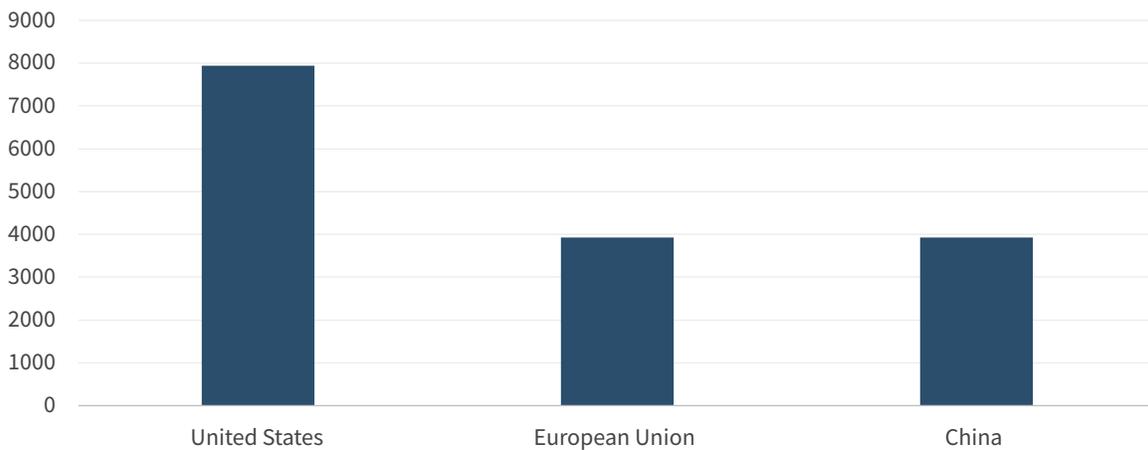
Data on cited AI conference papers, considered a useful metric to assess the quality of AI research, show the United States with significantly more cited AI conference papers than China or the European Union over the last decade. However, China surpassed the United States for the first time last year in global AI journal citations, accounting for 20.7 percent versus 19.8 percent from the United States and 11 percent from the European Union. China also leads in the total number of peer-reviewed AI publications, accounting for 22.4 percent of the world total, versus 16.4 percent from the European Union and 14.6 percent from the United States. The vast majority of peer-reviewed AI papers globally are affiliated with the academic field, accounting for 95.4 percent in China, 89.6 percent in the United States, and 81.9 percent in the European Union.

Figure 2: AI Journal and Conference Citations, 2020



Source: Artificial Intelligence Index, *Measuring Trends in Artificial Intelligence* (Stanford, CA: Stanford University, 2021), <https://aiindex.stanford.edu/report/>.

Figure 3: Number of Academic-Corporate Peer-Reviewed AI Publications, 2015–19



Source: Artificial Intelligence Index, *Measuring Trends in Artificial Intelligence* (Stanford, CA: Stanford University, 2021), <https://aiindex.stanford.edu/report/>.

According to Stanford University’s *Human-Centered Artificial Intelligence 2021 AI Index Report*, industry-university research centers and corporate contributions to university research have proliferated since the 1980s. From 2015 to 2019, the United States published nearly 8,000 academic-corporate peer-reviewed AI papers, versus just under 4,000 in the European Union and around 3,700 in China. In addition, large technology firms have increased their participation in major AI conferences. A recent report on technology leadership from the consultancy Bain & Company noted that a small number of large cloud service providers (CSPs), based in the United States and China, will fuel the AI industry due to their access to the enormous amounts of data needed to effectively train AI models.⁹⁸ These CSPs also

have the AI talent needed “to build and operate bespoke, large-scale systems,” as well as the computing architecture needed to handle the massive computing workloads associated with AI innovation.⁹⁹

Talent acquisition and an “expanding (technology) talent crunch” merit special attention in evaluating AI leadership in the context of research collaborations is evaluated. The NSCAI report refers to the talent needed to make AI breakthroughs as “the holy grail” in AI competition. While universities have increased the number of AI-focused faculty and AI courses offered, the United States is not growing its domestic AI talent pool fast enough to keep pace with growing demand. International students therefore remain a vital source of AI talent, with roughly two-thirds of all AI PhD graduates in North America hailing from abroad. Among recent international AI PhD graduates in the United States, 81.8 percent elect to stay in the United States, a higher “stay rate” relative to other known graduate specialties.¹⁰⁰ Recognizing the importance of AI talent to innovation, nearly two dozen countries have opened programs aimed at attracting top-tier AI researchers, and Canada, France, the United Kingdom, and China have enacted policies aimed at attracting high-tech talent through immigration reform.¹⁰¹ Notwithstanding these efforts, the United States maintains its lead in cultivation and retention of foreign AI talent, but its position is threatened by technology rivals as well as limits on U.S. immigration policies.

China has invested large amounts of capital in talent cultivation and recruitment. Programs such as the Thousand Talents and “Plan 111” are well-documented efforts to grow China’s human capital base. As noted above, China’s investment in building its talent base has paid dividends in the form of increased AI research publications and citations as well as AI-related patents filed, although AI patent data by geographic origin is incomplete. In 2017, the United States had 62.4 top AI researchers per 1 million workers, compared to 19.4 for the European Union and 3.2 for China.¹⁰²

While many experts judge the United States to currently lead in AI, China’s advantages in data quantity, AI adoption, domestic talent development, and state direction are cited as factors that could ultimately lead to China’s success in “winning the AI arms race.”¹⁰³ However, some AI researchers underscore the uncertainty around the trajectory of AI and its applications and caution against overstating China’s advantages, as such overstatement provokes insecurity and possibly a more aggressive posture on both sides.¹⁰⁴ This case study heeds that warning and does not attempt to answer the question of whether the United States or China is better positioned to “win” the AI competition. Rather, the evidence points to dynamic and ongoing competition in which both, along with a handful of others, led by the European Union, are able to compete at the cutting edge of AI innovation.

Allies and Partners

U.S. officials frequently comment that engagement with allies is critical to addressing national security and foreign policy concerns related to China, and U.S. officials indicate they are engaged in discussions with allied countries, especially suppliers of certain technologies of concern, to coordinate on common controls and policies. Certain EU member countries, along with the United Kingdom, Australia, Canada, and Japan, are close historical allies with advanced capability in AI. This study looks to their national AI strategies as well as recent statements and actions to assess the likelihood that they would follow the United States were it to restrict certain research collaborations in AI.

National and regional strategies put forth a vision for country or regional leadership in AI and in the application of AI for specific sectors such as healthcare. To the extent the United States or China are

named in these strategies, it is to reinforce the need to invest in national AI development to compete. Most strategies include a commitment to pursue the ethical development of AI systems, but in general they do not specify what ethical development would entail.

Over the past year, a series of official announcements point to a concerted effort to coordinate AI innovation with a handful of strategic U.S. allies. Last September the United States and the United Kingdom signed the Declaration of the United States of America and the United Kingdom of Great Britain and Northern Ireland on Cooperation in Artificial Intelligence Research and Development, which announced that the two countries “intend to advance our shared vision and work toward an AI R&D ecosystem” to include, *inter alia*, furthering researcher and student collaboration, promoting research and development in AI, focusing on challenging technical issues, and protecting against efforts to adopt and apply these technologies in the service of authoritarianism and repression.¹⁰⁵ The declaration marked the first international agreement on AI R&D signed by either country.

In March 2021, the leaders of Australia, India, Japan, and the United States announced the Quad Critical and Emerging Technology Working Group.¹⁰⁶ While the announcement did not explicitly mention AI cooperation, it referenced shared principles on technology design, development, and use and coordination on technology standards, and the working group was featured in a July speech by National Security Advisor Jake Sullivan at the NSCAI Global Emerging Technology Summit.¹⁰⁷ In June, EU and U.S. leaders launched the EU-U.S. Trade and Technology Council (TTC) as a forum “to coordinate approaches to key global trade, economic, and technology issues and to deepen transatlantic trade and economic relations based on shared democratic values.”¹⁰⁸ Among the 10 TTC working groups is “technology standards cooperation” which will include collaboration on AI, export controls, and the misuse of technology threatening security and human rights. Also in June, the U.S. National Science Foundation and the Natural Sciences and Engineering Research Council of Canada announced their first formal partnership to support collaborations between U.S. and Canadian researchers “in areas of mutual interest and national investment, such as AI and quantum.”¹⁰⁹ The National AI Initiative also directs the president to “support opportunities for international cooperation with strategic allies, as appropriate, on the research and development, assessment, and resources for trustworthy artificial intelligence systems.”¹¹⁰ More recently, President Biden remarked that AUKUS will “bring together our sailors, our scientists, and our industries to maintain and expand our edge in military capabilities and critical technologies,” including in artificial intelligence.¹¹¹

These announcements, which in at least one case includes a mechanism for common funding of AI research, represent steps toward a loose technology alliance. Some, for example, the TTC, are nascent at best and already showing signs that such an alliance may be premature. Others, such as between the United States and Canada and the United States and the United Kingdom, appear more concrete. Some EU member leaders, notably President Emmanuel Macron of France and Germany’s outgoing chancellor Angela Merkel, also explicitly reject the idea of taking sides, with the former indicating he would oppose joining together against China as a “scenario of the highest possible [potential for conflict]” while also indicating France and the United States share the same values and history.¹¹² In short, there is ample evidence of a desire to coordinate with the United States, but coordination may not necessarily include a willingness to restrict engagement with China.



U.S. Secretary of State Antony Blinken delivers remarks at the National Security Commission on Artificial Intelligence (NSCAI) Global Emerging Technology Summit.

Source: Jim Watson/Pool/AFP/Getty Images

ADHERING TO THE RULE OF LAW

The framework's rule of law component applies a legal review to any activity, disqualifying research collaboration by a U.S. person with any foreign entity that appears on the Commerce Department's Entity List without a license and the export (including of deemed exports) of any item that appears on the Commerce Control List (CCL) of the Export Administration Regulations (EAR) without a license. In this respect, the rule of law component highlights the role of existing mechanisms in managing risks stemming from research collaborations.

End-User Controls

The Department of Commerce's Bureau of Industry and Security (BIS) maintains restricted party lists, such as the Entity List, which identifies entities subject to a licensing policy or presumption of denial for all items subject to BIS jurisdiction.¹¹³ Thus far in 2021, the Commerce Department added seven Chinese entities to the Entity List due to concerns involving their support for China's military, military modernization, or its weapons of mass destruction programs; 14 Chinese entities for being implicated in human rights violations; and another five Chinese entities for acquiring or attempting to acquire U.S. technology to support military modernization.¹¹⁴

Unilateral Export Controls, Including Deemed Exports

The BIS also enforces the EAR, which regulates the exports, re-exports and transfers (in-country) of dual-use items (e.g., commercial items that also have a military application). The release of technology or source code subject to the EAR to a foreign person in the United States is considered a deemed export. The EAR includes the CCL, which lists those “dual-use” items subject to licensing requirements for export. The CCL is periodically updated, including for the addition of new controls related to emerging technologies.¹¹⁵ In January 2020, the BIS issued an interim final rule imposing controls on software specially designed to automate the analysis of geospatial imagery, marking the first control on AI software following passage of the Export Control Reform Act, which called on the BIS to expand controls to include “emerging” and “foundational” technologies that are essential to U.S. national security.

Multilateral Export Controls

Elements of the AI stack such as computers, microelectronics, and software can be subject to multilateral controls under the Wassenaar Arrangement, which is one of four multilateral export control regimes and deals with munitions and dual-use goods and technologies. Wassenaar’s 42 members include the United States, India, Russia, and many U.S. allies with advanced AI capabilities, such as Australia, Canada, France, Germany, Japan, Korea, and the United Kingdom. China is not a member.

FINAL ASSESSMENT

Research collaborations in AI benefit both the United States and China, while the prioritization of values-based and technology and innovation objectives yields an overall ambiguous assessment of the impact of such collaborations on U.S. objectives, warranting an evaluation of the effectiveness of restrictions. While the United States is assessed to currently lead in AI, the evidence points to a dynamic and ongoing competition in which both the United States and China, along with the European Union, are able to compete at the cutting edge of AI innovation. The effectiveness of restrictions on research collaborations is hindered by the open nature of the AI ecosystem and the mobility of talent. Effectiveness of controls could be supported by working with allies and partners; however, they also view the United States as a competitor in AI and are less likely to adopt restrictions on research collaborations. As such, programs to foster closer coordination among allies and partners are preferable to restrictions which have the potential to undermine U.S. leadership in AI.

Components of the AI Stack

A robust AI industry requires four main components: talent, data, algorithms, and microelectronics (or compute).

Talent: An AI-capable workforce is essential not only to build, use, and maintain complex models but also to implement wide adoption of the technology.¹¹⁶ Uneven investment in human capital has placed a premium on talent acquisition. The think tank Marco Polo estimates that in 2019 about 20 percent of top-tier AI researchers completed undergraduate studies in the United States versus 29 percent in China. Still, the United States remains by far the most attractive destination, with an estimated 59 percent of top-tier AI researchers working in the United States.¹¹⁷ International students are a vital source of AI talent for U.S. companies, with roughly two-thirds of all AI graduates hailing from abroad.¹¹⁸ By contrast, the number of domestic-born participants in U.S. AI graduate programs has not increased since 1990. Nearly two-dozen countries have opened programs aimed at poaching top-tier AI researchers in the United States.¹¹⁹

Data: Data are the raw materials used to train machine-learning programs, with system performance directly tied to the quantity, quality, and representativeness of data used. Data sets that are larger, more complete, and accurately describe the target minimize algorithm bias and result in higher model performance. Data sharing advances innovation. However, open and accessible data sets must be differentiated from data with sensitive national security concerns. Data describing intelligence or performance are already commonly controlled, and these types of data tend to be more fragmented and difficult to collect than those used commercially.¹²⁰

Software: The core of AI research is built on open-source algorithms and models known as fundamental or general-purpose research. General-purpose software provides other developers with frameworks and tools to create specialized, narrow-purpose programs. In general, AI researchers hold strong commitments to maintaining the open-source nature of general-purpose algorithms, since freely and widely shared algorithms benefit from the network effects of their broad adoption. In contrast, AI application software is much narrower in scope and applies technology for specific end uses and end users.¹²¹ Application-specific software requires large amounts of resources to train and produce, and companies seeking to protect their profits in this area generally invest heavily in anti-piracy and protection measures.¹²² While not all application-oriented AI is protected this way, highly specialized model variants and large commercial ventures generally are and can be amenable to export controls.

Microelectronics: Microelectronics, such as semiconductor chips, sensors, and transistors, provide the computing power and surrounding technology necessary to run complex AI models, and AI has been called “the defining computing workload that [will] underpin the success” of semiconductor developers and manufacturers.¹²³ Advances in chip design and processing ability have driven the bulk of progress in AI over the last decade, and the leap to quantum computing promises even greater growth. The demand for trusted microelectronics, with minimal supply-chain and security risks, will continue to increase as AI technology is adopted into military and intelligence structures.¹²⁴ Microelectronics has also been the most aggressively targeted component of the AI stack by U.S. government action so far. The CCL limits the export of a wide range of related technologies, including semiconductor manufacturing equipment and materials to China, through export license requirements. More recently, the BIS has enacted more stringent controls on specific “end users” through its entity list, blocking firms such as Huawei, Fujian Jinhua, and the Semiconductor Manufacturing International Corporation from access to U.S.-origin technology.¹²⁵ While controls have dampened Huawei’s revenue, they have also likely spurred Chinese onshoring efforts of key chip research and development capabilities at the expense of U.S. firms.¹²⁶

Biotechnology and Human Genomic Data Sharing

Biotechnology—the creation of products through biological processes—has been around for centuries (think of baking bread and brewing beer). More advanced biotechnologies such as genome editing technologies, which allow scientists to edit the DNA of living organisms, were first developed in the 1900s. But it was not until 2009 and the invention of a “simpler, faster, cheaper and more accurate” genome editing tool known as Clustered Regularly Interspaced Short Palindromic Repeats or “CRISPR” that biotechnology began to factor so prominently into discussions of U.S.-China competition. As the National Intelligence Council’s *Global Trends 2040* report notes, biotechnology “will enable societies to reduce disease, hunger, and petrochemical dependence.”¹²⁷ McKinsey & Company’s 2020 *Bio Revolution* report further estimates that biotechnologies hold the potential to alleviate 45 percent of the world’s disease burden and produce 60 percent of the world’s material goods, including alternative fuels.¹²⁸ With such significant and far-reaching applications, biotechnology is forecast to be a major driver of innovation, competitive advantage, and future economic growth.

APPLYING THE FRAMEWORK

Naming the Risk

There is already competition among global powers to innovate and harness new biotechnology capabilities, which in turn will produce strategic and economic advantages. As a dual-use technology, biotechnology also serves many military and defense applications, with the Department of Defense’s *Future of Defense Task Force Report 2020* identifying biotechnology as “creating new domains of warfare that are being aggressively pursued by potential adversaries, including China.”¹²⁹ As with AI, biotechnology innovation can be expected to impact the balance of political, economic, military, and security aspects of national power.

- **Political:** Biotechnology provides authoritarian regimes with greater means to control and subvert citizens, particularly those with opposing views or from minority groups. According to Human Rights Watch, the Chinese government has used DNA and other biomedical data, without informed consent, to identify ethnic Uyghurs, in violation of scientific and human rights norms.¹³⁰
- **Economic:** Biotechnology can drive economic growth through innovation in the health, agricultural, industrial, and environmental sectors. In addition, biotechnology fundamentally enables the production of novel goods that the world is not currently able to produce with petrochemicals or through traditional manufacturing processes. The first country to develop enhanced biomanufacturing capabilities—the ability to produce biomolecules for use in various goods—will have a significant advantage over economic competitors.¹³¹
- **Military and Intelligence Gathering:** Biotechnologies with enhanced material properties or other capabilities, such as thermal resistance and enhanced filtration, can be leveraged for use in military gear, while further advances in genome editing stand to augment combatant performance.¹³² Both the United States and China have prioritized advances in biotechnology in their military strategies. Biomedical data may also be used for non-traditional intelligence-gathering and surveillance purposes.¹³³
 - **Biodefense:** Biotechnologies are powerful dual-use technologies that may be used by malicious actors for the development of weapons of mass destruction or in acts of terrorism.¹³⁴
 - **Biosafety:** The unintentional release of pathogens or genetically modified organisms threatens the health of global citizens and ecosystems.¹³⁵

- **Biosecurity:** The intentional misuse, theft, or unethical use of biotechnologies, such as human genome editing similarly endangers the health and security of global citizens.¹³⁶ This threat was underscored in 2018 when a Chinese scientist became the first to edit the genes of twin human embryos. This was in violation of China’s 2003 *Guidelines for Ethical Principles in Human Embryonic Stem Cell Research* and highlighted the need for global development and enforcement of ethical standards in biotechnology.¹³⁷
- **Other:** Biotechnology is uniquely dependent on data to innovate.¹³⁸ Access to data provides economic advantages, where the greater quantity, quality, and diversity of data can translate into superior innovations. However, allowing access to data also enables cyber and insider threats, which risk the misuse, manipulation, damage, or erasure of data, as well as intellectual property or trade secret theft, threatening biosecurity. Further, the use of AI technologies in biotechnology research allows for greater volumes of data to be processed and more rigorously analyzed, heightening the benefits and risks to data sharing and access.¹³⁹ China currently amasses the most cross-border data in the world—double that of the United States—due in part to asymmetric data flows between the United States and China.¹⁴⁰

To provide a hypothetical but tangible example to test the framework, this case study centers on biotechnology in the health sector and, more specifically, the sharing of human genomic data between the United States and China (see footnote).¹⁴¹ Against the backdrop of a heightened focus on data as a national security risk, and alongside the knowledge that data sharing can accelerate innovation and improve outcomes, the question this case study seeks to answer is whether U.S.-China human genomic data sharing is *positive, negative, neutral, or ambiguous* for achieving identified U.S. objectives. If this study determines the sharing of human genomic data between the United States and China is negative or ambiguous for achieving U.S. objectives, the study team will evaluate the potential effectiveness of restricting such collaborations.

IDENTIFYING AND PRIORITIZING U.S. OBJECTIVES

Biotechnology competition encompasses all six areas of U.S. objectives under the framework: (1) geostrategic; (2) economic; (3) values-based; (4) global rules and norms; (5) global public goods; and (6) technology and innovation. Within these areas, the study team identifies seven objectives as the most affected by the sharing of human genomic data between the United States and China (Figure 4).

Assessment

Biotechnology was chosen as a case study given the multidimensional nature of the opportunities and risks it presents, as well as the considerable economic and research linkages that already exist between the United States and China. The case study narrows the focus to human genome data, reflecting the highly sensitive nature of collected data and the reality of asymmetric data flows between the two countries.

There are both benefits and downsides in terms of advancing U.S. objectives when human genomic data are shared between the United States and China. The authors judge that data sharing positively impacts economic growth, promotes the development of normative technology standards, and strengthens global public health and pandemic preparedness. Economically, data sharing allows countries to amass greater volumes of data, verify and inform pre-held data, and increase the diversity of data sets, which together support the pace and quality of innovation. And while the resulting economic gains can accrue to both the United States and China, it is worth noting that Chinese

human genetic resources (HGR) regulations require that any patent rights resulting from “exploratory research” under U.S. and Chinese collaboration be shared jointly by U.S. and Chinese parties.¹⁴² Data sharing strengthens global public health by improving the situational awareness of underlying health conditions, especially during a health crisis, and laying the foundation for medical advances and more rapid responses (e.g., new vaccine development). It also promotes the development of global normative technology standards, essential in an area with such rapid and consequential innovations.

Figure 4: Areas Impacted by U.S.-China Human Genomic Data Sharing

U.S. OBJECTIVES: FOCUS AREAS AND SPECIFIC GOALS	ASSESSMENT	RATIONALE
Technology and Innovation		
Maintaining U.S. technological leadership and setting technical standards	●	Leadership will depend on elements not uniquely controlled by one side or the other
Maintaining a military and intelligence-gathering advantage	●	Asymmetric data flows provide China with advantages in using U.S. human genomic data for military applications and intelligence-gathering means
Economic		
Pursuing sustainable, equitable, and balanced growth	●	Productivity gains from genomic data sharing will not be zero-sum
Values-Based		
Protecting human rights	●	Chinese historical use of genomic data and application of technology advances have violated human rights norms
Global Rules and Norms		
Establishing normative technology standards	●	Many normative standards regarding genomic data sharing and application are absent or underdeveloped
Accepting fragmentation in data and other technical standards	●	Collaboration requires sharing genomic data
Global Public Goods		
Strengthening global public health and pandemic preparedness	●	Sharing genomic data will inform global public health efforts and advance medical practices and treatments

Impact of U.S.-China Human Genomic Data Sharing on U.S. Objectives ● Positive ● Negative ○ Neutral ● Ambiguous

Source: Author’s original research and analysis.

Sharing human genomic data inherently goes against, and thus negatively impacts, the U.S. objective of data fragmentation and technical standards, as it entails linking American and Chinese researchers, labs, firms, and data repositories rather than fragmenting these information channels. There is also a negative impact on the protection of human rights insofar as China has been shown to use the collection of biometric data for purposes of minority group identification and in violation of human rights norms; therefore, the possible targeting of individuals using unique genomic data cannot be

discounted. Finally, the impact of data sharing for maintaining U.S. military and intelligence-gathering advantage is also assessed to be negative given the asymmetric nature of data collection, which puts the United States at a disadvantage.

The remaining U.S. objective—maintaining technological leadership—is determined to be ambiguously impacted by U.S.-China sharing of human genomic data. Sharing data grants the United States access to Chinese genetic information that can be used to advance health-related innovations and also provides the United States with insights into Chinese biotechnology advancements. China reaps the same benefits from sharing genomic data with the United States, and as previously noted, Chinese regulations require that any patent rights resulting from “exploratory research” under U.S. and Chinese collaboration be shared jointly by U.S. and Chinese parties. The current asymmetry in U.S.-China data flows stands to advantage China in technology innovation and may risk future U.S. dependence on China for innovative biotechnologies, including biopharmaceuticals. Yet, whether the United States or China gains relatively more will ultimately depend on other factors that contribute to innovation, for example, funding, talent, intellectual property protection, and dissemination efforts, as well as how innovations are ultimately applied, with some experts observing that the United States lags behind China when it comes to translating basic research into applications.

The assessment and prioritization of U.S. objectives are highly subjective, but the framework can motivate discussion of relevant U.S. objectives and how their achievement would be affected by genomic data sharing. Given that sharing of human genomic data was found to be “negative” or “ambiguous” for achieving several U.S. objectives, along with the study team’s estimation that values-based (protecting human rights) and technology and innovation (maintaining military and intelligence-gathering advantage) objectives are among the administration’s top priorities, the next step in the framework calls for the consideration of restrictions to data sharing based on their likely effectiveness.

ASSESSING EFFECTIVENESS OF RESTRICTIONS

The Information Technology and Innovation Foundation (ITIF) warns that stringent data protections could “reduce innovation in ways that harm both businesses and consumers.”¹⁴³ At the same time, the inherent uniqueness of biometric data makes it difficult if not impossible to “de-identify” or anonymize, raising the stakes for granting access to data and under what conditions.¹⁴⁴ Given the role of human genomic data in fueling innovation and advances in health, policymakers are challenged to balance the protection of such data and support for innovation and technological leadership in a field as dynamic as biotechnology.

Leadership

The United States is the world leader in biotechnology innovation across a range of metrics (see below), followed by the European Union, Japan, and the United Kingdom. However, in recent years, China’s drive to develop its domestic biotechnology capabilities has made it an increasingly important player with aspirations of matching U.S. leadership. Biotechnology was identified in 2015 as one of 10 key sectors for development under Made in China 2025, and China’s 14th Five-Year Plan, formally adopted in March, lists biotechnology as a continued technology focus.

To better assess the comparative positions of the U.S. and Chinese biotechnology industries, this case study focuses on the health sector and, more specifically, biologics—biologically derived medical treatments, including biopharmaceuticals—which represents the largest segment of the biotechnology

industry in both revenue and use of human genomic data.¹⁴⁵ As of 2019, the U.S. biologics market, estimated at \$118 billion, dwarfed China's market, estimated at \$4.7 to \$6.2 billion.¹⁴⁶ Within these markets, the United States leads in the development of innovative biologics—drugs with novel capabilities. In contrast, China predominantly produces less innovative “biosimilars,” which replicate the qualities of drugs that are already on the market, but at a lower cost.¹⁴⁷ The United States also leads China in the share of global biotechnology publications (33 percent versus 15 percent) and share of global biotechnology patents (36.4 percent versus 7.9 percent).¹⁴⁸

Notwithstanding the United States' current leadership position, some experts worry that China's structural advantages may help it close the gap in certain areas, a sentiment reflected in the U.S. National Security Commission on Artificial Intelligence's (NSCAI) warning that “the United States cannot afford to look back in 10 years and be ‘surprised’ by the biotechnology equivalent of Huawei.”¹⁴⁹ These structural advantages include a large and growing domestic market for biologics to fund new research and development, a less restrictive regulatory environment regarding genomic editing, and a top-down government approach to biotechnology investment and innovation that some experts view as helpful to achieving China's ambitions.¹⁵⁰

Most importantly, though, China amasses significant volumes of data, including human genomic data used in biologics innovations. In a recent speech, National Security Advisor Jake Sullivan noted that, “the dramatic growth of China's biotechnology sector shows Beijing's interest in the convergence of advanced biotech and AI . . . and the foresight that this revolution will be driven by amassing genomic data.”¹⁵¹

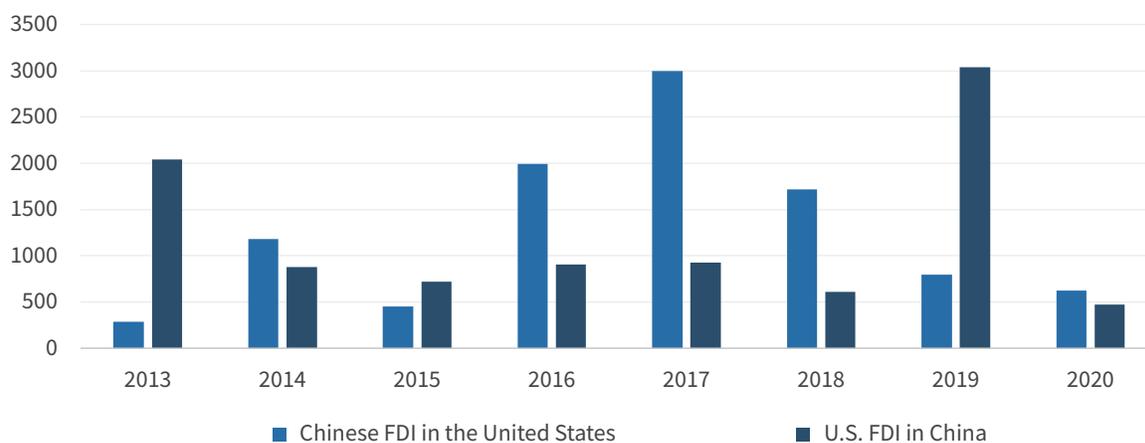
Recognizing its potential to boost innovation and economic competitiveness, China has centered its biotechnology development strategy around acquiring data, investing in health data collection centers, data processing infrastructure, and data access channels with other states.¹⁵² As relates to its interactions with the U.S. biotechnology sector, a 2019 Gryphon Scientific report produced for the U.S.-China Economic and Security Review Commission (USCC) identifies two primary ways China has accessed U.S. genomic data: investments and partnerships.¹⁵³ According to the report, China made \$1.5 billion in foreign direct investment (FDI) in the U.S. biotechnology industry between 2000 and 2017, peaking in 2017.¹⁵⁴ Looking at a broader metric, Rhodium Group reports that between 1990 and 2020, Chinese FDI in U.S. health, pharmaceuticals, and biotechnology totaled \$10.7 billion, of which \$10.5 billion was invested after 2013.¹⁵⁵ In both cases, the recent surge in Chinese investments was made through mergers and acquisitions, rather than greenfield investment, and by private companies. Such investments have provided China with access to American health data, genomic data, and proprietary technologies, as exemplified by BGI Group's 2013 acquisition of U.S. sequencing company Complete Genomics. That acquisition gave BGI Group, already one of the world's largest genomics companies, access to Complete Genomics' DNA sequencing technology and a base of operations in the United States.¹⁵⁶

FDI from China has dropped significantly since the 2018 Foreign Investment Risk Review Modernization Act (FIRRMA). FIRRMA expanded Committee on Foreign Investment in the United States (CFIUS) jurisdiction over foreign investments in critical technologies, including biotechnology and life sciences, requiring mandatory filings in certain instances. Since the passage of FIRRMA, Chinese FDI in the United States has dropped by 80 percent, while Chinese FDI in U.S. health, pharmaceuticals, and biotechnology has declined by 79 percent.¹⁵⁷

China has also rapidly invested in partnerships with U.S. universities, labs, hospitals, and companies, offering diagnostic and other health services in which they have low production cost advantages.¹⁵⁸

These partnerships can be measured by the number of Chinese companies that hold College of American Pathologists (CAP) accreditations, which are required for participation in U.S. health markets.¹⁵⁹ As of 2021, at least 76 Chinese companies are CAP accredited, giving them direct access to U.S. medical and health data via their participation in the U.S. healthcare system.¹⁶⁰

Figure 5: Annual Foreign Direct Investment in Health, Pharmaceuticals, and Biotechnology Industry (USD, millions)



Source: “U.S. China Investment Project,” Rhodium Group and the National Committee on U.S.-China Relations, <https://www.us-china-investment.org/about>.

The USCC and the United States’ Defense Innovation Unit (DIU) find that China’s access to U.S. data is, in part, due to relatively lower data protections in the United States, particularly for genomic data.¹⁶¹ The United States lacks a comprehensive federal data or privacy protection framework such as the European Union’s General Data Protection Regulation (GDPR) or China’s Personal Information Protection Law (PIPL). While the United States, through the Department of Health and Human Services and the HIPAA Privacy Rule, regulates access to personal health information and oversees clinical research and drug development activities, it does not apply to “de-identified” or anonymized data and does not necessarily apply to data used solely for research purposes or data used by direct-to-consumer (DTC) genetic testing companies, such as 23&Me, since researchers and DTCs are often not considered “covered entities” under HIPAA.¹⁶² HIPAA is also not enforceable internationally.¹⁶³ More generally, the United States largely relies on an open-science (and thus open-data) policy, particularly in research collaborations, to help foster innovation.¹⁶⁴ This raises a debate around the relative benefits of open-data policies and the associated security risks.

China’s access to U.S. data is not reciprocal. While U.S. FDI in China’s biotechnology is on par with Chinese levels, as demonstrated in Figure 5, U.S. investments have targeted access to Chinese consumer markets and low-cost manufacturing rather than data.¹⁶⁵ China also has a robust data protection regime in place that severely restricts foreign access to Chinese health or genomic information. China’s 1998 Human Genetic Resources (HGR) Regulations, revised in 2019, and 2020 Biosecurity Law stipulate that foreign entities cannot collect, store, use, transfer, or export human genomic data obtained in China unless given approval by the Human Genetic Resources Administration Office of China (HGRAC) under

the Chinese Ministry of Science and Technology.¹⁶⁶ Similarly, under China's 2017 Cybersecurity Law, the cross-border transfer of personal data is prohibited.¹⁶⁷ All foreign entities must also work with a Chinese partner, and the partnership must be approved once more by the HGRAC.¹⁶⁸ The HGR regulations also require that all intellectual property produced through these partnerships be shared between the two countries.¹⁶⁹ Furthermore, Chapter III of China's PIPL states that all personal information must pass a security assessment conducted by the Cyberspace Administration of China before it can be transferred outside of the state. This includes biometric data.¹⁷⁰

While many experts predict that the United States will continue to lead in biotechnology innovation, particularly in the development of biologics, China's advantages in data access, combined with its AI capabilities, are factors that could help China potentially close the gap with the United States. There are, however, several uncertainties regarding the trajectories of the U.S. and Chinese biotechnology industries. These include questions surrounding whether the United States will enact federal data legislation to better safeguard American genomic data and if China can successfully transition from the production of low-cost "me-too" drugs to the development of innovative biologics. This case study, therefore, does not attempt to answer the question of whether the United States or China is better positioned to lead the "bio-revolution." Instead, this assessment signals that close competition in biotechnology between the United States and China, along with Europe and Japan, is inevitable.

Allies and Partners

The Biden administration has consistently emphasized the importance of allied cooperation in technological competition with China to protect both national security interests and America's innovative edge. U.S. allies with the most developed biotechnology industries include the European Union, Japan, and the United Kingdom. This study analyzes the national biotechnology strategies of these select allies, as well as their recent statements and actions, to assess the likelihood that they would coordinate policies related to restricting data flows to China, particularly in human genomic data.

Unsurprisingly, the strategies put forward by U.S. allies aim to enhance each country or region's respective biotechnology research, development, and use capabilities in order to enhance economic growth, manufacturing capabilities, health innovations, and sustainability efforts. Allies are also committed to ethical biotechnology standards, particularly in genome editing, and to addressing biosafety risks, including the development of new pathogens. China and the United States are both characterized as technological competitors and potential collaborators. China, however, is also noted as a potential threat to allied economic security and democratic values.

Several partnerships have recently been created to coordinate biotechnology research and development efforts across countries. The Roadmap for a Renewed U.S.-Canada Partnership, launched in February 2021, includes an agreement on "threat reduction programs to improve biosafety, biosecurity, and biological norms for mitigating biological risks associated with life sciences research and biotechnology advances."¹⁷¹ In addition, the Quad—a strategic dialogue between the United States, Australia, Japan, and India—announced a new Critical and Emerging Technology Working Group in March, which focuses on pushing forward joint technology development opportunities, including in biotechnology.¹⁷² More recently, the Quad announced that it will also "monitor trends in critical and emerging technologies, starting with advanced biotechnologies, including synthetic biology, genome sequencing, and biomanufacturing."¹⁷³

The U.S.-Japan Competitiveness and Resilience Partnership is similarly dedicated to “advance[ing] biotechnology for the global good by focusing on genome sequencing and the principles of openness, transparency, collaboration, and research integrity.”¹⁷⁴ Furthermore, in a joint statement in May 2021, the United States and South Korea committed to co-lead in innovation in next-generation technologies, including biotechnology.¹⁷⁵ And finally, in June 2021, the United States and European Union noted their intent to “explore the possibility of developing a new research initiative on biotechnology and genomics, with a view to setting common standards” under a Joint Technology Competition Policy Dialogue.¹⁷⁶

The efforts specified in the various national (or regional) strategies and agreements above, however, are challenged by conflicting data sharing policies among allies.¹⁷⁷ The United States, as previously mentioned, has a relatively open data policy, with no comprehensive federal data regulation to guide what data is transferred and how. In sharp contrast, the European Union boasts stringent data protections, most notably the region’s GDPR, with strict adherence guidelines and high violation penalties. Lastly, Japan employs a “data free flow with trust” policy, under which data can be shared freely as long as concerns over privacy, intellectual property infringement, and security are met and trust is subsequently built. Mechanisms such as bilateral data-sharing frameworks (e.g., a renewed privacy shield between the United States and European Union), digital trade agreements, and data trusts (see footnote) hold potential to bridge allied data regimes, but these mechanisms remain challenging to put into practice.¹⁷⁸ More recent efforts, such as the newly announced U.S.-EU Data Governance and Technology Platforms working group under the TTC, also aim to reconcile allied data policies, but tangible actions have yet to be realized.¹⁷⁹

In summary, while there is a basis for coordinating controls on human genomic data flows to China among U.S. allies, ensuring that such controls are in accordance with diverse allied data policies will be a major challenge.

ADHERING TO THE RULE OF LAW

The rule of law component highlights the role of existing mechanisms in managing risks stemming from human genomic data sharing as well as the importance of evolving data governance and normative technology standards in controlling access. In particular, data sharing by a “U.S. person” with a foreign entity is prohibited if the entity appears on the Commerce Department’s Entity List without a license; the data are listed on the Export Administration Regulations’ (EAR) Commerce Control List (CCL) without a license; the data are associated with an export listed on the Australia Group’s export control list; or the data are protected under domestic and international data privacy laws.

End-User Controls

The Department of Commerce’s BIS maintains restricted party lists, such as the Entity List, which identify entities subject to a licensing policy or presumption of denial for all items subject to BIS jurisdiction. For example, BGI Group’s subsidiaries Beijing Liuhe BGI and Xinjiang Silk Road BGI were added to the Entity List in 2020 for their involvement in human rights abuses in Xinjiang involving the collection of Uyghur genomic data.¹⁸⁰

Unilateral Export Controls, Including Deemed Exports

The BIS also enforces the EAR, which regulates the exports, re-exports and transfers (in-country) of dual-use items (i.e., commercial items that also have a military application). The EAR includes the CCL,

which lists those “dual-use” items subject to licensing requirements for export. The CCL is periodically updated, including for the addition of new controls related to emerging technologies.¹⁸¹ Biotechnology equipment, inputs, and products are included in the CCL. More specifically, “genetic elements,” such as “genomes” (human genetic data), are controlled under ECCN 1C353, meaning their export requires a license granted by the Department of Commerce and subject to periodic review.¹⁸²

Multilateral Export Controls

Dual-use biotechnology equipment and software, including design data, can be subject to multilateral controls under the Australia Group, which is one of the four multilateral export control regimes and deals with goods and technologies that could be used in the development of chemical and biological weapons.¹⁸³ The Australia Group has 43 participating members, including the United States, Australia, Canada, France, Germany, Japan, Korea, and the United Kingdom. China is not a member.

Investment Reviews

CFIUS has the mission and authority to review transactions involving foreign investments.¹⁸⁴ The president may suspend transactions if such risks are identified. In 2018, FIRRMA expanded the scope of covered transactions under CFIUS, including noncontrolling investments in U.S. businesses related to critical technologies or that collect U.S. citizens’ sensitive personal information.¹⁸⁵ Such reviews and potential restrictions on Chinese investments may also hinder Chinese access to U.S. genomic data.

Data Regulations

As previously noted, HIPAA is the primary legislation that safeguards the privacy of American health data, allowing citizens the right to determine who can and cannot view their medical information.¹⁸⁶ In addition to HIPAA, there are two other regulations enforced by the United States pertaining to health data. The National Institutes of Health’s (NIH) 2008 Genomic Data Sharing Policy maintains that in order to access genomic data held in NIH databases, researchers must submit a formal request and be approved by a data access committee.¹⁸⁷ The Common Rule, recently revised in 2018, requires researchers to obtain informed consent from research participants in order to use their genomic data.¹⁸⁸ The United States has not enacted comprehensive federal data protection legislation.

Internationally, three bioethics declarations from the United Nations Educational, Scientific, and Cultural Organization (UNESCO) affirm an individual’s right to genomic data privacy. These include: the 1997 Universal Declaration on the Human Genome and Human Rights, the 2003 International Declaration on Human Genomic Data, and the 2005 Universal Declaration on Bioethics and Human Rights.¹⁸⁹ However, with its withdrawal from UNESCO in 2018, the United States is no longer bound by these declarations. The 1992 Convention on Biological Diversity and the 2010 Nagoya Protocol on Access to Genetic Resources and the Fair and Equitable Sharing of Benefits Arising from their Utilization recognize a state’s sovereign right to determine access to genetic resources, deemed a national resource, and require entities to obtain prior informed consent from the providing party to access genetic resources.¹⁹⁰ While China is a party to both agreements, the United States is not.

Normative Standards

Many gene therapy treatments remain experimental because the scientific community and policymakers have yet to address both technical barriers and ethical concerns surrounding genome editing.¹⁹¹ The NIH’s National Human Genome Research Institute (NHGRI) lists several unresolved ethical considerations, including whether genome editing should be used for non-therapeutic and enhancement

purposes and, relatedly, the impact of gene therapies on health inequality. In December 2015, the U.S. National Academies of Sciences, Engineering and Medicine, the British Royal Society, and the Chinese Academy of Sciences hosted an International Summit on Human Gene Editing, leading to agreement on principles to guide the research and clinical use of genome-editing technologies. A second international Summit on Human Genome Editing was held in 2018. Still, there are no universal regulations for genome-editing research or applications, and different countries have different regulations.



Chinese scientist He Jiankui speaks at the Second International Summit on Human Genome Editing in Hong Kong.
Source: Anthony Wallace/AFP/Getty Images

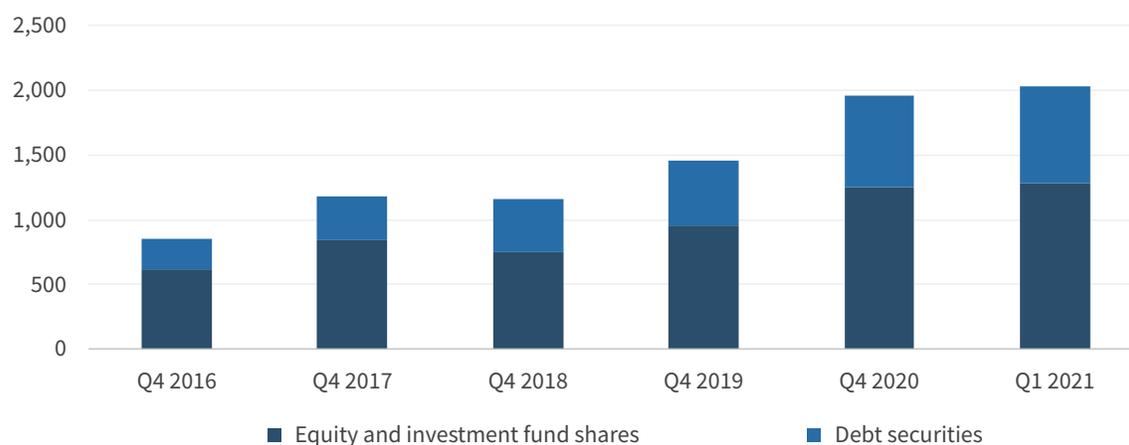
FINAL ASSESSMENT

Sharing human genomic data with China can increase the quantity of health data the United States has access to and can help inform and complement existing U.S. health data quality and diversity—all key inputs to innovation in the health sector. As the National Academies of Sciences, Engineering and Medicine’s 2020 report *Safeguarding the Bioeconomy* notes, U.S. open data access and sharing policies are the reason why the United States is the lead innovator in biotechnology.¹⁹² However, the data-sharing relationship with China is highly asymmetric, and there are severe economic, security, and human rights risks if the data is misused. Limits on the ability to truly anonymize data further raises the stakes for who has access to data and under what conditions. Prioritization of U.S. objectives may well be determinative in this assessment, where human rights objectives and establishing truly global ethical norms are currently at odds. While restricting data flows could threaten U.S. biotechnology leadership, augmenting data arrangements with allies and partners would mitigate downside impacts.

Capital Market Linkages and Cross-Border Portfolio Flows

Despite tensions in the bilateral relationship, cross-border portfolio flows between the United States and China have increased in recent years, even as foreign direct investment (FDI) and venture capital investment, to a lesser degree, have declined.¹⁹³ The U.S.-China Investment Project estimates that Chinese investors held about \$2.1 trillion in U.S. securities at the end of 2020, while U.S. investors held about \$1.2 trillion of Chinese securities.¹⁹⁴ Despite large headline numbers, U.S.-China financial integration lags what would be expected given the size and stage of development of each country's economy, reflecting China's history of capital and financial account restrictions. While China had been making incremental progress to liberalize its capital account and allow foreign investors direct access to onshore markets, the recent regulatory crackdown in the technology sector and realization of vulnerabilities in the property sector have raised awareness of risks associated with investing in Chinese securities, whether listed in China or offshore. At the same time, U.S. regulatory action to address gaps in accounting oversight and legal and regulatory uncertainty, along with an updated executive order prohibiting U.S. investment in Chinese companies implicated in China's Military-Civil Fusion (MCF) strategy and surveillance activities, has increased the chances that U.S.-China financial integration will slow or possibly move in reverse.

Figure 6: Portfolio Investment in China (USD, billions)



Source: International Monetary Fund, "China, P.R.: Mainland, IIP Standards Presentation (Millions of US Dollars)," *Balance of Payments and International Investment Position Statistics (BOP/IIP)*, IMF Data Access to Macroeconomic & Financial Data, <https://data.imf.org/?sk=7A51304B-6426-40C0-83DD-CA473CA1FD52&slid=1542640530277>.

APPLYING THE FRAMEWORK

Naming the Risk

Once seen as an avenue to advance U.S. objectives, economic linkages between the United States and China are now often viewed as a potential threat to U.S. national interests. Analysts skeptical of U.S.-China economic ties worry about U.S. dependency on China for export markets, critical inputs, and even human capital.¹⁹⁵ These "real economy" dependencies also apply in a financial context, where the risks include U.S. capital financing activities that pose a threat to U.S. national security (e.g., investments in companies affiliated with the Chinese military) or that threaten U.S. values (e.g.,

investments in surveillance technologies). Separately, there are risks to financial stability stemming from the opacity of Chinese financial disclosure and policymaking, limited market communications, and tendencies toward regulatory action that often appear sudden and punitive, especially to foreign observers. Given this case study's focus on official-sector actions and the impact on cross-border portfolio flows, it relies on past and present administrations' articulation of risks as well as views of relevant U.S. regulatory authorities.

- **Risks to National Security:** The Trump administration issued Executive Order (EO) 13959, which accuses China of exploiting U.S. capital to enable the development and modernization of its military, resulting in “an unusual and extraordinary threat to the national security, foreign policy and economy of the United States.” Using powers granted under the International Emergency Economic Powers Act (IEEPA), EO 13959 prohibited a U.S. person—defined as a U.S. “citizen, permanent resident alien, entity organized under the laws of the United States . . . or any person in the United States”—from transacting in securities linked to a Communist Chinese military company (CCMC), regardless of where the securities are traded. In June, President Biden amended the EO and expanded the scope of the national emergency to address threats posed by China's MCF strategy. In place of the term CCMC, the amended EO refers to entities involved “in the defense and related materiel sector or the surveillance technology sector of the economy of the PRC.”¹⁹⁶ A working paper posted by the State Department in May 2020 (and still on the State Department website) describes MCF as a strategy to make the Chinese military the most technologically advanced in the world. It describes “the elimination of barriers between China's civilian research and commercial sectors, and its military and defense industrial sectors” as a key part of the MCF strategy, making it difficult to clearly distinguish between military and civilian companies.¹⁹⁷ While the Biden administration describes the investment prohibitions as “targeted and scoped,” the very nature of the MCF potentially implicates a wide range of Chinese companies.
- **Risks to U.S. Values:** As noted above, the amended EO expands coverage to also include the risk of financing Chinese surveillance technology firms “that contribute—both inside and outside China—to the surveillance of religious or ethnic minorities or otherwise facilitate repression and serious human rights abuses.”¹⁹⁸ As background, the Trump administration established that China's repression of ethnic Uyghurs in Xinjiang amounted to genocide, a position also supported by the Biden administration.¹⁹⁹ The U.S. government has found that Chinese firms have supplied the authorities in Xinjiang with technology to aid the government in its surveillance and persecution of Uyghurs.²⁰⁰
- **Risks to Financial Stability:** In 2020, a speech by the then-chairman of the Public Company Accounting Oversight Board (PCAOB) highlighted the limitations on U.S. financial regulators to ensure high-quality disclosure standards in “many emerging markets, including China” due to reliance on the actions of local authorities. The speech highlighted the PCAOB's lack of access to inspect PCAOB-registered accounting firms in China, advising issuers to “clearly disclose the resulting material risks.”²⁰¹ Separately, the Securities Exchange Commission (SEC), which oversees the PCAOB, has raised concerns over the use of Variable Interest Entities in sensitive sectors, highlighting the legal and regulatory uncertainty around such structures.²⁰² In a September editorial, the SEC chairman wrote that he does not believe “China-related companies currently are providing adequate information about the risks they face” and, by extension, the risk to U.S. investors, citing new regulations from Beijing.²⁰³ Sudden changes in Chinese regulations have resulted in market volatility and depressed company valuations.²⁰⁴

- **Other:** U.S.-Chinese capital market linkages and cross-border portfolio flows present other potential risks to U.S. national power. For example, some scholars have highlighted China's efforts on environment, social, and governance (ESG) practices, noting the potential for China's ESG regime to be used eventually as a tool for Chinese foreign policy, and also the challenges to China reaching such a goal.²⁰⁵ Still others have pointed to political risks associated with deeper U.S.-China capital market and financial integration, with many U.S. businesses generally supportive of closer relations with Beijing given the size of the market and expectation of higher returns relative to more mature markets.²⁰⁶

Recognizing the wide range of potential risks implicated in capital market integration and cross-border portfolio flows, this case study narrows the focus to U.S. portfolio investment in Chinese companies. Applying the framework, the study team evaluates if U.S. portfolio investment in Chinese companies is positive, negative, neutral, or ambiguous for achieving identified U.S. objectives. If such investment is determined to be negative or ambiguous for achieving U.S. objectives, the study team will evaluate the potential effectiveness of imposing restrictions.

Identifying and Prioritizing U.S. Objectives

U.S. portfolio investment in Chinese companies is relevant to most areas of U.S. objectives under the framework, with the greatest impacts on (2) economic, (3) values-based, (5) global public goods, and (6) technology and innovation categories. Within these areas, the study team identifies seven objectives as the most affected:

Assessment

As with the other case studies, there are advantages and disadvantages to U.S.-China engagement in terms of the impact on achieving U.S. objectives. The authors judge that U.S. portfolio investment in Chinese companies positively impacts economic objectives, specifically economic growth and greater fairness in the bilateral economic relationship. Access to foreign capital benefits the companies that list on exchanges, making it more cost effective to raise capital and improving growth prospects. Investors in those companies, whether foreign or domestic, receive the upside of their participation through asset price appreciation, dividends and interest, or both, and diversification. In addition, U.S. investor access to onshore Chinese markets would represent a fairer, more reciprocal U.S.-China economic relationship—Chinese companies and investors have long enjoyed access to U.S. capital markets, but China has limited foreign ownership of domestic securities in general and particularly in sensitive sectors.

U.S. portfolio investment in Chinese companies is also positive for fighting global climate change. Access to capital will be a factor in determining whether companies (and countries) can transition to carbon neutrality. To achieve its goal of carbon neutrality by 2060, China is estimated to need more than \$20 trillion in debt financing, of which a portion will be raised on capital markets.²⁰⁷ U.S. and other foreign investors can help meet that need, while U.S. ESG investors can improve oversight, promote best practices in measurement and reporting, and help support convergence in global ESG standards which will benefit global climate finance.

U.S. portfolio investment in Chinese companies is likely negative for maintaining U.S. technological leadership. In contrast to economic objectives, which can benefit all participants, the objective of “leadership” implies relative winners and losers. To the extent U.S. portfolio investment provides capital to Chinese companies that are competing with the United States for leadership in strategic

technologies, that financing will benefit China.²⁰⁸ This is precisely the argument made in the original EO 13959, which cautioned against U.S. capital being used to enable the development and modernization of China’s military. U.S. portfolio investment in Chinese companies is also judged to be negative for the values-based objective of resisting authoritarianism, on the grounds that the provision of capital to Chinese firms supports the Chinese economy overall, which ultimately strengthens the legitimacy of the CCP. The specific links to companies involved in surveillance technology would also strengthen techno-authoritarianism by supporting the development of technologies to surveil the population and also playing a role in exporting China’s authoritarian model abroad.²⁰⁹

Figure 7: Areas Impacted by U.S.-China Capital Market Linkages and Cross-Border Portfolio Flows

U.S. OBJECTIVES: FOCUS AREAS AND SPECIFIC GOALS	ASSESSMENT	RATIONALE
Economic		
Pursuing sustainable, equitable, and balanced growth	●	U.S. investments would be consistent with financial account liberalization; economic upside would benefit all investors
Ensuring fairness in the economic relationship	●	Access to onshore Chinese markets would represent a more reciprocal U.S.-China economic relationship
Safeguarding global financial stability	●	Engagement provides U.S. with greater insights but also exposure to Chinese financial markets
Technology and Innovation		
Maintaining U.S. technological leadership and setting technical standards	●	Investment in Chinese companies competing for leadership in strategic technologies will benefit those companies
Values-Based		
Protecting human rights	●	Dependent on companies that receive funding; capital grows companies but also exposes them to shareholder pressure
Resisting authoritarianism	●	Growth in Chinese firms ultimately strengthens the Chinese state with links to techno-authoritarianism
Global Public Goods		
Fighting climate change	●	Transition to carbon free energy sources will require substantial amounts of capital
Impact of Cross-Border Portfolio Flows on U.S. Objectives		
	● Positive	● Negative
	○ Neutral	● Ambiguous

Source: Author’s original research and analysis.

Global financial stability and protecting human rights are both ambiguously impacted by U.S. portfolio investment in Chinese companies. For the former, engagement provides U.S. investors and the United States, by extension, with greater insights into the Chinese economy and financial markets, and access to the Chinese market provides investors with greater diversification. At the same time, investment in

Chinese companies exposes investors to underlying credit risk, and there are longstanding concerns over credit quality as well as a lack of transparency into company financials.²¹⁰ Furthermore, as the world's second-largest economy, economic and financial developments in China have repeatedly moved global markets, and recent and arguably sudden regulatory actions by Chinese authorities have led to market volatility. Regarding protecting human rights, the net impact will be dependent on companies that receive funding. On the one hand, Chinese firms are aiding the Chinese government by supplying security services with technology to track and surveil not only ethnic Uyghurs in Xinjiang but also political dissidents and democracy advocates throughout the broader population.²¹¹ Indeed, this factored into the Biden administration's rationale for expanding EO 13959. On the other hand, a foreign investor base would also introduce these companies to outside shareholder pressure, which in theory could work to advance human rights; while such pressure has been applied in a U.S. company context, there is little evidence to date of shareholder pressure factoring into company operating decisions in China.²¹²

The overall assessment of U.S. portfolio investment in Chinese companies is ambiguous, with a more positive assessment of the impact on economic and climate-related objectives and a more negative assessment of the impact on values-based and technology and innovation objectives. Given the priority assigned to values-based and technology and innovation objectives, the next step in the framework calls for the consideration of restrictions based on their likely effectiveness. In this case, the restrictions would be a prohibition on U.S. portfolio investment in Chinese securities.

ASSESSING EFFECTIVENESS OF RESTRICTIONS

Restrictions on capital and financial flows have declined globally since at least the 1970s, with the United States maintaining among the most liberal capital and financial account regimes in the world.²¹³ While the United States does not restrict entire classes of capital or financial flows, it does restrict assets and prohibit financial dealings with individuals and companies owned or controlled by, or acting for or on behalf of, targeted countries through the Office of Foreign Assets Control (OFAC) sanctions lists.²¹⁴ This case study looks to the precedent of EO 13959 and the companies listed on the Non-SDN-Chinese Military-Industrial Complex (NS-CMIC) list, noting that the EO prohibits transactions in any publicly traded security of any "person" on the NS-CMIC list, regardless of where that security is traded, by any U.S. "person."²¹⁵

The effectiveness of such controls can be judged narrowly as preventing the listed entity from accessing U.S. capital or, more broadly, as preventing the entity from accessing financing from the rest of the world. This case study evaluates the position of U.S. capital markets, specifically equity exchanges, relative to Chinese alternatives as well as the likelihood that other countries might join the United States in imposing restrictions on their citizens' ability to invest in targeted entities. Both factors are relevant to assessing effectiveness.

Leadership

One consequence of the EO was the announced delisting of named companies from U.S. exchanges. In the weeks following the initial Trump EO, the New York Stock Exchange (NYSE) delisted companies that appeared on the original list, including China Mobil, China Unicom, and China Telecom. All three companies' shares already traded in Hong Kong, and their share prices, while well below levels at the start of 2020, have been stable since the delisting was announced in January 2021. The *Wall Street Journal* reported in May that "the delistings have had little practical effect for the telecoms companies," noting that "buyers from the Chinese mainland have increased their holdings in the firms."²¹⁶

In response to the announced delisting, all three companies advanced plans to list on Chinese exchanges, with China Telecom making a second listing on the Shanghai Stock Exchange in August. China Mobile also filed a prospectus for listing in Shanghai, while China Unicom is reportedly considering a listing of a spin-off on a mainland exchange.²¹⁷ It remains to be seen whether Chinese and Hong Kong markets present a viable alternative to U.S. exchanges, which remain the largest and most liquid in the world, especially for companies looking to raise capital in initial public offerings. The NYSE and NASDAQ combined have a total market capitalization nearing \$60 trillion. The Shanghai and Shenzhen Stock Exchanges have a combined market capitalization of roughly one-fourth that amount, while the Hong Kong Stock Exchange has a market capitalization of roughly \$6 trillion. In addition, cross-listing on “more prestigious” exchanges such as the NYSE and NASDAQ has been shown to result in a higher valuation for the listed company, possibly attributable to firms’ heightened visibility, stronger corporate governance, and lower informational frictions and capital costs.²¹⁸

Beijing is promoting the development of its domestic capital markets by simplifying the process for firms to list on domestic exchanges and easing restrictions on foreign investment. China’s mainland exchanges have also been linked to the Hong Kong Stock Exchange as part of an effort to create a “single ‘China’ stock market.”²¹⁹ On the supply side, market participants believe Chinese companies listed onshore will be less susceptible to regulatory action by the Chinese authorities, while delistings from U.S. exchanges can be seen to foster development efforts by giving Chinese companies additional motivation to list onshore.²²⁰



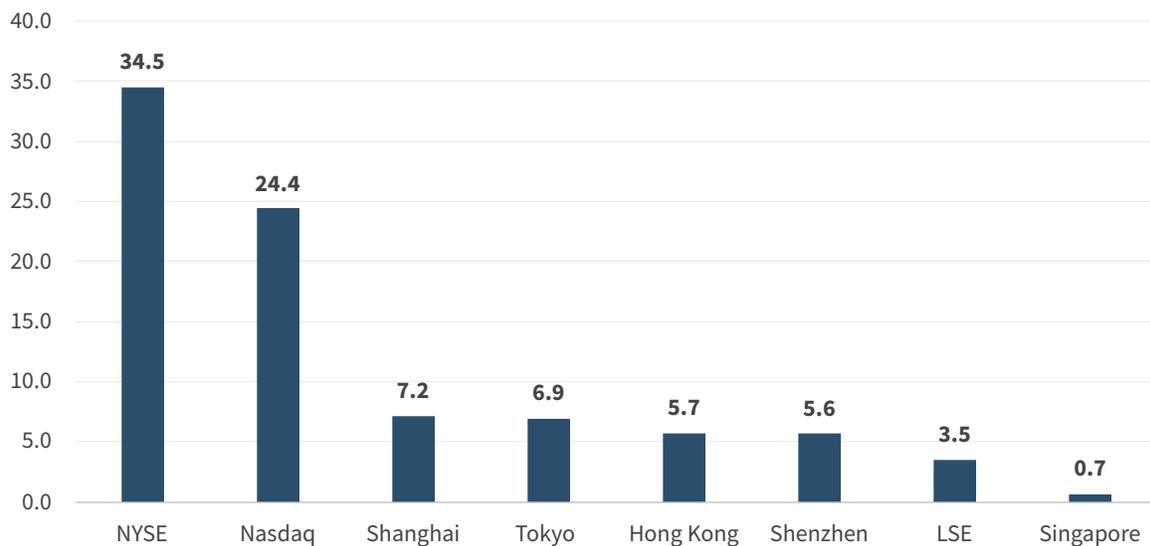
A pedestrian walks past the Shanghai Stock Exchange in Shanghai.

Source: Hector Retamal/AFP/Getty Images

Allies and Partners

The potency of restrictions depends not only on where a company trades but, more consequentially, on demand for the securities. As noted, the EO prohibits any U.S. person—defined as a U.S. “citizen, permanent resident alien, entity organized under the laws of the United States . . . or any person in the United States”—from transacting in securities issued by a company on the NS-CMIC list. Not only did the EO prevent individual and institutional investors from transacting in the securities of a listed company, but multiple index providers also removed Chinese stocks from their indices as it became clear that U.S. investors would be in violation of the EO if they invested in indices which included the listed companies.

Figure 8: Estimated Market Capitalization of Select Stock Exchanges (USD, trillions)



Source: Retrieved via Bloomberg Terminal; “Other Statistics: Market Capitalization,” Japan Exchange Group, <https://www.jpx.co.jp/english/markets/statistics-equities/misc/02.html>; “HKEX Monthly Market Highlights,” HKEX, September 2021, https://www.hkex.com.hk/Market-Data/Statistics/Consolidated-Reports/HKEX-Monthly-Market-Highlights?sc_lang=en; and “Singapore Exchange,” Trading Hours, <https://www.tradinghours.com/markets/sgx#market-cap>.

Using global wealth as a rough proxy for demand for global securities, the United States and China account for about 30 percent and 18 percent of global wealth, respectively. If effectiveness of restrictions is defined as the ability to deny the target access to global capital, cooperation would be needed to address the remaining 52 percent of global wealth. In contrast to efforts to boost coordination on foreign investment screening, for example, initiatives to work with allies and partners to restrict portfolio investment in Chinese firms appear nascent at best, while there is related precedent in the form of recent coordinated sanctions actions among the United States, European Union, United Kingdom, and Canada against Chinese officials in connection with human rights abuses against ethnic minorities in Xinjiang. While lawmakers in some allied countries have sought a blacklisting of firms linked to human rights abuses in Xinjiang, such proposals do not appear to have gained traction.²²¹ Such efforts are also complicated by the difficulty of identifying ownership and the existence of numerous subsidiaries that challenge effective coverage of targeted firms.

ADHERING TO THE RULE OF LAW

The framework's rule of law component applies a legal review to any activity. For this case study, rule of law is interpreted to apply to the legality and due process related to actions taken to restrict cross-border portfolio flows, as well as compliance with regulatory requirements.

Treasury's Office of Foreign Assets Control (OFAC) Sanctions List

The United States does not restrict entire classes of capital or financial flows, but it does restrict assets and prohibit certain financial transactions with individuals and companies through sanctions programs administered by the Treasury Department's OFAC.²²² The relevant sanctions list for this case study is the NS-CMIC list, and transactions in any publicly traded security of any "person" on the NS-CMIC list, regardless of where that security is traded, by any U.S. "person" is prohibited.

Regulation and the Securities and Exchange Commission (SEC)

The Securities and Exchange Act of 1934 created the SEC to enforce securities laws and especially disclosure requirements. The SEC enforces investor protections, including statutory disclosure requirements, enforces securities laws, and regulates securities markets. It has the authority to prevent companies from listing on U.S. exchanges if they do not meet adequate disclosure requirements, and it can suspend trading in a stock for a limited time. It also oversees the PCAOB, which oversees audit quality, including for overseas entities that list on U.S. exchanges.

Judicial Review and Due Process

As relates to EO 13959, at least two Chinese companies successfully challenged the designation as a "Communist Chinese military company" in U.S. District Court. The cases provide an example of judicial review in the U.S. system and a check on executive power. Some legal scholars have also questioned whether China may be using the transparency and due process afforded by the U.S. legal system to its asymmetric advantage given the absence of such protections in the Chinese system.²²³

FINAL ASSESSMENT

U.S. investment in portfolio flows is generally judged to be positive for U.S. economic and climate-related objectives but judged to be negative for maintaining U.S. technological leadership and values-based objectives. The results for values-based and technology and innovation objectives warrant an evaluation of the effectiveness of possible restrictions, notwithstanding the positive assessment of climate-related and economic objectives. U.S. equity markets are the global leaders, and their depth and liquidity cannot easily be replicated. China is mounting an effort to develop its capital markets and attract foreign investment, but development will take years to realize and is compromised by capital account restrictions and lack of rule of law. More relevant for the effectiveness assessment is the ability to restrict portfolio investment in targeted Chinese companies regardless of where they trade. It does not appear that other nations are willing to follow the United States' lead in restricting their citizens' ability to transact in Chinese securities, and unlike AI and biotechnology, there are few early signs of an emerging alliance on portfolio flows, even while efforts to more closely coordinate allies and partners on FDI screening proceed. While effectiveness arguments go against restrictions, values-based considerations may override economic ones, at least in specific company cases.

Key Findings

The *Degrees of Separation* project took place in two phases. The first phase reviewed the history of U.S.-China engagement dating back to the 1970s with the aim of understanding the motivation for and results of bilateral engagement. Implicit in the approach was the assumption that normalized relations with China, and closer ties over the ensuing decades, was a means to advance U.S. objectives. Those objectives have evolved, from largely geostrategic to increasingly economic. An emphasis on global public goods and global rules and norms emerged as China reformed and its economy grew. Values-based objectives, such as the protection of human rights, and technological objectives have been present since the early days of engagement; while these areas arguably receive greater priority today than in the past, their potency in making the case for engagement has clearly waned.

The second phase of the project has sought to update objectives for the period from 2021 to 2025, using achievement of U.S. objectives as the basis for evaluating whether U.S.-China engagement in a specific activity should be restricted. By doing so, the project seeks to advance a “targeted approach to decoupling” that restricts engagement only when it advances U.S. objectives. Having developed the framework, it has been applied to three case studies that sit at the heart of U.S.-China competition: artificial intelligence (AI), biotechnology, and financial flows. Roundtables convened for each of the case studies sought expert views from the official and private sectors and included participants from Canada, the European Union, Japan, the United Kingdom, and the United States. For the study team, key findings emerged both in developing the framework and in applying it to the case studies:

Elements of the framework, and therefore the assessment itself, are highly subjective. Naming the risk, identifying and prioritizing U.S. objectives, and assessing the impact of both engagement and efforts to restrict are all highly subjective. Often “where you stand depends on where you sit.” In general, private sector and academic participants from the three roundtables favored closer

engagement and saw risks to U.S. competitiveness (e.g., in AI innovation) and effectiveness (e.g., in public health) from efforts to restrict activity, while professionals with national security backgrounds were far more circumspect.

Data is a game changer. The emergence of data as a key driver of economic activity and innovation has fundamentally changed the perception of risk and what qualifies as a potentially risky activity in terms of the impact on national security. When data is everywhere—and its future applications unknown in the present—it is difficult to confidently draw the line between risky and safe activities.

As relates to data (and beyond), there is a grudging acceptance of fragmentation as the final destination. The emphasis on standard setting and new initiatives with U.S. allies and partners that exclude China offers the clearest sign yet of a U.S. strategy to lead among like-minded countries and implicitly accept, if not urge, fragmentation. Current U.S. leadership—including in all case study fields—enables some degree of fragmentation, provided the United States maintains openness in areas that are essential for innovation (e.g., in human capital).

Values have emerged as a unifying theme among U.S. allies and partners, with implications across a range of policy areas. In contrast to past practice, which emphasized bilateral engagement with China to advance values-based objectives, the current environment features values-based objectives as the basis for corraling the support of allies and partners behind U.S. objectives and countering Chinese influence.

Meaningful efforts are underway to coordinate policies and positions among like-minded countries, especially in technology policy, but the devil will be in the details. Technology, and AI in particular, has been a major focus of recent allied commitments, but the majority of pledged efforts have yet to be concretely acted upon. Data-sharing philosophies and regulations, in particular, remain disjointed.

European allies are the biggest wild card. The AUKUS agreement—a trilateral security pact signed between Australia, the United Kingdom, and the United States—may well prove to be a gamechanger in terms of affirming where Australia and the United Kingdom fall on the U.S.-China divide. Other allies, and the European Union especially, remain ambiguous. Much will depend on how narrowly or broadly the United States decides to pursue decoupling (even if by a different name) and especially on China's own actions.

In applying the report's framework to the three case studies—U.S.-China research collaborations in AI, U.S.-China human genomic data flows in biotechnology, and U.S.-China capital market linkages and cross-border portfolio flows—the report also yielded sector-specific findings.

Research Collaborations in Artificial Intelligence

- Cultivation and retention of human talent represents the “holy grail” of AI innovation. It is also the most difficult component of the AI ecosystem to control without simultaneously killing competitiveness. In general, any restrictions should focus on end-users rather than on specific technologies.
- Competitive advantage stemming from AI will likely depend on its adoption and application. Given the overall benefits for innovation, research collaborations can benefit both the U.S. and Chinese economies. However, there are trade-offs for technological leadership, military advantage and U.S. national security, and values-based objectives such as protecting human rights and resisting authoritarianism.

- Given these trade-offs and the challenges of imposing restrictions that are effective without undermining U.S. innovation, the best defense will be a strong offense. Recent funding and new coordinating mechanisms are to be applauded, as such an approach can maintain U.S. leadership in AI innovation.

Biotechnology and Human Genomic Data Sharing

- Sharing human genomic data—a key input to biotechnology innovation in the health sector—allows firms and states to amass, verify, and diversify data holdings, advancing the pace and quality of medical discoveries and services. Both the United States and China thus accrue economic and innovation gains and are better informed and equipped to respond to shared global public health challenges.
- U.S.-China human genomic data flows, however, also present significant risks to U.S. objectives, most notably to U.S. biosecurity and technological leadership and to global bioethics. These risks stem predominantly from the asymmetric nature of U.S.-China data flows. While the United States currently leads in biotechnology innovation, China’s data advantage will help it close the gap.
- China’s strict data regime is unlikely to change, leaving the United States to decide how to react to the asymmetric data relationship. The focus on technological leadership and values, in partnership with U.S. allies, points to a more reciprocal approach in the form of less data sharing. Incentivizing U.S. and allied actors to reduce China’s access to data will be favored over formal restrictions.

Capital Market Linkages and Cross-Border Portfolio Flows

- Despite the move to more conscious investing, evidenced by the growth in funds dedicated to environmental, social, and corporate governance (ESG), most global investors will be drawn by returns unless given a (legal) reason to act otherwise.
- At the same time, the globalization of capital flows—more accurately wealth—and financial structuring makes effective targeting of restrictions difficult to achieve. Efforts to keep Chinese companies off U.S. exchanges will not necessarily constrain their access to capital. A more effective approach will target the entity, but the bar should be very high; even then, it will be an uphill battle to convince others to go along.
- The preeminence of U.S. stock exchanges is not in doubt for the foreseeable future. Efforts to move Chinese companies off U.S. exchanges are currently warranted on regulatory grounds; still, delisting may ultimately foster the development of China’s domestic exchanges.

A final key finding is that existing mechanisms go a long way in protecting national security.

Foreign investment screening, unilateral and multilateral export controls, end-user controls, sanctions lists, formal classification protocols, and financial and (some) data regulation are already in place to screen risky activities. What is arguably lacking is a common risk assessment and agreement on U.S. objectives and their prioritization. The resulting clarity will go some way in identifying and securing meaningful coordination with allies and partners—and will be a helpful guide for the private sector.

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