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Assessing Chinese and U.S. Technology Diffusion Capacity

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About This Research Report

In this report, we measure U.S. and Chinese technological *diffusion capacity*, or a country's ability to effectively spread innovations through its economy. We ask, "Which country is better positioned to leverage technological advancements and maximize productivity gains?" The question is strategically consequential because it is at the core of today's economic competition between the two countries. Understanding diffusion capacity is important for U.S. policymakers because it is a crucial metric for assessing how technological change will shape the broader outcome of the strategic competition between the United States and China.

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Summary

Technological competition between the United States and China is a defining feature of contemporary strategic rivalry and will shape the future distribution of economic and geopolitical power. When considering this competition, the key question is not only, “Which country leads in technological innovation?” but also, “Which country is better able to diffuse technological advances across its economy and convert them into sustained productivity gains?” In this report, we examine the two countries’ potential technological diffusion capacity to understand the broader trajectory of U.S.-China competition.

Approach

To measure diffusion capacity, we develop an analytical framework comprising three components of national diffusion capacity: *actors*, *linkages*, and *contextual factors*. We then populate the framework using proxies that we selected based on their theoretical and empirical relationship to the framework component they aim to measure. Finally, we conduct a country-level comparative assessment based on these metrics. We explore each metric through two dimensions of technology diffusion: *production diffusion*, which refers to the process through which a new technology spreads in the production and supply side of an economy, and *adoption diffusion*, which describes the spread of technology on the demand and use side of the economy.

Key Findings

By using our technology diffusion framework, we arrived at the following cross-cutting key findings:

- The United States and China have developed fundamentally different, but comparably effective, models for *production diffusion* but neither country’s headline technology metrics accurately reflect the depth of its *adoption diffusion*. Both countries share a critical blind spot: the adoption gap among nontechnology small and medium-sized enterprises, which account for the majority of employment in both economies.
- Our analysis indicates that the United States holds an overall advantage over China in diffusion capacity. This finding reflects stronger performance across six of the eleven metrics in our framework, specifically research organizations, enterprise dynamics, research–enterprise linkages, absorptive capacity, intermediary organizations, and legal-commercial institutions (a subcategory of the legal and regulatory systems metric). In contrast, China leads in research–research linkages and state policy coordination (another subcategory of legal and regulatory systems), which underpins a more coordinated technology adoption architecture. However, China’s focus on selective, state-driven linkages, while strengthening research–research connections, appears to constrain broader

research–enterprise integration. For the remaining metrics, performance differences are present but do not point to a clear advantage for either country.

- This result should not be interpreted as indicating that China has a weak technological diffusion system; this implies only that the Chinese system has fewer structural advantages for technology diffusion than that of the United States in mid-2026. Additionally, available data and metrics to assess technological diffusion could fall short of fully capturing a highly informal system, such as that of China.

Our framework also revealed country-specific findings. For the United States, we found the following:

- In terms of technology production diffusion, the U.S. diffusion model is market-led and network-driven, anchored in strong research organizations, dense research–enterprise linkages, large firms, and a mature intermediary ecosystem. This creates a flexible and highly connected innovation system capable of translating new technologies into commercial applications across a wide variety of sectors.
- In terms of technology adoption diffusion, the United States demonstrates strong absorptive capacity and benefits from large enterprises and advanced intermediaries that facilitate technology uptake.
- Both production and adoption diffusion remain uneven and incomplete: They are concentrated in large firms, advanced sectors, and metropolitan areas, and there are persistent gaps among small and medium enterprises and across regions. As a result, diffusion depth is high where it occurs, but its breadth across the wider economy remains limited.

For China, we found the following:

- In terms of technology production diffusion, China’s diffusion model is state-coordinated, with strong policy direction, financial incentives, and dense research–research linkages that enable the rapid mobilization of resources in strategic sectors. This allows fast scaling of production capacity when priorities are clearly defined. However, the system relies on selective, policy-driven linkages, which can constrain broader research–enterprise integration and introduce risks of inefficiencies, overcapacity, and resource misallocation.
- In terms of technology adoption diffusion, China has built a more explicit and coordinated architecture for technology adoption, supported by national strategies, incentives, and platform-based diffusion mechanisms. This enables rapid and large-scale deployment of technologies across firms and sectors. However, adoption quality remains uneven and there is evidence of shallow or compliance-driven uptake and persistent disparities across regions and firm types.
- Chinese officials openly acknowledge several weaknesses in the current system, including weak university–industry linkages, talent mismatches, limited high-risk capital, uneven regional innovation capacity, underdeveloped technology-transfer services, and shortcomings in intellectual property enforcement. However, although China has introduced reforms since 2024 to address these issues, the government remains committed to its top-down, state-directed approach, meaning future success will depend on whether technocrats can effectively identify and diffuse the most important technologies across the broader economy.

Contents

About This Research Report	iii
Summary	iv
Figures and Tables	vii
Chapter 1. Introduction	1
Types of Technological Diffusion	2
Approaches for Different Types of Technological Diffusion	3
Chapter 2. Framework for Measuring Diffusion Capacity	5
A Country-Agnostic Framework for Measuring National Technological Diffusion Capacity	5
The Framework Tailored for a U.S-China Comparison	9
Chapter 3: Measuring U.S. and Chinese Diffusion Capacity	11
Metric 1: Research Organizations (Production Diffusion)	18
Metric 2: Enterprises (Production and Adoption Diffusion)	20
Metric 3: R-E Linkages (Production Diffusion)	22
Metric 4: E-E Linkages (Production and Adoption Diffusion)	22
Metric 5: R-R Linkages (Production Diffusion)	25
Metric 6: Absorptive Capacity (Production and Adoption Diffusion)	26
Metric 7: Financial Incentives (Production Diffusion and Adoption Diffusion)	29
Metric 8: Geography	35
Metric 9: Intermediary Organizations (Production and Adoption Diffusion)	39
Metric 10: Legal and Regulatory Systems	41
Chapter 4: U.S. and Chinese Diffusion Capacity Assessment	44
Where Each Country Leads	44
Where Each Country Falls Short	45
A Shared Shortcoming: Small and Medium-Sized Enterprises	45
China's Perception of Its Diffusion Deficit	46
Beijing Addresses Weaknesses with No Sign of a Change in Its Approach	49
Chapter 5. Conclusion	52
Four Implications for Policymakers, Enterprises, and Researchers	53
Appendix. Components of Diffusion Capacity and Proxies	54
Abbreviations	56
References	57
About the Authors	69

Figures and Tables

Figures

Figure 2.1. The Components of National Diffusion Capacity	6
Figure 3.1. Comparative Strengths and Weaknesses of U.S. and Chinese Technology Diffusion Models	12
Figure 3.2. Production Diffusion Capacity Comparison	14
Figure 3.3. Adoption Diffusion Capacity Comparison	16
Figure 3.4. Number of U.S. and Chinese Research Organizations, 2022–2024	18
Figure 3.5. Average Number of U.S. and Chinese Research Organization Publications per Sector, 2022–2024	19
Figure 3.6. United States—China Fixed Asset Investment, Year-on-Year (2018–2024)	30
Figure 3.7. Breakdown of United States—China Fixed Asset Investment, Year-on-Year (2018–2024)	31
Figure 3.8. Map of U.S. and Chinese Science and Technology Clusters in the 2024 Global Innovation Index Top 100	36

Tables

Table 3.1. Comparative Strengths and Weaknesses of U.S. and Chinese Technology Diffusion Models	13
Table 3.2. Production Diffusion Capacity Comparison	15
Table 3.3. Adoption Diffusion Comparison	17
Table 3.4. Top 10 U.S. Firms in March 2025, by Market Capitalization	20
Table 3.5. Top 10 Chinese Firms in March 2025, by Market Capitalization	21
Table 3.6. Number of Patent Citations Received per 1,000 Scholarly Publications, 2022–2024	23
Table 3.7. U.S. and Chinese Enterprise–Enterprise Linkages, 2021–2024	24
Table 3.8. U.S. and Chinese Rankings on Absorptive Capacity Proxies, 2024	27
Table 3.9. Top EV Sales in the United States and China, by State	38
Table 3.10. Selected Production and Adoption Diffusion Policies from China and the United States	41
Table 4.1. Revealed Versus Stated Weaknesses of China’s Diffusion Model	46
Table 4.2. Examples of Actions Taken by the Chinese Government in the Past Three Years to Address Diffusion-Related Weaknesses	50
Table A.1. Components of Diffusion Capacity and Proxies	54

Chapter 1. Introduction

When OpenAI launched ChatGPT in late 2022, it became one of the fastest-adopted technologies in history. Within two months, more than 100 million people had used it.¹ By mid-2025, one-third of Americans had tried the tool.² The release of Claude Code by Anthropic in January 2025 has also been met with enthusiasm by U.S. consumers; paid subscriptions for Claude have doubled from late 2025 to early 2026.³ Artificial intelligence (AI) adoption in China has moved almost as quickly. Since Hangzhou-based DeepSeek released its R1 model in January 2025, it has rapidly permeated everyday life: Baidu merged R1 into its search engine, carmakers embedded it in vehicles, and even the People’s Liberation Army (PLA) reportedly adopted it as part of its shift toward “intelligentized warfare.”⁴

Both the United States and China have shown that they can adopt new technologies at speed. But is one better positioned than the other to diffuse innovation across its economy? Studies have shown that countries that can do so have a better chance of improving their long-term economic prospects as technology diffusion is associated with significant productivity gains.⁵ Most important might be the diffusion of general-purpose technologies (GPTs). Historically, GPTs have driven productivity and long-term economic growth because they initiate subsequent rounds of innovation across a wide variety of industries. By serving as foundational platforms, such technologies as electricity, the internet, and—potentially—AI create spillover effects, permeate across the economy and society, boost efficiency, and have the ability to spark subsequent innovation, making these technologies central to sustained economic growth.

In this report, we conceptualize and measure *diffusion capacity*, which is a country’s ability to effectively spread innovations through its economy, as a metric by which to compare the

¹ Dan Milmo, “ChatGPT Reaches 100 Million Users Two Months After Launch,” *The Guardian*, February 2, 2023.

² Olivia Sidoti and Colleen McClain, “34% of U.S. Adults Have Used ChatGPT, About Double the Share in 2023,” Pew Research Center, June 25, 2025; Aaron Chatterji, Tom Cunningham, David Deming, Zoë Hitzig, Christopher Ong, Carl Shan, and Kevin Wadman, “How People Use ChatGPT,” Open AI, September 15, 2025.

³ Julie Bort, “Anthropic’s Claude Popularity with Paying Consumers Is Skyrocketing,” *TechCrunch*, March 28, 2026.

⁴ Daryl Lim, “DeepSeek: Changing the Game, Not the Leader,” *Think China*, March 10, 2025; Zeyi Yang, “Chinese Companies Rush to Put DeepSeek in Everything,” *Wired*, March 12, 2025; Sunny Cheung and Kai-shing Lau, “DeepSeek Use in PRC Military and Public Security Systems,” *China Brief: A Journal of Analysis and Information*, Jamestown Foundation, Vol. 25, No. 20, October 31, 2025, p. 23.

⁵ See, for example, Jeffrey Ding, “The Diffusion Deficit in Scientific and Technological Power: Re-Assessing China’s Rise,” *Review of International Political Economy*, Vol. 31, No. 1, January 2024b. Ding contends that historical examples illustrate this point. He argues that although the United States was weak in its ability to innovate in the 19th century, its strong capacity to diffuse innovation allowed it to achieve economic growth by the 20th century. The Soviet Union, on the other hand, had an advantage in innovation but could not diffuse technology effectively, and its economy failed by the 1990s.

United States and China.⁶ We distinguish *diffusion capacity* from *innovation capacity*, which is a country’s ability to generate and commercialize new ideas and technologies. Although explanations about changes in the economic power balance tend to emphasize the advantages of technological innovation, a country’s ability to deploy those technologies at scale might equally matter or matter more for lasting economic power.⁷

Types of Technological Diffusion

Technological diffusion can take several forms. In this section, we propose two types of technological diffusion that serve as the basis of national innovation diffusion capacity: production diffusion and adoption diffusion. We consider other forms of technological diffusion—such as knowledge diffusion—in this report but treat them as elements embedded within and contributing to production and adoption diffusion (i.e., knowledge transfer between research organizations and enterprises). Although this distinction is not standard in the technology diffusion literature, it is analytically useful because it captures two distinct processes that often rely on different types and, at times, different channels of technology.

Production diffusion refers to the process through which a new technology spreads in the production and supply side of an economy as firms within a country acquire the capabilities to design, manufacture, and scale the technology’s production. The term captures the expansion of domestic technological production capacity over time, reflected in a growing number of producers, deeper integration of the technology into industrial value chains, and the ability to bring innovations to market at scale. Production diffusion is, therefore, central to a country’s capacity to control, supply, and commercially exploit new technologies.

Adoption diffusion, by contrast, describes the spread of technology on the demand and use side of the economy; the term captures the extent to which firms and consumers integrate and use new technologies in their activities, regardless of where or by whom those technologies are produced. Adoption diffusion determines how widely and effectively innovations are embedded across sectors, shaping productivity gains, business transformation, and broader economic competitiveness.

The reason why we propose these two types of diffusion for our analysis is that we expect them to follow different dynamics and respond to different policy levers. For example, production diffusion is more directly influenced by industrial policy, investment incentives, and state support aimed at building domestic technological capacity, while adoption diffusion is likely to depend more on market conditions, institutional quality, and user behavior.

⁶ Diego Comin and Marti Mestieri, “Technology Diffusion: Measurement, Causes, and Consequences,” *Handbook of Economic Growth*, Vol. 2B, 2014.

⁷ Jeffrey Ding, *Technology and the Rise of Great Powers: How Diffusion Shapes Economic Competition*, Princeton University Press, 2024a.

Approaches for Different Types of Technological Diffusion

We built a framework to measure technological diffusion (production and adoption) capacity in China and the United States.

With regard to production diffusion, applying our framework to the United States and China reveals two fundamentally different dynamics. In the United States, the production diffusion system is driven largely by market forces and fosters production diffusion from nonstate actors. Market forces play an important role in industry performance in the Chinese system too, but, unlike the United States, production diffusion in China is influenced by state direction in strategic sectors. In China, government priorities influence where companies decide to invest, and the sectors and products they focus on, by providing attractive incentives in priority areas. This is especially true for key manufacturing sectors, thus skewing technological development and production diffusion toward sectors and projects identified as strategic by the state.

As for adoption diffusion, neither country's headline technology metrics accurately reflect on-the-ground adoption diffusion. The United States produces more frontier technology but struggles to diffuse it beyond a narrow band of large firms and metropolitan clusters. China deploys technology at extraordinary speed and scale through state incentives, but adoption quality is unclear and inconsistent, and differences between urban and rural areas and between the western and eastern parts of the country persist.

As of 2026, both countries can adopt new technologies quickly, albeit via different systems; in the United States, absorption happens through a greater number of large enterprises and well-developed intermediaries, while in China, it happens through policy and related incentives that prioritize strategic sectors throughout the country. However, neither country is able to diffuse new technologies broadly and uniformly across its entire economy. Both share a critical weakness: the adoption gap among nontechnology small and medium enterprises, which account for the majority of employment in both economies.

Measuring the capacity of a country to diffuse technology and diffusion itself, therefore, remains inherently challenging. Quantitative metrics have three key limitations. First, they struggle to capture the uneven depth of technology uptake across different segments of society and the economy. Second, available data typically lag by at least one or two years, offering a retrospective (and, at times, misleading) snapshot that fails to reflect the speed and nonlinear nature of technological diffusion in practice. This limitation also applies to diffusion adoption, perhaps more so.⁸ Third, the lack of transparency and access to reliable data in China means that data provided by international organizations that would normally allow a methodologically solid comparison between different countries—in this case, the United States and China—often provide an inaccurate picture of the situation.

⁸ Dixie Downing and Fernando Gracia, “Demographic Makeup of SMEs in the United States and United Kingdom,” United States International Trade Commission, July 2021; EUSME Centre, “SME Policy Environment Report: 2025 Update,” July 25, 2025.

To mitigate the above limitations, we rely on a mix of quantitative and qualitative data. We use qualitative data to show that the reality on the ground could differ from the picture provided by the quantitative metrics and proxies selected. That is especially the case for data about China.

We begin with a discussion in Chapter 2 of a country-agnostic framework for measuring both types of diffusion capacity followed by a discussion of how we tailored the framework for the U.S.-China competition. In Chapter 3, we evaluate U.S. and Chinese diffusion capacity using the framework. In Chapter 4, we offer an analysis of U.S.-China competition based on the evaluation in Chapter 3, and we provide our conclusions in Chapter 5. The appendix lists the components of diffusion capacity and our selected proxies.

Chapter 2. Framework for Measuring Diffusion Capacity

In this chapter, we first discuss a country-agnostic framework for measuring national technological diffusion capacity (for both production and adoption) and then explain how we tailored the framework to the U.S. and Chinese diffusion capacity ecosystem.

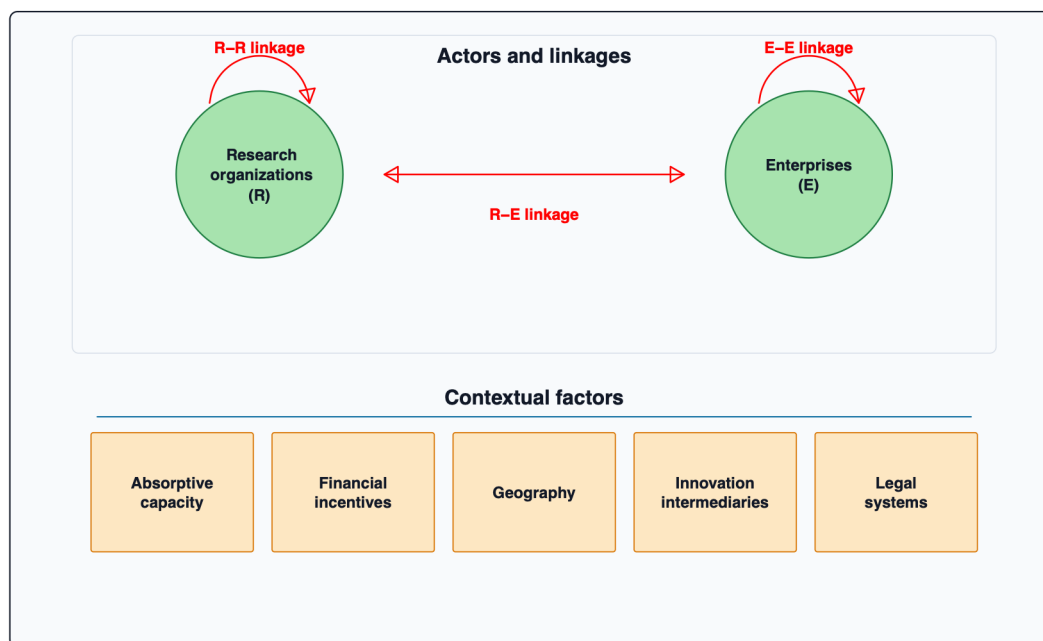
A Country-Agnostic Framework for Measuring National Technological Diffusion Capacity

Our conceptualization of national technological diffusion capacity comprises three components: *actors* (in circles), *linkages* (represented by lines), and *contextual factors* (in rectangles) (Figure 2.1). We also developed metrics for assessing the underlying qualities of these components and their relationships. Most countries, even relatively closed ones, acquire foreign innovations and diffuse them into their economy, and once acquired, these innovations flow through the same channels as endogenous innovations. For this reason, our framework does not separately analyze the mechanisms by which foreign innovations enter a country's domestic economy. The framework instead includes the acquisition of foreign technology in linkages between enterprises (E-E linkages) and in absorptive capacity (see Chapter 3). An economy that imports significant high-tech goods and pays substantial intellectual property (IP) licensing fees is one whose firms are actively acquiring technologies, which is a necessary (if not sufficient) condition for adoption diffusion.

Future research could usefully examine the origins of technological diffusion, distinguishing between foreign and endogenous sources; the channels through which diffusion occurs; and the processes and conditions under which externally sourced technologies and know-how are internalized and transformed into domestic capabilities.

Our framework evaluates technological diffusion capabilities in absolute terms, but our findings are presented comparatively to illustrate the relative strengths of the United States and China in their respective capabilities to diffuse technology.

Figure 2.1. The Components of National Diffusion Capacity



Actors

Actors are the entities who directly transmit and adopt new knowledge and technologies. More actors in a network increase the potential channels (which we call *linkages*) for sharing innovations—and, when those linkages exist and are strong, they can boost a country’s diffusion capacity. There are two main types of actors: research organizations and enterprises.

Research organizations—such as universities, private and government research institutes, and laboratories—are both diffusers and end-users of new scientific knowledge. They spread new knowledge by publishing research, making data available, and organizing conferences. They also use new discoveries to advance further research.

Enterprises—such as startups, firms, and intermediary and final goods providers—also sit on both sides of the diffusion process. They distribute new innovations through technology product sales, technology licensing, and technical support and training, and, as end-users, they apply these inputs to their operations, research and development (R&D), and production processes.

Linkages

Linkages are channels—formal agreements, commercial relationships, collaborative arrangements, and informal networks—that enable the flow of knowledge and technology between actors. The more linkages in an economy, the more pathways for resources to flow, boosting national diffusion capacity; fewer linkages, by contrast, mean fewer pathways and lower diffusion capacity. Similarly, stronger connections facilitate more-frequent or effective

resource transfers, while weaker ones do the opposite.⁹ We distinguish between two kinds of linkages: interorganizational linkages and intraorganizational linkages.

Interorganizational linkages (research–enterprise [R-E] linkages) connect research organizations and enterprises through technology licensing, joint research, contract research, or conferences. The direction of the flow can go either way; for example, a university might undertake contract research for a firm, or a firm might license a technology to a university.

Intraorganizational linkages (research–research [R-R] and enterprise–enterprise [E-E] linkages) connect organizations within the same organizational type. The R-R linkage connects research organizations, often through joint research or research consortia. The E-E linkage represents relationships between enterprises and might manifest as firm-to-firm sales or licensing of technology.

Contextual Factors

Contextual factors are the features of a country’s domestic environment that directly enable or constrain diffusion. We identify five of these factors: absorptive capacity, financial incentives, geography, intermediary organizations, and legal and regulatory systems.

Absorptive capacity refers to an actor’s readiness—for example, a firm’s installed technology base, a labor force’s overall technology-specific knowledge base and skills, and cultural elements, such as risk tolerance—to use transmitted knowledge productively.¹⁰ Organizations with high absorptive capacity effectively integrate new knowledge and technology into their operations, while those with low absorptive capacity struggle with implementation, constraining diffusion.¹¹

Financial incentives are fiscal and nonfiscal measures governments use to encourage technology transfers and adoption.¹² Direct support for diffusion can take the form of access to

⁹ Organisation for Economic Co-operation and Development (OECD), *University-Industry Collaboration: New Evidence and Policy Options*, 2019.

¹⁰ Francesco Caselli and Wilbur John Coleman II, “Cross-Country Technology Diffusion: The Case of Computers,” *American Economic Review*, Vol. 91, No. 2, May 2001; Steffen Strese, Daniel R. Adams, Tessa C. Flatten, and Malte Brettel, “Corporate Culture and Absorptive Capacity: The Moderating Role of National Culture Dimensions on Innovation Management,” *International Business Review*, Vol. 25, No. 5, October 2016; Rafael Sancho-Zamora, Santiago Gutiérrez-Broncano, Felipe Hernández-Perlines, and Isidro Peña-García, “A Multidimensional Study of Absorptive Capacity and Innovation Capacity and Their Impact on Business Performance,” *Frontiers in Psychology*, Vol. 12, October 2021; Xin Wang, Yufei Gan, Shiqi Zhou, and Xinqiao Wang, “Digital Technology Adoption, Absorptive Capacity, CEO Green Experience and the Quality of Green Innovation: Evidence from China,” *Finance Research Letters*, Vol. 63, May 1, 2024.

¹¹ Wesley M. Cohen and Daniel A. Levinthal, “Absorptive Capacity: A New Perspective on Learning and Innovation,” *Administrative Science Quarterly*, Vol. 35, No. 1, 1990.

¹² Mahmoud M. Abdellatif, Binh Tran-Nam, Marina Ranga, and Sabina Hodžić, “An Overview,” in Mahmoud M. Abdellatif, Binh Tran-Nam, Marina Ranga, and Sabina Hodžić, eds., *Government Incentives for Innovation and Entrepreneurship: An International Experience*, Springer, 2022.

credit, direct subsidies, or access to insurance.¹³ Indirect measures, such as pollution taxes, raise the cost of certain technologies (e.g., older, dirtier ones), making alternatives (e.g., cleaner ones) relatively cheaper and more attractive to adopt.

Geography affects how quickly and widely new technologies spread.¹⁴ When innovation actors are located near each other, they collaborate more and form stronger partnerships, speeding technology diffusion.¹⁵ Physical closeness makes it easier for innovators and early adopters to connect and for knowledge to spill over to other nearby people and organizations that might then copy and improve on new ideas.¹⁶

Intermediary organizations—such as incubators, accelerators, venture capital (VC) firms, and technology transfer offices—facilitate diffusion by matchmaking, aiding technology transitions, offering direct adoption incentives, and financing technology development.¹⁷ For example, financial service providers link technology developers to buyers, provide capital to scale or mature innovations, and perform due diligence and risk assessments.

Finally, *legal and regulatory systems* govern how new knowledge and technologies flow between organizations.¹⁸ Given the breadth of this metric and the different approaches of the United States and China, we divided legal and regulatory systems into two subcategories: state policy coordination and legal-commercial institutions, making the total of the metrics under consideration equal to 11. In countries where formal contracts matter more than personal relationships in business, contracting institutions promote diffusion by reducing risks and building trust in technology transfers.¹⁹ Likewise, in technologically advanced countries, strong IP institutions, such as those that provide patent protections, support diffusion by giving innovators predictable and remunerative channels (i.e., licensing) to share their work. However,

¹³ W. Edward Steinmueller, “Economics of Technology Policy,” in Bronwyn H. Hall and Nathan Rosenberg, eds., *Handbook of the Economics of Innovation*, Vol. 2, Elsevier Science, 2010.

¹⁴ Rui Baptista, “Geographical Clusters and Innovation Diffusion,” *Technological Forecasting and Social Change*, Vol. 66, Issue 1, January 2001.

¹⁵ Pablo D’Este and Simona Iammarino, “The Spatial Profile of University-Business Research Partnerships,” *Papers in Regional Science*, Vol. 89, No. 2, June 2010; Diego Comin, Mikhail Dmitriev, and Esteban Rossi-Hansberg, “The Spatial Diffusion of Technology,” National Bureau of Economic Research, Working Paper 18534, November 2012.

¹⁶ Nivedita Mukherji and Jonathan Silberman, “Knowledge Flows Between Universities and Industry: The Impact of Distance, Technological Compatibility, and the Ability to Diffuse Knowledge,” *Journal of Technology Transfer*, Vol. 46, No. 1, 2021.

¹⁷ Tindara Abbate, Raffaella Coppelino, and Francesco Schiavone, “Linking Entities in Knowledge Transfer: The Innovation Intermediaries,” *Journal of the Knowledge Economy*, Vol. 4, No. 2, June 2013.

¹⁸ Jon Schmid and Seokbeom Kwon, “Collaboration in Innovation: An Empirical Test of Varieties of Capitalism,” *Technological Forecasting and Social Change*, Vol. 157, August 2020.

¹⁹ Roland Helm and Martin Kloyer, “Controlling Contractual Exchange Risks in R&D Interfirm Cooperation: An Empirical Study,” *Research Policy*, Vol. 33, No. 8, October 2004; Schmid and Kwon, 2020; Sumon Bhaumik, Nigel Driffeld, Katiuscia Lavoratori, Meng Song, and Priit Vahter, “Multinational Strategy, Institutions and Spillovers: The Role of Institutions in Knowledge Spillovers in Emerging Markets,” *Journal of Technology Transfer*, October 2025.

for countries that do not have the capacity to innovate, strong patent protections could limit diffusion because it constrains these countries' ability to imitate others' innovations.²⁰

The Framework Tailored for a U.S-China Comparison

In this report, we infer national technology diffusion capacity from proxies that capture aspects of technology diffusion capacity, even if imperfectly. We selected one or more proxies for each of the 11 metrics outlined in the previous section based on three criteria. Proxies were first selected based on their theoretical and empirical link to diffusion. Second, proxies had to work in both U.S. and Chinese contexts to enable comparison. For instance, strength of contract enforcement might appear to be a good proxy for legal and regulatory systems, but, unlike in the United States, in China, networks and relationships tend to carry more weight than formal contracting mechanisms and, therefore, we did not use this proxy.²¹ Third, data on proxies had to be readily available from open sources. Although this report focuses on the United States and China, the goal is to ensure that our framework could be both easily used by government personnel to monitor diffusion capacities and able to adopt metrics that would allow these personnel to predict how well future technologies, including AI, might develop in an economy even before diffusion of said technology takes place. Although more and better proxies might exist, we consider the proxies proposed here to be capturing a comprehensive and reliable picture. Although our framework is not exhaustive, it is designed to capture the strength of a country's technology diffusion capacity.

The framework that we use is grounded in diffusion theory, which highlights that diffusion requires (1) channels through which knowledge and technologies can flow and (2) the minimum capacity to absorb and use them. Broader system characteristics shape the speed, scale, and efficiency of these processes.²²

Although our research concerns both production diffusion and adoption diffusion, there are variations to the extent that metrics and proxies apply to these two types of diffusion. For example, subsidies, a form of financial incentive aimed at nurturing a strategic sector, appear to affect production diffusion more than adoption diffusion, but other forms of financial incentives

²⁰ For example, see Rod Falvey and Neil Foster, *The Role of Intellectual Property Rights in Technology Transfer and Economic Growth: Theory and Evidence*, United Nations Industrial Development Organization, 2006.

²¹ Guanming Fang, "U.S.-China Differences and Their Effects on Business Behaviors," *China Currents*, Vol. 7, No. 1, November 20, 2008.

²² Cohen and Levinthal, 1990; Everett M. Rogers, *Diffusion of Innovations*, Free Press, 2003; Dan Andrews, Giuseppe Nicoletti, and Christina Timiliotis, "Digital technology diffusion," Organisation for Economic Co-operation and Development, OECD Economics Department Working Papers No. 1476, 2018; Timothy DeStefano, Nick Johnstone, Richard Kneller, and Jonathan Timmis, "Traditional Capital Incentives Slow the Diffusion of Next-Generation Technologies," Centre for Economic Policy Research, November 1, 2024; Paulo Bastos, Katherine Stapleton, Daria Taglioni, and Hannah Yi Wei, "How New Technologies Travel: Evidence from Global Firm Networks," Centre for Economic Policy Research, April 15, 2026.

(e.g., tax cuts for companies that integrate certain technologies) can contribute to adoption diffusion.

Therefore, proxies that capture technology diffusion fall into three categories. First are proxies that apply to both production and adoption diffusion, such as enterprises, E-E linkages, and the contextual factors of absorptive capacity, intermediary organizations, financial incentives and legal context. Second are proxies that differ between production and adoption diffusion, such as geography. Third are proxies that apply to production diffusion but are not useful for capturing adoption diffusion, such as research organizations, R-E linkages, and R-R linkages. Adoption diffusion usually occurs after a technology has been already commercialized rather than resulting directly from research.

In our development of this framework, we left out factors that are empirically difficult to measure but nevertheless could influence diffusion capacity. They include, for example, societies' tolerance for risk, the strategic culture of the elite, and the esteem in which societies hold scientists and entrepreneurs.²³

Finally, although the proxies were chosen carefully, changes in the availability of data, further research into the relationship between certain factors, and fieldwork in both the United States and China could expand and reshape the choices of proxies and, thus, the analysis.

²³ Kaiser Y Kuo, "Transcript: Is China Gaining Ground in Technology Diffusion? A Conversation with Jeffrey Ding," *Sinica* podcast, March 26, 2025.

Chapter 3: Measuring U.S. and Chinese Diffusion Capacity

In this chapter, we examine U.S. and Chinese diffusion capacity using the 11 metrics in our national diffusion capacity framework described in Chapter 2 and present a comparison of the relative strengths and weaknesses of the U.S. and Chinese models.

We use the framework to evaluate each country's diffusion capacity independently, but to facilitate comparison, we present the findings on a relative basis, highlighting whether the United States or China is better positioned to translate technological strengths into economywide uptake and deployment.

Our assessment shows that the United States has an edge over China in terms of overall diffusion capacity in six of the 11 metrics: research organizations, enterprises, R-E linkages, absorptive capacity, intermediary organizations, and legal-commercial institutions, which is a subcategory of legal and regulatory systems (a contextual factor). Our assessment suggests that the U.S. system builds more connections among key actors, creating a dense network in the innovation ecosystem that allows linkages to thrive in an environment that offers strong IP protection. China has an overall advantage in R-R linkages and state policy coordination (the other subcategory of legal and regulatory systems), that represents China's coherent technology-adoption policy architecture. One of the key reasons why China is strong in R-R linkages and weak in R-E linkages is that its government incentivizes selective connections that are aligned with strategic objectives, and, although this selectivity gives birth to successful R-R linkages, it also limits linkages among research organizations and enterprises.

Our analysis of the other metrics showed differences between the United States and China but no clear advantage for one or the other (see Figures 3.1–3.3 and Tables 3.1–3.3).

Figure 3.1. Comparative Strengths and Weaknesses of U.S. and Chinese Technology Diffusion Models

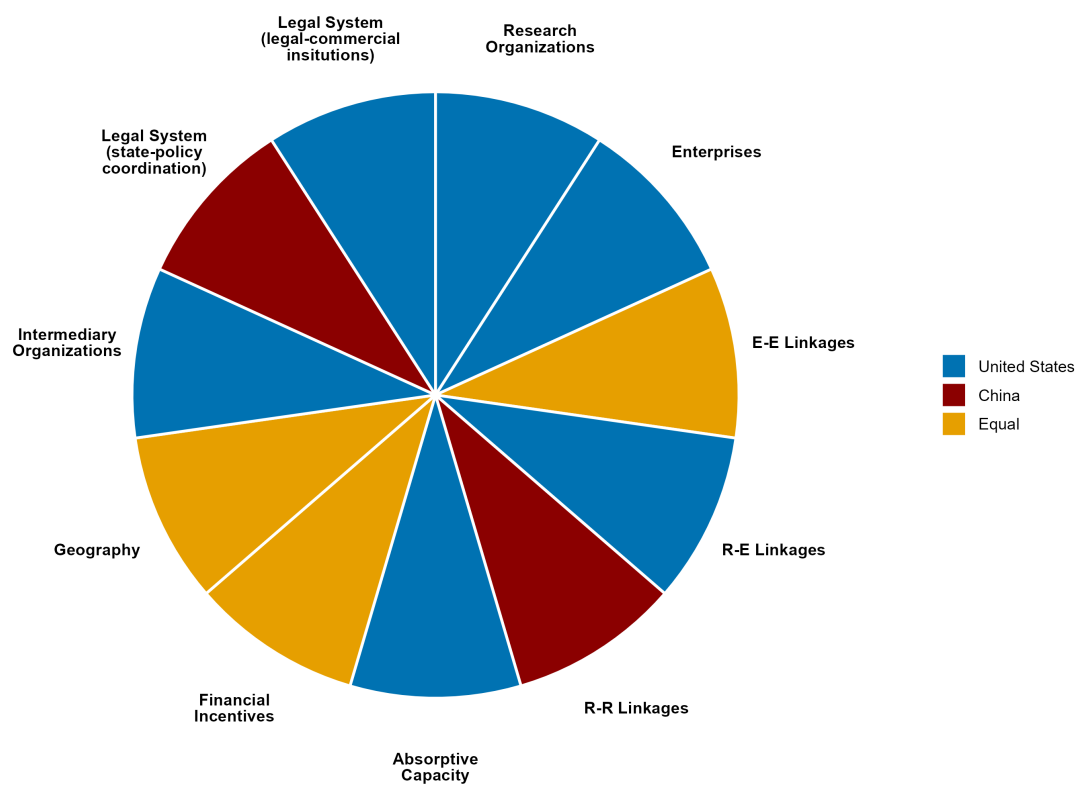


Table 3.1. Comparative Strengths and Weaknesses of U.S. and Chinese Technology Diffusion Models

Components	Metric	United States	China
Actors	Research organizations	Larger but unevenly productive research network	Smaller and unevenly productive research network
	Enterprises	More large companies and large numbers of SMEs	Fewer large companies but large numbers of SMEs
Linkages	E-E linkages	A more developed, formal mechanism for interfirm collaboration based on market principles	Does not rely on formal mechanisms for interfirm collaboration; difficult to measure
Linkages	R-E linkages	Stronger R-E linkages and advantage in patent citations, university-industry collaborations, and university spin-offs	Weaker R-E linkages; establishment of selective R-E capabilities aligned with national industrial objectives
	R-R linkages	Lower national collaboration rate across all surveyed disciplines compared with China	Advantage in national collaboration rate but unclear levels of efficiency after consolidation under New National Innovation System
Contextual factors	Absorptive capacity	Advantage in tertiary education, R&D that support knowledge creation, and knowledge absorption	Structural limitations to ability to absorb and exploit external knowledge
Contextual factors	Financial incentives	No clear winner; funding based on market principles, geographically concentrated funding vehicles, and a diverse set of target technologies	No clear winner; mostly government- or state-funded incentives, geographically spread-out funding vehicles, and strategic and limited set of target technologies
	Geography	Fewer but more geographically dispersed S&T clusters; better system for adoption diffusion	More but geographically concentrated S&T clusters; better system for production diffusion
	Intermediary organizations	Mature network of private sector-led intermediaries that provide quality services	Nascent system of state-backed S&T service providers struggling to match quantity with quality services
	Legal and regulatory systems (state policy coordination)	No national policies and targets with explicit mention of technological diffusion	Stronger national policies and targets with explicit mention of technological diffusion
	Legal and regulatory systems (legal-commercial institutions)	Stronger IP protection although with some signs of erosion in some sectors	Weaker IP protection compared with the United States and uneven enforcement

NOTE: Green cells show areas of clear advantage, red cells indicate areas of clear disadvantage, and yellow cells reflect cases in which neither country has a distinct lead and both might effectively diffuse technologies through different means. S&T = science and technology; SME = small and medium-sized enterprise.

Figure 3.2. Production Diffusion Capacity Comparison

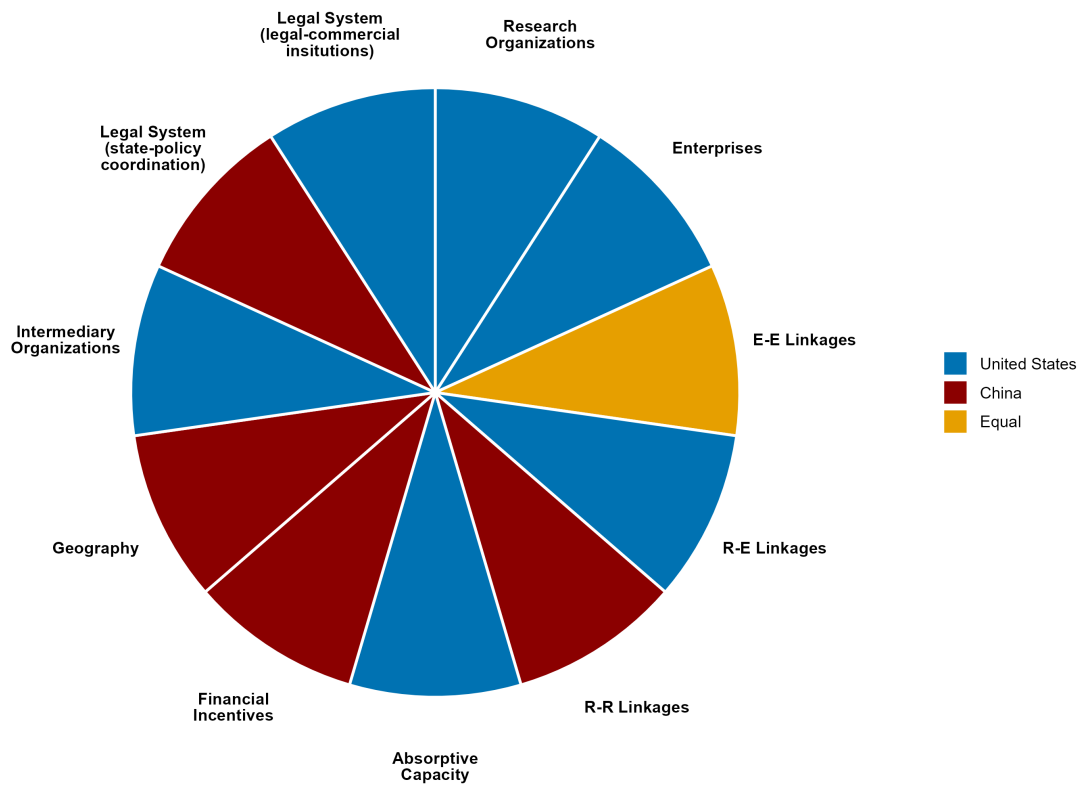


Table 3.2. Production Diffusion Capacity Comparison

Metric	United States	China	Analysis of Production Diffusion
Research organizations	Advantage	Disadvantage	The United States has a larger system, but both countries are unevenly productive. There is a question of whether China's New Innovation System is shifting the United States' advantage.
Enterprises	Advantage	Disadvantage	The United States has larger firms and scaling capacity.
R-E linkages	Advantage	Disadvantage	The United States has an advantage in university-industry collaboration and patent citations.
E-E linkages	Neither	Neither	There is no clear winner: The United States has stronger formal channels; however, China could achieve the same results through informal and unmeasured channels.
R-R linkages	Disadvantage	Advantage	China has an advantage in domestic research-organization collaboration rates.
Absorptive capacity	Advantage	Disadvantage	The United States has an advantage across the absorptive-capacity proxies used in this report.
Financial incentives	Disadvantage	Advantage	China has an advantage because of state incentives that are directed toward production diffusion.
Geography	Disadvantage	Advantage	China has more geographically concentrated S&T clusters.
Intermediary organizations	Advantage	Disadvantage	The United States has an advantage because of its overall more mature and higher-quality intermediary ecosystem for production diffusion.
Legal and regulatory systems (legal-commercial institutions)	Advantage	Disadvantage	The United States has an advantage because of its stronger IP and legal environment supporting commercialization and production diffusion.
Legal and regulatory systems (state policy coordination)	Disadvantage	Advantage	China has an advantage because of its stronger adoption-policy coherence and more-explicit adoption-targeted instruments.

NOTE: Green cells show areas of clear advantage, red cells indicate areas of clear disadvantage, and yellow cells reflect cases in which neither country has a distinct lead and both might diffuse effectively through different means.

Figure 3.3. Adoption Diffusion Capacity Comparison

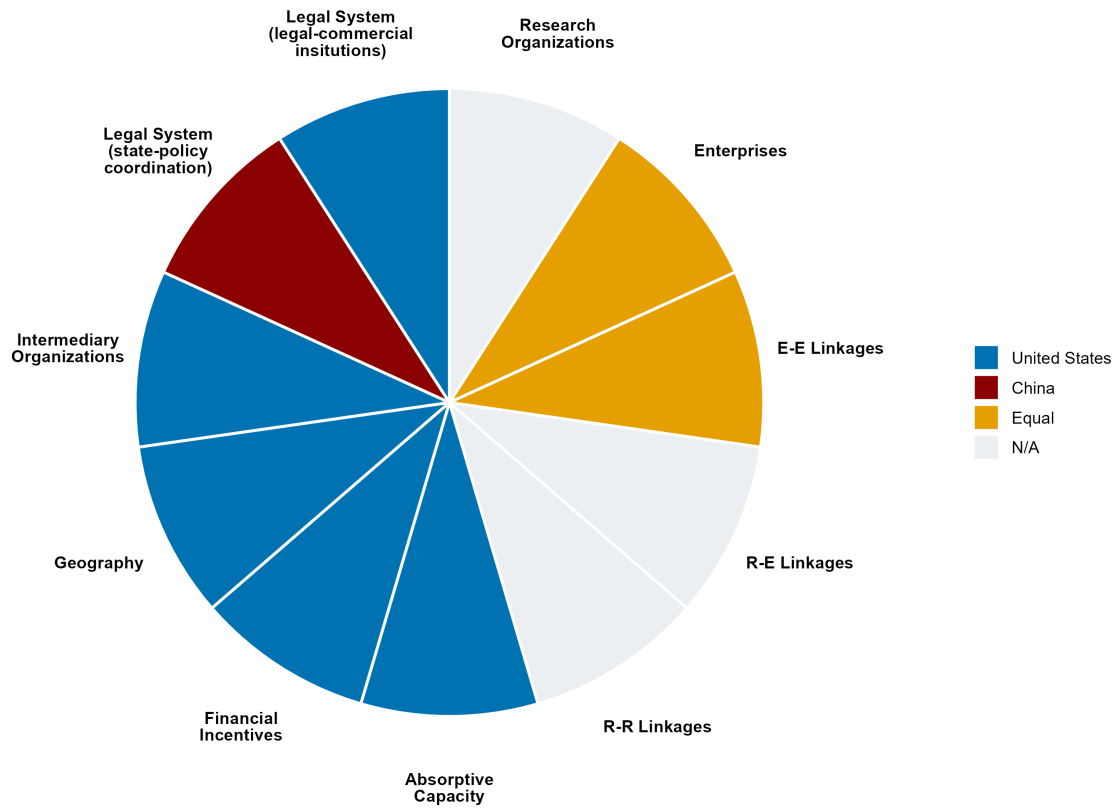


Table 3.3. Adoption Diffusion Comparison

Metric	United States	China	Analysis of Adoption Diffusion
Research organizations	N/A	N/A	This metric is not independently used for adoption diffusion.
Enterprises	Neither	Neither	The United States has more larger enterprises than can diffuse technology and has depth in enterprise technology use, but China seems to have more breadth and is leapfrogging the United States in such areas as green technology and cashless payments.
R-E linkages	N/A	N/A	This metric is not independently used for adoption diffusion.
E-E linkages	Neither	Neither	There is no clear winner: Official data show that the United States is clearly ahead, but China's system is based on informal connections that are not captured by official data.
R-R linkages	N/A	N/A	This metric is not independently used for adoption diffusion.
Absorptive capacity	Advantage	Disadvantage	The United States has an advantage in absorptive-capacity proxies, but China is improving year after year.
Financial incentives	Advantage	Disadvantage	The United States has an advantage: China's incentive architecture is broader in coverage and more explicitly adoption-oriented, but the United States is better at generating and diffusing a broader variety of innovations.
Geography	Advantage	Disadvantage	Both countries face persistent geographic adoption gaps. But in China, technology diffusion follows a more concentrated and coordinated spatial pattern than in the United States where adoption is more distributed across metropolitan markets.
Intermediary organizations	Advantage	Disadvantage	Both the United States and China have entities that adopt the platform-as-intermediary approach reaching SME scale. However, the United States has a more established and better functioning structure.
Legal and regulatory systems (legal-commercial institutions)	Advantage	Disadvantage	The United States has an advantage because of its stronger IP and legal environment supporting commercialization and production diffusion.
Legal and regulatory systems (state policy coordination)	Disadvantage	Advantage	China has an advantage because of its stronger adoption-policy coherence and more-explicit adoption-targeted instruments.

NOTE: Green cells show areas of clear advantage, red cells indicate areas of clear disadvantage, and yellow cells reflect cases in which neither country has a distinct lead and both might diffuse effectively through different means. N/A = not applicable.

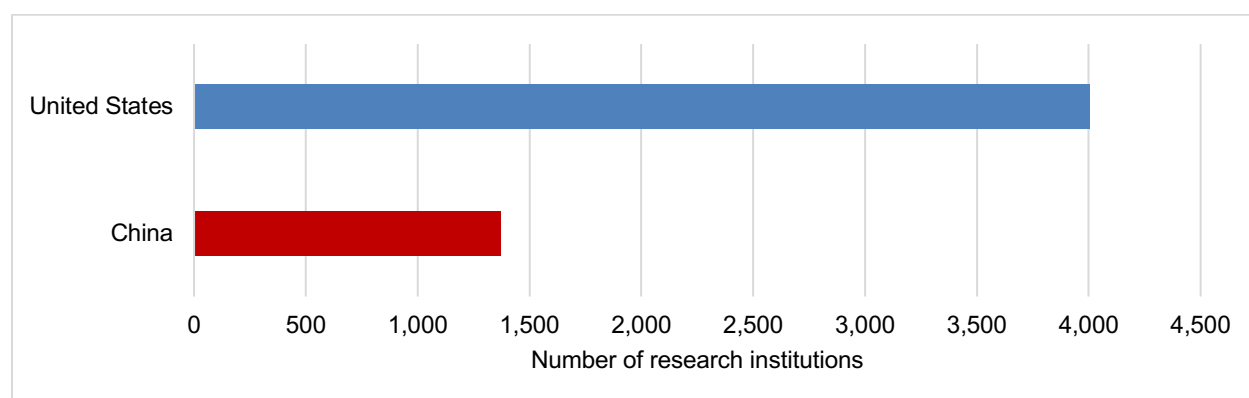
Metric 1: Research Organizations

Production Diffusion

Our examination of U.S. and Chinese research organizations shows that the United States has a larger research network than China, and, regardless of the difference in size, both the United States and China have an unevenly productive research network.

The United States commands the world's largest research enterprise. Between 2022 and 2024, the United States hosted roughly three times as many research organizations as China: The United States had around ten times as many corporate research entities, five times as many medical research institutions, three times as many government research entities, and about 50 percent more academic institutions (Figure 3.4).

Figure 3.4. Number of U.S. and Chinese Research Organizations, 2022–2024



SOURCE: Features data from SciVal, database, undated.

NOTE: Elsevier's SciVal defines a *research institution* as any organization that publishes at least one paper in a year. It combines related units—such as Stanford's School of Medicine and the Hoover Institution—under a single institution.

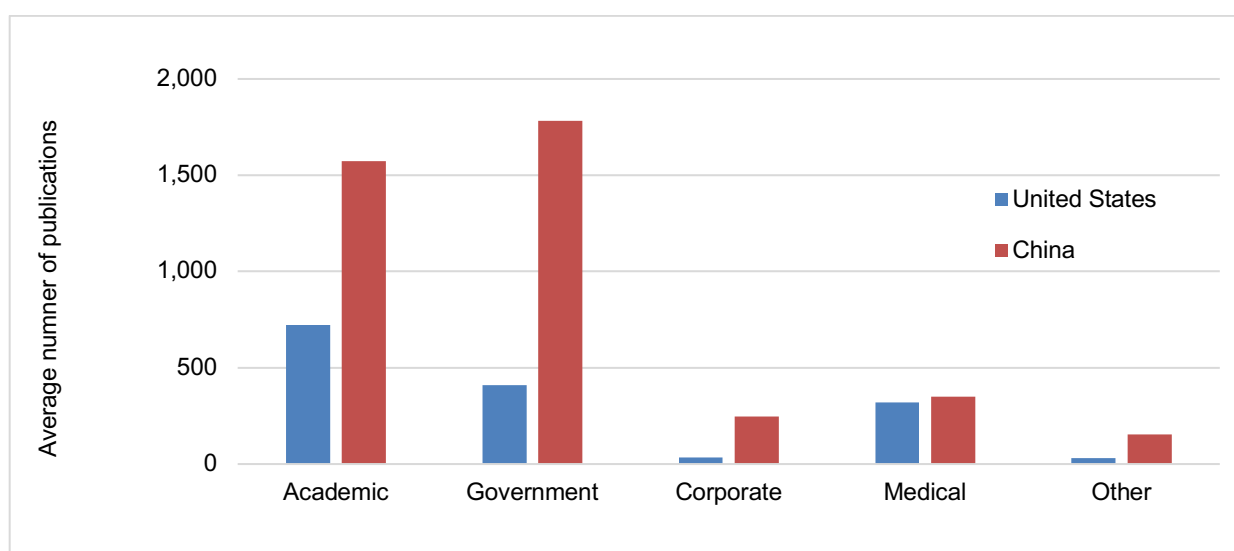
China's smaller number of research organizations reflects, in part, the result of the government's consolidation of national laboratories and state key laboratories since 2018 as part of the New National Innovation System and the vertical integration of China's research base.²⁴ Rather than cultivating new independent hubs, the Chinese government not only kept embedding new laboratories within existing universities or state-owned enterprises but also sought to reduce the number of research centers across the country to contain resource waste. However, as of August 2026, it is not clear to what extent the smaller number of research organizations and the consolidation of research efforts have resulted in a more efficient system.

²⁴ Jeroen Groenewegen-Lau and Michael Laha, *Controlling the Innovation Chain: China's Strategy to Become a Science & Technology Superpower*, Mercator Institute for China Studies, February 2, 2023.

The Chinese Ministry of Science and Technology’s 2025 reorganization of Hong Kong’s research network illustrates this point: The ministry reduced the number of state key labs from 16 to 12 while creating three new ones to align more tightly with national priorities, such as optical quantum research. Similar patterns occur across other provinces.²⁵

On paper, China’s research enterprise might seem more uniformly active. Between 2022 and 2024, 850 Chinese academic research bodies produced more than 1,000 papers annually, compared with 600 in the United States (Figure 3.5). However, China’s research and patenting figures are inflated by incentives that reward volume rather than quality.²⁶

Figure 3.5. Average Number of U.S. and Chinese Research Organization Publications per Sector, 2022–2024



SOURCE: Features data from SciVal, undated.

Systems with a larger and more diverse set of actors, combined with denser interconnections, create a greater surface for technology diffusion by offering more entry points and pathways through which technologies can spread. In both cases, however, research activity and its outcomes remain uneven, which can generate bottlenecks and reduce resilience. No single organizational model for research organizations has proven systematically more effective than the other in ensuring diffusion.

To the extent that the U.S. innovation system comprises a large number of firms, research organizations, and intermediaries connected through extensive formal and informal linkages, it

²⁵ Holly Chik, “How Mainland China Streamlines National Labs into Tech War Machines: The Hong Kong Case,” *South China Morning Post*, August 30, 2025.

²⁶ Dennis Normile, “China’s Scientists Often Cite Work from Their Own nation. Is That Skewing Global Research Rankings?” *Science*, September 25, 2024.

offers a wider surface for diffusion than more-concentrated or more-segmented systems. These dynamics are tested in the following sections.

Metric 2: Enterprises

Production and Adoption Diffusion

A comparison of enterprises shows that in the United States, economic activity is relatively concentrated among a smaller number of large firms; the top 1 percent of corporations control 97 percent of total asset shares.²⁷ This pattern is consistent with longer-term trends in which the largest firms capture an increasing share of assets, sales, and output over time. At the same time, both the United States' and China's economies are primarily composed of SMEs. In the United States, the Small Business Administration reports 36 million small businesses, representing 99.9 percent of all businesses.²⁸ In 2024, China had approximately 60 million SMEs.²⁹ Taken together, these figures suggest that the United States combines a much more dominant top tier of very large firms with a predominately small-business population, while China also has a very broad SME base but a much less dominant presence at the global corporate apex.

The United States has the biggest corporations in the world. In March 2025, 62 of the world's 100 largest companies by market capitalization were U.S. companies, compared with eight Chinese companies. Together, the U.S. firms were worth \$38.8 trillion, more than ten times the combined valuation of their Chinese peers (\$2.7 trillion) (Tables 3.4 and 3.5).³⁰ This difference is relevant because larger enterprises adopt technologies faster than SMEs.³¹

Table 3.4. Top 10 U.S. Firms in March 2025, by Market Capitalization

Global Ranking	Company	Market Capitalization (\$ billions)
1	NVIDIA Corporation	4,237
2	Apple Inc.	3,726
3	Alphabet Inc.	3,475
4	Microsoft Corporation	2,749
5	Amazon.com, Inc.	2,236
7	Broadcom Inc.	1,465

²⁷ Spencer Kwon, Kaspar Zimmermann, and Yueran Ma, "100 Years of Rising Corporate Concentration," Harvard Law School Forum on Corporate Governance, July 16, 2024.

²⁸ Office of Advocacy, "Frequently Asked Questions About Small Business 2026," U.S. Small Business Administration, February 3, 2026; OECD, *Financing SMEs and Entrepreneurs 2026: An OECD Scoreboard*, March 31, 2026a.

²⁹ OECD, 2026a.

³⁰ PwC, "Global Top 100 Companies—By Market Capitalisation," May 2025.

³¹ Faiz Faiz, Viet Le, and Eryadi K Masli, "Determinants of Digital Technology Adoption in Innovative SMEs," *Journal of Innovation and Knowledge*, Vol. 9, No. 4, October–December 2024.

Global Ranking	Company	Market Capitalization (\$ billions)
8	Meta Platforms Inc.	1,447
10	Tesla, Inc.	1,395
11	Berkshire Hathaway Inc.	1,033
12	Walmart Inc.	991

SOURCE: Features information from PwC, 2025.

Table 3.5. Top 10 Chinese Firms in March 2025, by Market Capitalization

Global Ranking	Company	Market Capitalization (\$ billions)
19	Tencent Holdings Limited	556
28	Industrial and Commercial Bank of China Limited	375
33	Agricultural Bank of China Limited	332
38	PetroChina Company Limited	315
45	China Construction Bank Corporation	287
46	Alibaba Group Holding Limited	280
49	Contemporary Amperex Technology Co., Limited	267
53	Kweichow Moutai Co., Ltd.	263
59	Bank of China Limited	256
69	China Mobile Limited	222

SOURCE: Features information from PwC, 2025.

From a diffusion perspective, these structural differences imply distinct transmission dynamics. Diffusion theory emphasizes that the spread of technology depends on both the number of actors and the density of linkages between them. Although a system such as China's includes major technology companies (e.g., Huawei, Semiconductor Manufacturing International Corporation, Tencent, Alibaba), the overall structure is less dominated by a small group of globally leading firms and more distributed across a broad base of smaller actors. China has a vast SME base, which provides a wide surface for diffusion, increasing the number of potential entry points and pathways through which technologies can spread, an advantage that is particularly relevant for adoption diffusion in which the breadth of uptake across firms drives productivity gains.

Conversely, a more concentrated system such as that of the United States offers fewer but larger and more resource-rich actors that could facilitate rapid scaling and coordination, features that are often advantageous for production diffusion in which capabilities must be concentrated to bring technologies to market and expand output. This concentration gives rise to a highly centralized diffusion model, in which these firms act as hubs, diffusing technologies through platforms, proprietary ecosystems, and global supply chains. Their control over such key infrastructures as cloud computing, semiconductors, and operating systems allows them to shape both the direction and pace of diffusion.

Evidence suggests that larger firms are better positioned to adopt and integrate new technologies because of stronger financial, organizational, and human capital capacities. For example, among OECD economies, the adoption of new technologies (e.g., AI) is strikingly uneven: SMEs lag well behind larger enterprises.³² As a result, technology diffusion across firms is often uneven because SMEs adopt technologies more slowly, particularly in the case of advanced or skill-intensive technologies. This means that, as far as the enterprise metric is concerned, the United States still has an advantage over China.³³

Metric 3: R-E Linkages

Production Diffusion

U.S. research organizations maintain closer ties with industry than their Chinese counterparts. They collaborate and coauthor more scientific papers, particularly in such high-value fields as computer science and engineering. Between 2015 and 2024, academic-corporate collaboration in the United States averaged 10.1 percent in computer science and 6.8 percent in engineering, roughly double China's rates of 4.7 percent and 4.3 percent, respectively.

U.S. firms also draw on academic research more extensively, citing it in patents at more than twice the rate of Chinese firms. Between 2022 and 2024, for every 1,000 papers published in the United States, 9.15 were referenced in patents, compared with 4.18 in China (Table 3.6).

Metric 4: E-E Linkages

Production and Adoption Diffusion

The E-E linkages metric underscores the limits of quantitative international indices in capturing systems, such as China's, in which informal and underreported processes continue to play a central role in economic activity and in shaping technological development and adoption. The United States relies on formal interaction channels, such as licensing and joint ventures, and for those, data show that the United States is ahead of China. But China does not always rely on such formalized linkage mechanisms, and, hence, it could be relying on more-unstructured channels that our analysis did not capture.

³² OECD, *AI Adoption by Small and Medium-Sized Enterprises: OECD Discussion Paper for the G7*, December 9, 2025.

³³ Dan Andrews, Chiara Criscuolo, and Peter N. Gal, *Frontier Firms, Technology Diffusion and Public Policy: Micro Evidence from OECD Countries*, Organisation for Economic Co-operation and Development, OECD Productivity Working Papers No. 02, November 2015.

Table 3.6. Number of Patent Citations Received per 1,000 Scholarly Publications, 2022–2024

Discipline	United States	China
Overall	9.15	4.18
Agricultural and biological sciences	5.77	3.39
Biochemistry	32.41	12.57
Chemical engineering	30.53	6.62
Chemistry	27.40	7.60
Computer science	14.47	6.03
Dentistry	3.39	3.46
Earth and planetary sciences	1.31	2.02
Energy	9.78	3.80
Engineering	12.95	4.72
Environmental science	5.97	2.97
Health professions	4.93	5.51
Immunology and microbiology	33.99	11.92
Materials science	15.23	4.63
Mathematics	6.09	2.42
Medicine	11.33	5.70
Neuroscience	10.49	6.18
Nursing	2.60	4.38
Pharmacology	40.03	12.79
Physics and astronomy	12.95	4.32
Veterinary	5.46	3.30

SOURCE: Features information from SciVal, undated.

In the Pearl River Delta electronics industry, firms with the most-intensive interactive learning were also the most likely to rely on informal *guanxi networks*, social networks that span business partners, relatives, and friends. In the Pearl River Delta electronics industry, cluster production is sustained through “networked enforcement mechanisms based on informality and cooperation.”³⁴ Firms deliberately leverage social proximity as a way to track technological and market developments, and this illustrates how, in China, diffusion occurs through embedded relationships, observation, and informal ties rather than formal licensing or joint ventures.³⁵

However, official data present a picture of U.S. companies tending to work with each other more than their Chinese counterparts. U.S. companies engage in joint ventures about 20 times

³⁴ Wenying Fu, “Interactive Learning and Systemic Innovation: Firm-Level Evidence from the Electronics Industry in the Pearl River Delta, China,” in *Towards a Dynamic Regional Innovation System: Investigation into the Electronics Industry in the Pearl River Delta, China*, 2015.

³⁵ Fu, 2015.

more often than their Chinese counterparts.³⁶ The United States also leads globally in IP receipts, capturing 4.08 percent of total trade from technology licensing revenues, more than ten times China's 0.37 percent, suggesting that the United States operates a more mature technology market in which firms regularly monetize intellectual assets through formal licensing arrangements. Notably, however, both countries show similar IP payment levels (1.61 percent for the United States versus 1.42 percent for China), indicating comparable legal technology acquisition activities from foreign sources (Table 3.7).

Table 3.7. U.S. and Chinese Enterprise–Enterprise Linkages, 2021–2024

Type of Linkage	United States		China	
	Value	Rank	Value	Rank
Joint ventures Per \$ billion PPP GDP, three-year average (2021–2023)	0.20	6	0.01	75
IP receipts Percentage of total trade, three-year average (2021–2023)	4.08	4	0.37	34
IP payments Percentage of total trade, three-year average (2021–2023)	1.61	20	1.42	25
Venture capital deal intensity Per \$ billion PPP GDP, three-year average (2022–2024)	0.63	20	0.19	52

SOURCES: Features data from the Global Innovation Index (GII) 2024 for Joint Ventures indicator (Dutta et al., 2024) and GII 2025 for the other proxies (World Intellectual Property Organization [WIPO], “China Ranking in the Global Innovation Index 2025,” webpage, undated-a).

NOTE: GII 2024 ranked 133 economies, while GII 2025 ranked 139 economies. Rankings indicate position among all GII economies. GDP = gross domestic product; PPP = purchasing power parity.

Additionally, the largest technology firms, through corporate VC, seek to embed AI tools into their workflows. This corporate VC activity might be seen as an indirect adoption incentive. For example, when Microsoft, Google, or Amazon invest in AI startups, they frequently bundle the resulting products into their cloud platforms, lowering the adoption threshold for enterprise customers. Chinese technology firms exhibit a partially analogous dynamic. Companies, such as Alibaba, Tencent, Huawei, and Baidu, combine strategic investment, platform ecosystems, and vertically integrated digital solutions to embed AI tools into enterprise workflows.³⁷ In both cases, this dynamic concentrates adoption pathways through a small number of platform gatekeepers, creating concentration and dependency risks for the adopting firms.

Overall, the United States promotes technology diffusion through a mature market structure characterized by formalized enterprise linkages, interoperability, and standardization. China, by contrast, combines weaker formal linkages with dense informal networks and platform-based ecosystems, enabling diffusion through social proximity, rapid iteration, and large-scale network

³⁶ Dutta, Soumitra, Bruno Lanvin, Lorena Rivera León, and Sacha Wunsch-Vincent, eds., *Global Innovation Index 2024: Unlocking the Promise of Social Entrepreneurship*, 17th ed., World Intellectual Property Organization, 2024.

³⁷ “Alibaba Cloud and Tencent AI Labs Boost Asia’s Digital Competitiveness,” *China Crunch*, October 7, 2025.

effects, albeit in ways that are less visible in conventional metrics and difficult to measure comparatively.

Metric 5: R-R Linkages

Production Diffusion

On paper, China has a clear advantage in domestic research linkages: Collaboration rates are significantly higher than in the United States. Between 2022 and 2024, 48.3 percent of Chinese papers across 20 disciplines included a coauthor from another Chinese institution, compared with 30.1 percent in the United States, a gap that persists across nearly all fields and continues to widen.³⁸ China's higher rates of domestic research collaboration are underpinned by the institutional structure of its innovation system. The state has actively engineered dense linkages across research organizations and reforms explicitly aimed at removing silos and aligning all actors under a unified strategic framework. Central coordination mechanisms, such as the Central Commission for Science and Technology, and joint funding instruments require multi-institutional participation, often bringing together universities, research institutes, and local governments to work on the same projects. For example, more than half of the projects funded under regional joint programs involve research teams from outside the host province, illustrating the extent of cross-institutional integration within the Chinese system.³⁹

As China has become the world's largest producer of scientific articles, the volume of available domestic partners has increased significantly, enabling collaboration to occur at scale within national borders. This characteristic is reinforced by the broader structure of China's research system. More than half of Chinese research output involves domestic collaboration, while only around 20 percent of papers involve international coauthorship, a much lower share than global averages. As a result, domestic collaboration has become the primary driver of growth in Chinese research output, whereas in the United States, high-impact research outcomes remain more closely tied to international partnerships. At the same time, the sheer scale of China's research output helps sustain high levels of domestic coauthorship. However, this metric is subject to the same caveat regarding collaboration quality noted in the "Metric 1: Research Organizations" section in relation to the quality of patents: High numbers do not automatically translate into high-quality research.

Despite high levels of collaboration, China's research system exhibits notable inefficiencies stemming from fragmentation and administrative complexity. Overlapping mandates across ministries and research bodies have historically produced inefficient and, at times, conflicting

³⁸ SciVal, undated.

³⁹ Siwen Xiao and Yaosheng Xu, *(Re)Centralization: How China is Balancing Central and Local Power in Science, Technology, and Innovation*, UC Institute on Global Conflict and Cooperations and Mercator Institute for China Studies, March 2024.

management and weak coordination, leading to the duplication of projects and inefficient allocation of resources. At the institutional level, the proliferation of laboratories with similar research agendas and limited coordination further dispersed talent and funding, while a heavy reliance on short-term, project-based funding encouraged fragmented, goal-specific collaborations rather than sustained, integrated research efforts.⁴⁰ As a result, although collaboration is dense, it is not always efficient; coordination challenges and bureaucratic incentives sometimes undermine the effectiveness of knowledge diffusion within the system.⁴¹

From a diffusion perspective, these dynamics point to a more tightly integrated domestic knowledge network in China. However, they also highlight a structural trade-off: Stronger internal connectivity could come at the expense of exposure to more-diverse external knowledge sources, particularly compared to such systems as the United States that remain more internationally embedded. This trade-off is further compounded by inefficiencies within China's collaboration architecture. As recognized by Chinese leadership (and despite dense R-R linkages), overlapping institutional mandates, fragmented governance across ministries, and the proliferation of parallel research structures can lead to the duplication of effort, suboptimal allocation of resources, and, ultimately, a failure to deliver on desired outcomes. The prevalence of short-term, project-based funding (see Metric 7) reinforces these dynamics by incentivizing narrowly defined, time-bound collaborations rather than sustained, systemwide integration.⁴² As a result, although China's research system has the capacity to enable rapid internal diffusion, the effectiveness of knowledge circulation is constrained by coordination challenges and bureaucratic fragmentation within the network.

Metric 6: Absorptive Capacity

Production and Adoption Diffusion

The proxies we selected for absorptive capacity capture key preconditions for both technology production and adoption diffusion. Such proxies as high-tech imports and IP

⁴⁰ People's Republic of China State Council, "Notice from the General Office of the State Council on the Establishment of the National Science and Technology Leadership Small Group" ["国务院办公厅关于成立国家科技领导小组的通知"], July 28, 2018; Central Commission for Discipline Inspection and National Supervisory Commission, "The Mobilization Meeting for the Third Central Inspection Team to Inspect the Party Leadership Group of the Ministry of Science and Technology Was Held" ["中央第三巡视组巡视科学技术部党组工作动员会召开"], Ministry of Science and Technology of the People's Republic of China, October 18, 2023.

⁴¹ China Development Portal [中国发展门户网], "Research on the Policy Allocation of Science and Technology Funding for the Reorganized National Key Laboratories" ["重组后的全国重点实验室科技经费配置政策研究"], December 21, 2023.

⁴² Guo Wen [郭雯], Kang Xiaoming [康小明], Lü Qiupei [吕秋培], "Key Issues That Need Attention to Strengthen Investment in Basic Research" ["加强基础研究投入需要重视的关键问题"], *Seeking Truth* [求是], February 13, 2019.

payments reflect the extent to which firms are actively acquiring external technologies, a necessary (if not sufficient) condition for adoption-led diffusion. Human capital variables, including tertiary education enrollment and quality, proxy a country's absorptive capacity via the ability to understand, adapt to, and effectively use imported technologies. Finally, infrastructure proxies capture the enabling environment that allows technologies to circulate and function, supporting both their dissemination and use across the economy.

On paper, the United States has a greater advantage across all dimensions of absorptive capacity compared with China. Such metrics as tertiary education and the number of R&D researchers per million people capture the human capital necessary for applying new technologies and knowledge; information and communication technology (ICT) infrastructure reflects the ability to disseminate knowledge rapidly; and knowledge absorption measures engagement with external sources of innovation (Table 3.8).

Table 3.8. U.S. and Chinese Rankings on Absorptive Capacity Proxies, 2024

Metric	U.S. Score (Global Rank)	China Score (Global Rank)
Tertiary education	31.40 (63)	22.30 (90)
Number of R&D researchers per million people	4,825.18 (NA) ^a	1849.25 (NA) ^b
ICTs	94.50 (9)	89.30 (25)
Knowledge absorption	50.90 (7)	42.70 (21)

SOURCE: Features information from WIPO, undated-a.

NOTE: Scores are calculated as weighted averages of normalized subindicators (0–100 scale). *Tertiary education* includes tertiary enrollment rates, graduates in science and engineering, and international student mobility. *ICT* is a composite of ICT access, use, government online services, and e-participation. *Knowledge absorption* includes intellectual property payments, high-tech imports, ICT services imports, foreign direct investment inflows, and business research talent. NA = not applicable.

^a This figure is derived from 2021 data.

^b This figure is derived from 2022 data.

The United States performs particularly well in ICT infrastructure, ranking 9th globally compared with China's 25th. China's relative weakness in these areas suggests structural limitations in its capacity to absorb and exploit new technology and knowledge, despite its substantial investments in research. For the first time in 2025, China entered the top ten of the GII developed by the WIPO; China demonstrated improvements in such areas as knowledge outputs, robotics, and labor productivity.⁴³ China's GII ranking suggests a strong innovation environment both internally and for exports, but it has weaker tertiary education, fewer R&D researchers, weaker ICT and knowledge absorption, and, thus, a weaker technological absorption capacity in both production and adoption compared with the United States.

⁴³ WIPO, "China Ranking in the Global Innovation Index 2025," webpage, undated-a.

Both production and adoption diffusion do not happen in isolated firms. Technologies propagate through supply chain relationships, industry consortia, and competitive mimicry. When an industrial platform connects thousands of firms to a shared digital infrastructure, adoption cascades through the economy in ways that no individual firm’s decision can achieve alone. For adoption diffusion especially, the maturity of an industry’s existing digital infrastructure (i.e., its readiness to absorb and propagate new tools) is a critical determinant.

The United States benefits from widespread broadband access, a mature digital economy, deep capital markets, and a large ecosystem of firms developing and deploying digital technologies. These factors create an environment in which firms and consumers can adopt and scale new technologies relatively rapidly. China, meanwhile, has substantially expanded the foundations for technology adoption over the past two decades through sustained investment in digital infrastructure and the development of a highly digitalized consumer economy. China’s rapid adoption of mobile payments, driven by platforms such as Alipay and WeChat Pay, represents one of the most notable examples of large-scale digital diffusion in a major economy. China’s ICT development has also been characterized by a rapid, state-led expansion of integrated digital infrastructure—including 5G networks, fiber broadband, and data centers—much of it supported by industrial policy and long-term strategic planning.⁴⁴ However, progress is constrained by weak industrial uptake, persistent urban-rural divides, financial pressures on telecom operators, and high energy intensity, meaning that China’s key challenge is not infrastructure strength but translating that strength into sustained productivity and innovation gains, both of which are fundamental for technology diffusion.

An additional challenge for measuring adoption concerns its quality. Firms, particularly smaller private enterprises, often adopt digital tools and emerging technologies at a superficial level, primarily to access policy incentives rather than to transform operations. Evidence from Chinese industry suggests that, although many firms report adopting advanced technologies (such as AI), only a small minority integrate them into core decisionmaking or production processes, and adoption is frequently limited to pilot projects or standalone systems.⁴⁵ In China, this pattern is partly linked to a system of state-driven incentives that reward alignment with policy priorities. However, this is not the only explanation. In the United States, firms also face institutional constraints and organizational inertia that hinder deeper integration, particularly among established firms. Although symbolic or compliance-driven adoption is not unique to

⁴⁴ China Academy of Information and Communications Technology, “White Paper on Broadband Development in China (2020)” [“中国宽带发展白皮书(2020年)”], October 2020; Ministry of Industry and Information Technology of the People’s Republic of China (MIIT), “5G Application ‘Sailing’ Action Plan (2021–2023)” [“5G应用 ‘扬帆’ 行动计划 (2021–2023年)”], July 12, 2021a; MIIT, “Notice from the Ministry of Industry and Information Technology on Issuing the 14th Five-Year Plan for the Development of the Information and Communication Industry” [“‘十四五’ 信息通信行业发展规划”], November 16, 2021b.

⁴⁵ Zhang Yushuo, “Fewer Than One in 10 Chinese Firms Translate AI Adoption Into Productivity or Profit, Accenture Says,” Yicai Global, July 25, 2025.

China, its governance and incentive structure—in which access to subsidies, financing, or preferential treatment is tied to demonstrating alignment with state objectives—might more systematically encourage firms to prioritize formal compliance over the more costly and complex process of genuine organizational transformation.

At first glance, the overall results for this metric place the United States in a better position to absorb technology; these results might appear to underestimate the Chinese system, one that has long relied on the absorption of foreign technology and know-how as a central driver of economic and technological development. However, two important caveats should be borne in mind. First, our analysis indicates that China’s absorptive capacity, while improving, remains weaker than the United States’; this does not imply that China’s absorptive capacity is weak in absolute terms. Second, quantitative indicators and composite indexes often fail to capture the full complexity of realities on the ground where Chinese firms and research entities have, in practice, demonstrated a substantial capacity to absorb and deploy advanced technologies.

Thus, although our comparison indicates an advantage for the United States, China’s apparent disadvantage should not be taken as sign of weakness in absorptive capacity and should be considered in terms of a system that, even according to imperfect international indexes, has been quickly closing the gaps.

Metric 7: Financial Incentives

Production Diffusion and Adoption Diffusion

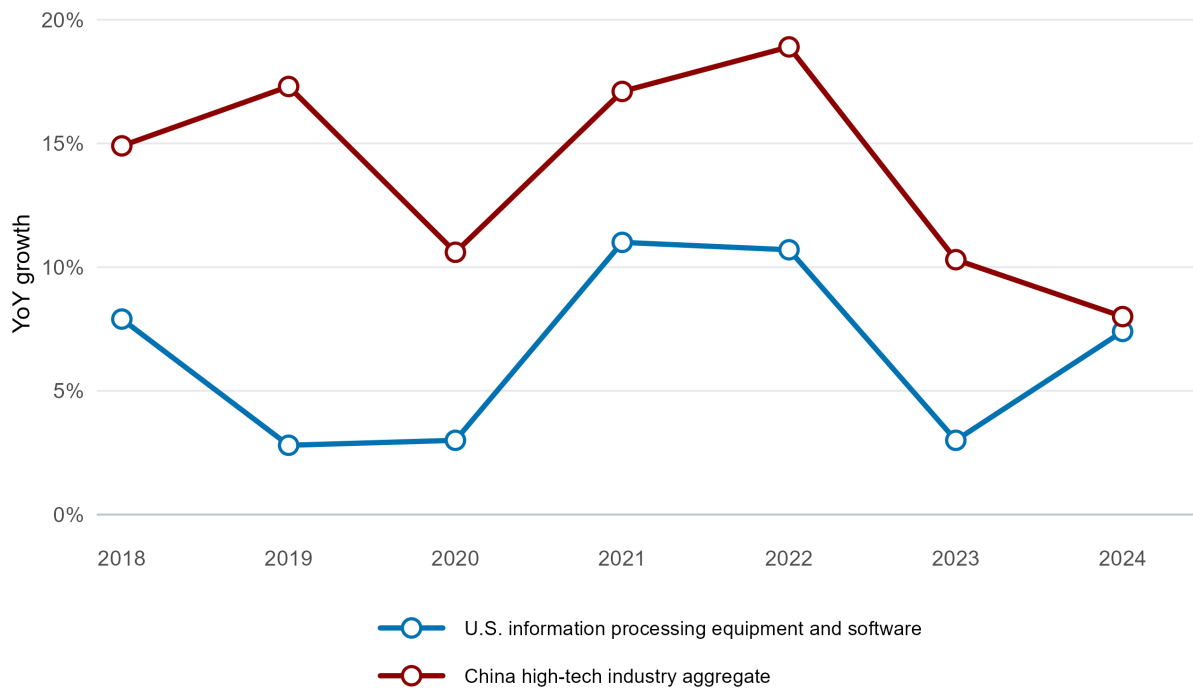
Financial incentives tend to have more-immediate and observable effects on production-side decisions, particularly those that reduce firms’ R&D costs or capital investment constraints. Although demand-side incentives can also support technology adoption (e.g., through subsidies, tax rebates, procurement), their effects are often mediated by additional factors, such as user behavioral responses, making their impact more contingent and context-dependent.

Fixed asset investment (FAI) is most useful as an indicator of production diffusion capacity and only indirectly relevant for adoption diffusion because it suggests that economies are building the physical capacity required to produce and deploy new technologies.

From 2018 to 2024, there seems to have been a divergence between China and the United States in the growth profile of technology-related FAI (Figures 3.6 and 3.7). Although both countries experienced a pandemic-era dip and subsequent recovery, the post-2022 period points to a clearer divergence: After several years of strong growth, China’s selected high-tech FAI indicators decelerated and became more uneven, whereas the United States showed signs of a more sustained recovery linked to the existing AI and digital-infrastructure investment cycle.⁴⁶

⁴⁶ The 2021–2022 peak in technology-related FAI reflects a two-phase dynamic in China: a 2021 surge driven by low base effects and pandemic-induced digitalization, followed by sustained 2022 growth from lagged capital

Figure 3.6. United States—China Fixed Asset Investment, Year-on-Year (2018–2024)

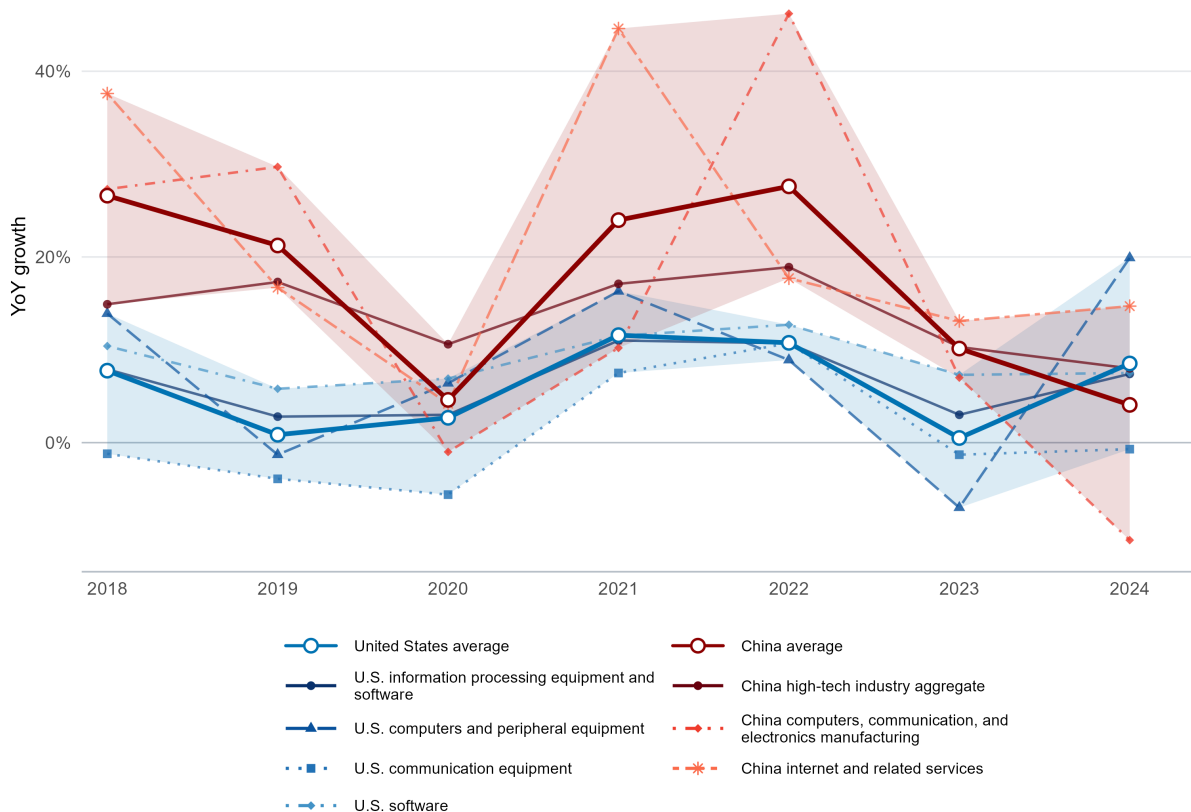


SOURCE: Features data from the U.S. Bureau of Economic Analysis's fixed investment and private fixed investment series and China's National Bureau of Statistics FAI series via CEIC. The United States' and China's data series are not a perfect comparison and should be read as such.

NOTE: YoY = year-on-year.

expenditure, policy support for new infrastructure and technological self-sufficiency, and supply-chain security concerns. After 2022, FAI normalized as demand weakened.

Figure 3.7. Breakdown of United States—China Fixed Asset Investment, Year-on-Year (2018–2024)



SOURCE: Features data from the U.S. Bureau of Economic Analysis's fixed investment and private fixed investment series and China's National Bureau of Statistics FAI series via CEIC. The United States' and China's data series are not a perfect comparison and should be read as such.

The United States and China finance technology diffusion in different ways; the countries diverge in terms of who supplies most of the capital, which innovations get backed, and where the capital lands. In the United States, the private sector largely decides where to invest. Washington mainly steps in to narrowly boost production and markets for targeted strategic sectors, if at all, but it could offer broader tax policy (such as tax exemptions or tax cuts) to provide indirect adoption incentives. For example, the CHIPS and Science Act and the Inflation Reduction Act (IRA) offered substantial incentives (a 25 percent investment tax credit for semiconductor manufacturing and \$369 billion in clean energy tax credits over a decade).⁴⁷ The target was mostly technology production rather than adoption, but ultimately, through production, the IRA aimed at boosting the adoption of green technologies across the economy.

In China, the state is the central architect of incentives in strategic sectors. The Chinese government picks strategic sectors years (sometimes decades) in advance and pours large

⁴⁷ Washington Council Ernst & Young, "CHIPS and Science Act Includes Tax Credits, Incentive," EY, August 12, 2022; UN Trade and Development, "\$369 Billion in Investment Incentives to Address Energy Security and Climate Change," August 16, 2022.

resources into bringing them to life, often via the state-owned financial sector. Firms crowd into these priority areas eager for their share. The state could nurture their growth through subsidies, tax breaks, or both, but Chinese companies are subject to intense internal competition to survive, which could lead to a race to the bottom in terms of prices and overcapacity—outcomes that are, to different degrees, tolerated by the Chinese state.⁴⁸ The selected protection of specific firms is also a means used by the Chinese government to favor certain firms, often state-owned enterprises, in strategic sectors.

The chief advantage of China’s approach to financial incentives compared with the United States’ is its ability to speed the initial scaling of state-backed technologies. Because companies must reach cost-competitiveness quickly and scale production fast to survive, these technologies are more likely to diffuse faster and more widely through society, first at home first and then abroad.

Green technologies and electric vehicles (EVs) are the clearest example of how China uses financial incentives to speed up the scaling of technologies. In 2009, few outside China had heard of BYD, which, at that time, was a smartphone battery maker pivoting into cars. But the former Chinese Minister of Science and Technology, Wan Gang, who bet on EVs in the late 2000s, helped establish BYD. Beijing followed through on this bet, pouring \$231 billion into its EV industry by 2023, including \$4.3 billion to BYD between 2015 and 2020.⁴⁹ Today, Chinese EVs dominate the global market and, with the sale of 2.26 million vehicles in 2025, BYD surpassed Tesla (which sold 1.64 million vehicles that year).⁵⁰ Although BYD’s success cannot be entirely attributed to subsidization, the decision to pivot from smartphone batteries to EV batteries and EVs is an example of a Chinese firm shaping its business development according to the direction of state financial incentives.

The EV example illustrates that production diffusion requires as much policy support as it requires capital for commercialization, scale-up, and capacity expansion. The United States and China provide that capital through fundamentally different financing architectures, reflecting their broader market-driven and state-directed approaches to technology diffusion.⁵¹

The United States dominates global VC, accounting for 57 percent of total global VC funding in 2025.⁵² Much of this capital is concentrated in AI infrastructure, AI model

⁴⁸ JS Tan, “Rethinking AI Diffusion in China,” *Value Added*, Substack, July 18, 2025.

⁴⁹ Arjun Kharpal and Evelyn Cheng, “Musk Once Laughed Off BYD as a Threat. Now the Chinese Giant Has Taken Tesla’s EV Crown—Here’s How,” CNBC, January 4, 2024; Annabelle Liang and Nick Marsh, “How China Made Electric Vehicles Mainstream,” BBC, June 22, 2025.

⁵⁰ Felix Richter, “BYD Surges Past Tesla to Become World’s Leading EV Brand,” *statista*, January 5, 2026.

⁵¹ National Venture Capital Association, *NVCA 2025 Yearbook*, 2025.

⁵² National Venture Capital Association, “NVCA Releases 2025 Yearbook Showcasing 2024 VC Trends,” press release, March 27, 2025.

development, semiconductor technologies, and developer tools, reinforcing the country's strength in technological commercialization and early-stage scaling.

China's private investment landscape for technology diffusion is shaped by a much heavier state hand. Government guidance funds (approximately 13 trillion yuan or US\$1.78 trillion at the 2024 exchange rate) function as quasiventure vehicles that direct capital toward sectors the state has prioritized for technology deployment.⁵³ The third phase of the China Integrated Circuit Industry Investment Fund (launched in 2024 and approximately US\$47.5 billion) and a new national VC guidance fund announced in December 2025, for example, channel capital not only into technology creation but explicitly into commercialization and deployment.⁵⁴

However, China's VC ecosystem faces structural constraints that affect adoption finance. The share of investment rounds involving overseas capital has declined sharply from 27 percent in 2021 to around 11 percent in 2025. This contraction reduces the diversity of investment perspectives and could narrow the variety of technologies that receive adoption funding. Additionally, Chinese data on innovation funding reveal an important limitation with potential spillovers for production diffusion of endogenous technologies. Although long-term policy frameworks create the impression of sustained and stable support, in practice, a large share of basic research funding (around 70 percent) is project-based, short-term (typically three to five years), and tied to clearly defined deliverables.⁵⁵ In the past, this structure has discouraged risk-taking and longer-term exploration, instead incentivizing incremental and low-ambition projects designed to meet funding criteria within constrained timeframes.⁵⁶

Finally, private enterprises in China do not spend on basic research as much as U.S. enterprises do.⁵⁷ Although the gap has a more direct impact on innovation rather than diffusion, China's weakness at the exploratory stage of technology can have a ripple effect on the availability of those technologies for diffusion.

⁵³ Xuan Li and Cornel Ban, "Financing Technological Innovation in China: Neo-Developmental Financial Statecraft Through Government Guidance Funds," BU Global Development Policy Center, GCI Working Paper 041, April 2025.

⁵⁴ Che Pan and Xinmei Shen, "Tech War: China's Big Fund III Brings US\$47.5 Billion in Fresh Outlay for Nation's Semiconductor Supply Chain, Analysts Say," *South China Morning Post*, May 29, 2024.

⁵⁵ "Xinhua Survey at the Two Sessions: Why Is Research Funding Always 'Losing Money Just to Gain Attention'?" ["两会新华调查: 科研经费, 为何总是 '赔本赚吆喝'?"], Xinhua News Agency [新华通讯社], March 9, 2014; Wen, Kang, and Lü, 2019.

⁵⁶ University of Science and Technology of China, "Application Notice for the 2022 Stable Support Young Teams Program in Basic Research of the Chinese Academy of Sciences" ["中国科学院2022年度稳定支持基础研究领域青年团队计划申报通知"], April 13, 2022; China Development Portal, 2023; University of Science and Technology of China, "Application Notice for the 2023 Stable Support Young Teams Program in Basic Research of the Chinese Academy of Sciences" ["中国科学院2023年度稳定支持基础研究领域青年团队计划申报通知"], April 18, 2023.

⁵⁷ OECD, "Gross Domestic Expenditure on R&D by Sector of Performance and Type of R&D," dataset, OECD Data Explorer, last updated August 7, 2026b.

The financing dynamics for adoption diffusion are somewhat different. Although significant investment in the United States also flows into application-layer companies, this segment is more fragmented and less capital-intensive, meaning that funding per firm is typically much smaller. As a result, areas critical for enterprise adoption, such as systems integration, workflow redesign, and industry-specific implementation, tend to be less visible in venture funding data and often rely more on incumbents and service-based models than on large-scale VC backing. Compared with the United States, China's incentive architecture for adoption diffusion is broader in coverage, more explicitly adoption-oriented, and state-driven. One example is the targeted tax credit for enterprises investing in the "digital and intelligent transformation" of eligible equipment, available from 2024 through 2027.⁵⁸ Local governments can add a further adoption-specific layer. The Lingang New Area in Shanghai, for example, offered subsidies for using autonomous computing chips and technology innovation vouchers for SMEs.⁵⁹ Similar voucher and subsidy schemes exist in Shenzhen, Hangzhou, and Chengdu, often tied to provincial "digital economy" targets.⁶⁰

The effectiveness of these layered instruments is debated. A series of empirical studies using Chinese A-share listed firm data have found that government subsidies do promote enterprise digital transformation, but their impact varies significantly. The strongest effects are seen on state-owned, small, and early-stage firms rather than on growing or medium and large private firms.⁶¹

All in all, both countries have deep pools of technology investment capital. Financially, the U.S. system optimizes for risk-taking and discovery through private capital, while China's system optimizes for scale and deployment through subsidized and coordinated capital. China appears to possess a comparative advantage in mobilizing capital toward the rapid scaling and commercialization of state-prioritized technologies, while the United States retains an advantage in financing technological experimentation and supporting a broader variety of innovation pathways. The U.S. approach, in that regard, displays a more diverse and larger set of actors that can provide financial incentives and support, and who, ultimately, will back any technology with commercial potential. A firm (such as Sequoia Capital) backs whatever shows market

⁵⁸ Chinese Ministry of Finance, "Announcement on Enterprise Income Tax Policies for the Digital and Intelligent Transformation of Energy and Water Conservation, Environmental Protection, and Safety Production Specialized Equipment" ["关于节能环保, 环境保护, 安全生产专用设备数字化智能化改造企业所得税政策的公告"], Ministry of Finance and State Taxation Administration Announcement No. 9, July 12, 2024.

⁵⁹ Lin-Gang Special Area Administration, "Industrial & Tech Policies," brochure, undated; Shanghai Municipal Commission of Science and Technology, "Innovation Vouchers Boost Shanghai's Tech Scene," International Services Shanghai, August 27, 2025.

⁶⁰ Daisy Wu, "Chinese Cities Offer Subsidies to Boost Access to the Computing Power Needed for AI," *South China Morning Post*, December 27, 2024.

⁶¹ Zhen Han, Erga Luo, Xuezhen Xiong, and Jinkai Li, "Government Innovation Subsidies and Enterprise Digital Transformation: Evidence from Chinese Listed Companies," *Technology in Society*, Vol. 84, March 2026.

potential—whether that is Nvidia, Cisco, and OpenAI or Instacart, Airbnb, and LinkedIn.⁶² The U.S. technology financing model not only is likely to allow the spread of a wider variety of innovations, but also it is not heavily dependent on public money. This suggests that, absent policy intervention, market-based systems (such as the system in the United States) might underinvest in sectors that are highly capital-intensive or characterized by uncertain or long-term returns.

Most importantly, neither country has solved the adoption funding gap. Both countries display a disconnect between capital that funds technology creation, capital that funds diffusion of production technologies, and capital that incentivizes ordinary enterprises to deploy technology in their operations. In the United States, this gap is filled imperfectly by private funding. In China, it is filled imperfectly by state-backed funding.

Metric 8: Geography

Technological diffusion is inherently spatial: Although technologies are typically developed in a limited number of locations, their economic benefits depend on widespread use across regions. The geographic distribution of technology adoption, therefore, provides a critical measure of diffusion, particularly on the demand side. In this section, we use such proxies as geospatial clustering, broadband penetration, enterprise digitalization, and rural-urban usage patterns to assess how evenly firms and households across each country are integrating new technologies. However, these proxies capture only part of the picture. Product-level proxies, including the sales or deployment of such technologies as robotics (production diffusion) and EVs (adoption diffusion), offer a complementary measure of how diffusion unfolds across space.

Production Diffusion

In terms of the geography metric, China hosts a greater number of densely populated innovation hubs, but their geographic concentration—much like in the United States—constrains the potential to diffuse innovation to other regions.

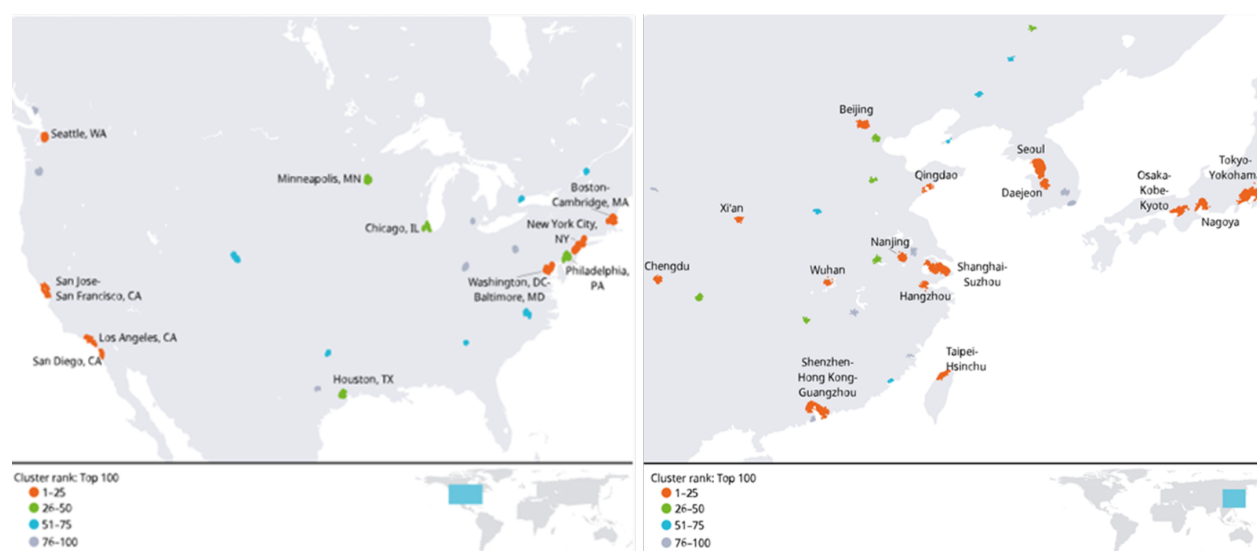
Over the past several years, China has slowly dethroned the United States in the number of S&T clusters it has. In 2018, China had 16 S&T clusters that were among the world’s top 100, compared with 26 in the United States. By 2022, China had pulled even at 21 clusters each. In 2024, it took the lead with 26 clusters to America’s 20. The shift holds even after adjusting for the size of the local population.

Where these clusters are located matters just as much as how many there are. Most U.S. and Chinese S&T clusters are located in a few metropolitan coastal cities, limiting further the reach of new technologies inland. China’s top S&T clusters are heavily concentrated in a few large coastal cities, such as Shenzhen, Hangzhou, and the Shanghai-Suzhou corridor. U.S. S&T

⁶² Sequoia Capital, “Our Companies,” webpage, undated.

clusters span every major region and have a stronger foothold in smaller cities, such as Ann Arbor, Michigan, or Raleigh, North Carolina. Still, nearly half of U.S. S&T clusters are in California, anchored in the San Francisco Bay area, Los Angeles, and San Diego, while the rest are situated along the Boston–New York–Washington, D.C., corridor (Figure 3.8).⁶³

Figure 3.8. Map of U.S. and Chinese Science and Technology Clusters in the 2024 Global Innovation Index Top 100



SOURCE: Adapted from WIPO, “Cluster Ranking,” webpage, undated-b (CC BY 4.0).

Industrial robotics adoption in both China and the United States is highly concentrated in manufacturing-intensive regions but at markedly different scales. China has become the dominant global market, installing around 295,000 industrial robots in 2024, accounting for more than half of global deployments, with robotics adoption activity heavily clustered in major industrial regions, such as the Yangtze River Delta and the Pearl River Delta. By contrast, the United States installed roughly 34,200 units in the same year, with adoption concentrated in established industrial sectors, particularly automotive manufacturing. In both countries, robot diffusion follows existing industrial geography rather than population or income alone, reinforcing the role of production structure and industrial clustering in shaping adoption patterns.⁶⁴

⁶³ WIPO, “Cluster Ranking,” webpage, undated-b.

⁶⁴ Artificial Intelligence Index, *Artificial Intelligence Index Report*, Stanford Institute for Human-Centered Artificial Intelligence, 2026.

Adoption Diffusion

Geography has implications for technology production diffusion but even more so for technology adoption diffusion. In the United States, technology intermediaries are concentrated in metropolitan areas, and businesses in rural areas are less likely to adopt cloud computing, AI, or advanced analytics than their urban counterparts.⁶⁵ Regions and counties with higher broadband adoption had higher business growth than counties with lower adoption and had higher per capita income growth.⁶⁶

As shown previously, China's geographic adoption divide operates along two axes: urban versus rural and eastern versus western provinces. A study published in *npj Urban Sustainability* analyzing 30 Chinese provinces from 2000 to 2020 found that early digitalization policies favored eastern provinces and that undeveloped provinces faced significant urban-rural inequalities that exacerbated the digital divide even as national-level indicators improved.⁶⁷

The east-west dimension compounds the urban-rural split, but Chinese policymakers have invested heavily in closing the geographic divide. An "Eastern Data, Western Computing" data project aims to distribute digital infrastructure more evenly.⁶⁸ There is evidence of progress in expanding rural broadband subscribers; however, researchers note that rural internet use remains concentrated on entertainment and social media rather than productivity-enhancing or business applications.⁶⁹

In the United States, EV diffusion shows a clear distinction between volume-driven and adoption-driven patterns. In absolute terms, EV sales are concentrated in large states, such as California, Texas, Florida, and New York, reflecting underlying market size rather than proximity to innovation clusters (Table 3.9). However, when measured in terms of market share, higher adoption is more closely associated with policy-driven and infrastructure-rich regions, many of which overlap with major innovation hubs.⁷⁰ This suggests that EV diffusion is shaped

⁶⁵ Jack Nicholaisen, "Urban Innovators: Tech Adoption by City vs. Rural Guide," Business Initiative, June 23, 2025.

⁶⁶ Anne N. Junod and Corianne Payton Scally, "Expanding Digital Opportunity in Rural Communities," Urban Institute, February 2025.

⁶⁷ Chuanglin Fang, Zehui Chen, Xia Liao, Biao Sun, and Lingyu Meng, "Urban-Rural Digitalization Evolves from Divide to Inclusion: Empirical Evidence from China," *npj Urban Sustainability*, Vol. 4, No. 1, 2024.

⁶⁸ National Development and Reform Commission, "Report on the Implementation of the 2024 Plan for National Economic and Social Development and on the 2025 Draft Plan for National Economic and Social Development," March 5, 2025.

⁶⁹ Jie Weng, Wang Li, and Xinru Zheng, "Internet Use, Income Mobility and the Expansion of the Rural Middle-Income Group: Evidence from China," *Heliyon*, Vol. 10, No. 16, 2024; Hui Xu, Xipu Wang, and Dawei Zhang, "Internet Access and Rural Energy Poverty Alleviation in China: The Moderating Role of Human Capital," *Energy*, Vol. 335, 2025.

⁷⁰ Registration data could provide a clearer picture, but reliable data for China at the local level were not found.

primarily by demand-side conditions, such as policy incentives, charging infrastructure, and income levels, rather than the geographic location of innovation activity alone.⁷¹

Table 3.9. Top EV Sales in the United States and China, by State

U.S.	China
California	Guangdong
Texas	Zhejiang
Florida	Jiangsu
New York	Shandong
Pennsylvania	Henan
Illinois	Shanghai
New Jersey	Sichuan

SOURCES: Anisha Talpade, “The US-China EV Story in Four Charts,” S&P Global, July 8, 2024; Lang Mai, Ming Liu, Han Hao, Xin Sun, Fanran Meng, Yong Geng, Zia Wadud, James E. Tate, Zhenyu Dong, Haoyang Li, et al., “A High-Resolution Dataset on Electric Passenger Vehicle Characteristics in China and the European Union,” *Scientific Data*, Vol. 12, No. 1, 2025.

Subnational EV data show that EV adoption in China is concentrated in major coastal metropolitan clusters, such as the Guangdong, Shanghai, and Shenzhen regions, mirroring the spatial clustering observed in innovation and industrial hubs.⁷² This indicates that diffusion is driven not only by demand-side factors (such as income and urbanization) but also by the colocation of production, infrastructure, and policy support. As a result, EV uptake in China follows a more concentrated and coordinated spatial pattern than in the United States, where adoption is more distributed across metropolitan markets. However, these also appear to be the areas where local policy incentives, infrastructure, and economic conditions align. Subnational variation in subsidies and regulatory measures, such as license plate restrictions, strongly favors EV uptake in large cities, while higher income levels and dense charging networks further reinforce these regional adoption hubs.⁷³

Both countries face geographically uneven EV adoption patterns that are structurally similar but differently configured. In the United States, disparities primarily reflect metropolitan-rural divides, reinforced by income inequality and uneven infrastructure provisions. In China, gaps are shaped by both urban-rural differences and regional imbalances between coastal and inland

⁷¹ Jason Jordhamo, “Mapping the EV Boom: State-by-State Electrification Trends,” Mobility Global, March 31, 2025; Alliance for Automotive Innovation, “Alliance for Automotive Innovation Releases State-By-State Analysis of the U.S. EV Market for Q1 2025,” MOTOR, June 24, 2025.

⁷² Mai et al., 2025.

⁷³ Harsh Chaudhary, Dinesh Prasad Sahu, Nidhi, and Ramita Sahni, “Predictive Modeling and Machine Learning-Based Analytics for Electric Vehicle Adoption and Market Forecasting,” *Next-Generation Networks and Deployable Artificial Intelligence*, 2026.

provinces. Although both countries have deployed policy tools to support adoption, these measures have so far struggled to close underlying structural disparities.

Metric 9: Intermediary Organizations

Production and Adoption Diffusion

Technological diffusion can happen through a direct connection between a technology's producer and the firm that ultimately uses it, but often between these two entities sits a layer of intermediary organizations whose specific function is to translate available technologies into deployable solutions and to support firms through the process of integration, training, and organizational change.

The United States has cultivated an unparalleled network of innovation intermediaries: incubators, accelerators, VC firms, and technology transfer offices. It remains the undisputed hub of global VC, drawing roughly 64 percent of worldwide funding in the second quarter of 2025.⁷⁴ That dominance reflects decades of institutional layering that provides the United States with an advantage over China in the intermediary organizations metric.

China, meanwhile, has moved quickly to replicate this formula. Its first incubator opened in Wuhan in 1987, and by 2023, China boasted 2.1 million science and S&T service providers, 12 regional technology transfer centers, 420 key transfer institutions, and 16,000 incubation platforms covering 95 percent of all counties.⁷⁵ The speed of this build-out is extraordinary. But scale has often outpaced substance.

There are stand-out successes. Hangzhou's "Six Little Dragons" (*Black Myth: Wukong* developer Game Science, ChatGPT's rival DeepSeek, Neuralink's competitor BrainCo, spatial intelligence firm Manycore Tech, and robotics giants Unitree Robotics and DEEP Robotics) were nurtured in local incubators. The same goes for voice recognition leader iFLYTEK, drone giant DJI, and chips manufacturer Cambricon Technologies.⁷⁶

Yet beyond these exemplars, quality varies sharply. Outside key hubs, many intermediaries resemble real estate ventures more than innovation engines, offering office space and administrative assistance rather than meaningful, specialized support.⁷⁷

⁷⁴ Alice Leonard, Rishi Roongta, and Arun Gomatam, "Global Venture Capital Outlook: The Latest Trends," Bain and Company, March 27, 2026.

⁷⁵ Chang Li [记者常理], "Effectively Improve the Conversion Rate of Scientific and Technological Achievements" ["切实提高科技成果落地转化率"], *Seeking Truth* [求是], April 5, 2025.

⁷⁶ MIIT, "MIIT Held a Press Conference on 'Promoting the High-Quality Development of the Science and Technology Service Industry' ["工业和信息化部举行 '推进科技服务业高质量发展' 新闻发布会"], May 15, 2025.

⁷⁷ Liu Zhenzhong [刘振中], "Explore the Path of Deep Integration of Scientific and Technological Innovation and Industrial Innovation" ["探索科技创新与产业创新深度融合路径"], *Seeking Truth* [求是], August 20, 2024;

This is a stark contrast to, for example, the Y Combinator that epitomizes the U.S. model. The Y Combinator does not just offer office space, it provides a network, feedback from veteran entrepreneurs, and introductions to investors who expect global scale. Its model is at the origin of many industry pioneers, including Airbnb, Coinbase, Dropbox, and Twitch.

The U.S. private intermediary ecosystem is strongly biased toward large enterprises; SMEs tend to have fewer funds available to hire information technology (IT) consultants for technological adoption.⁷⁸ The result is a bifurcated adoption support landscape: Large firms have access to sophisticated, well-resourced intermediaries, while SMEs with little to no external support lag behind.

In China, Haier's COSMOPlat (an industrial internet platform) offers integrated digital suites specifically tailored to the needs of SMEs that lack internal IT departments. These platforms bundle communication, workflow management, supply chain coordination, and increasingly AI-powered analytics into a single package that firms can adopt incrementally.⁷⁹

This platform-as-intermediary approach is present both in China and in the United States, and the platforms provide onboarding, training, and ongoing support as part of a subscription. Such an approach lowers the barrier for SME adoption, but costs can still function as barrier. COSMOPlat, for example, has connected enterprises to its industrial internet platform, offering not just software but production scheduling, quality monitoring, and supply chain matching services.⁸⁰ The trade-off, both in China and the United States, is vendor lock-in and data dependency: Enterprises that adopt these platforms become deeply embedded in a single ecosystem, often with limited interoperability.

Shishuo Xinyu [是说新语], "Deep Integration of S&T Innovation and Industrial Innovation: Where Should We Focus Our Efforts?" ["科技创新和产业创新深度融合, 从哪些方面发力?"] *Seeking Truth* [求是], April 10, 2025.

⁷⁸ Faiz Faiz, Viet Le, and Eryadi K. Masli, "Determinants of Digital Technology Adoption in Innovative SMEs," *Journal of Innovation and Knowledge*, Vol. 9, No. 4, October–December 2024.

⁷⁹ Yubin Xie and Yun Li, "Research on Haier COSMOPlat Promoting Industry Upstream and Downstream Collaboration and Cross-border Integration," 2020 IEEE 7th International Conference on Industrial Engineering and Applications, April 16–21 2020; Lucheng Chen, Haiqin Xie, Wen Yang, and Lin Xiao, "Data Space Based on Mass Customization Model," in Boris Otto, Michael ten Hompel, and Stefan Wrobel, eds., *Designing Data Spaces: The Ecosystem Approach to Competitive Advantage*, Springer, 2022; Wenhui Fu, Min Zhang, Xiande Zhao, and Fu Jia, "Interplay Between Servitization and Platforms: A Longitudinal Case Study," *International Journal of Operations & Production Management*, Vol. 42, No. 4, 2022; CaiYun Zhuang, Yu Lin, and LiLi Wang, "Research on Ambidextrous Digital Innovation Strategies of SMEs Embedded in Industrial Internet Platforms Based on Evolutionary Game Theory," *Scientific Reports*, Vol. 16, No. 1, 2026.

⁸⁰ Xie and Li, 2020; Chen et al., 2022; Fu et al., 2022; Zhuang, Lin, and Wang, 2026.

Metric 10: Legal and Regulatory Systems

Production and Adoption Diffusion

In this section, we catalog the principal legislative and policy frameworks in each country that directly or indirectly shape adoption diffusion. Given the broad nature of this metric and the different approaches of the United States and China, we split it into two subcategories: *state policy coordination* and *legal-commercial institutions*.

State Policy Coordination

Using the distinction between production diffusion and adoption diffusion, the key difference between China and the United States lies less in whether both countries pursue both objectives and more in how closely they connect both types of diffusion institutionally. In China, production and adoption diffusion are typically embedded within the same industrial-policy architecture: S&T commercialization rules, manufacturing digital transformation plans, industrial internet initiatives, and SME digitalization measures are designed both to expand domestic production capacity and to accelerate uptake across firms and supply chains. In the United States, by contrast, these functions are more clearly separated. Production diffusion is supported mainly through lab-to-market rules, federal technology transfer mechanisms, IP-based commercialization, and advanced manufacturing institutes, while adoption diffusion relies more on extension services, standards, and firm-level incentives that help users integrate technologies into their operations (Table 3.10).

Table 3.10. Selected Production and Adoption Diffusion Policies from China and the United States

Type of Technology Diffusion	China Policies (Year Adopted)	U.S. Policies (Year Adopted)
Production diffusion	• Law on Scientific and Technological Progress (1993, 2007, and 2021) • Law on Promoting the Transformation of Scientific and Technological Achievements (1996 and 2015) • Made in China 2025 (2015) • Manufacturing Digital Transformation Action Plan (2024) • Industrial Internet Innovation and Development Action Plan (2021 to 2023) • 14th Five-Year Plan for Intelligent Manufacturing (2011) • 15th Five-Year Plan (2026)	• Bayh-Dole Act (1980) • Stevenson-Wydler Technology Innovation Act (1980) • Federal Technology Transfer Act (1986) • Technology Transfer Commercialization Act (2000) • Manufacturing USA/Network for Manufacturing Innovation (2016) • CHIPS and Science Act (2022)
Adoption diffusion	• SME Digital Transformation Guide (2022) • Industrial Internet Innovation and Development action Plan (2021 to 2023) • AI+ Action Plan (2025) • 15th Five-Year Plan (2026)	• Manufacturing Extension Partnership (1988) • National Technology Transfer and Advancement Act (1996) • IRA (2022)

The absence of any recent, explicit U.S. economywide technology diffusion policies is less likely to be a lack of interest in diffusion than an indication of differences in the U.S. legal-governance model. In China, adoption is often advanced through administrative planning instruments, such as implementation guides, action plans, and sectoral roadmaps, and these instruments exist alongside formal law and are used to steer deployment directly across firms and supply chains. By contrast, the United States relies more on durable framework statutes and standing programs through which adoption is mediated in a more decentralized and market-facing way.

Legal-Commercial Institutions

Strong IP protection is another important factor for production diffusion in countries that have the capacity to innovate on their own. The U.S. system for commercializing IP assets outperforms China's. In 2025, the United States scored 5.67 out of 6.0 on the "Commercialization of IP Assets" section of the U.S. Chamber of Commerce's IP index, which measures such factors as barriers to technology transfer and registration and disclosure requirements of licensing agreements. That score is almost two and a half times China's score of 2.33.⁸¹ The gap between the two countries has, however, narrowed since 2018 when the index was first introduced. At that time, China scored 0.75 out of 3.0, one-quarter of the U.S. score of 3.0.⁸²

Indeed, China has come a long way in a short time and underwent numerous updates to its patent law, trademark law and copyright law in the 21st century.⁸³ Some of the most notable developments include its accession to the World Trade Organization (WTO) in 2001 and thus the need to comply with the Agreement on Trade-Related Aspects of Intellectual Property Rights (TRIPS); the issuing of the Action Plan for the Further Implementation of the National IP Strategy in 2014 to ramp up domestic IP creation, integrate IP into industry, and strengthen protections; and its accession to the Apostille Convention in 2023, which enabled the certification of documents as legitimate if they were certified from the country where they originated rather than through a complex chain of certifications.⁸⁴

Still, both legal frameworks and enforcement remain patchy. China's vast territory and the division of authorities between different levels of government and ministries make it hard to

⁸¹ Meir Pugatch and David Torstensson, *International IP Index: 2026 Fourteenth Edition*, Global Innovation Policy Center, U.S. Chamber of Commerce, 2026.

⁸² Meir Pugatch, Rachel Chu, and David Torstensson, *Create: U.S. Chamber International IP Index*, 6th ed., U.S. Chamber of Commerce, February 2018.

⁸³ Jie Hong, Jakob Edler, and Silvia Massini, "Evolution of the Chinese Intellectual Property Rights System: IPR Law Revisions and Enforcement," *Management and Organization Review*, Vol. 18, No. 4, August 2022.

⁸⁴ Gerald J. Krieger, "From 'Made in China' to 'Created in China': Intellectual Property Rights in the People's Republic of China," *Joint Force Quarterly*, Vol. 112, 1st Quarter 2024, p.86; Chris Borges, "Intellectual Property Rights in U.S.-China Innovation Competition," Center for Strategic and International Studies, May 16, 2024.

police violations consistently.⁸⁵ For example, in January 2025, the European Union advanced a case in front of the WTO in regard to China's use of the anti-suit injunctions.⁸⁶ The WTO arbitrator found that China's policy violates the TRIPS Agreement by restricting the ability of the IP holder "to prevent third parties not having its consent from making, using, offering for sale, selling, or importing the patented product."⁸⁷ Critically, China has since withdrawn its anti-suit injunction policy as a result, indicating its willingness to maintain alignment with the WTO ruling.⁸⁸

Despite the more mature legal system to protect IP in the United States, over the past 20 years, the U.S. Congress and the U.S. Supreme Court have made it harder for patent holders to stop unauthorized use, easier to challenge patents in court, and more difficult to patent certain types of innovations.⁸⁹ For example, U.S. wireless equipment manufacturer Sonos sued Google over an alleged violation of its patent concerning wireless audio technology in 2020. Although a jury awarded damages to Sonos in 2023, a court declared the Sonos patent invalid at that time. A U.S. appeals court, however, ruled in 2025 that the patent should not have been declared invalid, allowing Sonos to reopen the case.⁹⁰ Such cases carry not just legal fees but also a cost for business continuation and expansion.⁹¹

⁸⁵ Krieger, 2024, p.86.

⁸⁶ WTO, "EU Initiates Dispute Complaint Regarding Chinese Patent Licensing Measures," January 22, 2025.

⁸⁷ European Commission, "WTO Appeal Arbitrator Finds China Wrong to Restrict Intellectual Property Rights in Dispute Brought by EU," July 22, 2025.

⁸⁸ Mark A. Cohen, "China's ASI Strategic Retreat and WTO Compliance," *China IPR* blog, April 3, 2026.

⁸⁹ Chris Borges, "Intellectual Property Rights in the U.S.-China Innovation Competition," Center for Strategic and International Studies, May 16, 2024.

⁹⁰ Blake Brittain, "Sonos Wins Ruling to Revive US Patent in Case Against Google," Reuters, August 28, 2025.

⁹¹ Ignacio de Castro and Judith Schallnau, "What Does It Cost to Defend Your IP Rights?" *WIPO Magazine*, June 3, 2013.

Chapter 4: U.S. and Chinese Diffusion Capacity Assessment

In this chapter, we discuss the differences between U.S. and Chinese technology diffusion capabilities revealed through our analysis of the 11 metrics and the framework that we discussed in Chapter 2, and we explore China's perception of its diffusion model's weaknesses. We then examine China's efforts to overcome those weaknesses. The framework that we developed and applied in previous chapters assessed technology diffusion capabilities on an absolute basis. However, we have comparatively benchmarked the results to show respective strengths and weaknesses in the capacity to diffuse technology across each country.

We conclude that, although the Chinese government is taking steps to fix some of its problems, there is no sign that it will abandon its top-down approach because doing so fundamentally could require Beijing to loosen the very controls that sustain its authority and political stability.

Where Each Country Leads

The United States leads on absorptive capacity. Its universities remain the world's highest quality (ranking 1st on the GII), its enterprise software penetration is deeper, and its workforce's capacity to integrate complex technologies, especially in leading firms and clusters, is still better than in China, in part thanks to a higher number of larger enterprises with large market capitalization. The private consulting and systems integration market provides large enterprises with sophisticated adoption support. Where the United States decided to incentivize technology diffusion, such as in the clean energy sector via the IRA and the semiconductor industry via the CHIPS and Science Act, it has catalyzed investment at extraordinary scale (US\$422 billion in private investment from the IRA alone by early 2025). The regulatory environment, for all its fragmentation, permits the rapid deployment of such novel technologies as generative AI, giving U.S. firms an advantage in frontier adoption.

China leads on adoption breadth and policy coherence. It has a unified national technology adoption strategy (Digital China), a dedicated institutional home for digital transformation (the National Data Administration), and explicitly adoption-targeted incentive instruments (e.g., a 10-percent digital transformation credit).

Overall, the U.S. diffusion model is well suited to uncertainty, experimentation, and general-purpose or frontier technologies whose applications are not yet fully known. It supports quality, adaptability, and cross-sector spillovers but tends to concentrate gains in already-advanced firms and regions rather than delivering uniform economywide diffusion. China's diffusion model is most effective under certainty, especially if the state correctly identifies priority technologies and channels its resources accordingly. It can deliver fast and

visible diffusion outcomes and lead to leapfrogging in strategic areas but risks shallow or compliance-driven adoption and uneven adoption across the economy.

Where Each Country Falls Short

The United States has no recent national technology adoption strategy and no economywide digital transformation incentive. It lags behind in federal incentives, leaving the vast majority of the economy (such as manufacturing, services, and retail) without dedicated adoption support. The geographic digital divide persists, but data show gains in important infrastructure-related proxies, such as broadband adoption.⁹²

China's weaknesses are qualitative rather than quantitative. For example, the Accenture Digital Transformation Index scores Chinese companies at 49 out of 100 on digital maturity; their most-notable technological gains related to building a digital core and fostering a digital transformation in previous years, but there has been a progressive decrease in the optimization of these companies' operations.⁹³ Empirical research consistently finds that government subsidies are most effective for state-owned, small, and early-stage firms, but these subsidies lose effectiveness when it comes to scaling firms and risk creating digital facades through which adoption is performed for compliance rather than operational value. The internet penetration gap between urban and rural areas persists, and nationally representative survey data find that approximately half of Chinese households do not actively use the internet or e-payment systems despite nominal availability. The east-west provincial divide in digital infrastructure quality remains substantial, and diffusion happens more often near innovation hubs, whereas in the United States, it is more widespread. Plus, there is a usage divide: Rural residents use digital tools primarily for entertainment rather than productivity, undermining the adoption metrics that look impressive at the aggregate level.

A Shared Shortcoming: Small and Medium-Sized Enterprises

The single most important finding of our analysis is that neither country has solved the problem of technology adoption by nontechnology SMEs. This matters because SMEs account for the majority of employment and economic activity in both economies and because the marginal return to technology adoption is highest for firms that have not yet adopted it, not for firms that are already digitally mature.

⁹² Sue Marek, "U.S. Broadband Speeds Are Improving but the Digital Divide Is Growing," Ookla, April 23, 2025.

⁹³ Accenture, *Growth in a New Reality: Accenture China Digital Transformation Index 2025*, 2025.

In the United States, SMEs cite cost as a barrier to engaging IT consulting support.⁹⁴ In China, evidence of cost barriers has not been found in relation to the platform-as-intermediary offer, but the country lacks a mature intermediary environment outside the platform-as-intermediary model.

Thus, neither country reliably diffuses technology to the firms and regions where productivity gains would be greatest. Diffusion capacity remains a binding constraint on productivity growth and strategic advantage in both economies. The United States risks underrealizing its latent diffusion potential, while China risks overestimating the productivity impact of measured adoption. As a result, leadership in technology competition will increasingly depend not on who innovates first but on who can translate adoption into durable productivity gains beyond leading firms and regions.

China's Perception of Its Diffusion Deficit

Beijing appears to be aware of its diffusion deficit, even if it never uses that phrase (Table 4.1). Chinese policymakers rarely use the literal terms *technology diffusion* (技术扩散) or *diffusion capacity* (扩散能力), but a set of slogans betray the same concern. China still struggles to turn innovation gains into economic benefits because its research ecosystem and industrial base remain poorly linked.

Table 4.1. Revealed Versus Stated Weaknesses of China's Diffusion Model

Metric	Weaknesses in China's Diffusion System	Does Beijing Acknowledge the Problem?	Examples of Acknowledgment in Official Speeches, Press Conferences, and State Media
Research organizations	Smaller network of research institutions	Partially	Xi Jinping (2024): "We must strengthen the construction of national strategic S&T forces, optimize their positioning and layout, [and] improve the national laboratory system." ^a
Enterprises	Smaller network of billion-dollar companies	Partially	Xi Jinping (2025): "The key to integration is strengthening the leading role of enterprises in technological innovation. It is essential to fully leverage the leading role of technology-leading enterprises, encourage technological innovation in small and medium-sized enterprises and private companies, and support enterprises in leading or taking part in major national science and technology projects." ^b
R-E linkages	Weaker university-industry connections	Yes	<i>Economic Daily</i> (2024): "In reality, some industry-university-research cooperation models are limited to simple project cooperation or technology transfer, and there is a lack of in-depth communication and integration between the R&D end and the market end. This type of model is difficult to meet the current rapidly growing demand for scientific and technological

⁹⁴ Alessandra Costa, Antonio Crupi, Chiara Eleonora De Marco, and Alberto Di Minin, "SMEs and Open Innovation: Challenges and Costs of Engagement," *Technological Forecasting and Social Change*, Vol. 194, September 2023.

Metric	Weaknesses in China's Diffusion System	Does Beijing Acknowledge the Problem?	Examples of Acknowledgment in Official Speeches, Press Conferences, and State Media
Absorptive capacity	Limited bench of qualified talent	Yes	innovation and cannot adapt to the increasingly fierce market competition.” ^c <i>Economic Daily</i> (2024): “In the process of cultivating innovative talents, there is still a mismatch, and there is a disconnect between [the] talent chain, innovation chain, and industrial chain, which has become an important factor affecting the improvement of our country’s human capital level. In this regard, it is necessary to deepen the industry-university-research collaboration mechanism, innovate the talent training model, enhance endogenous motivation, and improve the quality level of cultivating top-notch innovative talents from multiple angles.” ^d
Financial incentives	Weaker high-risk capital support	Yes	<i>Economic Daily</i> (2025): “Technological innovation requires long-term capital support, but the current capital formation mechanism adapted to the laws of innovation is still imperfect, and financial supply suffers from problems, such as short-term funding and low risk tolerance.”
Geography	Geographic and sectoral concentration	Partially	<i>People’s Daily</i> (2025): “In recent years, the western region has seen the expansion of traditional industries, but its innovation capabilities remain weak.” ^e
Intermediary organizations	Nascent system of state-backed S&T service providers, struggling to match quantity with quality services	Yes	MIIT (2025): “We will strengthen service support. . . . We will formulate relevant standards for technology transfer institutions and other service providers, standardize service processes and evaluation systems, and improve the service capabilities of science and technology intermediary institutions.” ^f
Legal and regulatory systems	Weaker IP protection and enforcement uneven	Yes	China National Intellectual Property Administration (2022): “Currently, the biggest problem in intellectual property administrative protection is insufficient enforcement capabilities, posing major challenges for grassroots enforcement. Specifically, this manifests in two ways: first, relatively weak enforcement capabilities at the grassroots level and second, insufficient investment in grassroots enforcement.” ^g

^a Xi Jinping [习近平], “Speech at the Nationwide S&T Conference, National Science and Technology Awards Conference and the Conference of Academicians of CAS and CAE June 24, 2024” [“在全国科技大会, 国家科学技术奖励大会, 两院院士大会上的讲话 (2024 年 6 月 24 日)”, trans. by Etcetera Language Group, Inc., Center for Security and Emerging Technology, July 3, 2024.

^b Xi Jinping [习近平], “We Are Striving Forward Towards the Grand Goal of Building a Powerful Nation in Science and Technology” [“朝着建成科技强国的宏伟目标奋勇前进”, *Seeking Truth* [求是], March 31, 2025.

^c Li Zhiguo [李治国], “Innovation Models Must Adapt to the Needs of Scientific and Technological Innovation” [“创新模式要适应科创需求”, *Economic Daily* [经济日报], April 22, 2024.

^d Chen Jiawei [陈佳伟], “Deepening Industry-University-Research Collaboration to Cultivate Innovative Talents” [“深化产学研协同培育创新人才”, CPC News Network [中国共产党新闻网], November 28, 2024.

^e Huang Qinhua [黄庆华], “Trends and Main Focus Areas of Industrial Transformation and Upgrading in the Western Region” [“西部地区产业转型升级趋势主攻方向”, *People’s Tribune* [人民论坛], February 5, 2025.

^f MIIT, 2025.

^g China National Intellectual Property Administration, “Improving the Rule of Law in Intellectual Property Protection—He Zhimin, Member of the Standing Committee of the 13th National Committee of the Chinese People’s Political Consultative Conference and Deputy Director of CNIPA Gives an Interview to ‘Legal Daily’” [“提高知识产权保护工作法治化水平—全国政协十三届常委, 国家知识产权局副局长何志敏接受‘法治日报’采访”, March 8, 2021.

A commonly used phrase in government documents and state media articles that reflect this concern is *industry-academia-research cooperation* (产学研合作).⁹⁵ It is typically used to call for tighter links among universities, research institutes, and companies to accelerate the commercialization of scientific discoveries.⁹⁶ Weak coordination, Beijing argues, strands promising research in laboratories and deepens dependence on foreign “stranglehold” technologies.⁹⁷ Since 2023, China has called for an *enterprise-led* (企业主导) approach, and firms are expected to steer university-industry partnerships, fund joint labs, and align academic work with market demand.⁹⁸

A second cluster of terms—*convert* (转化), *transfer* (转移), *apply* (应用), and *industrialize* (产业化) *scientific and technological achievements* (科技成果)—reflects the same conviction that research must serve industrial goals.⁹⁹ Chinese leaders argue that science for its own sake is a luxury; discoveries should advance national development and strategic self-reliance. Even basic research is now encouraged to anticipate practical application, ensuring that public investment in science feeds directly into the real economy.¹⁰⁰

A third slogan—“promoting the integrated development of S&T innovation and industrial innovation” (推动科技创新和产业创新融合发展)—also captures Beijing’s ambition to better connect research and production.¹⁰¹ Officials often speak of linking the *innovation chain* (创新

⁹⁵ Slogans that are similar to this phrase include, for example, “promote closer collaboration between industries, universities, research institutes, and end-users” (深化产学研用结合).

⁹⁶ Government of the People’s Republic of China, “Government Work Report” [“政府工作报告”], March 12, 2025a.

⁹⁷ “Government Work Report” [“政府工作报告”], *People’s Daily* [人民日报], March 13, 2022; “Government Work Report” [“政府工作报告”], Xinhua News Agency [新华通讯社], March 12, 2024.

⁹⁸ Liu Lianlian [刘莲莲], “Enabling Enterprises to ‘Lead’ Industry-Academia-Research Collaborative Innovation” [“让企业‘领航’产学研协同创新”], *Economic Daily* [经济日报], April 12, 2025.

⁹⁹ Yin Shuanghong [尹双红], “Technology Transfer: Facilitating the Transition From ‘Bookshelf’ to ‘Shelf’” [“科技成果转化, 畅通从‘书架’到‘货架’的路”], *Seeking Truth* [求是], August 8, 2024. Chinese stakeholders often use the term *science and technology achievements* (科技成果), although they sometimes use the literal translation of *technology* (技术). A variation of the term is the phrase *work-related scientific and technological achievements* (职务科技成果), which appears in the 2015 Law of the People’s Republic of China on Promoting the Conversion of Scientific and Technological Achievements (see National People’s Congress [全国人民代表大会], Law of the People’s Republic of China on Promoting the Conversion of Scientific and Technological Achievements [中华人民共和国促进科技成果转化法], trans. by Etcetera Language Group, Inc., Center for Security and Emerging Technology, January 14, 2021).

¹⁰⁰ “Government Work Report,” 2022; Ministry of Justice of the People’s Republic of China, “Government Work Report” [“政府工作报告”], March 15, 2023; “Government Work Report,” 2024; Hu Yiyi [胡弋弋] and Feng Lei [封雷], “Accelerating the Transformation of Scientific and Technological Achievements” [“跑出科技成果转化‘加速度’”], *Seeking Truth* [求是], May 20, 2024.

¹⁰¹ Li Xiaohong [李晓红], “Promoting the Integrated Development of S&T Innovation and Industrial Innovation” [“推动科技创新和产业创新融合发展”], Communist Party Members Website [共产党员网], April 1, 2025. Chinese officials also use similar slogans such as “promoting the precise connection between innovation chains and

链)—from basic research to application—the *industrial chain* (产业链) of manufacturing and services.¹⁰² In their view, these chains too often operate in isolation, slowing the path from ideas to product. The solution, they argue, is to “deploy the chains around each other,” aligning research with industrial needs and ensuring that industry is ready to adopt and scale new technologies as soon as they emerge.¹⁰³

Beijing Addresses Weaknesses with No Sign of a Change in Its Approach

The Chinese government is trying to improve its diffusion capacity by addressing some of its weaknesses (Table 4.2). A key Chinese effort is the improvement of quality of its diffusion system, particularly for intermediary organizations.

Incentives for innovation intermediaries and financiers have traditionally not been designed to motivate the provision of quality services. They were managed by state employees whose performance system skewed toward rewarding quantity over quality, such as the number of startups launched, patents filed, and square meters built.¹⁰⁴

To change this system, the MIIT issued new guidelines in May 2025 that includes changes to performance evaluation criteria so that an emphasis is on factors, including the growth rate of incubated companies’ revenue and R&D investment.¹⁰⁵

China’s efforts to fix its diffusion problems are not aimed at fundamentally changing the top-down structure of the diffusion system. For example, the MIIT guidelines do not call for an overhaul of the state-backed system. This is likely because doing so would require a loosening of the control of the government, which could undermine the stability of the regime.

industrial chains” (促进创新链和产业链精准对接), “improving the level of coordination between innovation chains and industrial chains” (提高产业链创新链协同水平), and “promoting the deep integration of industrial chains and industrial chains” (促进产业链创新链深度融合).

¹⁰² Sheng Chaoxun [盛朝迅], “Promoting the Deep Integration of Industrial Chain and Innovation Chain” [“推动产业链创新链深度融合盛朝迅”], Xinhua News Agency [新华通讯社], April 27, 2022.

¹⁰³ Sun Shifang [孙世芳], “How to Promote the Deep Integration of the Industrial Chain and the Innovation Chain” [“如何促进产业链创新链深度融合”], *Guangming Daily* [光明日报], October 9, 2022; “Government Work Report,” 2024; Government of the People’s Republic of China, 2025a.

¹⁰⁴ Li Xiao and David North, “The Role of Technological Business Incubators in Supporting Business Innovation in China: A Case of Regional Adaptability?” *Entrepreneurship and Regional Development*, Vol. 30, Nos. 1–2, 2018.

¹⁰⁵ Government of the People’s Republic of China, “Interpretation of the Administrative Measures for Science and Technology Enterprise Incubators of the Ministry of Industry and Information Technology” [“工业和信息化部科技型中小企业孵化管理办法>解读”], June 16, 2025c.

Table 4.2. Examples of Actions Taken by the Chinese Government in the Past Three Years to Address Diffusion-Related Weaknesses

Metric	Weaknesses in China's Diffusion System	Example of Chinese Measures to Address Identified Weaknesses
Research organizations	Smaller network of research institutions	Since 2024, the Ministry of Education has approved and sponsored the creation of five <i>new-type research universities</i> (新型研究型大学), also known as <i>fourth-generation universities</i> (e.g., Shenzhen Polytechnic University, the Rehabilitation University). According to Chinese media, these institutions “take S&T research as their main task, integrating scientific research and classroom teaching, guiding students to learn and apply basic knowledge and scientific skills.” ^a
R-E linkages	Weaker university-industry connections	In February 2025, the Ministry of Education issued new measures, the Interim Measures for the Management of Industry Part-Time Faculty in Higher Education Institutions, to encourage industry professionals to take on part-time teaching or mentoring roles in universities. According to the ministry, the goal is to “integrate industry expertise into academic teaching and research” and “strengthen academia-industry collaboration.” ^b
Financial incentives	Weaker high-risk capital support	In June 2025, the China Securities Regulatory Commission set up a new “Science and Technology Innovation Growth Tier” (科创成长板块) designed to create a more inclusive and flexible market segment within the Shanghai Stock Exchange STAR Market for smaller, earlier-stage, and fast-growing technology companies. The growth tier will allow companies that might not yet be profitable or have limited revenue history but demonstrate strong innovation capacity, R&D intensity, and the potential to list and raise capital. ^c
Intermediary organizations	Nascent system of state-backed S&T service providers, struggling to match quantity with quality services	In May 2025, the MIIT issued new guidelines to pivot to a “quality-first consciousness” and standardize S&T services. ^d In June, it introduced measures to cultivate “excellence-level incubators benchmarked against the world's best,” building on pilots in Beijing and Shanghai. ^e

^a “High Starting Point, Small but Excellent, Research-Oriented! Are You Familiar with This New Type of Research University?” [“高起点，小而精，研究型！新型研究型大学你了解吗？”], Baidu, June 17, 2025.

^b Ministry of Education of the People's Republic of China, “MOE Expands Academia-Industry Collaboration with New Guidelines on Part-Time Faculty,” February 21, 2025.

^c Government of the People's Republic of China, “Opinions on Establishing a Science and Technology Innovation Growth Tier on the Science and Technology Innovation Board to Enhance Institutional Inclusivity and Adaptability” [“关于在科创板设置科创成长层增强制度包容性适应性的意见”], June 18, 2025d.

^d MIIT, 2025.

^e Huang Xiaohui [黄晓慧], “Shanghai Strengthens the Cultivation of High-Quality Incubators”

[“上海加强高质量孵化器培育”], *People's Daily* [人民日报], July 25, 2023; Government of the People's Republic of China, “Notice From the Ministry of Industry and Information Technology on Issuing the ‘Administrative Measures for Science and Technology Enterprise Incubators of the Ministry of Industry and Information Technology’”

[“工业和信息化部关于印发‘工业和信息化部科技型企业孵化器管理办法’的通知”], June 7, 2025b; Government of the People's Republic of China, 2025.

This raises the question of whether China will succeed in addressing its problems, which are sometimes a result of its technocrat-controlled structure. For example, R-E linkages are weaker in China partly because the government builds selective connections that are aligned with strategic objectives. To strengthen the linkages, the Ministry of Education began a program in 2024 that encourages industry professionals to take on part-time teaching or mentoring roles in universities as part of an effort to encourage more interaction between research institutes and

enterprises.¹⁰⁶ Whether such efforts are enough to overcome the problem remains unclear, but should China be able to strengthen R-E linkages and, most importantly, facilitate the adoption of technologies beyond leading regions and firms, it would then have an advantage over the United States.

Moreover, China's unwillingness to abandon the top-down approach means that the technocrats will continue to choose the priority technologies for diffusion. Whether the technocrats can choose the right sector will determine whether China can diffuse GPTs, which are key for economic growth. Choosing the right technology and diffusing it under an improved system might allow China to advance ahead of the United States but failing to do so will have placed the government's resources on the wrong bet.

¹⁰⁶ Ministry of Education of the People's Republic of China, 2025.

Chapter 5. Conclusion

In this report, we began with a straightforward but consequential question: Which country is better positioned to spread new technologies through its economy? Our answer is that both the United States and China possess substantial diffusion capacity, but they express it through different approaches and have different strengths and weaknesses.

The United States retains an overall edge. It performs more strongly in the institutional conditions that support production diffusion, especially in *research–enterprise linkages*, *absorptive capacity*, *intermediary organizations*, and *legal-commercial frameworks*. China’s clearest advantage lies in *research-to-research collaboration* and *state policy coordination*, and it has a system that is better set up to quickly scale adoption.

Distinguishing between production diffusion and adoption diffusion is essential to understanding this result.

In **production diffusion**, the United States benefits from a denser and more flexible ecosystem capable of moving ideas from research into commercial activity through multiple decentralized channels. China, however, can direct capital and coordination into selected strategic sectors with extraordinary speed, allowing it to scale production rapidly where policy support is strong.

In **adoption diffusion**, China has built a more explicit and coordinated architecture for pushing firms to adopt technology, including stronger state direction and more adoption-oriented incentives. Yet these same mechanisms often produce uneven or superficial adoption. The United States, by contrast, can spread technologies more widely, and it is stronger where firms already possess the capital, skills, and organizational capacity to use new technologies effectively.

An important implication is that neither country has solved the problem of broad-based technological adoption. Both systems remain too narrow in different ways. The United States spreads technology more widely, but the spread is still concentrated in large firms, advanced sectors, and metropolitan clusters. China spreads technology widely but often close to innovation hubs, and it struggles to ensure that adoption is deep, efficient, and productivity-enhancing. In both cases, nontechnology SMEs remain the key bottleneck.

This matters because we argue that long-term national advantage depends less on isolated excellence and more on whether general-purpose technologies become truly embedded across the ordinary fabric of economic life. A country that leads in invention but fails in diffusion will underperform its potential; a country that mobilizes fast but cannot ensure effective use will face diminishing returns.

China is aware of many of its own deficiencies and is attempting to address them through targeted diffusion policies focused on technologies, such as AI, but without abandoning the top-

down approach (at different levels) that produces those weaknesses in the first place. If the United States or China can overcome these internal contradictions, it will do much to shape the next phase of U.S.-China technological competition.

Four Implications for Policymakers, Enterprises, and Researchers

First, **adoption policy deserves dedicated institutional attention separate from innovation policy.** The instruments, intermediaries, and means needed to help a midsize steel distributor deploy a management digital system are fundamentally different from those needed to help a biotech startup commercialize a new drug. Conflating innovation and adoption under a single policy umbrella, as the United States currently does, systematically underserves both production and (especially) adoption diffusion. China's policies show at least an initial separation of the two, and that is a more appropriate approach, even if execution remains uneven.

Second, **the disconnect between capital that funds technology creation and capital that funds enterprise deployment is a structural failure in both systems.** Venture capital (largely private in the United States and state-driven in China) flows overwhelmingly to technology creators, not to the firms that help ordinary enterprises deploy technology. Government programs partially fill this gap (e.g., MIIT pilot programs, local vouchers in China) but at scales far below what the problem requires.

Third, **geographic equity in technology adoption is inadequate both in the United States and China.** If this trend continues, the economic consequences will compound: Rural counties in the United States with low broadband adoption already show less business growth than high-adoption counties, and China's inland provinces are falling further behind coastal manufacturing hubs in enterprise digital maturity. Neither country's policy toolkit delivers on this metric consistently outside major metropolitan areas.

Fourth, **the community of China analysts needs to find better ways to measure technological diffusion within the country and how it compares with other countries.** Available metrics and open-source data fail to capture the complexity and fast evolution of China's technology adoption system.

The governance of technology diffusion, not just innovation, will be a defining policy challenge of the coming decade. This report's framework offers one tool for tracking whether countries are making progress on the dimensions that matter most for adoption. The evidence suggests that both the United States and China have further to go than their headline technology metrics imply.

Appendix. Components of Diffusion Capacity and Proxies

Table A.1 lists the components of diffusion capacity and selected proxies.

Table A.1. Components of Diffusion Capacity and Proxies

Component	Metric	Production Diffusion Proxies	Adoption Diffusion Proxies
Actors	Research organizations	• Number of SciVal institutions^a • Number of distinct institutions that have published more than 100 papers each year	• N/A
	Enterprises	• Number of billion-dollar companies^b • Number of distinct organizations that have patented more than 100 patents domestically each year	• Same as production diffusion proxies
Linkages	R-E linkages	• Patent citations • Citations of academic research in patents submitted by firms • Academic-corporate collaboration rates • SciVal data for 16 disciplines used to examine coauthoring of papers between academics and businesses	• N/A
	R-R linkages	• National collaboration	• N/A
	E-E linkages	• GII joint ventures (intended to capture joint ventures working with each other) • GII IP receipts and payments (intended to capture how much firms monetize intellectual assets through formal licensing agreements) • GII VC deal intensity	• Industry maturity (e.g., shared standards, interoperability efforts) • Supply-chain digital integration (e.g., vendor-buyer data sharing, coinvestment structures) • World Bank Digital Adoption Index (business component) to measure how extensively firms in a country adopt and use digital technologies
Contextual factors	Absorptive capacity	• GII knowledge absorption metric • GII tertiary education metric • GII ICT metric • Upskilling and reskilling programs • Competitive pressure (competition environment)	• Same as production diffusion proxies
	Financial incentives	• Data on the nature, structure, and objectives of VC • Data on the nature, structure, and objectives of subsidies • Incentives for technology integration (e.g., digital transformation, digital economy, smart manufacturing upgrades, cloud migration, industrial internet systems)	• Same as production diffusion proxies

Component	Metric	Production Diffusion Proxies	Adoption Diffusion Proxies
	Geography	• Total number of S&T clusters in GII top 100 • Geographic distribution of U.S. and Chinese S&T clusters in GII cluster ranking	• Regional gaps and distribution
	Intermediary organizations	• Data on the maturity (e.g., years in operation, cumulative number), quality (e.g., breadth of services offered, recognition and accreditations), and effectiveness (e.g., start-up survival and scale-up rates, patents commercialized) of U.S. and Chinese intermediary services • Track record of matchmaking technologies with enterprises (e.g., documented success stories linking matchmaking to adoption, examples of repeated engagements)	• Same as production diffusion proxies
	Legal and regulatory systems	• Technology governance sophistication; national and local policies and guidelines for technology adoption • U.S. Chamber of Commerce index on the commercialization of IP assets and market access	• Same as production diffusion proxies

^a SciVal is an online database provided by Scopus and Science Direct that covers more than 50 million publication records.

^b We used PwC Global Top 100 Companies data (PwC, 2025).

Abbreviations

AI	artificial intelligence
E-E	enterprise–enterprise
EV	electric vehicle
FAI	fixed asset investment
GII	Global Innovation Index
GPT	general purpose technology
ICT	information and communication technology
IP	intellectual property
IRA	Inflation Reduction Act
IT	information technology
MIIT	Ministry of Industry and Information Technology of the People’s Republic of China
OECD	Organisation for Economic Co-operation and Development
PLA	People’s Liberation Army
R-E	research–enterprise
R-R	research–research
R&D	research and development
SMEs	small and medium-sized enterprises
S&T	science and technology
TRIPS	Agreement on Trade-Related Aspects of Intellectual Property Rights
VC	venture capital
WIPO	World Intellectual Property Organization
WTO	World Trade Organization

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