Tech Supremacy: The New Arms Race Between China and the United States

Xuan-Thao Nguyen*

In the brewing tech war between the United States and China, the quest for tech supremacy is in full force. Through enacting a series of laws and policies, China aims to reach its goal of tech supremacy. If China succeeds, U.S. corporations will face a daunting task in competing against Chinese products and services in core industries and in sectors where artificial intelligence and technological breakthroughs reign. This Article is the first to identify and analyze China's 2022 Law on Science and Technology Progress, Personal Information Protection Law, Made in China 2025, National Intellectual Property Strategies, and digital currency e-CNY; explore their potential impact on U.S. business; and urge immediate attention to the tech war.

* Pendleton Miller Endowed Chair in Law and Director, Asian Law Center, University of Washington School of Law.

INTRODUCTION

The war between Russia and Ukraine draws the United States and its European allies deep into the region of conflict without a clear exit strategy.[1] While attentions are directed to the war in Ukraine, another war brews between the United States and China on the innovation and technology frontiers.[2] China progresses as a formidable opponent such that both the U.S. government and U.S. corporations are increasingly facing a marketplace where China claims global leadership in core industries as well as scientific and technological breakthroughs.[3]

More than forty years ago, the U.S. government and corporations fought against fierce competition from Japan.[4] A similar fight continues today with China. Unfortunately, the comparison between the Japanese and Chinese experience fails because China possesses force in size and zeal dictated by the planned market economy of the Chinese Communist Party.[5] China's economic success enables the transformation of China from a global

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1. David E. Sanger & Eric Schmitt, *How Does It End? A Way Out of the Ukraine War Proves Elusive*, N.Y. TIMES (Mar. 13, 2022), https://www.nytimes.com/2022/03/13/us/politics/russia-ukraine-us-endgame.html [https://perma.cc/5VAM-MMRH]. The prolonged war distracts the United States from other regions. *See* Tom Hussain, *With US Distracted by Russia's Ukraine War and China, Economics and an Emboldened Iran Drive Middle East Powers to Redraw Alliances*, S. CHINA MORNING POST (Mar. 27, 2022), https://www.scmp.com/week-asia/politics/article/3171848/us-distracted-russias-ukraine-war-and-china-economics-and [https://perma.cc/22WC-WY9W].

2. The tech war has been brewing in the last few years. *See* Jeanne Whalen & Chris Alcantara, *Nine Charts That Show Who's Winning the U.S.-China Tech Race*, WASH. POST (Sept. 21, 2021), https://www.washingtonpost.com/technology/2021/09/21/us-china-tech-competition/ [https://perma.cc/XA84-NK7L] (discussing the tech war and each side's advancements); *US-China Tech War: Everything You Need to Know About the US-China Tech War and Its Impact*, S. CHINA MORNING POST (Apr. 23, 2021), https://www.scmp.com/tech/tech-war/article/3130587/us-china-tech-war-everything-you-need-know-about-us-china-tech-war [https://perma.cc/S2LH-YPUY] ("The US and China are now engaged in a full-blown tech war."). For a series of articles on the tech war, see *US-China Tech War & Rivalry: The Race for the Tech of the Future*, S. CHINA MORNING POST, https://www.scmp.com/knowledge/topics/us-china-tech-war-rivalry/news [https://perma.cc/P93Q-E3BA] (cataloging various articles and informative news about the tech war between the United States and China).

3. Jonathan Cheng, *China Is Starting to Act Like a Global Power*, WALL ST. J. (Mar. 22, 2023), https://www.wsj.com/articles/china-has-a-new-vision-for-itself-global-power-da8dc559 [https://perma.cc/TX95-QJBT]; *see also, e.g.*, GORDON G. CHANG, THE GREAT U.S.-CHINA TECH WAR (2020) (describing the relationship between relevant Chinese and United States actors, specifically as it relates to their tech war advancements).

4. One of the major legislations that the United States passed to combat Japan's rise in science and technology production and investment was the Bayh-Dole Act. *See* Bayh-Dole Act, Pub. L. No. 96-517, 94 Stat. 3015 (1980) ("It is the policy and objective of the Congress to use the patent system to promote the utilization of inventions arising from federally supported research or development [among other innovation objectives]."); *see also infra* Part V (discussing current and historic United States technology policy).

5. *See* Keith Bradsher & Chris Buckley*, China Outlines Plan to Stabilize Economy in Crucial Year for Xi*, N.Y. TIMES (Mar. 4, 2022), https://www.nytimes.com/2022/03/04/world/asia/china-economy-congress.html [https://perma.cc/4M3F-526W] (discussing Chinese government plans to unilaterally alter market and economic conditions through government intervention); Stephen McDonell, *Changing China: Xi Jinping's Effort to Return to Socialism*, BBC (Sept. 23, 2021), https://www.bbc.com/news/business-58579831 [https://perma.cc/X8DJ-X8QU] (describing Xi Jinping's efforts to increase government control and reduce Chinese capitalism); Orange Wang, *China Accelerates Inward Economic Pivot with Plan to Create a 'Unified Domestic Market*,*'* S. CHINA

manufacturer of cheap goods to a new global manufacturer of innovation.[6] Further, this success propels China to focus on the new goal of tech supremacy today. Under the quest for tech supremacy, China passed a series of new laws and policies related to science and technology production, personal information data protection, and the new digital currency for worldwide consumption.

For example, China recently passed a comprehensive statute—known as the 2022 Law on Science and Technology Progress—to transform the country into a worldwide science and technology powerhouse.[7] The new law frames the global economy as the battlefield where Chinese science and tech experts (talents) will engage in cutting-edge research to reduce their reliance on foreign technologies and achieve breakthroughs. The new law will construct a new system of national laboratories, substantially increase basic and applied research national budgets, and provide extensive tax benefits and incentives to firms that extend financing to research enterprises.[8] The new law aims to create thousands of new tech companies, or "little giants," promote gender inclusion, and address climate change.[9] Most importantly, the new law is part of a series of policy and legal reforms, including *Made in China 2025*[10] and *National Intellectual Property Strategies*,[11] that China has implemented to move the country towards its goal of tech supremacy.

In its tech supremacy quest, China relies on its strong position in artificial intelligence.[12] With a massively large population known to be enthusiastic users of new technologies, Chinese corporations can collect fresh and relevant data necessary to develop new smart products and services driven by algorithmic and machine learning. Unlike other nations with personal data protection laws, China zealously guards data by elevating data to a heightened level of national property. In so doing, China ensures that data is within its reach for its tech supremacy purposes.

Likewise, with the new introduction of its digital currency, e-CNY, China aims to control and lead in payments worldwide.[13] Additionally, China amasses data from payment transactions, positioning China apart from other countries in this tech supremacy quest.

If China succeeds, China's quest for tech supremacy will have a profound impact on U.S. corporations, as they will soon discover that competition against Chinese companies

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MORNING POST (Apr. 11, 2022), https://www.scmp.com/economy/china-economy/article/3173886/china-accelerates-inward-economic-pivot-plan-create-unified [https://perma.cc/WS7S-N9R8] ("Beijing has released new guidelines for a 'highly efficient, rules-based' domestic market that analysts say aims to tackle fragmented production and resource use.").

6. *See* Xuan-Thao Nguyen, *Manufacturing Innovation*, 56 INT'L LAW. 91, 109, 135–40 (2023) ("Most significantly, the recent revisions of the intellectual property laws support the country's shift from a manual-labor-based economy to an innovation-based economy.").

7. *See infra* Part II (discussing specific provisions and motivations concerning the new legislation).

8. *Id.*

9. *Id.*

10. *See* Elsa B. Kania, *Made in China 2025, Explained*, THE DIPLOMAT (Feb. 1, 2019), https://thediplomat.com/2019/02/made-in-china-2025-explained/ [https://perma.cc/23L9-6LNJ] (explaining the *Made in China 2025* initiative that China launched in 2015).

11. Aaron Wininger, *China Releases the "Plan for Further Implementation of the National Intellectual Property Strategy to Accelerate the Construction of an Intellectual Property Power Country by 2020,"* NAT'L L. REV. (Aug. 25, 2023), https://www.natlawreview.com/article/china-releases-plan-further-implementation-national-intellectual-property-strategy [https://perma.cc/ETK4-TYDY].

12. *See infra* Part III.

13. *See infra* Part IV.

in core industries where science and technology reign is daunting. U.S. corporations recently witnessed both chambers in Congress back a $52 billion investment in a "China Competition Bill" to aid chip manufacturing. Notwithstanding, that effort falls short of what the Chinese government has already passed in solidifying its position for tech supremacy.[14] As the United States further entangles itself in the war between Russia and Ukraine, legislative measures to engage in meaningful steps to combat China in the tech war recede to the background.[15] Time is of the essence for both the U.S. government and corporations to act.

Part I documents and explains China's 2022 Law on Science and Technology Progress. Part II demonstrates China's national strategies and campaigns for innovation in context. Part III focuses on China's Personal Data Information law and how data has become national property. Part IV charts the formation of China's new digital currency and ambition. Part V explores the implications of China's tech supremacy for U.S. corporations. The Article concludes by calling for immediate action.

I. CHINA'S LAW ON SCIENCE AND TECHNOLOGY PROGRESS OF 2022

In early January 2022, while the United States and Western Europe were paying attention to the brewing trouble in Ukraine, China's Law on Science and Technology Progress went into effect.[16] The new law reflects China's determination to lead globally in scientific and technological advancements and to become the world's science and technology powerhouse.[17] The new law garners commitment from the "total leadership of the Chinese Communist Party."[18] Simply put, no other country has ever enacted a law equivalent in both scope and ambition.[19]

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14. Daniel Flatley, *Senate Passes China Competition Bill to Start Talks With House*, BLOOMBERG (Mar. 28, 2022), https://www.bloomberg.com/news/articles/2022-03-28/senate-passes-china-competition-bill-to-start-talks-with-house [https://perma.cc/CU7U-THVX].

15. Robert Delaney, *Ukraine War: White House Ties Missiles Used by Kyiv to Its China Competition Bill*, S. CHINA MORNING POST (May 3, 2022), https://www.scmp.com/news/china/article/3176302/ukraine-war-white-house-ties-missiles-used-kyiv-its-china-competition [https://perma.cc/4PFU-G4UY] ("The White House has tried to shore up support for legislation that aims to boost domestic semiconductor chip manufacturing by linking it to US military aid for Ukraine.").

16. Zhonghua Renming Kexuejishu Jinbu Fa (中华人民共和国科学技术进步法) [Law of the People's Republic of China on Progress of Science and Technology] (promulgated by the Standing Comm. Nat'l People's Cong., Jul. 2, 1993, *rev'd* Dec. 24, 2021, effective Jan. 1, 2022), art. 117 (China) [hereinafter STP].

17. STP, *supra* note 16, art. 2 ("The State shall adhere to the new concept of development (新发展理念) and the core position of S&T [Science & Technology] innovation in the big picture of the nation's modernization drive, take S&T self-reliance (自立自强) as the strategic support for national development, implement the Strategy of Rejuvenating China through Science and Education, the Talent Powerhouse Strategy, and the Innovation-Driven Development Strategy, follow the path of independent innovation (自主创新) with Chinese characteristics, and transform China into an S&T powerhouse." (footnote omitted)).

18. *Id.* ("The total leadership of the Chinese Communist Party over the cause of science and technology shall be adhered to.").

19. Comparatively, Congress passed the Bayh-Dole Act to promote the utilization of patents resulting from federally supported research or development and the collaboration between industry and universities. *See* 35 U.S.C. § 200 (articulating the policy objectives of the Bayh-Dole Act); *see also* Brenda M. Simon, *Preserving the Fruits of Labor: Impediments to University Inventor Mobility*, 89 TENN. L. REV. 1, 32–35 (2021) (explaining the legislative underpinnings of the Bayh-Dole Act); Ian Ayres & Lisa Larrimore Ouellette, *A Market Test for*

A. China's Science and Tech Powerhouse Purpose

China articulated several purposes for the new law. The law intends to maximize the role of science and technology as "the number-one productive force," innovation as "the number-one driving force," and Chinese talents as "the number-one resource" for converting scientific and technological progress into practical applications that support and lead China's economic and social development.[20] The law frames the economy as the "battlefield" where China's science and technology progress must be at "the cutting edge of the world science and technology" in order to serve the "major needs" of the nation, enhance "the life and health" of the public, "safeguard[]" Chinese national security, and ensure the "sustainable development of humanity."[21]

The law, nevertheless, guarantees "the freedom" of scientific exploration and innovation to researchers and the protection of their rights and interests associated with the researchers' endeavors.[22] Under the law, researchers enjoy the right to independently select their topics, explore their inquiries in unknown scientific fields, and engage in both basic research and cutting-edge tech research for the public good.[23] In other words, purely scientific and technological inquiries for philosophical musings must be within the framework to serve the public good.[24] Further, only research inquiries that serve what the Chinese government believes is advancing China's goal of becoming the world's leader in science and technology are covered in fiscal funding and qualify for tax benefits.[25]

The Chinese Communist Party uses the term "powerhouse" as a way to describe their desire to not be dependent on other countries for knowledge, ideas, and experience in the science and technology spaces.[26] The Chinese government set a goal to reduce its over-

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Bayh-Dole Patents, 102 CORNELL L. REV. 271, 279–80 (2017) (noting shortcomings of the commercialization theory of the Bayh-Dole Act and proposing a solution that would help determine whether exclusive patent grants arising from federally funded research are necessary to incentivize commercialization). For a more comprehensive analysis explaining why the Bayh-Dole Act does not have the same scope and ambition as China's new laws, see *infra* Part V.

20. STP, *supra* note 16, art. 1.

21. *Id.* art. 3.

22. *Id.* art. 8.

23. *Id.* art. 7. Article seven provides the pertinent portion:

> The State shall follow the principle of combining service rendered by S&T activities to national goals with encouragement of free exploration, make far-sighted arrangements for major basic research, cutting-edge technological research with prospects for major industrial applications, and technological research for the public good, support the sustained and stable development of basic research, cutting-edge technological research, and technological research for the public good, strengthen original innovation and breakthroughs on key and core technologies (关键核心技术), and accelerate the achievement of high-level S&T self-reliance.

Id.

24. *Id.*

25. STP, *supra* note 16, art. 85–97.

26. *See id.* art. 2, 20 (describing, using the term "powerhouse," to describe both the general Chinese strategy and the final goal for China to become a technological powerhouse); *see also* CTR. FOR SEC. EMERGING TECH., GEORGETOWN UNIV., TRANSLATION OF THE LAW OF THE PEOPLE'S REPUBLIC OF CHINA ON PROGRESS OF SCIENCE AND TECHNOLOGY 2 fn.2 ("Translator's note: This translation renders the Chinese word 强国 qiángguó—which literally means "strong nation"—in English as "powerhouse," as in the phrase "talent powerhouse" (人才强国).").

reliance on foreign technologies in core areas[27] by enshrining "self-reliance" in the new law.[28] Both self-reliance and independent innovation are to be infused with "Chinese characteristics," distinguishing China from other nations in its path of transformation into a powerhouse.[29]

Moreover, to set China apart from other nations, the new law demonstrates China's resolve to address climate change.[30] Specifically, in improving old industries and promoting and developing high-tech industries and social undertakings, the law aims to "support the achievement of goals of reaching . . . carbon neutrality."[31] The Chinese Communist Party believes addressing their climate change goals will generate new momentum and achieve high-quality development.[32]

To underscore the significance of the new law, the "State Council" or the "Central People's Government," China's highest executive body of power and administration,[33] will "lead the work" of science and technology progress across China, "formulate" all medium and long-term science and technology development and innovation plans, and "determine" major national projects with strategic guidelines, resource allocation, and policy formulation.[34] Provincial and local governments are required to incorporate the work on science and technology progress into national economic and social development plans.[35] Governments at all levels across China are also required to take effective measures to assist, optimize, and promote the work of science and technology progress.[36] In other words, from the highest level of China's Central Government to the local municipality, all hands are on deck in executing the goals and ambitions of transforming China into the science and technological progress global powerhouse.

To pursue its ambitious goals, China's Law on Science and Technology Progress dictates that the Chinese government must enhance available fiscal funds to reflect an increase in the overall level of science and technology funding.[37] The law requires the government to apply a growth rate to the national budget used for science and tech funding allocation that is "higher than the rate of increase of the regular revenue of the national budget."[38] Additionally, funding will also come from private sources, including venture

27. *China Aims for Tech Independence Amid Looming Cut-Throat Race with US*, GLOB. TIMES (Mar. 1, 2021), https://www.globaltimes.cn/page/202103/1216926.shtml [https://perma.cc/XV9W-Y84F].

28. STP, *supra* note 16, art. 2.

29. *Id.*

30. STP, *supra* note 16, art. 4, 47 ("The relevant departments of the State Council and provincial people's governments should develop . . . environmental protection and climate change policies to guide and motivate enterprises to research and develop new technologies, new products, and new processes; carry out technological transformation and equipment updating; eliminate technologically backward equipment and processes; and stop producing technologically backward products.").

31. *Id.* art. 4.

32. *Id.*

33. *State Council*, EMBASSY OF THE PEOPLE'S REPUBLIC OF CHINA IN NEPAL (Oct. 27, 2004), https://www.mfa.gov.cn/ce/cenp/eng/ChinaABC/zz/t167478.htm#:~:text=The%20State%20Council%20is%20responsible,economic%2C%20cultural%20and%20educational%20affairs [https://perma.cc/T8D8-V22A].

34. STP, *supra* note 16, art. 15.

35. *Id.*

36. *Id.*

37. *Id.* art. 87–88.

38. STP, *supra* note 16, art. 86.

capital, secured financing with intellectual property assets as collateral, donations, and capital markets.[39]

B. Investment in Basic Research

Generally, economists share the belief that basic science research is crucial for economic growth.[40] Basic research is fundamental to innovation.[41] Funding for basic research, however, often falls to the government to supply.[42]

China understood the important role of basic research in generating original ideas and breakthrough technologies. Accordingly, China devotes the entire Chapter II of the Law on Science and Technology Progress statute to address the vision for and execution of basic research and progress. Most importantly, the new law demonstrates China's recognition that basic research projects need government funding. Indeed, the new law indicates that funding basic research is an investment that requires the national government to include funds for basic research in the fiscal budget each year.[43] Similarly, local governments are required to include funding for basic research in their fiscal budgets.[44] In addition to public funds, the law requires private enterprises to increase their investment in basic research through multiple channels, such as donations to the formation of special private

39. *Id.* art. 42, 92.

40. Philip Barrett et al., *Why Basic Science Matters for Economic Growth*, INT'L MONETARY FUND (Oct. 6, 2021), https://blogs.imf.org/2021/10/06/why-basic-science-matters-for-economic-growth [https://perma.cc/4UHB-Z45D]; THE ENDLESS FRONTIER: THE NEXT 75 YEARS IN SCIENCE 28 (Nat. Acads. Press ed., 2020), https://nap.nationalacademies.org/read/25990/chapter/9 [https://perma.cc/3UBY-FBD5] ("[E]conomists have shown that much of GDP is the result of advances in science and technology."); Jo Handelsman, *The Value of Basic Research*, WHITE HOUSE: PRESIDENT BARACK OBAMA (June 2, 2015), https://obamawhitehouse.archives.gov/blog/2015/06/02/value-basic-research [https://perma.cc/3JP5-SKZ2] (discussing the investment in the sciences will help develop "game-changing new technologies" that "keep[] America on the cutting-edge").

41. Peter Gruss, *Basic Research Is the Key Driver of Innovation*, MAX PLANCK RSCH. (2009), https://www.mpg.de/799746/W000_Viewpoint_006-009.pdf [https://perma.cc/35DD-A6DZ]; Martin Steinacher, *Fundamental Research: At the Heart of Innovation*, CERN (Mar. 12, 2019), https://home.cern/news/opinion/knowledge-sharing/fundamental-research-heart-innovation [https://perma.cc/R-A6F-X87U]; Liz Karagianis, *The Brilliance of Basic Research*, MIT: SPECTRUM (2014), https://spectrum.mit.edu/spring-2014/the-brilliance-of-basic-research/ [https://perma.cc/FKJ2-9XRT].

42. *E.g.*, Xuan-Thao Nguyen & Jeffrey A. Maine, *Attacking Innovation*, 99 B.U. L. REV. 1687, 1694–95 (2019) ("To remedy [innovation] market failure, the government has stepped in to support innovation."); Christopher Pece, *Funding for Basic Research*, NAT'L SCI. FOUND., https://nsf.gov/statistics/2019/nsf19321/overview.htm [https://perma.cc/H94Z-4EQ6] (reporting government funding for various R&D efforts); Jeffrey Mervis, *Data Check: U.S. Government Share of Basic Research Funding Falls Below 50%*, SCI. (Mar. 9, 2017), https://www.science.org/content/article/data-check-us-government-share-basic-research-funding-falls-below-50 [https://perma.cc/QPN3-PB5S] (discussing how, when private spending increases, government funding can take responsibility for a lower percentage of total expenditures); M. Anthony Mills, Opinion, *Why the Federal Government Must Put More Money Toward Basic Science*, HILL (May 6, 2021), https://thehill.com/opinion/finance/551730-why-the-federal-government-must-put-more-money-toward-basic-science/ [https://perma.cc/V239-PJ8N] (discussing government involvement in R&D efforts).

43. STP, *supra* note 16, art. 20, 87.

44. *Id.* art. 20.

funds.[45] In exchange, the government will provide fiscal, financial, tax, and other policy support to these enterprises.[46]

Basic research projects often demand laboratory space and special equipment. To meet the facility challenge, the law states that the Chinese government will build national laboratories in all major science and technology innovation fields and create a "sound laboratory system" nationwide.[47] The Chinese government, at different levels, will embark on the establishment and construction of national high-tech industrial development zones, national independent innovation demonstration zones and parks, and major science and technology bases and platforms.[48]

China also desires to create Research and Development (R&D) institutions to conduct basic research and cutting-edge technology research. Specifically, the law permits Chinese individuals, corporations, and organizations to establish R&D institutions in China as well as branches abroad.[49] With an open policy to attract both Chinese and non-Chinese talents, the law permits overseas individuals and organizations to independently establish R&D institutions in China.[50] With respect to funding control, the law dictates that R&D institutions that are established with government funds must be in compliance with national strategic requirements.[51] The law emphasizes that the government will use government funds to establish R&D institutions to engage in basic research, in addition to "cutting-edge technology research, and technology research for the public good."[52] The law authorizes R&D institutions to possess autonomy over their internal management and revenue generated from their technological achievements.[53] Further, R&D institutions can receive donations and financial support from other sources beyond government funding.[54]

The law focuses on resource allocation to ensure that basic research will attract "outstanding" personnel to participate in research.[55] Because higher education institutions are good training grounds for basic research talents, the law requires the government to provide support to higher education institutions.[56] Sharing knowledge and advancing interdisciplinarity in research endeavors is imperative; the law requires the government to improve and promote the coordinated development of basic research and applied research.[57]

With respect to natural science research, the law also instructs the government to establish a natural science foundation to fund "basic research and support talent training

45. *Id.*
46. *Id.* art. 20, 41–43.
47. *Id.* art. 48.
48. STP, *supra* note 16, art. 71–75.
49. *Id.* art. 49.
50. *Id.*
51. *Id.* art. 48–49.
52. *Id.* art. 49.
53. STP, *supra* note 16, art. 50.
54. *Id.*
55. *Id.* art. 23.
56. *Id.* art. 25.
57. *Id.* art. 22, 24.

and team building."[58] The funding for these projects will be in accordance with the principles set forth by the National Natural Science Foundation of China.[59]

Most importantly, the law addresses problems relating to the distribution of government funding.[60] For years, scientists and researchers complained about how the cozy relationships between government funding bureaucrats and favored grant applicants undermined and undervalued scientific merit.[61] The new law aims to address the funding distribution problem by focusing on the promotion of talents and their ideas.[62]

C. Applied Research and Conversion of Achievements into Practical Applications

To realize the goal of becoming a powerhouse in science and technology progress, China strategically focuses on translating the achievements of basic research and applied research into practical applications. Chapter III of China's Law on Science and Technology Progress addresses such translation endeavors.

In envisioning the conversion of achievements into practical applications, the law requires the Chinese government to promote the "deep integration" of the innovation chain, production chain, and supply chain together.[63] That means the innovations and achievements must be intentional and purposeful in meeting national strategic needs, supporting the life and health of the public and gaining independence in key, core technologies.[64] The law dictates that R&D institutions and higher education institutions receiving government fiscal funds must actively engage in converting science and technology achievements into practical applications.[65] In other words, experimentation and acceleration of the transformation from ideas to products is the guiding force.[66] Joint efforts, alliances, and consortia are expected to achieve effective conversions.[67]

The intellectual property assets resulting from projects funded by the government will be owned by individuals and entities who undertake the projects. Under the law, such intellectual property holders can transfer and exploit their intellectual property rights.[68] If such persons fail to exercise their intellectual property rights within a reasonable period of time, the government may step in and seize the intellectual property rights. In such cases, the government does not have an obligation to compensate the persons who developed the intellectual property assets.

Moreover, the government may exercise intellectual property rights materialized from projects funded by government grants for national security and public interest reasons without compensation.[69] The government may also authorize others to use the intellectual

58. STP, *supra* note 16, art. 21.
59. *Id.*
60. *Id.*
61. *E.g.*, Yigong Shi & Yi Rao, *China's Research Culture*, 329 SCI. 1128, 1128 (2010) (noting how the committees that determine the annual research grants "often listen to and usually cooperate with the bureaucrats" that appointed them).
62. *See infra* Part I.E.
63. STP, *supra* note 16, art. 26.
64. *Id.* art. 27–28.
65. *Id.* art. 30.
66. *Id.*
67. *Id.* art. 31.
68. STP, *supra* note 16, art. 32.
69. *Id.*

property rights with or without compensation.[70] Also, to ensure China acquires the first dip in the intellectual property rights procured with government funding, the intellectual property rights must first be used within China.[71] Consequently, the law ensures China will be the direct beneficiary of the intellectual property rights resulting from Chinese government funding.

With a vision for science and technology progress to revitalize rural areas and modernize agricultural industries, the law requires governments at all levels to adopt measures to support applied research in these industries.[72] Most importantly, governments must accelerate the conversion of achievements in science and technology progress in applied research to promote new agricultural varieties and technologies.[73] Such acceleration is designed to ensure that rural areas are not left behind during China's transformation into a science and technology powerhouse.[74] In parallel, the law mandates that the national government coordinate the overall regional distribution of science and technology resources and adopt multiple measures to support regional science and technology innovation.[75]

The ability to leverage the end results of applied research and conversions of achievements to practical applications demands a robust market for new technologies.[76] The law recognizes that there are many different types of participants in the robust market for new technologies.[77] The law states that the government must "cultivate and develop a unified, open, and interconnected technology market" wherein intermediary service entities, tech valuators, tech brokerage firms, and entrepreneurs can participate and compete in the trading of new technologies.[78]

D. Creating a Market-Oriented Ecosystem for Science and Technology Progress

Similar to Silicon Valley—where for the last sixty years a vibrant ecosystem of venture capitalists, founders, and entrepreneurs disrupted old industries and created new industries[79]—China, through Chapter IV of its Law on Science and Technology Progress, sets forth a new vision and execution of a market-oriented ecosystem.[80] In other words,

70. *Id.*
71. *Id.* art. 34.
72. *Id.* art. 36.
73. STP, *supra* note 16, art. 71–78.
74. *Id.*
75. *Id.*
76. *Id.* art. 38.
77. *Id.*
78. STP, *supra* note 16, art. 38.
79. MAXIMILIAN SCHROECK, GOPAL SRINIVASAN & AISHWARYA SHARAN, DELOITTE, HOW TO INNOVATE THE SILICON VALLEY WAY 3 (2016), https://www2.deloitte.com/content/dam/insights/us/articles/tapping-into-silicon-valley-culture-of-innovation/DUP_3274_Silicon-Valley_MASTER.pdf [https://perma.cc/KQ5M-AVQS] (discussing Silicon Valley and its disruptive nature).
80. *See* STP, *supra* note 16, art. 1 ("This Law is enacted . . . [to] promot[e] scientific and technological . . . progress, maximizing the role of science and technology as the number-one productive force . . . .").

China is strengthening the university-industry linkage in research and commercialization to foster new ideas and breakthroughs and accelerate them to applications.[81]

Under the new law, China must establish a market-oriented ecosystem where enterprises, R&D institutions, and higher education institutions are the stakeholders.[82] The enterprises will play key roles in a number of activities to establish, develop, and nurture new R&D institutions and other research entities.[83] The enterprises embrace the entrepreneurial spirit by actively engaging in different phases of innovation, aiming to introduce new technologies, products, and processes to the market.[84] To encourage the enterprises' activities, the law provides generous tax deductions and accelerates the depreciation taken by the enterprises.[85]

The law welcomes venture capital funds from multiple channels and makes it easier for multi-level capital markets to invest in and support the development of entrepreneurial enterprises.[86] Under the law, China is required to enhance and ease the financing for science and technology enterprises, enabling these entities to take full advantage of the capital markets that further innovation.[87] This will create a clearer path to an initial public offering for some successful and high-growth enterprises. Moreover, the law bestows tax preferences on venture capital firms and other financial firms that invest in startup science and technology enterprises.[88]

With intellectual property being considered an asset class to be used as collateral in secured financing, the law requires the Chinese government to encourage financial institutions to engage in making loans and extending credit lines backed by intellectual property assets.[89] Recognizing the uncertainty and risks associated with intellectual property secured financing, the law instructs the government to encourage insurance institutions to develop new insurance products that would provide comfort to lenders in their financing of high-tech industries.[90] Consequently, financial and insurance institutions will assist in propelling high-tech industries on their development paths.

To cultivate both market competitiveness and independent innovation ability, the law guarantees that the government will protect the intellectual property assets procured by enterprises.[91] Additionally, the law requires that the government provide support for the construction and operation of public R&D platforms and services institutions that will, in turn, provide services to the technology innovation of small and medium-sized

81. With its new Law on Science and Technology Progress, China addresses the criticism that its university-industry linkage was weak. *See* Daitian Li, Tony W. Tong & Yangao Xiao, *Is China Emerging as the Global Leader in AI?*, HARV. BUS. REV. (Feb. 18, 2021), https://hbr.org/2021/02/is-china-emerging-as-the-global-leader-in-ai [https://perma.cc/5N28-WX2W] (representing "university-industry linkages in China [as] relatively weak" prior to the new law).

82. STP, *supra* note 16, art. 39.

83. *Id.* art. 40–41.

84. *Id.* art. 41.

85. *Id.*

86. *Id.* art. 42.

87. STP, *supra* note 16, art. 42.

88. *Id.* art. 43.

89. *Id.* art. 92.

90. *Id.*

91. *Id.* art. 45.

companies.[92] This demonstrates that China recognizes that innovations often occur at startups and small businesses, and it demonstrates that China is willing to support such entities accordingly.

E. Talents, Human Capital, and Gender Inclusion

Science and technology progress cannot occur without talented people. Human capital is indeed key to China's plan to become the world's leader in science and technology.[93] To that end, the new law devotes substantial provisions to an ambitious buildup of its science and technology workforce.[94]

The law states that China will implement multiple steps to accelerate the building, training, and recruitment of strategic talent forces.[95] Education at different levels must improve to identify and enhance new talent pools.[96] The law instructs schools to link theory with practice, cultivate students' ability to be independent thinkers, and instill in the students "the scientific spirit of pursuing truth, revering innovation, and seeking truth from facts."[97] At premier education institutions, where high-level specialists are trained and engage in scientific research, the law insists that the specialists possess a "sense of social responsibility, innovative spirit, and practical ability."[98]

With regards to income distribution, the law insists that governments at all levels take appropriate measures to reflect the value of contributions by innovators.[99] In addition to salary, the law instructs that R&D institutions, higher education institutions, and enterprises adopt various equity, options, and profit-sharing incentives to attract and retain talents.[100]

Recognizing that certain jobs within the science and technology fields are located in remote locations and may, therefore, pose hardship to employees, the law dictates that employers provide subsidies and adopt safety measures.[101] Moreover, ensuring talents keep up with rapid changes, employers must provide continuing education and training to science and technology personnel.[102]

To remove barriers blocking young talents from advancing their careers in science and technology, the law specifies that young personnel shall enjoy equal rights in competing for higher positions and undertaking new projects.[103] The law commands governments at all levels, as well as public and private institutions, to create environments and conditions for young talents to grow and "boldly explore and dare to try in

92. STP, *supra* note 16, art. 44.
93. *See id.* art. 9–12, 56–78 (implementing human resource considerations into its larger plan).
94. *Id.* art. 9–12, 56–78 (dictating how the State shall support, improve, promote, and capitalize upon talents).
95. *Id.* art. 58.
96. *Id.* art. 59.
97. STP, *supra* note 16, art. 9.
98. *Id.*
99. *Id.* art. 60.
100. *Id.*
101. *Id.* art. 65.
102. STP, *supra* note 16, art. 61, 65.
103. *Id.* art. 66.

technological fields."[104] In this regard, the law aims to eliminate negative vestiges stemming from having too much respect for elders and senior personnel.

Likewise, the law requires that women in science and technology fields be treated equally for promotion, new R&D projects, and continuing education opportunities.[105] Acknowledging that women can get pregnant, bear children, and nurse infants, the law instructs all levels of government and all public and private employers to show concern for women during such times.[106] Additionally, the law dictates that all levels of governments and all employers should improve training, evaluation, and incentive mechanisms for women, and encourage and support women in having a greater role in the progress of science and technology.[107]

To honor science and technology talents, the law proclaims that May 30th of each year will be celebrated as "National Science and Technology Workers Day."[108] The law channels the new belief that science and technology personnel are an important talent force in the "socialist modernization drive," and that they should be "respected by the whole society."[109] The law also advocates that the "whole society shall respect labor, knowledge, talent, and creation, and develop a prevailing custom of revering science."[110] The law further requires China to institute National Highest Science and Technology Awards and other awards to reward organizations and individuals, including overseas entities and individuals, for their contributions.[111] The State Council will determine specific measures for the awards.[112]

F. National Security

One of the most striking features in China's Law on Science and Technology Progress is how often national security is invoked.[113] The law accentuates national security ten times throughout various chapters.[114] The emphasis on national security marks a departure from an older version of China's Law on Progress of Science and Technology, revealing how

104. *Id.*
105. *Id.*
106. *Id.*
107. STP, *supra* note 16, art. 66.
108. *Id.* art. 18.
109. *Id.* art. 10.
110. *Id.* art. 11.
111. *Id.*
112. STP, *supra* note 16, art. 18.
113. China's Law on Progress of Science and Technology uses the term "national security" ten times and considers the issue even more without explicit mention. *See, e.g.*, *id.* art. 5 ("The State shall coordinate development and *security* . . . .") (emphasis added). In comparison, the U.S. Department of Defense spent $5.5 billion from 2012 to 2017 on research and prototype projects with technology companies. That spending has increased "due to U.S. concerns of losing the technology race with countries considered our adversaries and the increased need to take advantage of developing commercial technologies from companies adverse to traditional procurements." Daniel J. Kelly, *IP Rights Under NASA and DOD "Other Transaction" Agreements—Inventions and Patents*, *in* BRIEFING PAPERS: SECOND SERIES, at 1, 1 (Ser. No. 18-9, Aug. 2018) [https://perma.cc/6NYZ-HHPL].
114. *See* STP, *supra* note 16. The document is riddled with mentions of national security, seen in articles 5, 19, 27, 32, 48, 107 and 112.

vital science and technology progress are to China's national security today and in the future.[115]

In article 3, the new law states that work on science and technology progress must be oriented to "the safeguarding of national security."[116] As explained by the Chairman of the National People's Congress Education, Science, Culture and Health Committee, because the world is now "undergoing rapid evolution" unseen in a century, science and technology progress contains the "dual functions" of "development and security."[117] The law mandates that the Chinese government coordinate development and security by supporting science and technology innovation "in the field of national security" and improving the capability and level of science and technology innovation "to support national security."[118] In other words, China is very explicit about its national security focus on science and technology progress.

Illustratively, basic research must meet "the major needs of national security."[119] Likewise, applied research and conversion of achievements into practical applications must meet "the major needs of national security."[120] Overall, both basic and applied research plans blur the division between military and civilian use[121] because the research plans will be under the banner of national security.[122]

Also, under the law, national laboratories in major science and technology innovation fields must be constructed "for the overall national security."[123] Moreover, in order to receive government fiscal funding, the entities that conduct science and technology research must cause "no harm to national security."[124] In addition, the government may use the resulting intellectual property from such research and achievements without compensation "for the benefit of national security."[125] Any research activities that are deemed endangering "national security" will be prohibited.[126] Violators face restitution costs, termination of activities and licenses, administrative penalties, and sanctions.[127]

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115. In the older version, "national security" is used in only three articles. Zhonghua Renming Kexuejishu Jinbu Fa (中华人民共和国科学技术进步法) [Law of the People's Republic of China on Progress of Science and Technology] (promulgated by the Standing Comm. Nat'l People's Cong., Jul. 2, 1993, *rev'd*, Dec. 29, 2007, effective July 1, 2008), art. 20, 28–29 (China).

116. STP, *supra* note 16, art. 3.

117. Li Xueyong, Chairman, Educ., Sci., Culture & Health Comm. of the Nat'l People's Cong., Explanation of the "Law of the People's Republic of China on Progress in Science and Technology" before the Standing Committee of the Thirteenth National People's Congress (Aug. 17, 2021), www.npc.gov.cn/npc/c30834/202112/0c407a3dee7c4a32bb9a870afa3b4022.shtml [https://perma.cc/5AAU-HPEA].

118. *Id.*

119. STP, *supra* note 16, art. 19.

120. *Id.* art. 27.

121. *Id.* art. 6 ("The State shall strengthen the coordinated development of military-use and civilian-use S&T, and promote interoperability, exchange, and two-way technology transfer of military-use and civilian-use S&T resources and technology development requirements.").

122. *Id.* art. 19 (the basic research is required to meet "the major needs of national security").

123. *Id.* art. 49.

124. STP, *supra* note 16, art. 32.

125. *Id.* The government may also permit others to use the intellectual property procured with government fiscal funding with or without compensation "for the benefit of national security." *Id.*

126. *Id.* art. 107.

127. *Id.* art. 112.

In summary, China's new law on science and technology progress is bold, ambitious, and comprehensive in setting forth a new vision of China for Chinese tech supremacy wherein Chinese innovations will produce long-lasting impact at home and abroad.

II. CHINA'S NATIONAL STRATEGIES IN CONTEXT

In positioning China for tech supremacy on the global stage, the Chinese government has initiated and implemented several strategic national campaigns. Notably, two national campaigns most relevant to China's tech supremacy are *Made in China* and *National Intellectual Property Strategy*.

A. The Made in China *National Campaign*

In 2011, China witnessed Germany outlining its national strategic initiative "Industry 4.0."[128] In the late 2000s and early 2010s, Germany aimed to focus on intelligent or smart manufacturing and to embrace the rapid advancements in information technology at all levels of production. Additionally, Germany aimed to incentivize small- and medium-sized German companies to fully embrace the Internet of Things, network connection, and maximization of efficiency.[129] Subsequently, in 2013, Germany adopted its Industry 4.0 initiative; in response, China rolled out its *Made in China* national strategies in 2015.

Made in China is a comprehensive plan to further develop ten specific industries; namely, (i) advanced information technology; (ii) automated machine tools and robotics; (iii) aerospace and aeronautical equipment; (iv) ocean engineering equipment and high-tech shipping; (v) modern rail transport equipment; (vi) energy saving and new energy vehicles; (vii) power equipment; (viii) new materials; (ix) medicine and medical devices; and (x) agricultural equipment.[130] Through *Made in China*, the government aims to reduce the nation's dependence on foreign technology, increase indigenous innovations, and position Chinese tech companies to compete both at home and abroad. That means, that, in the ten identified industries, China will make significant investments towards innovations for smart production and manufacturing in addition to improvements in the financial, education, and healthcare sectors.[131]

Most importantly, *Made in China* is a national campaign that frames a new mindset for the Chinese people regarding their national pride in the New China. *Made in China* proposes to erase numerous scandals dealing with Chinese citizens unknowingly consuming unsafe China-made products. In 2008, more than 296,000 babies became ill

128. *See* Scott Kennedy, *Made in China 2025*, CTR. FOR STRATEGIC & INT'L STUD. (June 1, 2015), https://www.csis.org/analysis/made-china-2025 [https://perma.cc/3RD8-THVP] (discussing the goals of "Industry 4.0").

129. *See* DEMETRIUS KLITOU ET AL., DIGITAL TRANSFORMATION MONITOR, GERMANY INDUSTRIE 4.0 3 (2017), https://ati.ec.europa.eu/sites/default/files/2020-06/DTM_Industrie%204.0_DE.pdf [https://perma.cc/3AK6-63SP] ("'Industrie 4.0' (Industry 4.0 (I40)) is a national strategic initiative from the German government through the Ministry of Education and Research (BMBF) and the Ministry for Economic Affairs and Energy (BMWI). It aims to drive digital manufacturing forward by increasing digitisation and the interconnection of products, value chains and business models. It also aims to support research, the networking of industry partners and standardisation.").

130. U.S. CHAMBER OF COM., MADE IN CHINA 2025: GLOBAL AMBITIONS BUILT ON LOCAL PROTECTIONS 10 (2017).

131. *Id*.

with kidney diseases,[132] swollen heads,[133] and some died after drinking Sanlu milk tainted with toxic chemical melamine.[134] In addition to tainted milk, other basic foods and beverages—eggs,[135] oil,[136] snacks,[137] meat,[138] and bottled water[139]—were among the food scandals crushing the Chinese people's confidence in domestic products. The proud athletes, pop stars, scholars, physicians, and government officials selected as spokespeople for advertisement campaigns of food products that turned out to harm consumers, caused distrust.[140] While China announced the *Made in China* initiative in 2015, some Chinese residents with sufficient financial means traveled to Japan as tourists to purchase billions worth of products[141] or used buyer agents in the United States to acquire healthcare

132. *See* Peng Hu et al., *Clinical Observation of Childhood Urinary Stones Induced by Melamine-tainted Infant Formula in Anhui Province, China*, 9 ARCHIVES MED. SCI. 98, 98–104, (2013) (noting that the Chinese Ministry of Health had reported that 294,000 infants had been affected by melamine-contaminated infant formula and that there have been more than 5000 infants hospitalized and 6 confirmed deaths).

133. *See* David Barboza, *Former Executive Pleads Guilty in China Milk Scandal*, N.Y. TIMES (Jan. 1, 2009), http://www.nytimes.com/2009/01/01/world/asia/01iht-milk.1.19025735.html [https://perma.cc/X4WC-Q2NF] (reporting that Sanlu's tainted milk was "watered-down milk being doctored with a chemical used in plastics and fertilizer to falsely raise its protein count" and "sickened nearly 300,000 children").

134. *Timeline: China Milk Scandal*, BBC (Jan. 25, 2010), http://news.bbc.co.uk/2/hi/7720404.stm [https://perma.cc/B7ML-EAEG]; *see also* Chenglin Liu, *Profits Above the Law: China's Melamine Tainted Milk Incident*, 79 MISS. L.J. 371, 376–78 (2009) (explaining how the Sanlu milk crisis is a result of China's building demand for domestic milk production and consumption).

135. *See* David Bandurski, *China Quiet on Bad Eggs as the Premier Talks Tough on Safety*, CHINA MEDIA PROJ. (Oct. 27, 2008), http://cmp.hku.hk/2008/10/27/1303/ [https://perma.cc/38JC-LGK5] (reporting on the chicken eggs and related products scandals); *Wal-Mart Removes Brand of Eggs from China Stores*, ABC NEWS (Oct. 28, 2008), http://abc7chicago.com/archive/6474164/ [https://perma.cc/RK6E-3ZBF] (same); *Chinese Eggs Tainted with Excessive Melamine*, NBC NEWS (Oct. 26, 2008), http://www.nbcnews.com/id/27389907/ns/health-food_safety/t/chinese-eggs-tainted-excessive-melamine/#.VqkqBPkrKUk [https://perma.cc/4RAX-XRB7] (same); *Chinese Delayed Disclosure of Tainted Eggs*, USA TODAY (Oct. 29, 2008), http://usatoday30.usatoday.com/news/health/2008-10-29-china-eggs_N.htm [https://perma.cc/TQU2-ZU86] (same).

136. *See* Austin Ramzy, *Reports on "Gutter Oil" Series, Assaulted, People's Daily Says*, N.Y. TIMES: SINOSPHERE (May 19, 2014), http://sinosphere.blogs.nytimes.com/2014/05/19/reporters-on-gutter-oil-series-assaulted-peoples-daily-says/ [https://perma.cc/FH2W-DCUW].

137. *See* Austin Ramzy, *5 Die from Food Poisoning from Southern Chinese Snack*, N.Y. TIMES: SINOSPHERE (July 4, 2014), http://sinosphere.blogs.nytimes.com/2014/07/04/5-die-in-food-poisoning-from-southern-chinese-snack/ [https://perma.cc/A7ER-3K7J].

138. *See* Dan Levin & Crystal Tse, *In China, Stomachs Turn at News of Traders Peddling 40-Year-Old Meat*, N.Y. TIMES (June 24, 2015), https://www.nytimes.com/2015/06/25/world/in-china-stomachs-turn-at-news-of-traders-peddling-40-year-old-meat.html [https://perma.cc/VRT9-6Z8D] (reporting half a billion dollars' worth of frozen meat with some dating to the 1970s was seized by government).

139. *See* Abigail Barnes & Wei Cao, *Muddy Waters: The Public Health Risks and Sustainability of Bottled Water in China*, 38 VT. L. REV. 971, 971 (2014) ("Approximately 70% of China's fresh water supplies are polluted to some degree, and the water pipes in many urban areas are outdated, often leeching impurities into the public drinking water."); *see also* Jan Mei Soon & Xin Liu, *Chinese Consumers' Risk Mitigating Strategies Against Food Fraud*, 115 FOOD CONTROL 1, 1 (Apr. 11, 2020) (discussing the aftermath of food scandals in China and how they caused distrust among Chinese consumers of domestic products).

140. Liu, s*upra* note 134, at 377–78 (discussing the national advertisements of tainted dairy products).

141. *See* Adam Minter, *Why Chinese Tourists Love Japan*, BLOOMBERG VIEW (Mar. 25, 2015), http://www.bloombergview.com/articles/2015-03-25/why-chinese-tourists-love-japan [https://perma.cc/82QE-P2FR] ("Given China's frequent product safety scandals . . . Chinese often schedule shopping sprees when they're outside the country. In 2014 alone, Chinese consumers spent $164 billion abroad, making them the world's

products for safe household consumption instead of spending money on China-made goods.[142]

Made in China became the rallying cry for quality control on Chinese products in general, but particularly within the selected ten industries.[143] To achieve both quality and innovation, China has provided enormous subsidies to companies in the different sectors.[144] For instance, the Chinese government created funds of around 2 trillion Chinese yuan to distribute to high tech companies.[145] In 2020, the Chinese government selected 113 companies in the semiconductors sector as recipients of 10.6 billion Renminbi (RMB) for their research and manufacturing of the capital-heavy computer chips.[146] Similarly, the Chinese government poured subsidies into the pharma sector by selecting strategic companies like CanSino Biologics and Shanghai Pharmaceuticals Holding for increased subsidies.[147]

Made in China ensures companies gain access to loans, enjoy tax breaks, and benefit from grants.[148] Illustratively, Huawei received $46 billion in loans and credits, $25 billion in tax breaks, and $1.6 billion in grants.[149] Additionally, the Chinese government extends subsidies to companies for obtaining patents and trademarks.[150] Such subsidies propelled

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biggest vacation spenders . . . . During this past February's Chinese New Year, Chinese tourists spent around $1 billion in Japan.").

142. *See* Alice Yan, *China's Shopping Agents, Online Firms Flourish as Locals Look Abroad for Quality Health-Care Goods*, S. CHINA MORNING POST (Nov. 15, 2015), http://www.scmp.com/news/china/money-wealth/article/1878930/chinas-shopping-agents-online-firms-flourish-locals-look [https://perma.cc/DJT2-7ATM] (discussing efforts to purchase health care goods outside of China); *see also* Tadanori Yoshida, *Counterfeit Products Driving Chinese Shoppers Overseas*, NIKKEI ASIAN (Jan. 26, 2016), http://asia.nikkei.com/Business/Consumers/Counterfeit-products-driving-Chinese-shoppers-overseas [https://perma.cc/27TB-8KQR] (discussing consumer woes and responsive efforts following scandals).

143. U.S. CHAMBER OF COM., *supra* note 130 (stating that *Made in China* has "a focus on quality" and the investment is "towards technological innovation").

144. Yusho Cho, *Eyeing US, China Wields $33Bn Subsidies to Bolster Chips, Defense*, NIKKEI ASIA (May 17, 2021), https://asia.nikkei.com/Politics/International-relations/US-China-tensions/Eyeing-US-China-wields-33bn-subsidies-to-bolster-chips-defense [https://perma.cc/X2V2-AJ56]; Chuin-Wei Yap, *State Support Helped Fuel Huawei's Global Rise*, WALL ST. J. (Dec. 25, 2019), https://www.wsj.com/articles/state-support-helped-fuel-huaweis-global-rise-11577280736 [https://perma.cc/G53R-NRMC]; *see also* John VerWey, *Chinese Semiconductor Industrial Policy: Past and Present*, J. INT'L COM. & ECON. (July 2019), https://www.usitc.gov/publications/332/journals/chinese_semiconductor_industrial_policy_past_and_present_jice_july_2019.pdf [https://perma.cc/6JYJ-3XJG].

145. *See* Shinya Matano, *The Impact of China's Industrial Subsidies on Companies and the Response of Japan, the United States, and the European Union*, MITSUI & CO. GLOB. STRATEGIC STUD. INST. (Jan. 2021), https://www.mitsui.com/mgssi/en/report/detail/__icsFiles/afieldfile/2021/02/19/2101c_matano_e.pdf [https://perma.cc/K3NL-UWSV] (discussing the influence of foreign government subsidies to high-tech companies).

146. Cho, *supra* note 144.

147. *Id.*

148. *Id.*

149. Chuin-Wei Yap, *State Support Helped Fuel Huawei's Global Rise*, WALL ST. J. (Dec. 25, 2019), https://www.wsj.com/articles/state-support-helped-fuel-huaweis-global-rise-11577280736 [https://perma.cc/E36U-2VYX].

150. *Trademarks and Patents in China: The Impact of Non-Market Factors on Filing Trends and IP Systems*, USPTO (Jan. 2021), https://www.uspto.gov/sites/default/files/documents/USPTO-TrademarkPatentsInChina.pdf [https://perma.cc/D58M-7NP6].

Huawei to become one of the top global patent holders.[151] At the individual level, Chinese local governments directed generous housing subsidies to talented individuals who work in sectors known for creating intellectual property assets.[152] In summary, the *Made in China* national campaign is intimately intertwined with China's *National Intellectual Property Strategies*, which the government launched earlier in 2008.

B. China's National Intellectual Property Strategies

China understands the importance of intellectual property assets like patents, copyrights, trademarks, and trade secrets to national economic growth. With that understanding, China has embarked on a comprehensive approach to new developments in creation, commercialization, protection, and administration of intellectual property.[153] China's *National Intellectual Property Strategies* catapulted the country to occupy the highest perch of being the leading global producer of utility patents, design patents, industrial designs, and trademarks.[154] China—not the United States, Germany, nor Japan—is the annual international leader in total filings of patent and trademark protection devices.[155]

To achieve the apex of global production of intellectual property assets, China steadily moved from being a labor-intensive production economy to an information-based economy.[156] Also, China embraced numerous reforms in the judiciary system for intellectual property adjudications.[157] For the administration of intellectual property, China revamped its national offices that handle the examinations and procurements of intellectual property assets by enterprises and individuals. The reforms in the courts and administrative agencies demonstrate to both Chinese and foreign companies that, upon cementing its

151. James Kynge, *Huawei Records Biggest Jump in Patent Ownership in 2020*, FIN. TIMES (Mar. 16, 2021), https://www.ft.com/content/614c6149-2f6e-482f-b64a-97aa2496ac7f [https://perma.cc/KQ9K-5HQ6] (reporting that Huawei is the lead patent holder in China and, by year-end 2020, "the company held more than 100,000 active patents, up from just over 85,000 active patents at the end of 2019"); Josh Ye, *China Data Privacy: Big Tech Will Be 'A Lot Less Powerful' After Beijing Passes Sweeping New Law*, *Experts Say*, S. CHINA MORNING POST (Aug. 24, 2021), https://www.scmp.com/tech/policy/article/3146078/china-data-privacy-big-tech-will-be-lot-less-powerful-after-beijing [https://perma.cc/8UQP-B8UC] (reporting that Huawei is "taking the top spot" after having 4411 patent applications last year).

152. Aaron Wininger, *District in Guangzhou, China Proposes 2.5 Million RMB Housing Subsidy to Attract Intellectual Property Professionals*, NAT'L L. REV. (Aug. 20, 2021), https://www.natlawreview.com/article/district-guangzhou-china-proposes-25-million-rmb-housing-subsidy-to-attract [https://perma.cc/V3PT-ZZ26] (reporting special housing subsidies for Chinese IP professionals).

153. *See* David J. Kappos, *On Becoming an Even Stronger Patent Powerhouse, China's National Patent Development Strategy, 2011–2020*, LANDSLIDE, Mar.–Apr. 2011, at 8 (discussing China's National Intellectual Property Rights Strategy); Aaron Wininger, *Understanding IP Law in China*, ASPATORE, 2011 WL 2532951 (2011) (discussing China's implementation of subsidies for patent filings, decreased corporate income tax rates for innovate companies, and intellectual property enforcement campaign).

154. *See generally* Nguyen, *supra* note 6 (discussing China's new initiatives and general strategy).

155. *China Leads the World in AI Related Patent Filing,* WIPO (Sept. 28, 2021), https://www.wipo.int/about-wipo/en/offices/china/news/2021/news_0037.html [https://perma.cc/7CT3-PD3Z]; *World Intellectual Property Indicators Report: Worldwide Trademark Filing Soars in 2020 Despite Global Pandemic*, WORLD INT'L PATENT ORG. (Nov. 8, 2021), https://www.wipo.int/pressroom/en/articles/2021/article_0011.html [https://perma.cc/4R3W-ZN26].

156. Nguyen, *supra* note 6, at 109 (tracing China's transformation from labor-intensive to innovation-based economy).

157. *Id.*

status as the global producer of intellectual property assets, China intends to maintain its position at the commanding height.

1. Strategic Revisions of Intellectual Property Laws, Restructuring Administrations, and Court Expansion

One of the most startling features of China's quest for tech supremacy is how frequently it has revised its intellectual property laws. From the time China began to initiate its policy to open its doors to the international community in the 1980s to the present, China has revised its patent law four times.[158] Often, China revised other intellectual property laws like trademark law[159] and copyright law[160] at the same time as it made revisions to its patent law. This demonstrates an understanding that, in the marketplace, companies require different types of intellectual property assets working in concert for their daily business functioning and expansion.

At each interval of revisions, China calibrates its purpose of why the revisions occurred. For enticement of foreign investments, China revised its intellectual property laws in the 1990s.[161] For ascension to the World Trade Organization, China amended its intellectual property laws in the early 2000s.[162] For its own domestic embrace of a new economy with a stronger tech focus, China changed its intellectual property laws in the 2010s.[163] For a stronger recognition of intellectual property as assets and rewarding the creators, China's latest round of intellectual property law revision occurred in the 2020s.

Revisions of intellectual property law occur contemporaneously with the restructuring of the administrative agencies handling the rapid increase in the number of intellectual

158. *General Introduction to the Third Revision of the Patent Law of the People's Republic of China and Its Implementing Regulations*, CHINA NAT'L INTELL. PROP. ADMIN. (July 17, 2013), https://english.cnipa.gov.cn/art/2013/7/17/art_1349_81674.html [https://perma.cc/3DGC-EEF8] ("[T]he 17th National Congress of the Communist Party of China put forward the target of enhancing the capacity of indigenous innovation and building an innovative country, and the State Council formulated the Outline of National Intellectual Property Strategy."); *China Promulgates Fourth Amendment to Patent Law*, JONES DAY (Nov. 2020), https://www.jonesday.com/en/insights/2020/11/china-promulgates-fourth-amendment-to-patent-law [https://perma.cc/GN2E-GE5P].

159. Zhonghua Renming Shangbiaofa (中华人民共和国商标法) [Trademark Law of the People's Republic of China] (promulgated by the Standing Comm. Nat'l People's Cong., Apr. 23, 2019, effective Nov. 1, 2019) (China) (noting that, in amending the law, that the law has been either adopted or amended in 1982, 1993, 2001, and 2019).

160. *See* Linda Zhao, *China Passes Harsher Amended Copyright Law*, MANAGING IP (Dec. 9, 2020), https://www.managingip.com/article/b1plvjd646ffr7/china-passes-harsher-amended-copyright-law [https://perma.cc/JA6S-4C3E]; *China Amends Copyright Law*, CHINA.ORG.CN (Nov. 16, 2001), http://www.china.org.cn/english/2001/Nov/22246.htm [https://perma.cc/976Z-V67F] ("[T]he amendments greatly reduce differences between China's copyright laws and the international conventions on copyright protection, and the WTO's Agreement on Trade-Related Intellectual Property Rights (TRIPS).").

161. *See generally* Jie Hong, Jakob Edler & Silvia Massini, *Evolution of the Chinese Intellectual Property Rights System: IPR Law Revisions and Enforcement*, 18 MGMT. & ORG. REV. 755 (2021) (discussing China's evolving IP law in the 1990s and 21st century).

162. *Id.*

163. *Id.*

property applications for registration.[164] For instance, trademark filings grew from 1,113,120 in 2010 to an astounding 8,602,788 in 2019.[165] Patent filings in China leaped from 308,326 in 2010 to 1,327,847 in 2019.[166] The strengthening of intellectual property administration in China allows innovators and business entrepreneurs to quickly obtain their new assets in order to compete in the marketplace.[167]

In addition to the frequent revisions of intellectual property laws, China's Supreme People's Court (SPC) plays a pivotal role in formulating guidelines and interpretations in intellectual property protection and enforcement for lower courts.[168] Illustratively, the SPC issued the *People's Court 5-Year Intellectual Property Judicial Protection Plan* in 2021, instructing all courts to strengthen judicial protection of intellectual property rights and improve trial quality in patent litigation, damages, and punishment of bad faith trademark registrations.[169] The SPC also annually selects a set of guiding cases with significance in scope for lower courts to follow.[170] China's sophisticated intellectual property court is staffed with judges who possess scientific and technical education and expertise in understanding patents and innovations.[171] At the SPC's level, China inaugurated the Intellectual Property Court of the SPC in accordance with the decisions of the CPC Central

164. *China to Restructure SIPO–A Step Toward Better IP Protection*, OSHA BERGMAN WATANABE BURTON NEWSL. (Apr. 30, 2018), https://www.obwbip.com/newsletter/china-to-restructure-sipo-a-step-toward-better-ip-protection [https://perma.cc/9WTH-53P4]; *The Regulations on CNIPA Functions, Internal Departments and Staffing*, CHINA NAT'L INTELL. PROP. ADMIN., https://english.cnipa.gov.cn/col/col2068/index.html [https://perma.cc/TB4N-RCB9] ("The China National Intellectual Property Administration (CNIPA) is a vice-ministerial-level state agency under the State Administration for Market Regulation of China.").

165. *See* S*tatistical Country Profiles: China*, WORLD INT'L PATENT ORG., https://www.wipo.int/ipstats/en/statistics/country_profile/profile.jsp?code=CN [https://perma.cc/WA9Y-UV99].

166. *Id.*

167. *Id.*; *see also* Xia Yu*, New Fast Tracking Patent Application Program in China*, HG.ORG LEGAL RES., https://www.hg.org/legal-articles/new-fast-tracking-patent-application-program-in-china-44498 [https://perma.cc/2FK7-A2PL] (explaining the new fast tracking program that China implemented for its patent applications); Xiaofan Chen, *How to Fast Track Patent Applications in China Through Prioritised Patent Examination*, AWA POINT (June 24, 2020), https://awapoint.com/how-to-fast-track-patent-applications-in-china-through-prioritised-patent-examination/ [https://perma.cc/8RBN-KPAU] (same).

168. *See China Released a White Paper on IP Protection in 2020*, CHINA INTELL. PROP. (Apr. 27, 2021), http://www.chinaipmagazine.com/en/news-show.asp?id=12131 [https://perma.cc/BY9Y-YK9Z].

169. *Id.*

170. *SPC's Intellectual Property Court Releases Annual Report and Typical Cases*, CHINA DAILY (Mar. 1, 2021), https://ipc.court.gov.cn/en-us/news/view-1072.html [https://perma.cc/4GH5-62XL]; *China's Guiding Cases in IP Law, Part III: Infringement of Design Patents*, OSHA BERGMAN WATANABE & BURTON NEWSL. (Nov. 30, 2017), https://www.obwbip.com/newsletter/chinas-guiding-cases-in-ip-law-part-iii-infringement-of-design-patents [https://perma.cc/4CA5-V48U]. Runhua Wang, *New Private Law? Intellectual Property "Common-Law Precedents" in China*, 89 UMKC L. REV. 353, 365–67 (2020) (discussing the SPC's Guiding Case system); *see also* Aaron Wininger, *China's Supreme People's Court Releases Typical Cases of Punitive Damages in Intellectual Property Infringement*, NAT'L L. REV. (Aug. 26, 2023), https://www.natlawreview.com/article/china-s-supreme-people-s-court-releases-typical-cases-punitive-damages-intellectual [https://perma.cc/K4VJ-PUTR] (discussing punitive damages in IP infringement cases).

171. *See List of Courts Having Jurisdiction Over Patent Disputes*, INTELL. PROP. CT., https://ipc.court.gov.cn/en-us/news/more-2-27.html [https://perma.cc/V9HH-NZGX] (noting that many of these Intellectual Property Courts are "divisions of intermediate people's courts, enjoying trans-administrative regional jurisdiction of technology related intellectual property cases, such as patent cases").

Committee and Standing Committee of the National People's Congress in 2019.[172] The IP justices at the SPC are experienced jurists in intellectual property cases as well as some acquired scientific and technical expertise.[173] In sum, the IP courts actively participate in judicial evolution, keep up with the frequent revisions of intellectual property laws, and adjudicate an astoundingly large volume of disputes concerning intellectual property rights brought by Chinese holders of IP assets. At the national level, the Intellectual Property Court at the SPC decided 4,220 intellectual property cases by February of 2021.[174] Overall, Chinese courts at all levels decided 541,000 intellectual property cases at the trial level in 2021.[175]

2. IP as an Assets Class for Financing

With the fast increase in the number of patents, trademarks, and copyrights obtained by innovators and entrepreneurs, China's recognition of intellectual property as an asset class is unprecedented. Today, China allows secured financing with the use of intellectual property as collateral. This practice transforms intellectual property from illiquid assets to valuable assets capable of serving as security for loans and credit lines.[176] Also, the practice enables intellectual property owners to access needed financing for their operations and expansion.[177]

Moreover, as part of its national intellectual property strategies, China handsomely rewards the creators of intellectual property. For instance, such creators and owners of intellectual property can use their new assets to obtain loans and credit in a matter of a few days.[178] In 2020 alone, loans with patents and trademarks as collateral reached 218 billion RMB, reflecting a 40% increase from 2019 and representing 12,093 projects.[179] Such widespread growth materialized because China implemented measures that incentivized the insurance industry to provide insurance products that enhance the value of intellectual property assets for lenders.[180] Also, among the debtors who used patents for secured financing, industrial enterprises accounted for 97.9% of the total number of collateralized

172. *Introduction to the Intellectual Property Court of the Supreme People's Court*, IP CT. (Dec. 26, 2018), https://ipc.court.gov.cn/en-us/news/view-136.html [https://perma.cc/2FMB-D8F6].

173. *See* Nari Lee & Liguo Zhang, *Specialized IP Courts in China—Judicial Governance of Intellectual Property Rights*, 48 INT'L REV. INTELL. PROP. & COMPETITION L., 900, 917–18 (2017) (listing the necessary credentials to be selected as an IP judge).

174. *SPC's Intellectual Property Court Releases Annual Report and Typical Cases,* INTELL. PROP. CT. (Mar. 3, 2021), https://ipc.court.gov.cn/en-us/news/view-1072.html [https://perma.cc/49T4-7QEQ].

175. *China Steps Up Judicial Protection of IPR: Reports*, CHINA DAILY (Mar. 17, 2022), https://ipc.court.gov.cn/en-us/news/view-1849.html [https://perma.cc/CF2L-D5PD].

176. *See Patent and Trademark Pledge Financing in China Gains the Largest Increase in the 13th Five-Year Plan Period*, CHINA NAT'L INTELL. PROP. ADMIN. (Mar. 9, 2021), https://english.cnipa.gov.cn/art/2021/3/9/art_1340_157495.html [https://perma.cc/H922-Y7TL] ("Many micro and small enterprises face sluggish development, which is a common difficulty caused by liquidity pressure despite their possession of IP rights such as patents and trademarks.").

177. *Id.* ("IP pledge financing allows enterprises to attract financing support through intellectual property pledge, broadening their financing options and creating new opportunities for their development.").

178. *Id.* (noting instances when an inventor received financing days after their IP registration was completed).

179. *Id.*

180. *Id.* (reporting on the best practices workshop series conducted by CNIPA and the China Banking and Insurance Regulatory Commission (CBIRC) to connect banks and entrepreneurs).

patents in 2020.[181] China also instituted a policy to embrace and support inventors. Under such a policy, investor applicants possessing a certain number of patents enjoyed a higher priority for consideration in publicly listing their enterprises on the Shanghai Science and Technology Innovation Board.[182]

III. INFORMATION DATA AS NATIONAL PROPERTY AND FOR COMMON PROSPERITY

China's tech supremacy quest must be understood in connection with China's embracing and leveraging of information data as the new national property for common prosperity.[183] China passed the 2021 Personal Information Protection Law in order to execute its new strategy regarding information data.[184]

A. Data and China's Artificial Intelligence

China has distinguished itself in the areas of technology and data-based technology. In fact, China has already transformed as the global leader in artificial intelligence (AI).[185]

Two assets that are considered critical to AI are (i) data and computer science, and (ii) engineering talent—both of which China has aplenty. In recent decades, China has embarked on intensive efforts to promote and strengthen the technology and engineering

181. *Patent and Trademark Pledge*, *supra* note 176.

182. Aaron Wininger, *Patents Required to List on the Shanghai Stock Exchange's Science & Technology Board*, CHINA IP L. UPDATE (Mar. 20, 2020), https://www.chinaiplawupdate.com/2020/03/patents-required-to-list-on-the-shanghai-stock-exchanges-science-technology-board/ [https://perma.cc/A2JF-ZTDW] (noting, among other things, that applicants must own at least five patents to list on the Shanghai Science and Technology Innovation Board); Zhu Shenshen & Huan Yixuan, *Sci-Tech Companies Bask in the Glow of the STAR Market*, SHINE: NEWS (Aug. 13, 2021), https://www.shine.cn/news/in-focus/2108133535/ [https://perma.cc/S3LP-TKMT] (describing China's Shanghai Science and Technology Innovation Board, otherwise known as the STAR Market).

183. Comparatively, the European Union's perspective of information data solidifies through the lenses of human dignity. *See* Dongsheng Zhang, *Revolt Against the U.S. Hegemony: Judicial Divergence in Cyberspace*, 39 WIS. INT'L L.J. 1, 4 (2021) (explaining the contrasting ways the EU and China have defined "sovereignty" related to the internet).

184. Ken (Jianmin) Dai & Jet (Zhisong) Deng, *China's Personal Protection Law (PIPL)*, BLOOMBERG L. (Apr. 12, 2022), https://pro.bloomberglaw.com/brief/china-personal-information-protection-law-pipl-faqs/ [https://perma.cc/GME4-QHQ3] (describing what the PIPL is, how it is implemented, and what is protected under it).

185. Dan Milmo, *TechScape: How China Became an AI Superpower Ready to Take on the United States*, GUARDIAN (Dec. 8, 2021), https://www.theguardian.com/technology/2021/dec/08/techscape-china-ai-united-states [https://perma.cc/E2SK-HCZB] (reporting that "a mix of state support and entrepreneurial zeal means China is poised to win the next tech revolution—just as a former Google exec predicted"); *see generally* Fabian Westerheide, *China—The First Artificial Intelligence Superpower*, FORBES (Jan. 14, 2020), https://www.forbes.com/sites/cognitiveworld/2020/01/14/china-artificial-intelligence-superpower/ [https://perma.cc/9A32-S3JF] (comparing China's progress on AI to other international powers). Recently, China became the first country to pass the final text of new regulations governing artificial intelligence. *See* Joshua R. Fattal & Omer Tene, *China Passes Extensive Regulations Governing Artificial Intelligence Algorithms*, GOODWIN (Jan. 28, 2022), https://www.goodwinprivacyblog.com/2022/01/28/china-passes-extensive-regulations-governing-artificial-intelligence-algorithms/?utm_source=Mondaq&utm_medium=syndicate&utm_campaign=LinkedIn-integration [https://perma.cc/RR7J-YKV7] (stating that the Regulations became effective on March 1, 2022).

fields that produce high-quality computer scientists and engineers.[186] With enormous investment in Science, Technology, Education, and Math (STEM) education, China projects to produce more than 77,000 STEM Ph.D. graduates per year by 2025, while the United States will produce only 40,000.[187] Instead of leaving China for the United States, Chinese data scientists and engineers now choose to stay in China where top talents receive significantly larger salaries compared to their peers elsewhere.[188] China also initiates many programs to attract returning scientists and researchers whose overseas network and experience contributes to China's science and technology quest.[189] The welcoming of scientists and researchers by China stands in contrast with the United States' recent persecution and prosecution of Chinese nationals at U.S. universities.[190]

China is viewed as the Saudi Arabia of data. Whereas Saudi Arabia's oil reserves will be depleted through consumption over time, China's vast population, with hyper-adoptive and hyper-adaptive drives toward new technologies, generates fresh data beyond any reserve capability.[191] With unlimited sources of fresh data, Chinese firms can maintain their "competitive advantages" stemming from "the extent to which they can assemble a large database—and develop domain-specific knowledge or applications around the database—faster than anyone else."[192] While other countries may have large populations and potentially vast data-generated sources, they are unable to harness the power of data in

186. Li, Tong & Xiao, *supra* note 81 ("[China's] decades-long effort in promoting technology and engineering gives it a rich supply of high-quality computer scientists and engineers.").

187. Yojana Sharma, *Should The US Fear Rising Number of STEM PhDs in China?* UNIV. WORLD NEWS (Sept. 10, 2021), https://www.universityworldnews.com/post.php?story=20210910110221730 [https://perma.cc/C9QP-7ZW].

188. *China Hedge Funds Pay $300,000 to Beat Wall Street to Best Graduates*, BLOOMBERG (Sept. 1, 2021), https://www.bloomberg.com/news/articles/2021-08-31/china-quants-pay-300-000-to-beat-wall-street-to-best-graduates?in_source=embedded-checkout-banner [https://perma.cc/W6ZA-LY7Y] (reporting that top AI and computer science graduates defer their studies in the United States for high paying jobs in China); Fatou Darboe, *$3 Million Pay Packages. How a Chinese Startup Is Attracting Top Talent.*, CRM.ORG (Apr. 2, 2018), https://crm.org/articles/3-million-pay-packages-how-a-chinese-startup-is-attracting-top-talent [https://perma.cc/AGP2-FQ4R] (noting how ByteDance Technology is paying "unlimited salary for unlimited talent"); *AI Doctorates Earning Significantly More in China*, CHINA DAILY (Nov. 21, 2018), https://global.chinadaily.com.cn/a/201811/21/WS5bf4cbd7a310eff30328a1e2.html [https://perma.cc/K3RM-VXY8] (stating that AI professionals in China are in high demand).

189. Cong Cao, et al., *Returning Scientists and the Emergence of China's Science System*, 47 SCI. & PUB. POL'Y 172, 175 (2020), https://academic.oup.com/spp/article/47/2/172/5658550 [https://perma.cc/Q63R-MQQH] (listing the various Chinese programs intended to attract talent back to Chinese institutions).

190. Amy Qin, *As U.S. Hunts for Chinese Spies, University Scientists Warn of Backlash,* N.Y. TIMES (Nov. 28, 2021), https://www.nytimes.com/2021/11/28/world/asia/china-university-spies.html [https://perma.cc/SHT6-87R8] ("A chilling effect has taken hold on American campuses, contributing to an outflow of academic talent that may hurt the United States while benefiting Beijing."); Yojana Sharma, *Racial Profiling of Chinese Scientists Is Spreading Fear*, UNIV. WORLD NEWS (Oct. 29, 2021), https://www.universityworldnews.com/post.php?story=20211029085717338 [https://perma.cc/ZN6E-TC3B] (reporting on a major survey that shows the "[r]acial profiling of both Asian-American and Asian scientists in the United States is causing fear and anxiety, and particularly for researchers and faculty from China, leading them to reassess their future in the country").

191. Zak Dychtwald, *China's New Innovation Advantage*, HARV. BUS. REV., May-June 2021, at 55, 55 ("China is achieving a new level of global competitiveness, thanks to its hyper-adaptive population.").

192. Li, Tong & Xiao, *supra* note 81.

the AI areas to the same degree as China.[193] Moreover, as *The Economist* notes, China is exceedingly successful at utilizing AI because the country garners "good data."[194]

With "good data," Chinese AI companies can quickly deploy their new platform products and attract investors in their capital markets. For instance, Megvii and SenseTime, two Chinese AI startups, fetched billions in valuation because their applications are "the most widely deployed forms of artificial intelligence in the world."[195] SenseTime was named the world's highest-valued AI startup in 2018.[196] China's surge in AI dominance seems unstoppable. In fact, Nicholas Chaillan, the Pentagon's first chief software officer, resigned in protest of the United States' failure to keep up with China's AI capabilities.[197] The U.S. National Security Commission on Artificial Intelligence also issued a report detailing China's domination in the AI area and how China has been on track to surpass the United States as an AI superpower.[198] China's AI dominance is not a product of happenstance. In 2017, China's State Council proclaimed the initiation of the New Generation of Artificial Intelligence Development Plan to ensure the rapid transformation of China as the world's AI powerhouse.[199]

193. Ajit Ranade et al., *How China Has Left Behind India in the AI Race*, TIMES INDIA (Feb. 2, 2022), https://timesofindia.indiatimes.com/india/how-china-has-left-behind-india-in-the-ai-race/articleshow/89296335-.cms [https://perma.cc/P5YD-YG4M]; R. Shashank Reddy, *Can India Become an AI Hub for the Developing World?*, BBC (June 27, 2018), https://www.bbc.com/news/world-asia-india-44614802 [https://perma.cc/GG6Q-SCSE] (stating that, based on a report conducted by the Indiana government on AI, that "[w]hat stands out about the report is its suggestion that India cannot and will not compete with China in the AI realm - instead it will play to its advantages by becoming a global AI hub for non-Chinese and non-Western markets").

194. *China's Success at AI Has Relied on Good Data*, THE ECONOMIST (Jan. 2, 2020), https://www.economist.com/technology-quarterly/2020/01/02/chinas-success-at-ai-has-relied-on-good-data [https://perma.cc/TDT5-328Y].

195. *Id*.

196. Jon Russell, *China's SenseTime, The World's Highest-Valued AI Startup, Closes $620M Follow-on Round*, TECHCRUNCH (May 30, 2018), https://techcrunch.com/2018/05/30/even-more-money-for-senstime-ai-china/ [https://perma.cc/C2EG-YRDU].

197. Ben van der Merwe, *Weekly Data: How China Became an AI Powerhouse*, INV. MONITOR (Nov. 9, 2021), https://www.investmentmonitor.ai/tech/artificial-intelligence-monitor/weekly-data-how-china-became-an-ai-powerhouse [https://perma.cc/SXD7-JABE]; Rita Liao, *Chinese Facial Recognition Unicorn Megvii Prepares China IPO*, TECHCRUNCH (Jan. 13, 2021), https://techcrunch.com/2021/01/12/megvii-ipo-china/ [https://perma.cc/M78G-AR2Q].

198. *See* NAT'L SEC. COMM'N ON A.I., FINAL REPORT: NATIONAL SECURITY COMMISSION ON ARTIFICIAL INTELLIGENCE 7 (2021), https://www.nscai.gov/wp-content/uploads/2021/03/Full-Report-Digital-1.pdf [https://perma.cc/2QKU-FFZ8] ("China possesses the might, talent, and ambition to surpass the United States as the world's leader in AI in the next decade if current trends do not change.").

199. Guowuyuan Guanyu Yinfa Xinyidai Reng Fazhang de Tongzhi (国务院关于印发新一代人工智能发展规划的通知) [Notice of the State Council Issuing the New Generation of Artificial Intelligence Development Plan] (promulgated by the State Council Doc. No. 35, July 8, 2017, effective July 8, 2017) (China). Subsequently, China's State Council released new reports on China's AI strategies. *See* Peng Cai, *Focal Point of Legislation*, *in* AI, MACHINE LEARNING & BIG DATA LAWS AND REGULATIONS 2023 (5th ed. 2023), https://www.globallegalinsights.com/practice-areas/ai-machine-learning-and-big-data-laws-and-regulations/china [https://perma.cc/N63R-3YMS] (discussing Chinese AI strategy).

The "good data" that Chinese entities can harvest in abundance is a result of very lax privacy laws.[200] Despite the attention Chinese individuals get for being considered hyper-adapters that fuel innovation in China, little attention is given to privacy concerns.[201]

Because "good data" is vital to China's AI domination, the Chinese government installed a new legal framework to protect data as national property and articulate a common prosperity vision to rein in China's Big Tech's powerful influence.[202] Specifically, China enacted a series of laws pertaining to data security and protection, notably the Personal Information Protection Law, in late 2021.[203]

B. China's Personal Information Protection Law

On November 1, 2021, China imposed for the first time a comprehensive set of rules on data collection and protection under the new Personal Information Protection Law (PIPL).[204] Though the PIPL contains provisions similar to data protection principles seen in the European Union's General Data Protection Regulation (GDPR), the PIPL elevates China's control over data akin to control over national property. Also, the PIPL is seen as China's scheme to control Big Tech companies because they have become too powerful.

1. PIPL and Typical Data Protection Framework

China follows the GDPR approach by formulating similar key definitions. For instance, the PIPL broadly defines "personal information" to cover "various information related to identified or identifiable natural person recorded electronically or in other ways, excluding anonymized information."[205] PIPL distinguishes "personal information" from "sensitive personal information" which is defined as:

> personal information that, once leaked or used illegally, may easily lead to the infringement of the personal dignity of natural persons or may endanger his personal safety or property, including information such as biometrics, religious

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200. Tom Simonite, *How Health Care Data and Lax Rules Help China Prosper in AI*, WIRED (Jan. 8, 2019), https://www.wired.com/story/health-care-data-lax-rules-help-china-prosper-ai/ [https://perma.cc/8WSW-Q662] ("Gathering health care data is much easier for Chinese companies than for their US counterparts—a boost for machine-learning algorithms.").

201. Dychtwald, *supra* note 191.

202. Arjun Kharpal, *In a Quest to Rein in Its Tech Giants, China Turns to Data Protection*, CNBC (Apr. 11, 2021), https://www.cnbc.com/2021/04/12/china-data-protection-laws-aim-to-help-rein-in-countrys-tech-giants.html [https://perma.cc/5FDH-YXCP].

203. *China Passes Data Privacy Law Amid Clampdown on Tech Sector*, NIKKEI ASIA (Aug. 20, 2021), https://asia.nikkei.com/Politics/China-passes-data-privacy-law-amid-clampdown-on-tech-sector [https://perma.cc/N2Q5-Z4UF] (reporting on the set of new laws and regulations enacted by China to control tech companies); Scott Ikeda, *New Data Security Law in China Makes Government Power Over Tech Giants Absolute*, CPO MAG. (June 21, 2021), https://www.cpomagazine.com/data-protection/new-data-security-law-in-china-makes-government-power-over-tech-giants-absolute/ [https://perma.cc/7W3V-BU4U].

204. Zhōnghuá rénmín gònghéguó gèrén xìnxī bǎohù fǎ (中华人民共和国个人信息保护法) [Personal Information Protection Law of the People's Republic of China] (promulgated by the Standing Comm. Nat'l People's Cong., Aug. 20, 2021, effective Nov. 1, 2021) (China) [hereinafter PIPL].

205. *Compare id.* art. 4, *with* Commission Regulation 2016/679 of Apr. 27, 2016, Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Directive 95/46/EC, art. 4, 2016 O.J. (L 119) 1, 33 [hereinafter GDPR] (defining, for the European Union, "personal data" to mean "any information relating to an identified or identifiable natural person").

> belief, specific identity, medical health status, financial accounts, and the person's whereabouts, as well as the personal information of minors under the age of 14 years.[206]

That means the PIPL governs all personal information except the irreversibly anonymized information.[207]

The consent requirement in the PIPL is similar to that of the GDPR.[208] An individual's consent "shall be given voluntarily and explicitly by the individual under the premise of full knowledge."[209] However, article 13 of the PIPL provides exceptions to the processing of personal information without consent.[210]

Similarly, the PIPL embraces the GDPR's "individual's rights"[211] over their personal information, including: (1) the right to be informed and make decisions about the processing of their personal information;[212] (2) the right to restrict the processing of their personal information by others;[213] (3) the right to data portability;[214] (4) the right to

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206. *Id.* art. 28.

207. Ryan D. Junck et al., *China's New Data Security and Personal Information Protection Laws: What They Mean for Multinational Companies*, SKADDEN ARPS SLATE MEAGHER & FLOM LLP (Nov. 3, 2021), https://www.skadden.com/Insights/Publications/2021/11/Chinas-New-Data-Security-and-Personal-Information-Protection-Laws [https://perma.cc/SD8W-8HBC].

208. GDPR, *supra* note 205, art. 4(11) defines consent as "[c]onsent of the data subject means any freely given, specific, informed and unambiguous indication of the data subject's wishes by which he or she, by a statement or by a clear affirmative action, signifies agreement to the processing of personal data relating to him or her." *See also What Are the GDPR Consent Requirements?* GDPR.EU, https://gdpr.eu/gdpr-consent-requirements/ [https://perma.cc/M7EK-FEGB].

209. PIPL, *supra* note 204, art. 14. Additionally, article 13(1) states that "Personal information processors can only process personal information if one of the following circumstances is met: (1) Obtain the consent of the individual." *Id.* art. 13(1); *see also id.* art. 21–23.

210. The exceptions include:

> (2) Necessary for the conclusion or performance of a contract in which the individual is a party, or necessary for human resources management in accordance with the labor rules and regulations established in accordance with the law and collective contracts signed in accordance with the law;
>
> (3) the processing is necessary for the performance of statutory duties or obligations;
>
> (4) the processing is necessary for the response to public health emergencies, or for the protection of life, health, and property safety of natural persons in emergencies;
>
> (5) the personal information is reasonably processed for news reporting, media supervision, and other activities conducted in the public interest;
>
> (6) the personal information disclosed by the individual himself or other legally disclosed personal information of the individual is reasonably processed in accordance with this Law; and
>
> (7) other circumstances as provided by laws or administrative regulations.

Id. art. 13.

211. The GDPR's "individual rights" cover the right to be informed, the right to access, the right to rectification, the right to erasure, the right to restrict processing, the right to data portability, the right to object, and the rights related to automated decision-making including profiling. Luke Irwin, *What Are the Data Subject Rights under the GDPR*, IT GOVERNANCE (Mar. 10, 2021), https://www.itgovernance.co.uk/blog/what-are-the-data-subject-rights-under-the-gdpr [https://perma.cc/ADM8-CRKR].

212. PIPL, *supra* note 204, art. 44.

213. *Id.*

214. *Id.* art. 45.

access;[215] (5) the right to delete;[216] (6) the right to correct or supplement their personal information;[217] (7) the right not to be subject to automated decision making;[218] (8) the right to object and withdraw consent;[219] and (9) the right to file a lawsuit in a people's court if the personal information processor refuses an individual's request to exercise their rights.[220] Furthermore, the PIPL contains specific provisions pertaining to government permission on data transfer.[221]

2. PIPL and Government Permission on Data Transfer

In addition to the typical framework of data protection seen in the European Union's General Data Protection Regulation, China's PIPL law imposes strict requirements on the transferring of Chinese citizens' data outside China.[222] The requirements include acquiring government permission.[223] Entities wishing to engage in any activities involving the transfer of personal information data must pass a security assessment conducted by the China Cyberspace Administration.[224] Alternatively, the entities may obtain a certification issued by an organization authorized by the China Cyberspace Administration.[225] The entities in China and overseas companies receiving the data must sign a cross-border data transfer agreement specifying the rights and obligations of the parties in accordance with the standard contract formulated by the China Cyberspace Administration.[226]

Essentially, data belongs neither to the users of technologies nor collectors. Data belongs to the State because only the Chinese government has the authority to grant

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215. *Id.*

216. *Id.* art. 45–47.

217. PIPL, *supra* note 204, art. 45–47.

218. *Id.* art. 24. Article 24 states the following:

> Personal information processors using personal information to make automated decision-making shall ensure the transparency of decision-making and the fairness and impartiality of the results, and shall not impose unreasonable differential treatment on individuals in terms of transaction prices and other transaction conditions.
>
> Pushing information and commercial marketing to individuals through automated decision-making methods should also provide options that are not tailored to their personal characteristics, or provide individuals with a convenient way to refuse.
>
> To make decisions that have a significant impact on personal rights and interests through automated decision-making, individuals have the right to require personal information processors to explain, and have the right to refuse personal information processors to make decisions only through automated decision-making.

Id.

219. PIPL, *supra* note 204, art. 47.

220. *Id.* art. 50.

221. *See infra* Part III.B.2 (discussing data transfer laws under the PIPL).

222. *See* Rogier Creemers & Graham Webster, *Translation: Personal Information Protection Law of the People's Republic of China – Effective Nov. 1, 2021,* DIGICHINA (Sept. 7, 2021), https://digichina.stanford.edu/work/translation-personal-information-protection-law-of-the-peoples-republic-of-china-effective-nov-1-2021/ [https://perma.cc/3XJG-XWZU].

223. PIPL, *supra* note 204, art. 55.

224. *Id.*

225. *Id.*

226. *Id.*

permission for the transfer of data outside of China. In other words, China is treating data as a type of national property that is essential to its security in order to become a powerhouse in science and technology, including AI. Because of such treatment, PIPL violators face penalties for noncompliance. Penalties for noncompliance include a warning and an order to correct the violation, suspension of services, revocation of business licenses, confiscation of ill gains, administrative fines, and criminal liabilities.[227] Most severely, violators' employees can be held personally liable and face up to three years of imprisonment if the violations are more severe in scope.[228]

Consequently, China's Big Tech companies cannot engage in activities related to data without compliance with the new PIPL law.[229] Many see China controlling tech giants by using the PIPL to crack down on these companies because they now must obtain user consent to collect and use the data.[230] However, Chinese government agencies collecting and using personal information data do not face similar restrictions to those imposed on private companies. That means the Chinese government can continue to collect vast data as it has always done to fulfill its "statutory duties" and responsibilities.[231]

In addition, the Chinese government has positioned its efforts to rein in Big Tech companies under the campaign for common prosperity.[232] Collecting and using massive

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227. *Id.* art. 71.

228. *See China's New National Privacy Law: The PIPL*, COOLEY ALERT (Nov. 30, 2021), https://www.cooley.com/news/insight/2021/2021-11-30-china-new-national-privacy-law [https://perma.cc/GZ9H-685Z]

> Companies and/or their employees may even face criminal liability in serious cases. For instance, any person who illegally obtains, sells or supplies to third parties more than 500 pieces of information that can affect citizens' personal and financial safety (such as lodging information, communication records, health and physical information, transaction information, etc.) in violation of the PIPL may be sentenced to up to three years of detention.

See also Zhonghua Renming Xingfa (中华人民共和国刑法) [The Criminal Law of the People's Republic of China] (promulgated by the Standing Comm. Nat'l People's Cong. July 1, 1979, *rev'd* Feb. 28, 2009, effective Feb. 28, 2009, art. 7 (China) (adding article 253a to the criminal code); and art. 5.4 of the Interpretation of the Supreme People's Court and the Supreme People's Procuratorate on Several Issues concerning the Application of Law in the Handling of Criminal Cases of Infringing on Citizens' Personal Information.

229. Kharpal, *supra* note 202.

230. *Id.; see also* Ye, *supra* note 151 (noting that in addition to user consent, a "key aspect of the legislation is its ban on algorithmic price discrimination, which will have a huge impact on ride-hailing platforms like Didi Chuxing").

231. PIPL, *supra* note 204, art. 34–35.

232. As the income gap has widened, President Xi Jinping has called on big businesses and entrepreneurs to narrow the wealth gap under the Communist Party's "common prosperity" vision. *See* Chris Buckley, Alexandra Stevenson & Cao Li, *Warning of Income Gap, Xi Tells China's Tycoons to Share Wealth*, N.Y. TIMES (Nov. 11, 2021), https://www.nytimes.com/2021/09/07/world/asia/china-xi-common-prosperity.html [https://perma.cc/935X-7459] (discussing President Jinping's comments). China's Big Techs have participated in the common prosperity. *See* Xinmei Shen, *China's Big Tech Answers Xi's Call for 'Common Prosperity' as Tencent, Meituan and Pinduoduo Launch New Initiatives*, S. CHINA MORNING POST (Sept. 1, 2021), https://www.scmp.com/tech/big-tech/article/3147185/chinas-big-tech-answers-xis-call-common-prosperity-ten-cent-meituan [https://perma.cc/BH5F-5XLN] ("China's biggest tech giants are answering Beijing's call to help reduce the wealth gap by adding new initiatives to other recent philanthropic efforts"); Arjun Kharpal, *China's Tech Giants Pour Billions into Xi's Vision of 'Common Prosperity*,*'* CNBC (Sept. 5, 2021), https://www.cnbc.com/2021/09/03/chinas-tech-giants-pour-billions-into-xis-goal-of-common-prosperity.html [https://perma.cc/Z8QA-6F7Y].

"good data" has allowed Big Tech companies to become too powerful in a short period of time.[233] To rein in Big Tech companies, China bans certain anticompetitive business models, such as algorithmic price discrimination.[234] In addition, China reduces the stronghold exerted by Big Tech by forcing them to permit small companies access to technology and platforms.[235] Also, under the direction of the Ministry of Industry and Information Technology, small companies will gain opportunities to be "little giants" through tax cuts, generous loans, personnel benefits, and technology access.[236] Outside China, however, "little giants" are viewed as new weapons in the tech wars between China and the United States.[237]

In summary, by transforming information data into national property and controlling tech companies of all sizes, the Chinese government consolidates its authority over the most valuable assets necessary for the tech supremacy quest.

IV. DIGITAL RMB FOR DOMESTIC AND INTERNATIONAL MARKETS FOR TECH PRODUCTS AND SERVICES

Because the Chinese population is known to be willing to adapt to new technologies, the enormous Chinese market is very attractive for producers of new tech products and services.[238] Leveraging Chinese enthusiasm for acquisitions of new technologies, China

233. For instance, Didi Chuxing, China's Uber ride-hailing platform, uses data in its business model, including algorithmic price discrimination. China uses the PIPL law to ban such discrimination. Ye, *supra* note 151 (reporting that a "key aspect" of PIPL legislation is "its ban on algorithmic price discrimination, which will have a huge impact on ride-hailing platforms like Didi Chuxing").

234. *See id.* (discussing Chinese government efforts to curb price anticompetitive price discrimination).

235. *China to Add 3,000 'Little Giants' This Year to Spur Innovation*, BLOOMBERG (Feb. 28, 2022), https://www.bloomberg.com/news/articles/2022-02-28/china-to-add-3-000-little-giants-this-year-to-spur-innovation [https://perma.cc/J26Z-UETD] (reporting that China will "encourage large companies to make their markets, technologies and talents accessible for such startups"). In total, almost 8000 companies have received the Little Giants designations. *Id.; see also* Josh Horwitz, *Chinese Tech Execs Support 'Common Prosperity', Helping SMEs at Internet Summit*, REUTERS (Sept. 26, 2021), https://www.reuters.com/technology/chinese-tech-execs-support-common-prosperity-helping-smes-internet-summit-2021-09-26/ [https://perma.cc/DR3V-TBAN] ("Chinese technology executives, facing a crackdown by the authorities, pledged support on Sunday for Beijing's 'common prosperity' drive and to help smaller companies.").

236. *China to Add 3,000 'Little Giants' This Year to Spur Innovation*, *supra* note 235.

237. *China's 'Little Giants' Are Its Latest Weapon in the U.S. Tech War*, BLOOMBERG NEWS (Jan. 24, 2022), https://www.yahoo.com/now/china-little-giants-latest-weapon-210011125.html [https://perma.cc/CZ98-UY76]; Xavier Kong, *"Little Giants" of China to Lead New Wave of Tech War*, TECHWIRE (Jan. 26, 2022), https://techwireasia.com/2022/01/little-giants-of-china-to-lead-new-wave-of-tech-war/ [https://perma.cc/54KN-2KFZ].

238. Katie Canales, *How Silicon Valley Came to Depend on China for Success—and Why It's Bent Over Backward to Stay in the Government's Good Graces*, BUS. INSIDER (Dec. 15, 2021), https://www.businessinsider.com/silicon-valley-china-tech-apple-linkedin-google-2021-12#:~:text=The%20tech%20giant%20has%20grown,total%20iPhone%20sales%2C%20analysts%20estimate [https://perma.cc/G9B2-3G6V] (reporting that "China is a lucrative market for large US tech companies" and that LinkedIn, Apple, and other tech companies have abided by the Chinese government's wishes in order to operate there); Sarah Kelly, *Apple Reaches Highest-Ever Market Share in China*, SWRVE (Feb. 24, 2022), https://www.swrve.com/resources/weblog/apple-reaches-highest-ever-market-share-in-china [https://perma.cc/D2EQ-4MS3]; Josh Horwitz, *Apple Grabs Record China Market Share as Q4 Sales Surge-Research*, REUTERS (Jan. 26, 2022), https://www.reuters.com/technology/apple-grabs-record-china-market-share-q4-sales-surge-research-2022-01-26/ [https://perma.cc/JEN7-UUBG].

introduced the digital RMB (or e-CNY) after successful pilot testing in multiple cities. The e-CNY cements China's leadership in digital currencies for central banks in other countries. Most importantly, the e-CNY will allow easy means of payment and settlement both domestically and internationally.

China's digital currency should be contextualized within recent new laws—the 2022 Law on Science and Technology Progress, the 2021 Personal Information Protection Law, and national strategies relating to *Made in China 2025* and *National Intellectual Property Initiatives*. China's plan to be a powerhouse in science and technology means both Chinese and international markets should expect a new era of Chinese tech products and services. Consequently, if China achieves its goal of tech supremacy, an influx of Chinese tech products and services will likely dominate both domestic and international markets. In such a case, e-CNY will be the currency of exchange.

Strategically, China's release of the e-CNY as a centralized, cash-like digital currency competes against other digital currencies, including cryptocurrencies; the e-CNY is fully backed by the People's Bank of China (PBOC) or China's Central Bank.[239] That means the Renminbi continues to be the dominant currency in China.

In addition, China wants to control the entire payment system by providing the e-CNY as a digital currency that is easy to use, fully accessible to all, low cost, and with limited anonymity.[240] Only a mobile phone number is required in order to have an e-CNY wallet.[241] Consequently, all mobile payment service providers can immediately put the e-CNY into operation.[242] Additionally, The e-CNY wallets are not bank accounts.[243] Only banks have the authority to convert e-CNY into bank deposits and turn deposits into e-CNY.[244] China designated six large state-owned banks and two internet banks, WeBank[245]

239. *Digital Yuan: What Is It and How Does It Work?,* DEUTSCHE BANK NEWS (July 14, 2021), https://www.db.com/news/detail/20210714-digital-yuan-what-is-it-and-how-does-it-work [https://perma.cc/FXC7-A93V].

240. *Id.*

241. *Id.*

242. *Id.*

243. *Id*

244. *Digital Yuan*, *supra* note 239.

245. WeBank is the world's leading digital bank in China. *The Largest Digital Bank in China Featured in the Latest Forbes Blockchain 50*, CISION PR NEWSWIRE (Feb. 11, 2022), https://www.prnewswire.com/news-releases/the-largest-digital-bank-in-china-featured-in-the-latest-forbes-blockchain-50-301480517.html [https://perma.cc/DP5A-ENFK]; *see also About Us*, WEBANK FINTECH, https://fintech.webank.com/en/aboutus/ [https://perma.cc/UA5D-7WMA]

> As the 1st digital bank in China, WeBank is devoted to offering unbanked and underbanked individuals and SMEs with a variety of convenient and high-quality financial services around the clock. In 2018, WeBank has furthered its commitment to financial inclusion by launching WeBank FinTech to promote the Open Banking ecosystem to enable inclusive and contextual financial services for international partners.

and MYBank,[246] with the authority to open e-CNY wallets.[247] In other words, these eight banks will provide customer services and exercise Know Your Customer duties.[248] These banks will collect data, trace transactions, and know all activities relating to e-CNY.

Internationally, China is working with the Bank of International Settlements, together with the Bank of Hong Kong, Bank of Thailand, and the Bank of the United Arab Emirates, to develop interoperability of the e-CNY.[249] With cross-border functionality of the e-CNY, China expects to see its renminbi as *the* currency for international payments and settlements.[250]

In summary, China's quest for tech supremacy is deeply anchored in positioning e-CNY as the digital currency of choice so that users' transactions and activities may serve as new sources of "good data" within the control of the Chinese government.

V. IMPLICATIONS OF TECH SUPREMACY TO THE U.S. BUSINESS AND POLICY MAKERS

In 1980, four decades before China's quest for tech supremacy, the United States passed its only legislation addressing the utilization of science and technology prowess

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246. *Jack Ma's Online Bank Is Leading a Quiet Revolution in Chinese Lending*, FORTUNE (July 29, 2019), https://fortune.com/2019/07/29/jack-ma-mybank-lending/ [https://perma.cc/E2EW-SQCS]

> Using real-time payments data and a risk-management system that analyzes more than 3,000 variables, Ma's four-year-old MYbank has lent 2 trillion yuan ($290 billion) to nearly 16 million small companies. Borrowers apply with a few taps on a smartphone and receive cash almost instantly if they're approved. The whole process takes three minutes and involves zero human bankers. The default rate so far: about 1%.

MYbank's Use of Digital Technology Leads to Record Growth in Rural Clients, BUS. WIRE (June 23, 2021), https://www.businesswire.com/news/home/20210623005998/en/MYbank%E2%80%99s-Use-of-Digital-Technology-Leads-to-Record-Growth-in-Rural-Clients [https://perma.cc/N9TN-PKY9]; *Ant-Backed MYbank Joins China's Digital Yuan Pilot,* REUTERS (Feb. 22, 2021), https://www.reuters.com/article/us-china-ant-group-yuan/ant-backed-mybank-joins-chinas-digital-yuan-pilot-idUSKBN2AM0V5 [https://perma.cc/B3SZ-JKH5].

247. *Digital Yuan*, *supra* note 239.

248. *Id.*; *see also What Is KYC?*, SWIFT, https://www.swift.com/your-needs/financial-crime-cyber-security/know-your-customer-kyc/meaning-kyc [https://perma.cc/8ZTA-AC8E] (explaining KYC standards are designed to "protect financial institutions against fraud, corruption, money laundering and terrorist financing. KYC involves several steps to: establish customer identity; understand the nature of customers' activities and qualify that the source of funds is legitimate; and assess money laundering risks associated with customers").

249. Ananya Kumar, *A Report Card on China's Central Bank Digital Currency: The e-CNY,* ATL. COUNCIL (Mar. 1, 2022), https://www.atlanticcouncil.org/blogs/econographics/a-report-card-on-chinas-central-bank-digital-currency-the-e-cny/#:~:text=China's%20e%2DCNY%20is%20the,central%20banks%2C%20and%20international%20institutions [https://perma.cc/XMD4-AKR7]; *see also* BIS INNOVATION HUB, PROJECT MBRIDGE: CONNECTING ECONOMIES THROUGH CBDC 8 (2022), https://www.bis.org/about/bisih/topics/cbdc/mcbdc_bridge.htm [https://perma.cc/WY5J-L9MV] (discussing how the international central bank digital currency movement can connect different economies).

250. *Id.*; *see also* Mikk Raud & Eli MacKinnon, *China's Digital Currency and Blockchain Network: Disparate Projects or Two Sides of the Same Coin?*, DIGICHINA (Mar. 8, 2022), https://digichina.stanford.edu/work/chinas-digital-currency-and-blockchain-network-disparate-projects-or-two-sides-of-the-same-coin/ [https://perma.cc/H2LB-LP28] ("[T]he Chinese government aims to develop a global universal digital payments network (UDPN) 'enabling a standardized digital currency transfer method and payment procedure for any information system.'").

stemming from universities and research institutes.[251] The celebrated Bayh-Dole Act allows universities and nonprofit organizations to own and commercialize patents resulting from government-funded research.[252] Ironically, the Bayh-Dole Act was a response to the then-decline of U.S. innovations in *post*-World War II as well as the global rise of Japanese corporations in tech production and investment.[253]

The Bayh-Doyle Act unleashes universities–industries linkages that have generated more than $1.3 trillion in U.S. economic growth and created more than 4.2 million jobs.[254] Across the nation's universities, 11,000 new startups sprung up.[255] Prior to 1980, federal-

251. Liza Vertinsky, *Universities as Guardians of Their Inventions*, 2012 UTAH L. REV. 1949, 1966 (stating that the Bayh-Dole Act is the "only major modern piece of federal legislation dealing specifically with university technology transfer" that allows universities to develop and own innovations with federal grants for subsequent commercialization with the private sector); David B. Audretsch, *Scientific Entrepreneurship: The Stealth Conduit of University Knowledge Spillovers*, 21 GEO. MASON L. REV. 1015, 1019 (2014) (recounting U.S. Senator Birch Bayh's statement regarding the "wealth of scientific talent at American colleges and universities" responsible for innovation scientific breakthroughs would go to waste if government barriers are not removed through new legislation); *see also* Jay P. Kesan, *Transferring Innovation*, 77 FORDHAM L. REV. 2169, 2175 (2009) (providing an analysis of university technology transfer activities after the Bayh-Dole Act became effective).

The Bayh-Dole Act, 35 U.S.C. § 200, articulates its policy and objective for universities and nonprofit organizations to pursue patents and commercialize their inventions:

> It is the policy and objective of the Congress to use the patent system to promote the utilization of inventions arising from federally supported research or development . . . to promote collaboration between commercial concerns and nonprofit organizations, including universities; to ensure that inventions made by nonprofit organizations and small business firms are used in a manner to promote free competition and enterprise without unduly encumbering future research and discovery; to promote the commercialization and public availability of inventions made in the United States by United States industry and labor . . . .

35 U.S.C. § 200.

252. *See, e.g.*, Vertinsky, *supra* note 251, at 1965 ("The Bayh-Dole Act was widely heralded as landmark legislation that would promote increased utilization of university discoveries."); Michael S. Mireles, Jr., *States as Innovation System Laboratories: California, Patents, and Stem Cell Technology*, 28 CARDOZO L. REV. 1133, 1141 (2006) (discussing the purposes of the Bayh-Dole Act as the federal model for patent ownership with government funding); *see also* Charles R. McManis & Brian Yagi, *The Bayh-Dole Act and the Anticommons Hypothesis: Round Three*, 21 GEO. MASON L. REV. 1049, 1057 (2014)

> Further empirical support for the conclusion that the patent system in general and the Bayh-Dole Act in particular played an important role in stimulating university patenting and licensing in the United States can be found in studies comparing the experience of universities in the United States with experiences elsewhere in the world during the same period.

253. Julie Manning Magid, *Monetize vs. Incentivize: Contracting for Health Care Innovation*, 19 U. PA. J. BUS. L. 369, 387–88 (2017) (discussing the origin of the U.S. legislation to spur innovations to address the concerns in the 1970s that American inventiveness was in decline and U.S. corporations were falling behind Japanese competitors in production and investment in technologies); Parker Tresemer, *Best Practices for Drafting University Technology Assignment Agreements After* Filmtec, Stanford v. Roche*, and Patent Reform*, 2012 U. ILL. J.L. TECH. & POL'Y 347, 349 (recounting how both U.S. innovation decline and global competition from Japan in the 1960s were key factors that influenced the passage of the Bayh-Dole Act).

254. Walter Copan, *Reflections on the Impacts of the Bayh-Dole Act for U.S. Innovation, on the Occasion of the 40th Anniversary of This Landmark Legislation*, IPWATCHDOG (Nov. 2, 2020), https://www.ipwatchdog.com/2020/11/02/reflections-on-the-impacts-of-the-bayh-dole-act-for-u-s-innovation-on-the-occasion-of-the-40th-anniversary-of-this-landmark-legislation/id=126980/ [https://perma.cc/9PFB-4W4Y].

255. *Id.*

funded research yielded no new drugs or vaccines because the federal government locked up the ownership of intellectual property rights.[256] The Bayh-Dole Act changed that, and over 200 new drugs and vaccines have been developed and approved, in addition to numerous developments in technologies in all sectors, from transportation to the internet, drones, artificial intelligence, renewable energies, consumer electronics, food products, and new materials, among others.[257] The Bayh-Dole Act is an exemplar of strong bipartisan support to create a law for lasting impact on public-private partnership and entrepreneurship.[258] But after subsequent decades of government gridlocks, discontent, and divisions, the Bayh-Dole Act serves as a distant memory of bipartisan cooperation.[259]

Most dangerously, China's quest for tech supremacy—as seen in China's 2022 Law on Science and Technology Progress, *Made in China 2025*, and China's *National Intellectual Property Strategies*—is so ambitious and vast in scale that it would render Bayh-Dole Act's impact too small in today's tech war. China's all-out-efforts—from Little Giants to national laboratories systems, R&D institutions, universities–industries linkages, market-oriented ecosystems with VCs and financing enterprises, entrepreneur benefits, and massive funding and support at all government levels for institutions, businesses, and individuals in the science and technology fields—will unleash an impact unmatched by the current approach of the United States.

Moreover, AI and new technologies today rely heavily on "good data" that is outside the scope of the Bayh-Dole Act's vision of patent ownership and commercialization by research institutions. China's ability to generate fresh data on a massive scale will position China to leap ahead of the United States in AI areas.

Consequently, U.S. businesses should anticipate the speed of new technologies developing in China and the momentum of Chinese independence from U.S. core technologies. That means that U.S. companies currently enjoying nice market shares in

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256. *Id.*

257. *Id.*

258. Carl E. Gulbrandsen, *Bayh-Dole: Wisconsin Roots and Inspired Public Policy*, 2007 WIS. L. REV. 1149, 1149.

> When a person discusses the Bayh-Dole Act—named after two highly respected U.S. Senators, Birch Bayh of Indiana and Robert Dole of Kansas—a gravitational force inevitably pulls one towards the Senate . . . . It is a truism that the Senate took the lead. Bayh and Dole were the original' cosponsors.

The Act aimed to create "partnerships between government, universities, and start-up firms." *Id*. at 1150.

259. *See* Abbe R. Gluck, Anne Joseph O'Connell & Rosa Po, *Unorthodox Lawmaking, Unorthodox Rulemaking*, 115 COLUM. L. REV. 1789, 1818 (2015) (focusing on how the current gridlock, failures, and divisions in Congress led to unorthodox lawmaking and rulemaking). The authors observed:

> Major policy today is often the product of "unorthodox lawmaking" and "unorthodox rulemaking"—deviations from traditional process marked by frequent use of omnibus bills and multiple agency implementation; emergency statutes and regulations issued without prior comment; outsourcing to lawmaking commissions and unconventional delegates; process shortcuts outside of emergencies; presidential policymaking; and outside drafters, some nonpartisan and others hyperpartisan. These unorthodoxies are everywhere, and they have shifted the balance in the elected branches and beyond, often centralizing power in actors—like party leadership and the White House—not traditionally part of the core lawmaking and rulemaking processes. These unorthodoxies are the new textbook process.

Id. at 1789. Interestingly, government failures are seen in a survey of 28 countries, including the United States. Caroline Kaeb*, Corporate Engagement with Public Policy: The New Frontier of Ethical Business*, 50 CASE W. RSRV. J. INT'L L. 165, 178 (2018).

China should expect a reduction in demand from China. Moreover, Chinese companies with new technologies and breakthrough ideas receiving subsidies, tax benefits, and support from the Chinese governments at all levels will be dominant competitors to U.S. companies in the U.S. domestic market.

Even before the enactment of the 2022 Law on Science and Technology Progress, we had already witnessed the beginning of Chinese breakthroughs. MIT's landmark study, *The Future Postponed*, identified numerous Chinese breakthroughs while their U.S. counterparts have been suffering from a severe lack of research funding.[260] Illustrative examples of Chinese companies with breakthroughs include TikTok,[261] Cambricon,[262] Megavii, and SenseTime.[263] As these companies provide a very small hint of what China's tech supremacy may generate, U.S. companies will face formidable challenges as they encounter innovative Chinese products and services in core industries.

CONCLUSION

With the United States turning its attention to the war and humanitarian crisis in Europe and increasing its defense budget, China marches feverishly and confidently forward towards new frontiers of scientific and technological progress. The gap is narrowing between the United States and China on many fronts, but it will close entirely if there is no serious response from both U.S. businesses and the government on all levels.[264]

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260. COMM. TO EVALUATE THE INNOVATION DEFICIT, MASS. INST. TECH., THE FUTURE POSTPONED: WHY DECLINING INVESTMENT IN BASIC RESEARCH THREATENS A U.S. INNOVATION DEFICIT (2015), https://www.aau.edu/sites/default/files/AAU%20Files/Key%20Issues/Innovation%20%26%20Competitiveness/Future-Postponed.pdf [https://perma.cc/L6LZ-5NSP] (listing achievements such as "the discovery of a new fundamental particle" and "development of the world's fastest supercomputer"). The study documents the innovation crisis in the United States with examples of "under-exploited areas of science and likely consequences in the form of an innovation deficit, including: opportunities with high potential for big payoffs in health, energy, and high-tech industries; fields where we risk falling behind in critical strategic capabilities such as supercomputing, secure information systems, and national defense technologies; areas where national prestige is at stake, such as space exploration, or where a lack of specialized U.S research facilities is driving key scientific talent to work overseas." *Id*. at v–vi; *see also* Nguyen & Maine, *supra* note 42, at 1689 (discussing MIT's study).

261. Johan Moreno, *TikTok Surpasses Google, Facebook as World's Most Popular Web Domain*, FORBES (Dec. 29, 2021), https://www.forbes.com/sites/johanmoreno/2021/12/29/tiktok-surpasses-google-facebook-as-worlds-most-popular-web-destination/?sh=78d6fdfd43ef [https://perma.cc/8UPP-QCNM]; *The Story of TikTok: How It Took the World by a Storm?*, BRAINIUM (May 14, 2020), https://www.brainiuminfotech.com/blog/story-of-tiktok-how-it-took-world-by-storm/ [https://perma.cc/X72P-VNAE].

262. Cambricon produced the first AI-optimized computer chip worldwide. *See* Christina Larson, *China's Massive Investment in Artificial Intelligence Has an Insidious Downside, The Country's R&D Advances Are Disrupting the Industry—and Strengthening Control of the Populace*, SCI. (Feb. 8, 2018), https://www.science.org/content/article/china-s-massive-investment-artificial-intelligence-has-insidious-downside [https://perma.cc/9J8U-W3ZY] (discussing Cambricon); *Cambricon Unveils Its First AI Chip for Cloud Computing*, MEDIUM (May 3, 2018), https://medium.com/syncedreview/cambricon-unveils-its-first-ai-chip-for-cloud-computing-d3f7acdb4076 [https://perma.cc/VC4R-3CSF].

263. *See China's Success at AI Has Relied on Good Data*, THE ECONOMIST (Jan. 2, 2020), https://www.economist.com/technology-quarterly/2020/01/02/chinas-success-at-ai-has-relied-on-good-data [https://perma.cc/TDT5-328Y].

264. The United States did try to respond by enacting the CHIPS Act to increase the production of computer chips domestically, for fear that China may invade Taiwan and cause disruption, but those efforts fell short. *See* Don Clark & Ana Swanson, *U.S. Pours Money Into Chips, but Even Soaring Spending Has Limits*, N.Y. TIMES (Jan. 1, 2023), https://www.nytimes.com/2023/01/01/technology/us-chip-making-china-invest.html [https://perma.cc/C8FC-TJ8T].