

China's biopharmaceutical revolution and policy implications

Dan Prud'homme & Tao Bai *

Abstract

China has rapidly emerged as a major source of global biopharmaceutical innovation, raising questions about what has driven its rise and what it means for Europe. Drawing on industry interviews and data on licensing, drug development, R&D, and scientific research, we identify several factors underlying this revolution. These include growing scientific and entrepreneurial capabilities; scale, agglomeration, and speed in the drug development ecosystem; and deep integration with the global pharmaceutical industry. State intervention also contributed to biopharmaceutical development in China, particularly through reforms to clinical trial governance and regulatory standards; financing and reimbursement policies also played a role. The contribution of domestic intellectual property reform is less clear. For Europe, policy should distinguish concentrated manufacturing dependencies from engagement with China's growing innovation and drug development capabilities. Europe can build supply chain resilience and strengthen its own biopharmaceutical capabilities while remaining open to Chinese innovation.

I. INTRODUCTION

China has rapidly emerged as a major center of global biopharmaceutical innovation. Chinese companies now account for approximately 30% of the world's innovative-drug pipeline, that is, of the novel drug candidates in development worldwide, according to a 2025 industry estimate.¹ This rapid ascent is challenging the traditional position of the United States and Europe as the principal

* Dan Prud'homme is Associate Professor in International Business at Florida International University (FIU). Tao Bai is Senior Lecturer in International Business at the University of Queensland.

¹A. R. Popli et al., *The Emerging Epicenter: Asia's Role in Biopharma's Future* (McKinsey & Company, January 2026), 8, <https://www.mckinsey.com/industries/life-sciences/our-insights/the-emerging-epicenter-asias-role-in-biopharmas-future>.

centers of global pharmaceutical innovation. The implications are particularly significant for Europe. Reflecting these challenges, Pfizer executive Alexandre de Germay remarked in 2026, “We [Europe] have to compete with the US, but we also have to compete with China.”² China’s rise therefore represents not simply an expansion of global biopharmaceutical innovation, but a potentially significant shift in its geographic center of gravity.

At the same time, Chinese firms’ rise in the biopharmaceutical industry is not simply a story of China competing against the rest of the world. In fact, Chinese firms have become increasingly important sources of innovative pharmaceutical assets for global companies, especially for American and European pharmaceutical firms. In 2025, Chinese companies were counterparties in approximately 48% of large-pharma licensing deals involving upfront payments of \$50 million or more, up from virtually none in 2020.³ China’s emergence therefore presents Europe with a more complicated issue: European pharmaceutical companies can benefit from access to China’s rapidly expanding innovation base even as China’s growing capabilities place increasing competitive pressure on Europe’s own biopharmaceutical ecosystem.

To complicate matters further, these developments come as Europe is confronting vulnerabilities elsewhere in the pharmaceutical value chain. Europe’s share of global active pharmaceutical ingredient (API) production by value has fallen sharply, from over 80% in the late 1990s to around 30% today, compared with 35% for China and 20% for India.⁴ Its share of global API drug master files has declined even more sharply, from 49% in 2000 to just 7% in 2021.⁵ European Union (EU)⁶ policymakers consequently face the dual challenge of strengthening

² M. Fick, “China Outpacing Europe in Drug Innovation and Development, Pfizer Executive Says,” *Reuters*, June 23, 2026, <https://www.reuters.com/legal/litigation/china-outpacing-europe-drug-innovation-development-pfizer-executive-says-2026-06-23/>.

³ S. Ezell et al., *China’s Burgeoning Biopharmaceutical Competitiveness Demands a US Response* (Washington, DC: Information Technology and Innovation Foundation, June 29, 2026), 4, <https://itif.org/publications/2026/06/29/chinas-burgeoning-biopharmaceutical-competitiveness-demands-us-response/>; L. C. Lee and J. Qian, “China’s Biotech Boom: Why the Nation Must Collaborate to Stay Ahead,” *Nature* 650 (2026): 296–98.

⁴ Pharma Focus Europe, “Europe’s Dramatic Decline in Pharmaceutical Production Threatens Health Sovereignty,” December 30, 2025, <https://www.pharmafocuseurope.com/news/europes-dramatic-decline-in-pharmaceutical-production-threatens-health-sovereignty>.

⁵ D. Stanton, “Second Act? Addressing Europe’s Biomanufacturing Blind Spot,” *BioProcess International*, April 21, 2026, <https://www.bioprocessintl.com/global-markets/second-act-addressing-europe-s-biomanufacturing-blind-spot>.

⁶ Unless otherwise indicated, “Europe” refers to the broader European region as defined in the underlying data sources, which may include non-EU countries such as the United Kingdom and Switzerland; “EU” refers to the European Union and its institutions and policies.

Europe's capacity for biopharmaceutical innovation while reducing vulnerabilities in pharmaceutical production and supply chains. In response, the EU's *Critical Medicines Act*, proposed in 2025, seeks to strengthen the availability and production of critical medicines and reduce strategic dependencies,⁷ while the proposed *European Biotech Act* seeks to improve conditions for biotechnology Research and development (R&D), financing, commercialization, and manufacturing.⁸

These developments raise fundamental questions about China's emerging place in the global biopharmaceutical innovation system. *Where does China stand in global biopharmaceutical innovation, what has driven its rise, and how should European policymakers respond?* This chapter addresses these questions. We first benchmark China's emerging position in the global biopharmaceutical innovation system – examining R&D, scientific publications, and innovative drug development and approval indicators. Second, drawing on interviews with senior industry experts (e.g., executives at Chinese and Western biopharmaceutical firms, and service providers) as well as supplementary analysis of asset licensing and other data, we examine how China made the transition to an important source of global biopharmaceutical innovation. Third, we identify the principal challenges and opportunities this transformation creates for European policymakers.

We draw three main conclusions. First, China has become an important source of global biopharmaceutical innovation, but its rise is deeply intertwined with US and European firms and markets and cannot be understood solely through its domestic market. Second, this transformation reflects the interaction of scientific and entrepreneurial capabilities built through a growing domestic talent base and returnees; rapid execution, enabled by a robust drug-development ecosystem, extensive clinical-trial infrastructure, and fast patient recruitment; and global integration through scientific exchange, investment, and increasingly cross-border asset licensing. In addition, state intervention directly drove some of these developments (particularly in clinical trial regulation), indirectly enabled others (particularly drug pricing and reimbursement), and constrained or played little role in still others. Third, European policymakers have legitimate

⁷ European Commission, "Critical Medicines Act," https://health.ec.europa.eu/medicinal-products/critical-medicines-act_en; "Group of EU States Seeks to Reduce Dependency on China for Pharmaceuticals," *Reuters*, May 2, 2023, <https://www.reuters.com/world/europe/group-eu-states-seeks-reduce-dependency-china-pharmaceuticals-2023-05-02/>.

⁸European Commission, "European Biotech Act," 2026, https://health.ec.europa.eu/biotechnology/european-biotech-act_en.

reasons to reduce critical pharmaceutical manufacturing dependencies, particularly for essential drug ingredients and other difficult-to-substitute inputs. However, such targeted de-risking should be distinguished from broader disengagement from Chinese biopharmaceutical innovation, which could reduce European firms' access to valuable innovation and ultimately weaken rather than strengthen European biopharmaceutical competitiveness.

II. WHERE DOES CHINA STAND IN GLOBAL BIOPHARMACEUTICAL INNOVATION?

China's advancement in global biopharmaceutical innovation is visible across multiple dimensions, reflecting both its firms' capabilities supporting innovation and the scale and novelty of innovative outputs. Because no single indicator captures all of these dimensions, the evidence below considers several complementary measures to assess China's position relative to the United States and Europe.

R&D expenditure measures the financial resources devoted to generating and developing new technologies and therefore provides an indicator of the inputs supporting biopharmaceutical innovative activity. China has experienced exceptionally rapid growth on this measure, although its absolute R&D expenditure remains substantially below that of the United States and Europe. Annual pharmaceutical R&D expenditure, including for biopharma, in China increased from approximately €1.7 billion in 2010 to €14.8 billion in 2022.⁹ Over the same period, expenditure increased from €27.9 billion to €47.0 billion in Europe, from €9.2 billion to €10.4 billion in Japan, and from €38.6 billion to €71.5 billion in the United States.¹⁰ China therefore remained well behind the United States and Europe in absolute pharmaceutical R&D expenditure in 2022; however, its growth was substantially faster (see Figure 1).

The number of companies engaged in pharmaceutical R&D provides a complementary measure of the breadth of the corporate base participating in innovative activity. China has also

⁹European Commission, *Commission Staff Working Document Accompanying the Proposal for a European Biotech Act*, SWD (2026) 450 final, Part 1/2, 23–24, https://eur-lex.europa.eu/resource.html?uri=cellar:37ba5c7c-5ab0-11f1-aa6d-01aa75ed71a1.0001.02/DOC_1&format=PDF.

¹⁰ European Commission, “European Biotech Act,” 2026, https://health.ec.europa.eu/biotechnology/european-biotech-act_en.

gained substantially on this measure. China's share of global companies involved in biopharmaceutical R&D increased from approximately 5% in 2017 to 16% in 2024.¹¹

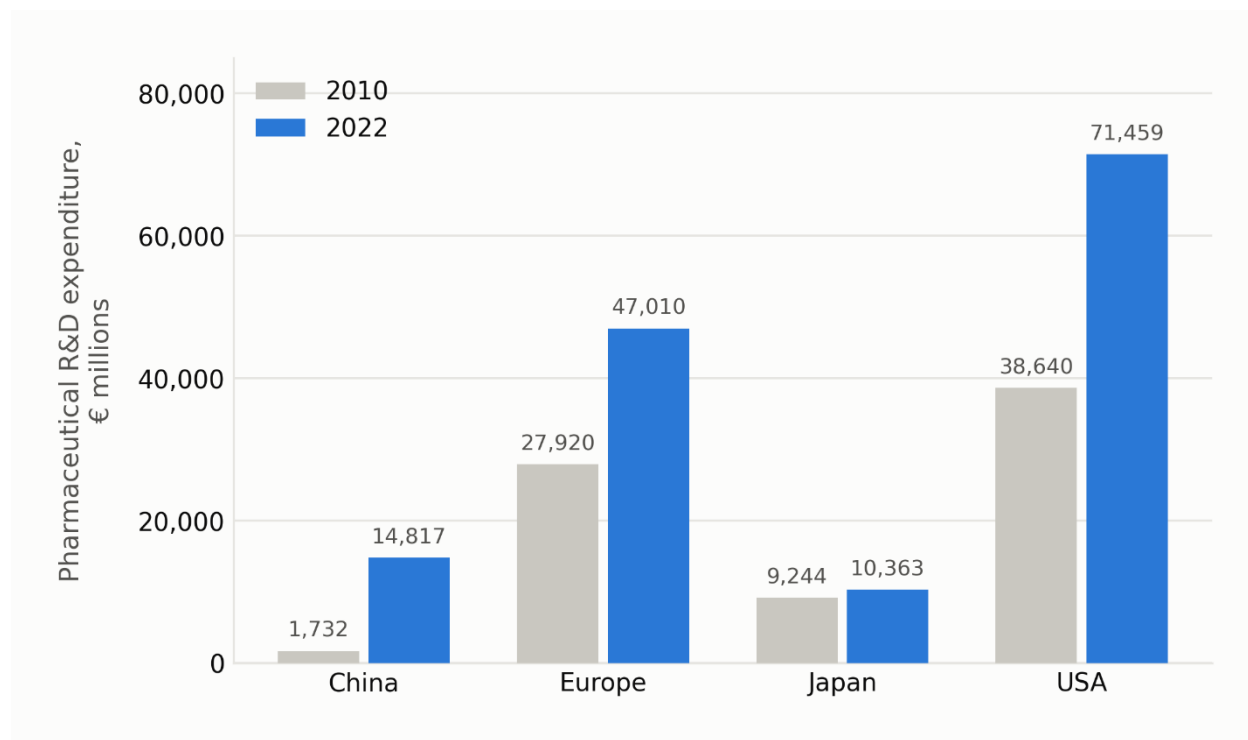


Figure 1: Pharmaceutical R&D expenditure in China, Europe, Japan, and the United States, 2010 and 2022

Source: Data from European Commission (2026), Figure 3, p. 24; underlying data from the European Federation of Pharmaceutical Industries and Associations (EFPIA).

Scientific publications capture the research and knowledge base from which biopharmaceutical innovation can emerge, while publications in leading journals provide a more demanding indicator of research at the scientific frontier. On these measures, China has expanded rapidly but continues to lag the United States and the EU at the scientific frontier of the biomedical fields most directly relevant to biopharmaceutical innovation. In 2022, EU continued to account for a larger share of publications than China in both Biomedical and Clinical Sciences and Health Sciences, although in Biomedical and Clinical Sciences China's share was nearly equal to the EU's

¹¹S. Barbosu, *How Innovative Is China in Biotechnology?* (Information Technology and Innovation Foundation, 2024), 8, <https://itif.org/publications/2024/07/30/how-innovative-is-china-in-biotechnology/>.

and above that of the United States.¹² The gap is particularly evident at the scientific frontier: when the analysis is restricted to publications in the top 5% of journals, the United States retains a clear lead in both fields, with EU also remaining ahead of China (see Figure 2). Thus, China’s rapid rise in biopharmaceutical development has occurred even while its frontier biomedical research continues to lag the established US and European scientific centers.

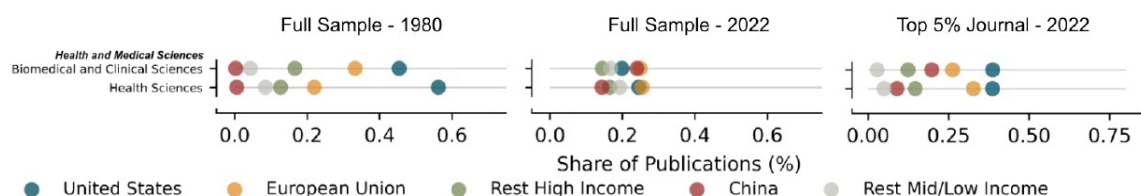


Figure 2: Geographic distribution and quality of scientific research, including biomedical and clinical sciences

Note: The source compares geographic shares of total publications with shares of publications in the top 5% of journals.
Source: Nagaraj and Yao (2026), Figure 2, p. 18.

The geographic origin of early-stage drug-development programs provides a more direct measure of where new biopharmaceutical development activity is being generated. On this measure, the global geography of biopharmaceutical innovation has shifted dramatically toward China. China’s share of global early-stage development programs rose from 8.0% in 2015 to 32.3% in 2024 and continued increasing into 2025, when it overtook the United States.¹³ Over the same period, the US share declined from about 48% to just over 37% (see Figure 3). Because programs are attributed according to the headquarters of their originating companies, these trends indicate a major shift in the geographic origin of early-stage biopharmaceutical innovation rather than simply increased Chinese participation in programs originating elsewhere.

¹²A. Nagaraj and R. Yao, “The Geography of Science,” NBER Working Paper No. 34694 (Cambridge, MA: National Bureau of Economic Research, 2026), 8–9, 18, <https://doi.org/10.3386/w34694>.

¹³S.-Y. Kang and Y. Ji, “Geographic Shifts in Early-Stage Biopharmaceutical Innovation,” *JAMA* 335, no. 15 (2026): 1356, <https://doi.org/10.1001/jama.2026.1962>. Kang and Ji’s quarterly series runs from January 2015 to September 2025; China’s share first exceeds that of the United States in the first quarter of 2025.

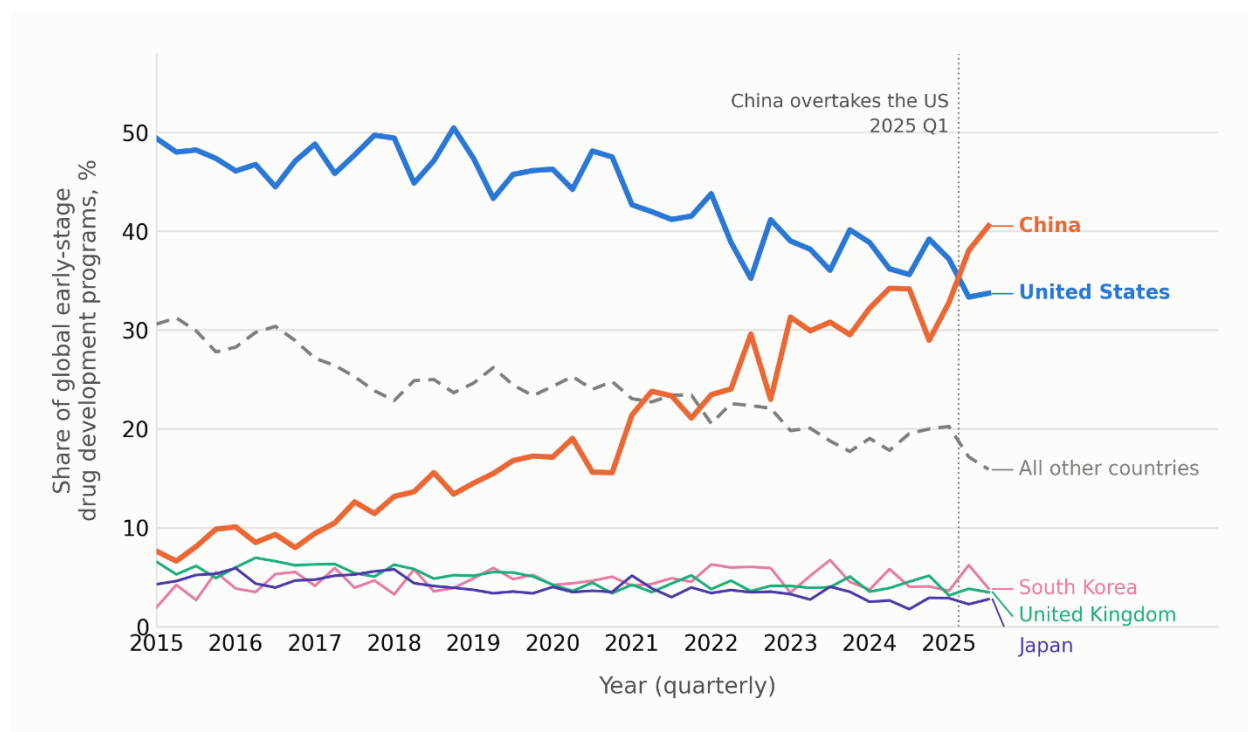


Figure 3: Share of global early-stage biopharmaceutical development programs by originating country, 2015–2025

Note: Programs attributed to the headquarters of the originating company. Quarterly data, January 2015–September 2025. *Source:* Data from Kang and Ji (2026), p. 1356

Scale alone, however, does not demonstrate that Chinese companies are producing more technologically novel drug candidates. Technological novelty can arise from both the biological “targets” being pursued and the therapeutic “modalities” used to pursue them. A therapeutic “*target*” identifies the biological mechanism that a drug seeks to influence. This is distinct from a drug’s “*modality*,” which describes the technological approach used to produce that therapeutic effect — for example, antibody-drug conjugates, bispecific antibodies, engineered cell therapies, or other emerging platforms. A drug employing a newer modality can target well-established biology, while a drug directed against a novel target can potentially employ a more established modality. Novel targets provide a particularly demanding indicator of technological inventiveness; however, new modalities also represent highly valuable and innovative output in their own right.¹⁴

¹⁴ Authors’ consultations with senior biopharmaceutical executives, Shanghai, May 2026.

In terms of modalities, Chinese-origin companies have developed substantial numbers of clinical-stage candidates across several emerging therapeutic modalities, suggesting that China's expansion is not restricted to conventional drug-development technologies.¹⁵ This technological breadth is also relevant to China's growing role as a source of drug candidates for foreign pharmaceutical companies, which increasingly license Chinese-developed assets for further global development.

As indicated, novel therapeutic targets are an important complementary indicator of biopharma innovativeness. Innovative Phase I programs provide one target-based measure of technological novelty by identifying drug candidates pursuing a new biological target or target combination. China's rise is pronounced on this demanding measure of innovation. Across 2021-2025, Chinese companies originated approximately 160 such innovative programs, compared with approximately 240 in the United States.¹⁶ More strikingly, China's contribution increased from approximately 10% of annual innovative Phase I programs in 2021 to roughly 40% in 2025.¹⁷ US companies continued to originate approximately 40–60 innovative programs annually and European companies approximately 15-20 (see Figure 4).¹⁸ By 2025, China therefore accounted for approximately as large a share of these innovative programs as the United States and substantially more than Europe, although the United States remained ahead on the cumulative number of programs over 2021-2025.

¹⁵ L. Chen et al., *New Drug Modalities 2025* (Boston Consulting Group, October 9, 2025), <https://www.bcg.com/publications/2025/emerging-new-drug-modalities>.

¹⁶ P. Jacquet et al., *The New Geography of Biopharma Innovation* (L.E.K. Consulting, 2026), 4, fig. 2, <https://www.lek.com/insights/biotech-and-pharmaceuticals/new-geography-biopharma-innovation>.

¹⁷ Jacquet et al., *The New Geography of Biopharma Innovation*, 4, fig. 2.

¹⁸ Jacquet et al., *The New Geography of Biopharma Innovation*, 4, fig. 2.

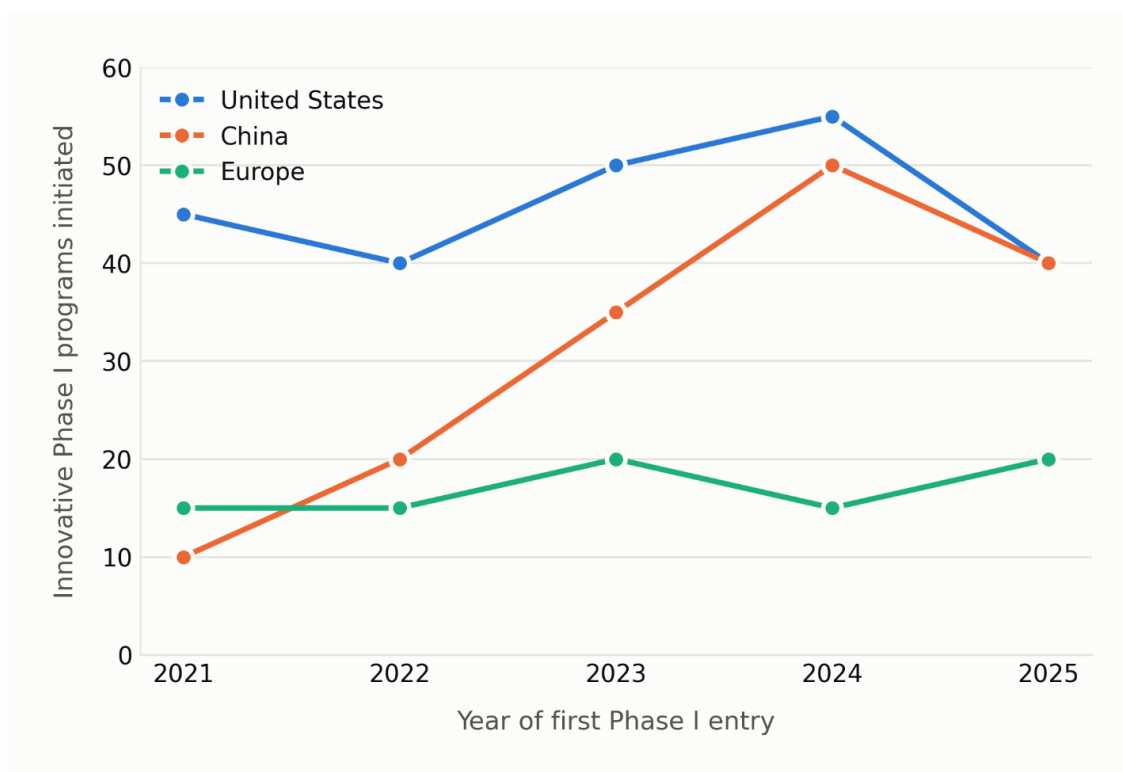


Figure 4: Innovative Phase I programs initiated by region, 2021-2025.

Note: “Innovative” refers to drugs pursuing a new biological target or target combination. *Source:* Based on data from Jacquet et al. (2026), Figure 2, p. 4.

The share of a region’s new Phase I programs that are innovative measures the innovation intensity of its own early-stage pipeline, rather than its contribution to the global pool of innovative programs. China’s improvement on this measure indicates that its rising global contribution is not simply a consequence of having a much larger overall pipeline. Based on reported counts, innovative programs increased from approximately 4.3% of China’s new Phase I programs in 2021 to 14.8% in 2025, bringing China approximately level with the United States (15.4%), although still below Europe (18.2%) (see Figure 5). Thus, both China’s contribution to the global pool of innovative Phase I programs and the innovation intensity of its own early-stage pipeline increased substantially.

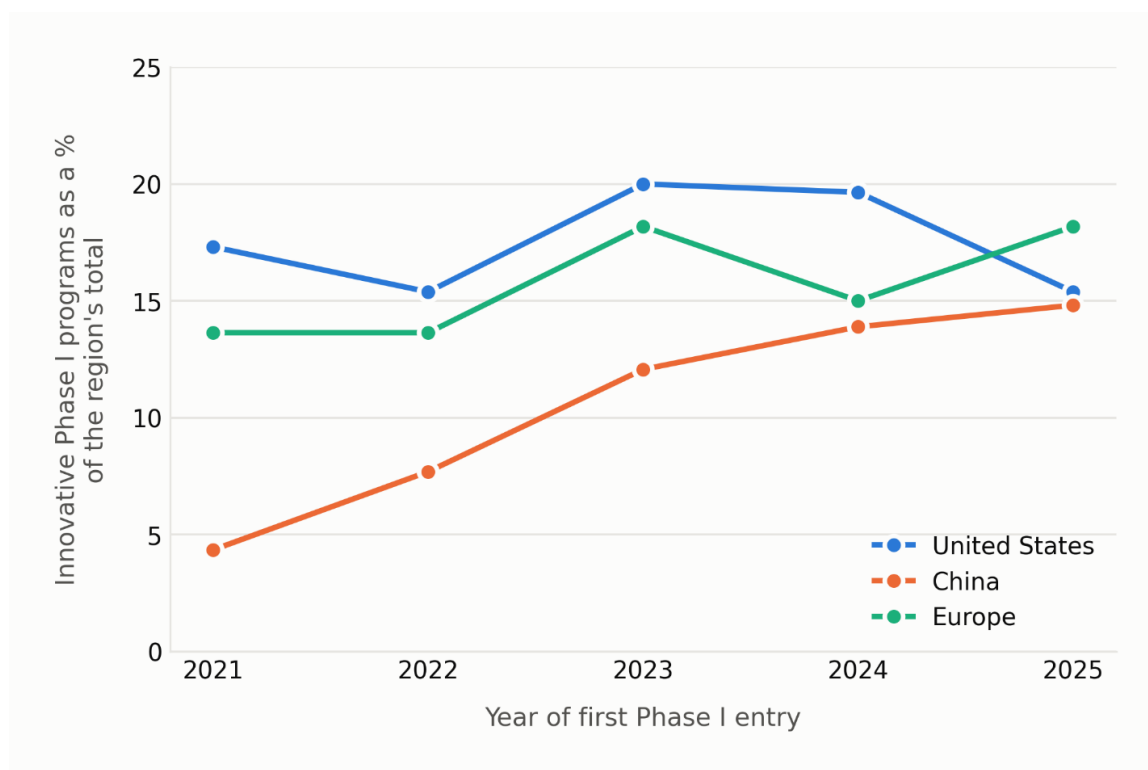


Figure 5: Innovative Phase I programs as a share of the region’s total, 2021–2025.

Note: “Innovative” refers to drugs pursuing a new biological target or target combination. *Source:* Authors’ approximate percentage calculations based on count data in Jacquet et al. (2026), Figure 2, p. 4.

Other measures of novel therapeutic targets shed light on China’s innovativeness in biopharma. Recent approvals provide evidence that Chinese drug development has begun to excel in this space. For example, Avram et al.’s assessment of drugs approved in 2025 identifies seven novel-target drugs first approved by the US Food and Drug Administration (FDA), two by China’s National Medical Products Administration (NMPA), and one by the European Medicines Agency (EMA) (see Figure 6).¹⁹ Particularly notable is the authors’ observation that 2025 was the first year in which drugs acting on completely novel targets were first introduced in China. Although China therefore remains behind the United States on this frontier measure, this development suggests China’s increasing progress at the technological frontier.

¹⁹ S. Avram et al., “Novel Drug Targets in 2025,” *Nature Reviews Drug Discovery* 25 (2026): 503, <https://doi.org/10.1038/d41573-026-00102-9>.

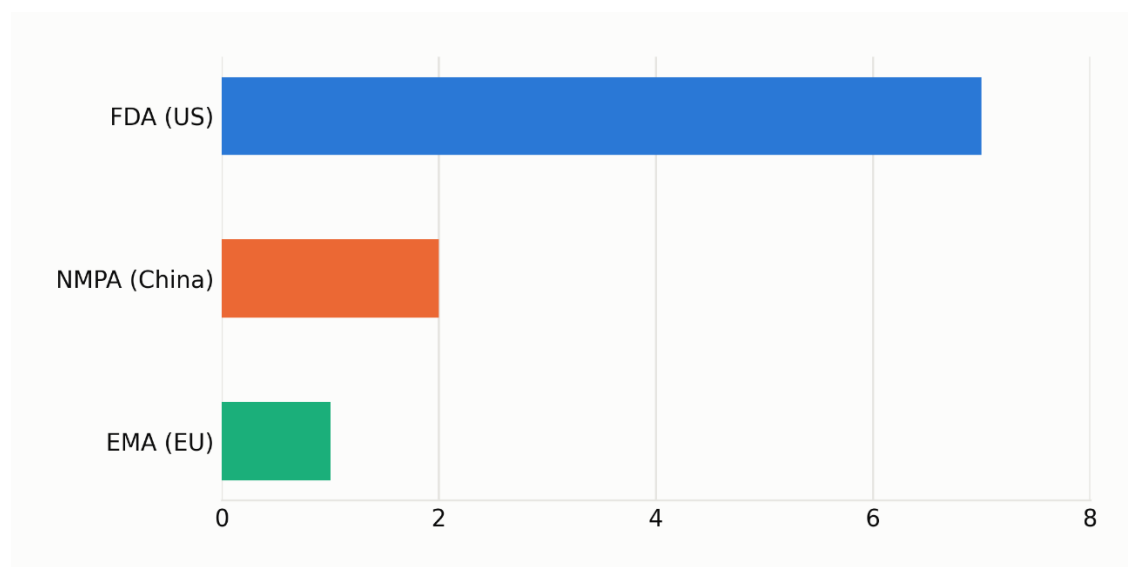


Figure 6. Drugs with novel mechanism-of-action targets, by first approving agency, 2025.

Note: FDA = 7; NMPA = 2; EMA = 1. Because these are approving-agency counts, they should not be interpreted as the nationality of the originating company. Source: Authors' visualization based on data from Avram et al. (2026), Table 1, p. 503.

Relatedly, expedited regulatory review provides a complementary indicator of the flow of drugs considered sufficiently innovative or clinically important to qualify for priority regulatory treatment. China has narrowed a previously substantial gap with Western regulators on this measure, consistent with the much larger flow of innovative drugs through its development system. There was a pronounced increase between 2015 and 2024 in the annual number of innovative drugs receiving expedited regulatory review in China, which by 2024 exceeded the number in the EU, although it remained well below the US level (see Figure 7).²⁰ Because regulatory pathways and qualification criteria differ across jurisdictions, however, expedited-review counts should not themselves be interpreted as a direct measure of technological novelty.

²⁰ A. Tong et al., "China Biotech's Stunning Advance Is Changing the World's Drug Pipeline," *Bloomberg*, July 13, 2025, <https://www.bloomberg.com/news/features/2025-07-13/china-drugmakers-catching-up-to-us-big-pharma-with-new-medicine-innovation>.

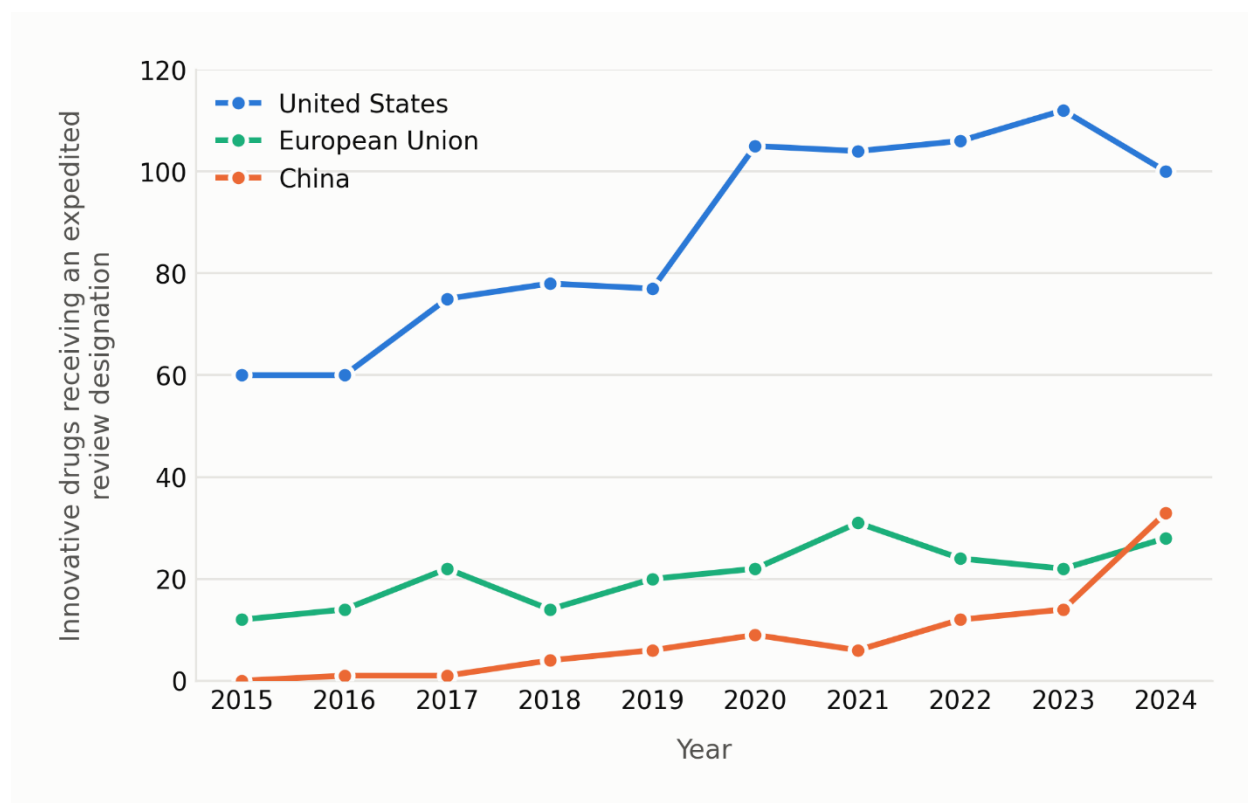


Figure 7: Annual number of innovative drugs receiving expedited reviews from leading regulators in the United States, European Union, and China, 2015–2024.

Note: Expedited-review pathways and qualification criteria are not identical across jurisdictions. *Source:* Tong, Hong, and Chen (2025); underlying data from Norstella, analyzed by Bloomberg.

Together, these indicators point to a substantial but uneven convergence toward the global biopharmaceutical frontier. China still trails the United States and, on some measures, Europe in frontier biomedical science and technological novelty. Yet its position is considerably closer to these established leaders on measures of the scale and intensity of innovative drug development. China’s pharmaceutical R&D expenditure and R&D-company base have expanded rapidly; its share of global early-stage drug development and contribution to annual innovative Phase I programs has risen sharply; Chinese companies have established substantial positions across emerging therapeutic modalities; and, most recently, China has begun introducing approved medicines against completely novel biological targets. The evidence therefore indicates a transition not simply toward greater scale, but increasingly toward greater technological novelty, although, again, China’s position remains uneven across different dimensions of innovation.

III. HOW DID CHINA BECOME SO INNOVATIVE IN BIOPHARMACEUTICALS?

The evidence presented above raises an important question: *how* did China become so innovative in biopharmaceuticals? To explore this question, we conducted interviews with ten leading practitioners with extensive experience in China’s biopharmaceutical industry. These included four senior executives at Chinese biopharmaceutical firms; two current or past senior executives at Western biopharmaceutical firms, one headquartered in the United States and one in Germany; a Western government official involved in monitoring biopharmaceutical developments in China; and three other industry specialists, including practitioners from a biopharmaceutical data-intelligence firm and private-practice consultants and lawyers advising biopharmaceutical firms in China.²¹ We supplemented these interviews with supporting data from other sources. Our research points to four closely related explanations for China’s rise: talent and entrepreneurial capabilities; scale, agglomeration, and speed in the drug-development ecosystem; integration with the global biopharmaceutical system; and state-driven changes in regulation, pricing, financing, and intellectual property protection. Importantly, our research does not support a simple explanation centered on any single factor. Rather, it suggests that these developments interacted to strengthen China’s capacity to generate, develop, and commercialize innovative drugs. Because this qualitative evidence rests on ten interviews, it is best read as identifying the mechanisms experienced practitioners regard as most important rather than as a representative survey of the industry; where possible, we corroborate interview accounts with quantitative data from other sources.

A. Talent and entrepreneurial capabilities

A first explanation consistently raised in the interviews was the accumulation of *scientific, managerial, and entrepreneurial talent*. China developed a large pool of domestically trained scientists while simultaneously drawing back Chinese scientists and managers who had studied or worked abroad. Interviewees traced this process at least to the mid-2000s, when growing numbers

²¹ The interviews were conducted between April 2026 and August 2026, in person in Shanghai, Beijing, and Suzhou, and remotely. Interviewees were selected purposively for their direct, senior-level experience in China’s biopharmaceutical industry, supplemented by referrals from initial interviewees. Interviews were semi-structured, lasted approximately 60 minutes each, and were conducted on condition of anonymity; quotations are therefore attributed by role only. We have no financial relationships with any of these interviewees.

of overseas-trained Chinese scientists began returning to China and establishing or joining biotechnology companies.

Returnees — or *haigui* (海归), literally “sea turtles” — were particularly important because they brought more than scientific training. Many had worked in US or European pharmaceutical companies, biotechnology firms, or academic laboratories and returned with practical experience in drug discovery, clinical development, regulation, project management, and the organization of pharmaceutical R&D. A recurring pathway described in the interviews involved Chinese scientists obtaining advanced training in the United States, working for US pharmaceutical companies, accumulating practical experience, and subsequently returning to China. Some returned following layoffs or restructuring within US pharmaceutical companies while others returned because China’s developing biotechnology sector offered attractive professional and entrepreneurial opportunities.

This circulation of talent was to some degree reinforced by the presence of multinational pharmaceutical companies and the growth of China’s contract research sector. During the 2000s, companies including Pfizer, Roche, Eli Lilly, and Novartis established or expanded R&D activities in China, particularly around Shanghai. Although many of these operations were subsequently reduced or restructured, they exposed Chinese scientists and managers to multinational drug-development practices. At roughly the same time, Chinese contract research organizations (CROs) expanded rapidly, often founded or managed by scientists with US training or pharmaceutical-industry experience.

Several interviewees also emphasized the *scale and cost of China’s scientific workforce*. China offered large numbers of highly trained chemists, biologists, and other scientific personnel at substantially lower cost than comparable personnel in the United States or Europe. Firms could consequently assemble large scientific teams and conduct extensive experimentation without incurring Western R&D labor costs. China’s talent advantage therefore did not simply consist of inexpensive scientific labor. It combined a large domestic scientific workforce with internationally experienced personnel and comparatively low costs, allowing firms to deploy substantial human resources against promising technological opportunities.

The accumulation of talent was accompanied by a stronger *entrepreneurial and financing ecosystem*. Interviewees identified approximately 2010 onward as an important period in the growth of biopharmaceutical entrepreneurship and early-stage investment, followed by a proliferation of Chinese biotech companies during the second half of the 2010s. Venture-capital (VC) financing expanded rapidly alongside this initial growth. McKinsey reports that VC funding to Chinese biotech companies tripled from approximately \$4 billion in 2015–2017 to \$12 billion in 2018–2020.²² Foreign investors, in particular, have been an important part of this emerging financing ecosystem: an earlier study identified 106 financing rounds involving Chinese biotech companies and foreign investors between 2000 and 2017, with a combined round value of \$3.9 billion, and found that foreign participation accelerated substantially after 2014.²³ The expansion of available capital gave experienced scientists greater opportunities to establish or join entrepreneurial biotechnology firms.

Returnees also connected these new Chinese firms to the *global pharmaceutical industry*. Their professional networks included foreign scientists, investors, pharmaceutical executives, and other industry participants, initially helping young Chinese biotechnology companies overcome problems of visibility and credibility. Interviewees described an earlier period in which internationally connected intermediaries sometimes served as bridges between smaller Chinese firms and Western pharmaceutical companies. As China's biotechnology sector matured, however, Chinese firms increasingly established these connections directly. Chinese scientists presented results at major international conferences, including the American Society of Clinical Oncology (ASCO) Annual Meeting, and published findings in leading international journals, allowing foreign pharmaceutical companies to identify promising Chinese assets directly.

International experience also gave Chinese firms knowledge of *how global pharmaceutical companies evaluate and commercialize innovation*. Managers increasingly understood international clinical and regulatory standards, patenting and freedom-to-operate (FTO)

²²J. Algazy et al., *Vision 2028: How China Could Impact the Global Biopharma Industry* (McKinsey & Company, August 15, 2022), 4, <https://www.mckinsey.com/~/media/mckinsey/industries/life%20sciences/our%20insights/vision%202028%20how%20china%20could%20impact%20the%20global%20biopharma%20industry/vision-2028-how-china-could-impact-the-global-biopharma-industry.a>.

²³Gryphon Scientific and Rhodium Group, *China's Biotechnology Development: The Role of U.S. and Other Foreign Engagement* (report prepared for the U.S.-China Economic and Security Review Commission, 2019), 52, <https://www.uscc.gov/research/chinas-biotechnology-development-role-us-and-other-foreign-engagement>.

requirements, and the evidence potential partners expected when evaluating asset licensing opportunities. Returnees therefore provided both scientific and managerial capabilities and the networks and knowledge needed to translate Chinese-developed drug candidates into internationally credible and commercially transferable assets.

China's talent accumulation was thus not an isolated domestic process. Chinese scientists trained and worked abroad; multinational companies trained personnel within China; CROs accumulated expertise partly by serving foreign pharmaceutical clients; internationally experienced scientists founded and joined Chinese biotechnology companies; and investors and professional networks connected these firms back to global markets. China's emerging capabilities consequently appear to reflect a process of absorbing, circulating, and recombining knowledge from across the international pharmaceutical system.

Our interviews also help clarify the nature of China's emerging innovative advantage in line with the analysis in Section II. Practitioners generally did not argue that Chinese firms had overtaken US and European companies across every dimension of pharmaceutical innovation. Several considered the United States and Europe to retain advantages in frontier basic science and the discovery of entirely novel biological targets. Instead, Chinese firms were frequently described as particularly capable of developing promising biological opportunities through new modalities, indications, combinations, and other forms of technological iteration. This does not make such output inherently less innovative; major Western pharmaceutical companies likewise generate substantial value through new modalities and improved applications of existing biological knowledge.

China's talent base alone, however, does not explain the speed with which Chinese firms have been able to convert scientific opportunities into drug-development programs. Interviewees repeatedly emphasized that these capabilities operate within a broader development ecosystem — including CROs, contract development and manufacturing organizations (CDMOs), clinical-trial infrastructure, and large patient populations — that allows firms to test and advance drug candidates exceptionally quickly.

B. Scale, agglomeration, and speed in the drug-development ecosystem

One prominent theme across the interviews was “China speed.”²⁴ Interviewees repeatedly described China’s ability to move rapidly from scientific opportunity through experimentation and drug development as a major competitive advantage. One senior executive emphasized the ability to test hypotheses quickly through wet experiments, while a former senior executive identified “operational excellence” as a key explanation for China’s rise in biopharma. Speed matters because pharmaceutical development often involves races among firms pursuing similar targets or technological opportunities. Faster experimentation allows firms to test more alternatives, abandon unsuccessful approaches earlier, optimize promising candidates more rapidly, and reach meaningful clinical evidence before competitors. In this sense, speed is not simply a cost advantage; it can itself become an innovative capability.

Interviewees identified a major foundation for this speed as the scale and geographic concentration of China’s drug-development ecosystem. Interviewees emphasized that large pools of scientific and technical personnel are combined with dense clusters of biotechnology firms, CROs, CDMOs, laboratories, suppliers, hospitals, and other specialized capabilities. The principal clusters repeatedly identified in the interviews were Shanghai, Suzhou, and Beijing. This concentration matters because firms do not need to reproduce every capability internally. A relatively small biotechnology company can maintain a focused scientific organization while drawing on nearby providers for research, testing, process development, manufacturing, and other specialized functions. Zhangjiang Hi-Tech Park in Shanghai, Zhongguancun Life Science Park in Beijing, and BioBay in Suzhou were said to be especially important biotechnology clusters in China.²⁵ Agglomeration provided by high-tech parks pools scientific expertise, technological facilities, biotech companies, incubators, and financial resources.²⁶ For example, BioBay’s CROs provide a full suite of services including chemistry synthesis, reagent provisioning, gene synthesis, and sequencing.²⁷

The CRO/CDMO ecosystem is therefore important not only because it can reduce costs, but because it helps convert scale and agglomeration into development speed. Interviewees described

²⁴On this phenomenon more generally, see D. Prud’homme and M. von Zedtwitz, “The Changing Face of Innovation in China,” *MIT Sloan Management Review* 59, no. 4 (2018): 24–32, <https://mitsmr.com/2LKRS2G>.

²⁵Barbosu, *How Innovative Is China in Biotechnology?*, 28–29, <https://www2.itif.org/2024-chinese-biotech-innovation.pdf>.

²⁶Barbosu, *How Innovative Is China in Biotechnology?*.

²⁷Barbosu, *How Innovative Is China in Biotechnology?*.

a system in which specialized external providers allow even relatively small firms to access capabilities that would otherwise require the infrastructure of a much larger pharmaceutical company. One senior consultant to the biopharma industry based in China described China's CDMO ecosystem as potentially its "single biggest structural advantage globally." McKinsey similarly characterizes China's CRO/CDMO ecosystem as a deep and scaled network of specialist service providers offering a more "plug-and-play" environment in which proximity enables fast collaboration.²⁸ Its modeled comparison of a best-in-class Chinese fast-follower biopharma company with a global-company benchmark estimates approximately 36 months of discovery in China versus 54 months globally, and approximately 87 months of development versus 100 months.²⁹ McKinsey attributes China's speed advantage to several reinforcing factors, including faster execution, parallelized workflows, scaled external infrastructure, and clinical-trial advantages.³⁰

A second major source of speed is the supply and accessibility of clinical-trial participants. Interviewees emphasized China's large population, as well as the concentration of patients in major hospitals and the resulting ability to recruit comparatively rapidly. Other evidence strongly supports this mechanism. As shown in Figure 8, median patient-recruitment rates in China exceed the US or global comparator in 10 of the 11 therapeutic comparisons reported. Across the five named autoimmune diseases, China's recruitment rate is approximately 1.53 to 2.08 times the US rate.³¹ The oncology comparison is 2.37 times the global median, while the respiratory comparison is the one exception, at 0.82 times the global median. The neurology comparison is an unusually large outlier at 13.38 times the global median.³²

²⁸G. Agrawal et al., *Biopharma R&D: The Evolving Formula for Discovery and Development* (McKinsey Global Institute, June 2026), 3, 6–7, <https://www.mckinsey.com/our-insights/biopharma-r-and-d-the-evolving-formula-for-discovery-and-development>.

²⁹Agrawal et al., *Biopharma R&D*.

³⁰Agrawal et al., *Biopharma R&D*.

³¹C. S. Fishburn, "Speed of China's Early Clinical Trials Raises Bar for Western Biotechs," *BioCentury*, April 17, 2025, <https://www.biocentury.com/article/655627/speed-of-china-s-early-clinical-trials-raises-bar-for-western-biotechs>.

³²Fishburn, "Speed of China's Early Clinical Trials."

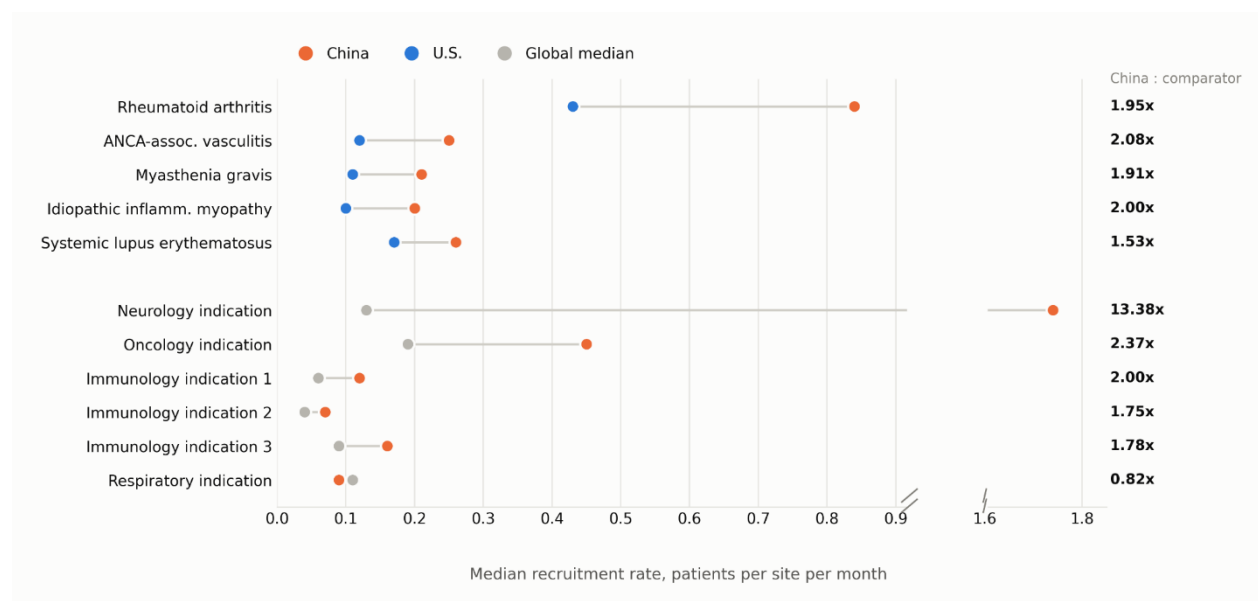


Figure 8: Median clinical-trial patient-recruitment rates in China relative to the United States or global median

Source: Fishburn (2025)

A complementary measure is the time required to recruit patients. Figure 9 shows that median recruitment time was shorter in China in five of six phase-by-therapeutic-area comparisons for single-country trials conducted from 2020 to 2024.³³ For anti-cancer trials, median recruitment took 8.7 months in China versus 17.5 months in the United States in Phase I and 17.5 versus 24.2 months in Phase II; China was slightly slower in Phase III, at 17.1 versus 15.4 months.³⁴ For anti-obesity trials, China was faster in all three phases: 2.7 versus 7.4 months in Phase I, 5.4 versus 8.7 months in Phase II, and 9.2 versus 11.5 months in Phase III.³⁵

³³ Tong et al., “China Biotech’s Stunning Advance.”

³⁴ Tong et al., “China Biotech’s Stunning Advance.”

³⁵ Tong et al., “China Biotech’s Stunning Advance.”

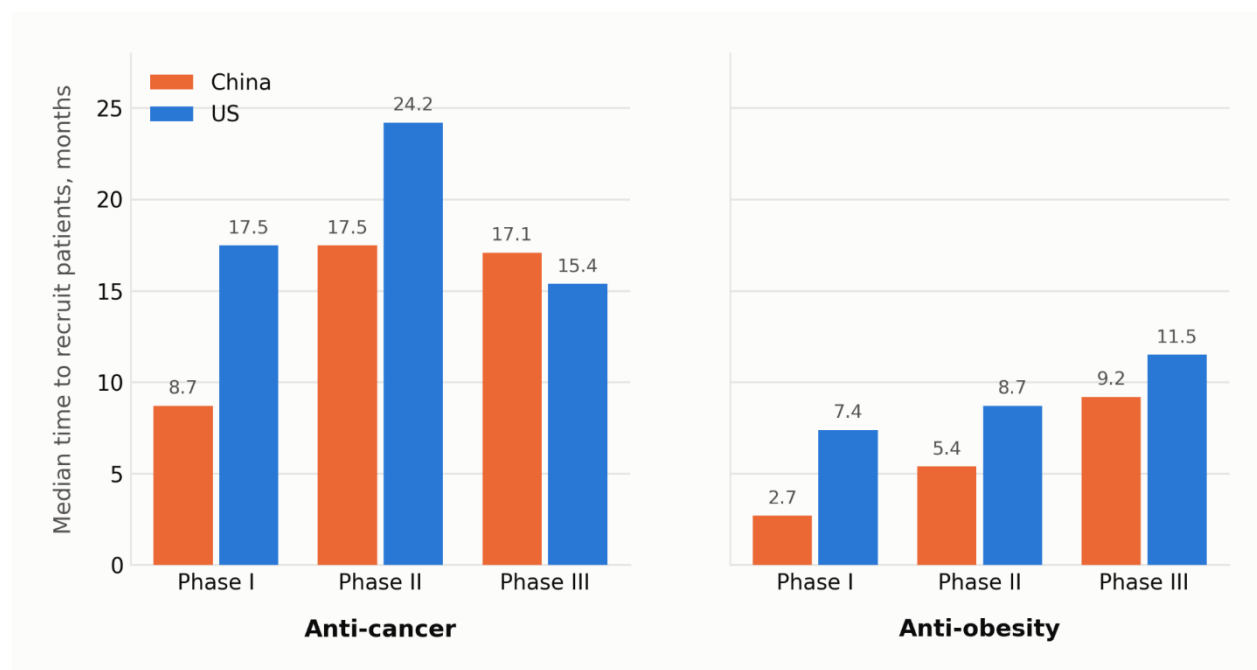


Figure 9: Median time to recruit patients for anti-cancer and anti-obesity trials in China and the United States

Source: Data from Tong, Hong, and Chen (2025)

McKinsey provides broader corroboration of the clinical-development mechanism. It reports that China has more than 1,500 clinical sites, more than one-fifth of which can conduct Phase I trials, and estimates that companies in China enroll patients two to five times faster than the global benchmark.³⁶ It attributes this advantage partly to a large patient pool with high unmet need, the concentration of patients in leading hospitals, and the scale of the clinical-site network.³⁷

These clinical advantages shorten an important bottleneck in drug development. Faster recruitment can allow firms to establish proof of concept, identify unsuccessful candidates, and advance promising programs more quickly. Combined with rapid experimentation and readily accessible CRO/CDMO capabilities, this increases the number of development opportunities firms can pursue within a given period. Not every Chinese trial or development process is faster than its US or European counterpart. Rather, the interview and other evidence point to a system in which large-scale resources are geographically concentrated and can often be mobilized quickly across successive stages of drug development.

³⁶ Agrawal et al., *Biopharma R&D*.

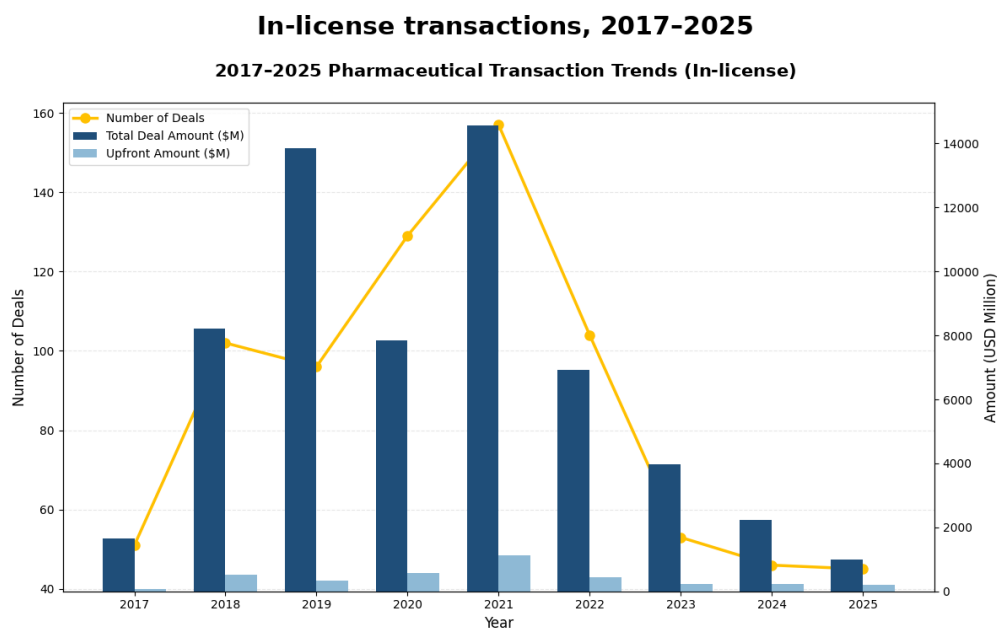
³⁷ Agrawal et al., *Biopharma R&D*.

Taken together, China's biopharma advantages are therefore better understood as a system-level capability than as any single low-cost input. Scale supplies scientific personnel, specialized service providers, and potential trial participants; geographic agglomeration makes many of these resources readily accessible; and CRO/CDMO and clinical infrastructure allow firms to deploy them rapidly. These capabilities can create innovative value even when a firm is not first to identify the underlying biological target: rapid testing of modalities, optimization of candidates, exploration of indications, and generation of clinical proof of concept can transform a scientific opportunity into a commercially valuable pharmaceutical asset. Regulatory changes that reduced institutional frictions and strengthened the credibility of Chinese clinical evidence reinforced these advantages, but those state-driven changes are examined separately in Section III.D. The next section turns to the global system in which these assets are increasingly commercialized, including Western pharmaceutical companies' recurring need to replenish pipelines as major products approach patent cliffs and other losses of market exclusivity.

C. Integration with the global biopharmaceutical system

A third major explanation for China's competitiveness in biopharma is its firms' increasing integration with the global biopharmaceutical system. This integration has operated in both directions. Chinese firms initially absorbed knowledge, capital, and pharmaceutical assets from abroad; more recently, they have become increasingly important suppliers of drug candidates to foreign pharmaceutical companies. The shift is important because it connects China's growing innovative capabilities to the much larger commercial and development resources of the global pharmaceutical industry.

The interviews described a substantial reversal in the direction of technology licensing over time. During the mid-2010s, a common strategy among emerging Chinese companies was to in-license foreign compounds for development and commercialization in China. By the late 2010s and especially the early 2020s, Chinese companies increasingly out-licensed their own drug candidates to foreign pharmaceutical companies. The transaction data strongly corroborate this shift.



Distribution of Transaction Behaviors (2017-2025)

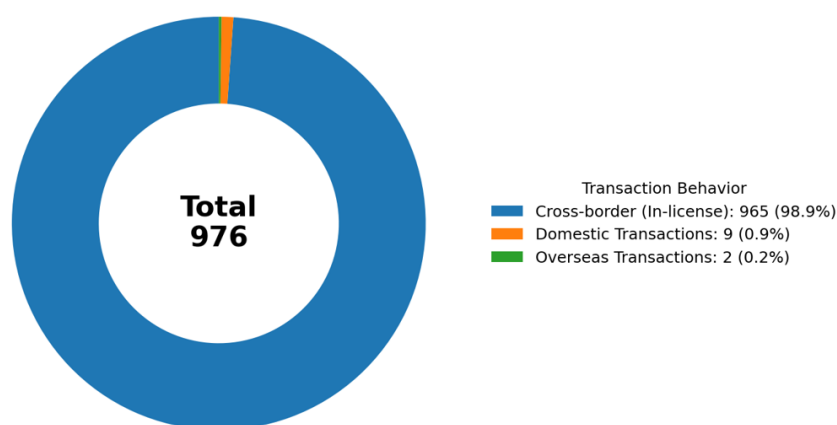


Figure 10: In-licensing transactions in China: transaction trends and cross-border orientation, 2017–2025

Source: Authors' analysis of DXY Insights data.

According to our analysis of DXY Insights data³⁸, pharma asset in-licensing activity in China grew strongly during the late 2010s, peaked around 2021, and subsequently declined (see Figure

³⁸ DXY Insights is a commercial pharmaceutical-intelligence database operated by DXY, a Chinese medical-information company. Our analysis covers in- and out-licensing transactions (e.g., of patents, know-how, and clinical data) recorded between January 1, 2017 and December 31, 2025.

10). It was overwhelmingly international: 965 of 976 transactions classified by transaction behavior (98.9%) were cross-border. This captures the earlier phase identified in the interviews, when Chinese pharmaceutical companies extensively sourced technologies and drug assets from abroad.

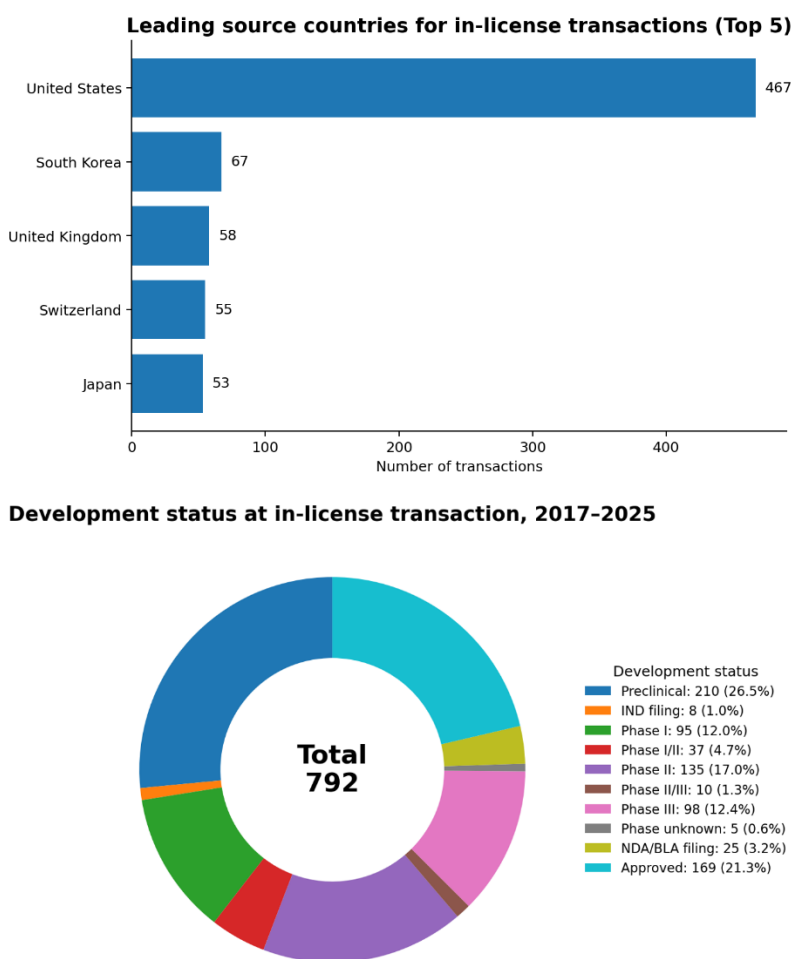


Figure 11: In-licensing transactions in China: leading source countries and development stage, 2017–2025

Source: Authors' analysis of DXY Insights data.

The geographic pattern on pharma asset in-licensing reinforces this interpretation (see Figure 11). Among the five leading foreign source countries represented in the data which together account for 700 transactions, the United States accounted for 467 of these transactions (about two-thirds), followed by South Korea (67), the United Kingdom (58), Switzerland (55), and Japan (53). The assets also spanned the development pipeline: among 792 transactions with classified

development status, 210 were preclinical, while substantial numbers were at clinical stages and 169 were already approved. China's earlier integration into global biopharma therefore involved the acquisition of both early-stage technologies and more mature pharmaceutical assets.

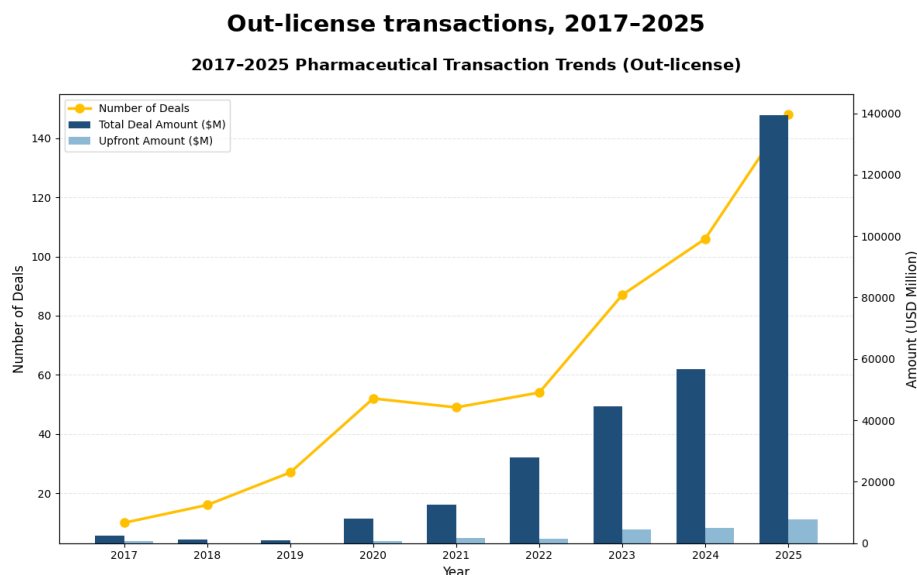
The economic limitations of the Chinese market help explain why this model subsequently became less attractive. Interviewees repeatedly pointed to pricing and reimbursement constraints that limited expected returns from drugs developed primarily for the domestic market, issues discussed further in Section III.D. This constraint is also evident in the distribution of global pharmaceutical demand: China accounted for just 7.5% of global pharmaceutical sales in 2023, compared with 53% for the United States and 23% for Europe.³⁹ Much of the commercial purchasing power for pharmaceutical innovation therefore remains outside China.

At the same time, Western pharmaceutical companies faced a complementary demand-side problem: recurring pressure to replenish their pipelines. Major products periodically lose patent protection and other forms of market exclusivity, producing the industry's recurring "patent cliffs" and increasing the need for replacement assets. McKinsey explicitly identifies patent cliffs and slowing new-molecular-entity submissions as part of the global productivity challenge that makes Asia an increasingly important complementary source of biopharmaceutical innovation.⁴⁰ Large pharma companies have long used licensing and acquisitions to supplement internally-generated R&D. As Chinese firms became capable of generating credible drug candidates rapidly, China therefore emerged as an increasingly important source of assets that could help fill these pipeline gaps.

Our interviewees described a marked acceleration on Chinese biopharma asset out-licensing from approximately 2022 onward, with the senior executive at the US big pharma company characterizing the period as a "feeding frenzy." Lower valuations and greater foreign confidence in Chinese innovation encouraged more transactions, while licensing allowed a foreign pharmaceutical company to acquire rights to a specific asset without purchasing the entire Chinese firm. This created a strong complementarity: Chinese biopharma companies needed access to larger foreign markets and later-stage development capabilities, while Western pharmaceutical companies needed new pipeline assets.

³⁹Ezell et al., *China's Burgeoning Biopharmaceutical Competitiveness*, 4.

⁴⁰Popli et al., *Emerging Epicenter*, 14.



Distribution of Transaction Behaviors (2017-2025)

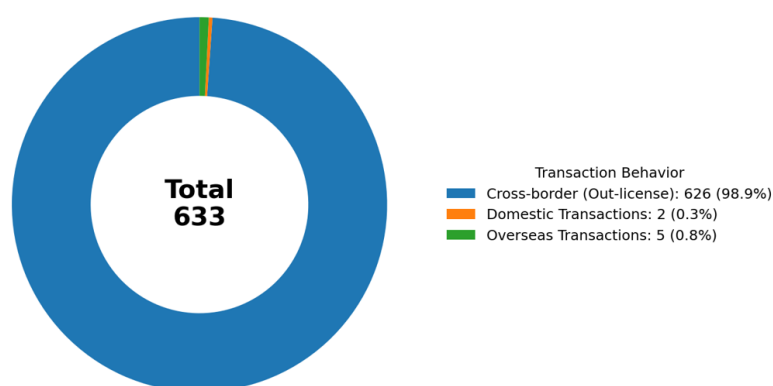
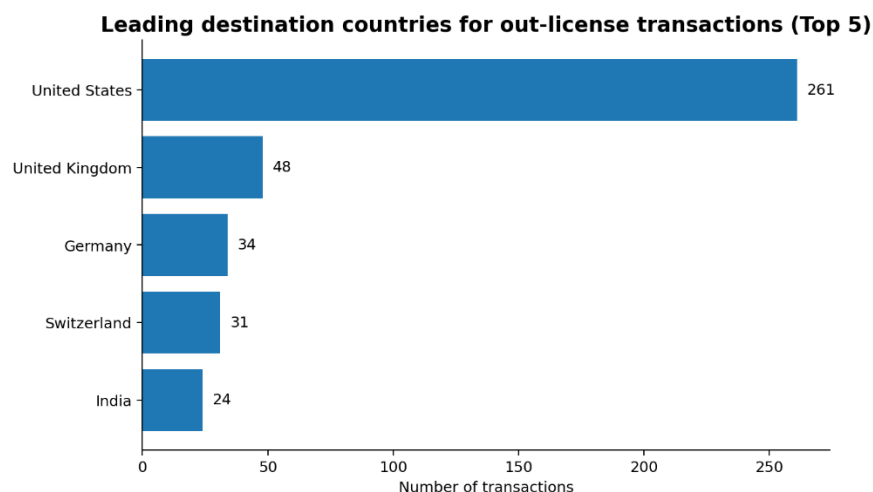


Figure 12: Chinese out-licensing transactions: transaction trends and cross-border orientation, 2017–2025

Source: Authors' analysis of DXY Insights data.

According to our analysis, Chinese pharma firms' out-licensing increased sharply after 2020, reaching approximately 150 transactions in 2025 (see Figure 12). Of 633 out-licensing transactions classified by transaction behavior, 626 (98.9%) were cross-border. The change therefore represents more than growth in transaction volume: China has shifted from primarily sourcing foreign pharmaceutical assets toward becoming an increasingly important international supplier of drug candidates.



Development status at out-license transaction, 2017–2025

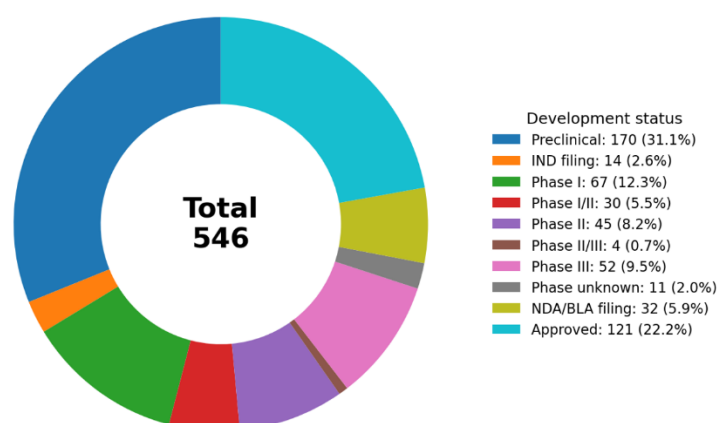


Figure 13: Chinese out-licensing transactions: leading destination countries and development stage, 2017–2025

Source: Authors' analysis of DXY Insights data.

The United States is particularly important to this outward model, although Europe and other nations also play a part (see Figure 13). Among the five leading destination countries represented in the data, which together account for 398 transactions, the United States accounted for 261 of 398 transactions, followed by the United Kingdom (48), Germany (34), Switzerland (31), and India (24). Chinese firms also frequently out-license assets before approval. Among 546 transactions with classified development status, 170 (31.1%) were preclinical, 14 were at investigational new drug filing, 67 in Phase I, 30 in Phase I/II, 45 in Phase II, 4 in Phase II/III, 52 in Phase III, 11 of

unknown clinical phase, 32 at new drug or biologics license application filing, and 121 involved approved products.

This model allows Chinese companies to participate in global commercialization without building complete multinational organizations themselves. They can generate and advance promising assets and then transfer rights, often patents or know-how, to partners with the capital, later-stage clinical-development experience, regulatory expertise, manufacturing capabilities, and commercial organizations required for global development. Out-licensing can therefore convert China's upstream development capabilities into global commercial value while allowing foreign pharmaceutical companies to replenish their pipelines from an increasingly important external source.

Table 1: Leading Chinese pharmaceutical out-licensors, 2017–2025

Company	Transactions
Fosun Pharma	34
Bio-Thera Solutions	27
Biocytogen Pharmaceuticals (Beijing)	24
Harbour BioMed	23
HitGen	19
Jiangsu Hengrui Pharmaceuticals	19
Mabwell	18
Luye Pharma	16
Innovent Biologics	14
BeiGene	11

Source: Authors' analysis of DXY Insights transaction data, aggregated to the parent-company level.

Our firm-level data further show that out-licensing extends beyond a handful of Chinese national champions (see Table 1). The leading out-licensors include both established pharmaceutical companies and newer biotechnology firms, indicating that international asset licensing has become a broader feature of the Chinese biopharmaceutical ecosystem.

Table 2: Leading foreign pharmaceutical licensors into China, 2017–2025

Company	Transactions
Eli Lilly	21
Sanofi	19
Bristol Myers Squibb	18
Novartis	18
AstraZeneca	17
Pfizer	14
Roche	12
Johnson & Johnson	9
GlaxoSmithKline	9
Merck & Co.	8

Source: Authors’ analysis of DXY Insights transaction data, aggregated to the parent-company level.

The complementary in-licensing data show the depth of China's historical interaction with established foreign pharmaceutical companies (see Table 2). Major global pharmaceutical companies were important suppliers of assets into China during the earlier phase; Chinese firms now increasingly appear on the opposite side of comparable cross-border transactions. The direction of pharmaceutical knowledge and assets has therefore become increasingly two-way.

Interviewees also emphasized that licensing structures themselves facilitate this internationalization. Rather than acquiring a Chinese company outright, a foreign pharmaceutical company can obtain rights to a specific drug candidate while limiting exposure to unrelated organizational, legal, or geopolitical liabilities. Practitioners also described “NewCo” structures in which investors establish a new entity, often outside China (e.g., in the US), to which the Chinese firm licenses relevant technology. Conventional direct licensing nevertheless remains most important.

Patents are central to this model because they help make pharmaceutical assets identifiable, protectable, and transferable. Chinese firms pursuing international commercialization often seek patent protection in the jurisdictions where partners intend to develop and sell the product, including the United States and Europe. Emphasizing this, many of our interviewees described the strong patent and other intellectual property (IP) protections available in the US and Europe as

critical, or “absolutely critical” in the words of a biopharma company executive in China, to their globally-integrated commercialization models. Similarly, interviewees stressed that IP quality matters: potential partners conduct substantial patent and freedom-to-operate diligence and value strong, defensible protection around the asset. Yet international commercialization does not depend entirely on the strength of patent protection inside China. This distinction is important for the discussion in Section III.D: patents are clearly important to the licensing business model, even if practitioners disagreed about whether improvements in China’s domestic patent system caused the country’s earlier innovation takeoff.

Taken together, the interview and transaction evidence depicts China's rise as deeply integrated with the existing global pharmaceutical system. Chinese firms first absorbed foreign knowledge, assets, capital, and development capabilities; they now increasingly supply drug candidates back into that same system. The interaction is mutually reinforcing: China’s expanding development ecosystem generates a growing supply of pharmaceutical assets, while foreign markets and Western companies facing patent cliffs and pipeline-replenishment pressures provide demand, capital, later-stage development capabilities, and commercialization channels.

D. State-Driven Change

Changes to Chinese law and state policy also featured prominently in many interviews, although practitioners did not attribute equal importance to all forms of state intervention. China introduced numerous pharmaceutical policies during the period examined here, spanning regulatory review, clinical trials, reimbursement and procurement, market access, financing, intellectual property, and broader support for innovative drugs.⁴¹ Rather than reviewing these policies individually, we focus on the institutional changes that practitioners most consistently connected to the industry’s innovation rise. Among our interviewees, drug-regulatory reform, particularly the changes beginning in 2015, was emphasized the most often and in the most depth.

⁴¹S. Liu et al., “The Rise of China’s Pharmaceutical Industry from 2015–2024: A Decade of Innovation,” *Nature Reviews Drug Discovery* 24, no. 10 (2025): 738–39. The supplementary policy-reform timeline documents a broader sequence of reforms from 2015 to 2024 spanning drug and medical-device review, clinical-trial data integrity, priority and expedited review, ICH alignment, reimbursement and procurement, market access, intellectual property, clinical-value-oriented development, and additional support for innovative drugs.

Drug-regulatory reform: The year 2015 was repeatedly identified as a decisive turning point. The State Council launched a major reform of drug and medical-device review, while the China Food and Drug Administration (CFDA) initiated the self-examination and inspection of drug clinical-trial data – the so-called “7.22” reform emphasized in the interviews. The data clean-up required firms to examine and attest to the authenticity of submitted clinical-trial evidence, strengthening incentives to improve trial quality. Practitioners viewed this change as especially consequential because faster development was commercially valuable only if investors, regulators, and prospective foreign licensees could trust the underlying evidence. A Western pharmaceutical company might repeat or extend Chinese studies after licensing an asset, but it still needed confidence that the original results represented a genuine clinical signal.

International regulatory alignment: China’s accession to the International Council for Harmonisation of Technical Requirements for Pharmaceuticals for Human Use (ICH) in 2017 further reduced the institutional separation between Chinese and global drug development. Interviewees repeatedly identified ICH accession as important because greater alignment with international standards made Chinese-generated evidence more compatible with globally oriented clinical-development programs. Together with improvements in data integrity and review, this helped increase the international credibility and usability of Chinese clinical evidence. Later reforms further accelerated and formalized review pathways, but the interviews placed greatest causal weight on the earlier improvements in data quality, regulatory review, and international alignment.⁴²

Financing reform: Scientific opportunities also required sustained access to capital. Some interviewees emphasized the expansion of domestic and foreign venture investment and, particularly, new exit opportunities. The 2018 introduction of Chapter 18A of the Hong Kong Stock Exchange’s listing rules enabled qualifying pre-revenue biotechnology companies to list, creating a public-market financing and exit channel for firms whose products might still be years from generating revenue.⁴³ Practitioners connected the broader expansion of financing opportunities to the proliferation of Chinese biotechnology firms during the second half of the

⁴² Liu et al., “Rise of China’s Pharmaceutical Industry.”

⁴³ Hong Kong Exchanges and Clearing Limited, “New Listing Regime for Emerging and Innovative Companies,” news release, April 24, 2018, https://www.hkex.com.hk/News/Regulatory-Announcements/2018/180424news?sc_lang=en.

2010s. Regulatory credibility and finance were therefore complementary: more credible development increased the attractiveness of Chinese firms to investors, while deeper financing allowed firms to exploit scientific opportunities.

Pricing and reimbursement reform: Perhaps most interestingly, some Chinese state policies appear to have influenced innovation through a less intentional mechanism. Our interviewees strongly argued that the Chinese governments' reimbursement pressure and volume-based procurement reduced the profitability of conventional generics and, more broadly, constrained returns from products commercialized primarily in China. One senior lawyer advising biopharma companies based in China described the resulting shift toward innovation as an "unintentional consequence" of government policy. Other interviewees, including another consultant and senior biopharmaceutical company executives, echoed these sentiments. The same pressures also weakened the economics of the earlier in-licensing model, under which Chinese firms acquired foreign compounds mainly for domestic commercialization. In this account, constrained domestic returns increased incentives both to pursue more differentiated products and to seek larger foreign markets through out-licensing. State intervention therefore sometimes stimulated innovation simply by making established domestic strategies less attractive.

Intellectual-property reform: The interviews were considerably more divided over the historical importance of improvements in China's domestic IP system. Formal changes were substantial.⁴⁴ For example, in 2017, China revised its Patent Examination Guidelines to require consideration of qualifying post-filing experimental data, and revisions effective in 2021 further clarified the treatment of such data specifically in pharmaceutical patent applications.⁴⁵ China's fourth amendment to the Patent Law, adopted in 2020 and effective June 1, 2021, introduced patent-term compensation for qualifying new drugs and established the statutory basis for pharmaceutical patent linkage.⁴⁶ China subsequently implemented a national regulatory drug-trial-

⁴⁴D. Prud'homme and T. Zhang, *China's Intellectual Property Regime for Innovation: Risks to Business and National Development* (Cham: Springer, 2019).

⁴⁵China National Intellectual Property Administration, "Decision on Amending the Patent Examination Guidelines" (Order No. 74), effective April 1, 2017, https://www.cnipa.gov.cn/art/2017/3/2/art_74_27617.html; China National Intellectual Property Administration, "Announcement on Amending the Patent Examination Guidelines" (Announcement No. 391), effective January 15, 2021, https://www.cnipa.gov.cn/art/2020/12/14/art_74_155606.html.

⁴⁶Standing Committee of the National People's Congress, Patent Law of the People's Republic of China (Fourth Amendment), arts. 42 and 76, effective June 1, 2021, https://english.cnipa.gov.cn/art/2022/10/13/art_3068_179273.html.

data-protection (RDP) regime in May 2026, providing up to six years of protection for qualifying innovative and originator drugs, with shorter periods for specified other categories.⁴⁷ These reforms may strengthen incentives for future innovation, but their timing makes them difficult to treat as causes of an innovation rise already well underway.

Further, the uncertain role of IP reform in driving the development of China's biopharmaceutical industry is consistent with our mixed interview evidence. Some practitioners regarded stronger domestic IP institutions as helpful to originator drug development, whereas others considered regulatory reform much more consequential. For example, one former senior IP executive at a major European pharmaceutical company stated that Chinese IP protection "plays no role in this at all" in explaining the industry's rise. The distinction is important. Patents matter to the business model because they allow pharmaceutical assets to be protected and licensed, including in the major foreign markets discussed above. Yet the interviews provide much less consistent support for the separate proposition that improvements in China's domestic patent system caused the innovation takeoff.

Overall, the Chinese state's role appears important but not always straightforward or as one may expect. Drug-regulatory reform emerges most consistently as a direct enabler because it improved the quality and international credibility of Chinese drug development. Financing reforms expanded firms' ability to exploit scientific opportunities, while pricing and reimbursement policies may have unintentionally pushed firms away from low-margin domestic strategies toward innovation and international commercialization. Domestic IP and regulatory-data-protection reforms may strengthen the industry's future development, but the evidence is considerably weaker that they were principal causes of its earlier takeoff.

IV. IMPLICATIONS FOR EU POLICYMAKERS AND CONCLUSIONS

Our interviews and other evidence suggest that China's biopharmaceutical rise reflects the interaction of several mutually reinforcing factors rather than a single dominant cause: scientific and entrepreneurial capabilities built through a growing domestic talent base and returnees; rapid

⁴⁷National Medical Products Administration, "Announcement on Issuing the Measures for the Implementation of Drug Trial Data Protection" (Announcement No. 47 of 2026), arts. 3, 5–8, and 15, <https://www.nmpa.gov.cn/xxgk/ggtg/ypggtg/ypqtggtg/20260515145324185.html>.

execution enabled by a robust drug-development ecosystem, extensive clinical-trial infrastructure, and fast patient recruitment; and global integration through scientific exchange, investment, and increasingly cross-border asset licensing. The global asset licensing evidence highlights a particularly important transition from an industry heavily engaged in importing pharmaceutical assets toward one increasingly supplying drug candidates to leading global pharmaceutical companies. State intervention directly drove some of these developments, particularly clinical-trial regulatory reform; indirectly enabled or incentivized others, including through financing and drug pricing and reimbursement policies and perhaps some patent reforms; and constrained or played little role in still others. China's rise therefore appears to reflect the interaction of talent, execution speed, ecosystem development, global integration, and institutional change rather than any single policy or capability.

For Europe, the relevant policy question is not whether to de-risk from China generally, but what to de-risk. The answer depends on the nature of the dependency. Reliance on concentrated Chinese manufacturing of essential pharmaceutical inputs creates fundamentally different vulnerabilities from conducting clinical development in China or licensing a Chinese-developed drug candidate. When providing policy advice, we therefore distinguish among three stages of the biopharmaceutical value chain: downstream manufacturing, midstream clinical development, and upstream innovation.

A. Downstream: Reduce critical manufacturing dependencies

At the downstream stage, there is a strong rationale for reducing European dependence on other countries, including China, where production of essential APIs, key starting materials, or other critical pharmaceutical inputs is highly concentrated. These are physical inputs whose disruption can directly constrain the production of medicines. Where they are difficult to substitute and concentrated in a small number of suppliers or locations, geopolitical conflict, trade restrictions, production disruptions, or other shocks can therefore create genuine physical chokepoints.

This does not imply that Europe should attempt to reshore pharmaceutical manufacturing wholesale. Such an approach would be costly and unnecessary where reliable alternative suppliers exist. A more targeted strategy would identify critical, highly concentrated, and difficult-to-

substitute dependencies and selectively build redundancy through alternative suppliers, diversified sourcing, strategic European production capacity, or inventories.

B. Midstream: Preserve access to China’s clinical-development ecosystem

Recent US scrutiny of pharmaceutical companies conducting clinical trials in China raises the question of whether clinical research should itself become subject to broader China-related restrictions.⁴⁸ For Europe (or the US for that matter), there is little reason to move in this direction simply because trials are conducted in China. As documented above, China offers large patient populations, extensive clinical infrastructure, and rapid patient recruitment across many therapeutic areas, allowing companies to establish clinical signals and proof of concept more rapidly. European firms can benefit from these capabilities without surrendering control over subsequent development: European regulators retain authority to determine whether evidence generated outside the EU satisfies applicable standards and what additional evidence is required for marketing authorization. Chinese clinical evidence can therefore help firms evaluate and advance promising candidates while additional trials are conducted in Europe or elsewhere where necessary. The relevant policy issue should be the quality, reliability, ethics, and security of the clinical research — not its Chinese location per se.

Europe should instead consider what it can learn from China’s clinical-development efficiency. Some advantages, notably population size and the concentration of patients in major hospitals, cannot, of course, readily be replicated. However, others may reflect potentially reducible bottlenecks in patient identification and recruitment, site activation, coordination among hospitals and sponsors, trial administration, and other development processes. Europe should examine how these processes can be accelerated without compromising evidentiary or ethical standards. China’s experience demonstrates that clinical-development speed can itself constitute an important source of biopharmaceutical competitiveness.

C. Upstream: Strengthen European innovation while remaining open to Chinese innovation

⁴⁸ A. Alper, “US Clinical Trials in China Questioned by US Lawmakers,” *Reuters*, August 21, 2024, <https://www.reuters.com/business/healthcare-pharmaceuticals/us-clinical-trials-china-questioned-by-us-lawmakers-2024-08-20/>.

The case for continued openness to Chinese biopharma firms is strongest at the upstream innovation stage. As the licensing evidence demonstrates, Chinese-developed drug candidates are increasingly becoming inputs into the innovative pipelines of European and other non-Chinese pharmaceutical companies. European firms already access this innovation through several channels: China-based business-development and licensing teams that source and evaluate local assets (e.g., AstraZeneca); minority stakes in China-focused venture funds (e.g., Sanofi, AstraZeneca); incubators that host and de-risk early-stage start-ups (e.g., Novo Nordisk, Bayer, Roche); and dedicated R&D hubs in China for discovery and translational research (e.g., Novo Nordisk, AstraZeneca, Roche).⁴⁹ This is particularly important as established pharmaceutical companies continually seek new assets to replenish their pipelines, including as major products approach “patent cliffs” and lose patent protection or other forms of market exclusivity.

The strategic characteristics of this exchange differ from those associated with some other technologies. Biopharmaceutical innovation, for example, should not automatically be treated as analogous to semiconductors. Semiconductor dependencies can involve highly concentrated fabrication capacity, specialized equipment, and other difficult-to-reproduce capabilities requiring continued physical asset access. By contrast, when a European pharmaceutical company licenses a Chinese-developed drug candidate, it typically acquires contractual rights to a relatively discrete technological asset, protected primarily through patents in relevant jurisdictions. Although not all aspects of pharmaceutical innovation are entirely codified or public, biopharmaceutical assets are often comparatively amenable to cross-border exchange through patents, scientific publications, clinical evidence, regulatory documentation, conferences, and licensing agreements. Subsequent clinical development, regulatory approval, manufacturing, and commercialization can also often be undertaken outside China. Access to Chinese pharmaceutical innovation therefore should not be equated with continuing technological dependence on China.

This distinction has important policy implications. Restricting such transactions could impose costs on European firms themselves, particularly as Chinese companies become an increasingly important source of drug candidates while global pharmaceutical companies face continuing pressure to replenish their pipelines. A European company can license a promising

⁴⁹Marie-Lyn Horlacher et al., *From “Made in China” to “Innovated in China”: An Oliver Wyman Perspective* (Oliver Wyman, May 2026), 15.

Chinese asset and subsequently develop, manufacture, obtain regulatory approval for, and commercialize it internationally. Access to Chinese innovation may therefore complement rather than necessarily substitute European biopharmaceutical innovation.

This also suggests a need for caution in extending targeted security measures into generalized technological restrictions. The emerging US approach illustrates a more restrictive alternative. Measures such as the BIOSECURE Act respond to particular concerns involving designated Chinese biotechnology companies, federal relationships, sensitive data, supply chains, and national security.⁵⁰ While some risks targeted by such measures are indeed worth mitigating, many do not necessarily justify restrictions on the licensing of Chinese-developed pharmaceutical innovation more generally. Worse, broader restrictions could become economically counterproductive if they prevent European pharmaceutical companies from accessing promising assets available to their US and other global competitors.

Of course, continued openness should not substitute for strengthening Europe's own capabilities. Europe should improve the translation of its strong scientific base into commercially viable drug candidates, expand financing for biotechnology firms, improve clinical-development efficiency, and accelerate adoption of emerging technologies. Artificial intelligence is particularly important in this respect. The European Commission has identified weaknesses in Europe's integration of AI into biopharmaceutical research and clinical development relative to the United States and China.⁵¹ Strengthening European capabilities in these areas is warranted. But capability-building and openness are not competing strategies.

D. Intellectual property risks

Finally, our findings also identify several IP issues that may merit continued engagement by European policymakers with Chinese authorities. For example, some of our interviewees raised concerns that patent-term extension in China has been implemented more narrowly than the patent law appeared to contemplate, particularly its limitation to certain “innovative drugs,” and alleged that foreign pharmaceutical patents have sometimes been improperly invalidated in China. They

⁵⁰ D. W. Baxtresser et al., “BIOSECURE Act Becomes Law, Limiting Grants with ‘Biotechnology Companies of Concern,’” Latham & Watkins LLP, December 31, 2025.

⁵¹ European Commission, *Commission Staff Working Document Accompanying the Proposal for a European Biotech Act*.

also pointed to an emerging concern that Chinese firms may use AI tools to rapidly mine newly published foreign pharmaceutical patent applications and generate follow-on Chinese filings. These issues suggest that EU-China engagement should focus not only on formal improvements to China's IP framework, but also on how pharmaceutical patent rights are interpreted, administered, and enforced in practice.

E. Conclusion

China's emergence as a major source of biopharmaceutical innovation represents an important expansion of global innovative capacity, driven by the interaction of scientific and entrepreneurial capabilities, execution speed and a dense drug-development ecosystem, global integration, and state-driven institutional change. For Europe, this development creates substantial opportunities alongside more specific strategic risks. Access to Chinese drug candidates, scientific capabilities, and clinical-development capacity can strengthen European pharmaceutical innovation and benefit patients, while heavy reliance on China for critical pharmaceutical manufacturing — like excessive reliance on any single country — can create supply-chain vulnerabilities. European policy should therefore combine targeted de-risking of concentrated manufacturing dependencies with efforts to strengthen Europe's own innovative and clinical-development capabilities, while remaining open to collaboration with and innovation from China. The objective should be a more resilient, innovative, and internationally connected European biopharmaceutical system, rather than pharmaceutical self-sufficiency or generalized technological separation.