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The Geopolitics of Biotech

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TJ Nzewi
Geopolitical Strategist


Trenton Stone
Geopolitical Analyst
(Lead Author)


Robert Bailey
Geopolitical Analyst

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New York
30 Rockefeller Plaza
New York, NY 10112
United States
+1 212 632 6000

London
20 Manchester Square
London W1U 3PZ
United Kingdom
+44 20 7187 2000

Paris
175 Bd Haussmann
75008 Paris
France
+ 33 1 44 13 01 11

Tokyo
Sanno Park Tower
25th Floor
11-1 Nagatacho 2-chome
Chiyoda-ku Tokyo
100-6125
Japan
+81 3 5511 6011

San Francisco
4 Embarcadero Center
24th Floor
San Francisco, CA 94111
United States
+1 415 623 5000

Austin
200 West 6th St
Suite 1650
Austin, TX 78701
United States
+1 512 652 2600

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I Executive Summary

Executive Summary

Biotechnology is emerging as a pivotal frontier in 21st century geopolitical competition, driven by its growing capacity to revolutionize human health, economic systems, and military capabilities while potentially also unleashing unprecedented new risks.

This report explores these dynamics, taking stock of where geopolitical competition over the biotech sector stands today and what it could look like tomorrow. It analyzes the key national players in the sector and identifies geopolitical choke points that could be leveraged as global trade tensions and national security pressures rise. It also maps how these players are attempting to protect national leadership in biotech, promote new innovation, and partner through emerging technological alliances. Finally, the report outlines how growing geopolitical competition in biotech could increasingly affect companies—from small start-ups to global investors and large, multinational life sciences and tools companies.

The report makes several key findings relevant to a broad range of stakeholders in the biotech sector and policy ecosystem:

1 **Biotech is increasingly an arena of geopolitical and technological competition.** Recognition of the sector's importance to national security, economic growth, and human health is growing rapidly, pushing it to the forefront of policymaking. This includes a broad range of policy initiatives focused on both the promotion (e.g., critical medicine subsidies) and protection (e.g., advanced tooling export controls) of national biotech sectors.

2 **China's role in biotech is rising rapidly and is creating a new competitive landscape.** China's rise is challenging longstanding market dynamics in biotech, where the traditional technological edge held by the US, Europe, and Japan is being significantly challenged. Other actors such as India and South Korea are also playing a growing role.

3 **Several geopolitical choke points exist within the biotech sector, especially related to the flow of data and capital.** Intensified competition, export controls, and supply chain decoupling efforts are fragmenting the industry and driving nations to localize innovation. The level of geopolitical risk partly depends on the specific biotechnology in focus, with synthetic biology, AI-infused biotech platforms, and innovative therapies likely facing the most significant risks.

4 **Geopolitics is increasingly driving biotech investment decisions relative to traditional economic and market factors.** Over the last decade, geopolitically-related factors and policy dynamics were a core self-reported motive for more than one in two foreign direct investment projects, up nearly 20% compared to the preceding decade. Consequently, biotechnology manufacturers, innovators, and capital allocators must now give greater attention to geopolitical considerations than ever before.

5 **Growing fragmentation of biotech value chains along geopolitical fault lines is presenting an evolving set of risks and opportunities for companies.** Trends such as supply chain localization and investment restrictions pose challenges to cross-border business activities, but they are also creating new pathways for innovation (e.g., fast-tracked approvals), market access (e.g., regulatory simplification), and government support (e.g., subsidies).

6 **Other emerging domestic policy dynamics could shift the status quo for biotech.** Domestic policy developments—such as US reductions in regulatory funding and staffing, mounting pressures on drug pricing and production (e.g., "most favored nation" pricing, Inflation Reduction Act, tariffs), and global moves toward regulatory simplification—could significantly reshape the biotech sector's incentives and structure in ways that could fundamentally alter corporate strategy and investment flows.

II Biotech as a New Geopolitical Frontier

Biotech as a New Geopolitical Frontier

The biotechnology sector is emerging at the forefront of national and economic security policymaking, driven by deepening West–China tensions and intensifying global competition for leadership in advanced technology. In the US, the scope of policies to protect "sensitive" technologies and data has grown substantially over the last ten years. Early instances include the first Trump administration's scrutiny of Huawei's role in telecom infrastructure. Under the Biden administration, the focus expanded sharply to competition across all things related to advanced computing: leading-edge semiconductors and tooling, artificial intelligence (AI), and quantum computing. European policymakers are similarly pushing forward an economic security strategy in these areas, while emerging critical technology players in Asia invest heavily in domestic industry. Meanwhile, focus has been growing on biotech—broadly defined in this report as a multidisciplinary field that employs biological processes to develop technologies primarily for healthcare applications but also for other areas such as agriculture and manufacturing. Early policy measures such as January 2025 biotech export controls in the US, efforts to reduce biopharma supply chain dependencies on China, and multi-country biotech industrial policy initiatives indicate a growing geopolitical focus on biotech globally.

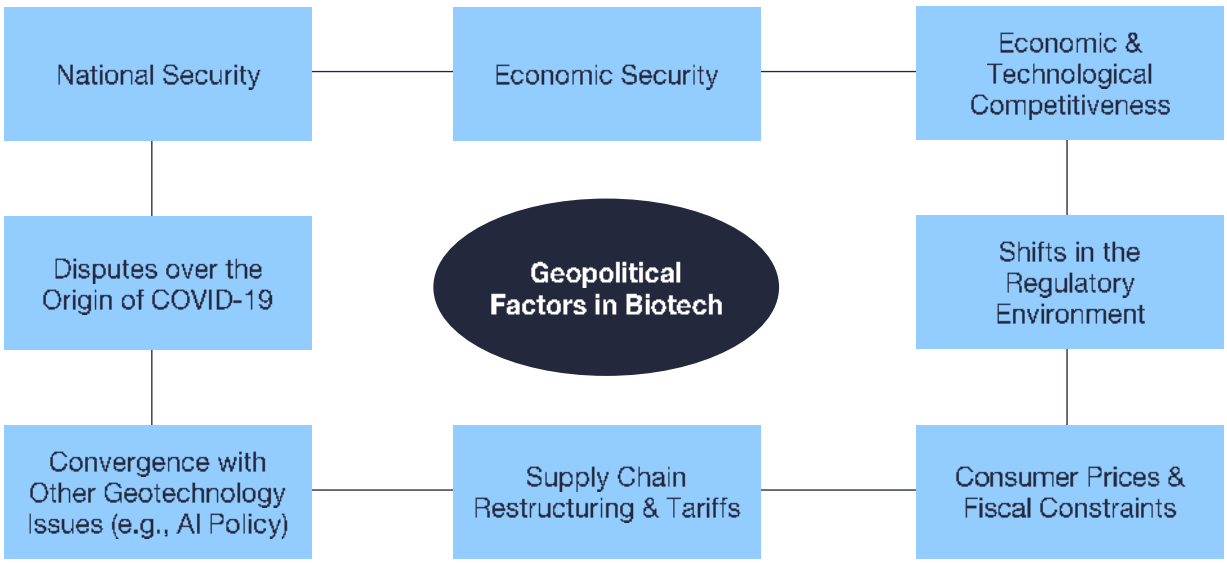
We find four primary reasons biotech is emerging as a new geopolitical frontier:

1. **Biotech is increasingly seen as a critical technology for both economic and national security:** The growing strategic importance of biotech for policymakers is driven by a broader focus on protecting critical technologies from adversaries and promoting domestic innovation. Similar to geopolitical competition dynamics in recent years in the telecom, semiconductor, AI, quantum computing, robotics, critical materials, and energy sectors, biotech is increasingly being seen by policymakers around the world as core to great power competition and national success. This trend was, in part, prompted and accelerated by the COVID-19 pandemic, where biotech supply chain disruptions and life science technological leadership became even more critical. The pandemic also advanced concerns over national security and biosecurity related to the growing potential for biotechnology and related supply chains to be leveraged as a tool of geopolitical coercion and political influence.
2. **Biotechnology innovations are converging with other critical technologies:** The convergence of technologies presents considerable force multipliers: AI can accelerate drug discovery timelines and improve early-stage success rates while machine learning can compress gene-editing protocols and research. This sort of acceleration creates new opportunities to boost health outcomes and enable biological interventions but also creates new risks for biotech's use in military contexts and an opportunity to establish economic–technological supremacy over national competitors. This creates several major concerns for policymakers, such as competitors' ability to use AI tools to rapidly generate large amounts of biological data to train AI models, design targeted bioweapons, build advanced military biomanufacturing processes, or leverage databases of genetic data for population surveillance.
3. **Lower technical and financial barriers to entry are enabling a broad diffusion of biotech innovation capabilities:** Biotech innovation and production have typically been concentrated among well-capitalized firms or large public research institutions across a few geographies like Europe, the US and Japan, and now increasingly in India, China, South Korea, and

Singapore. The industry traditionally relied heavily on innovation clusters, high levels of investment, large consumer markets, highly skilled labor pools, and supportive regulatory environments. However, rapid advancements in recent years in synthetic biology, life science therapies, biological data generation, and biomanufacturing are lowering the barriers to entry as data inputs and tools have become more readily available around the world. Today, many advanced biotech activities and research could be conducted by a single individual in a garage or at a computer. This is enabling a wide range of companies, academic institutions, governments, and non-state actors to innovate outside traditional institutions; this is also enabling non-traditional state actors such as China and South Korea to rapidly catch up and, in some cases, out-innovate traditional leaders in the sector.

4. **Growing concerns over economic growth and competitiveness are driving a sharp increase in policymaker focus on the geopolitics of biotech:** Amid fears that long-standing national leaders in biotech innovation (e.g., Europe and the US) are losing ground to emerging players, policymakers are increasingly focused on protecting and promoting their domestic biotech industries through a range of policies. This includes EU and US efforts to screen foreign investment in biotech; US proposals to impose pharmaceutical tariffs; efforts by Europe, Japan, and the US to provide subsidies and favorable regulatory incentives for the domestic manufacturing of critical medicine; fiscal stimulus in China targeting the industrial upgrading of medical devices and tools; and fierce global competition over the flows of biotech talent, capital, and data. The most obvious example of growing cross-border biotech competition is between the West and China, where China's policy priorities and strategic state investment have helped Chinese biotech value chains become more advanced (e.g., more original and leading research, the discovery of more innovative therapies). Europe and the US are scrambling to both reshore biotech-related supply chains (e.g., EU's Critical Medicines Act and Biotech Act) and retain technological leadership. At the same time, consumer pricing concerns—especially for medicines—are driving proposals for "most favored nation" (MFN) drug pricing in the US.

Geopolitical Dynamics Currently Impacting the Biotech Sector



Comparing policy concerns around biotechnology to those around semiconductors, biotech faces some similar supply chain and technological choke points. For instance, the sector has supply chain dependencies on many basic life science and tooling products from China and India, while there has been a splintering of the gene editing machinery market between the US and China. China's ban on imports of some US sequencers and US restrictions on exports of certain cytometers and spectrometers echo the chip wars of recent years. However, there are additional distinct challenges in the biotech sector that often make national security policymaking more complex than in other critical or emerging technology sectors. The most notable difference is that many biotech products or technologies have direct applications to human health and the preservation of life. While semiconductors, for instance, power the modern digital economy, biotech can directly protect and enhance human life and the biological world around us. This makes the sector all the more critical to national security, but it also makes it significantly challenging to regulate and build constructive policies that do not disrupt supply chains, innovation, and the treatment of patients—and that target the right set of specific biotechnologies within the broader sector.

Biotechnologies in Scope for Geopolitical Competition

A key challenge for policymakers is mapping value chains in the sector and identifying critical biotechnologies—and related goods or services—that could be regulated. The biotech sector draws on a diverse set of disciplines to employ biological processes to develop technologies. For the purposes of this report, we focus most closely on applications of biotech for medical and health end uses, but there are important lessons also drawn out for the defense, agriculture, industrials, and technology sectors. Just as different stages of the AI and semiconductor value chains have been leveraged for geopolitical policymaking, medical and health end uses of biotech contain critical nodes. These are outlined below, along with the countries that generally lead in each category today.

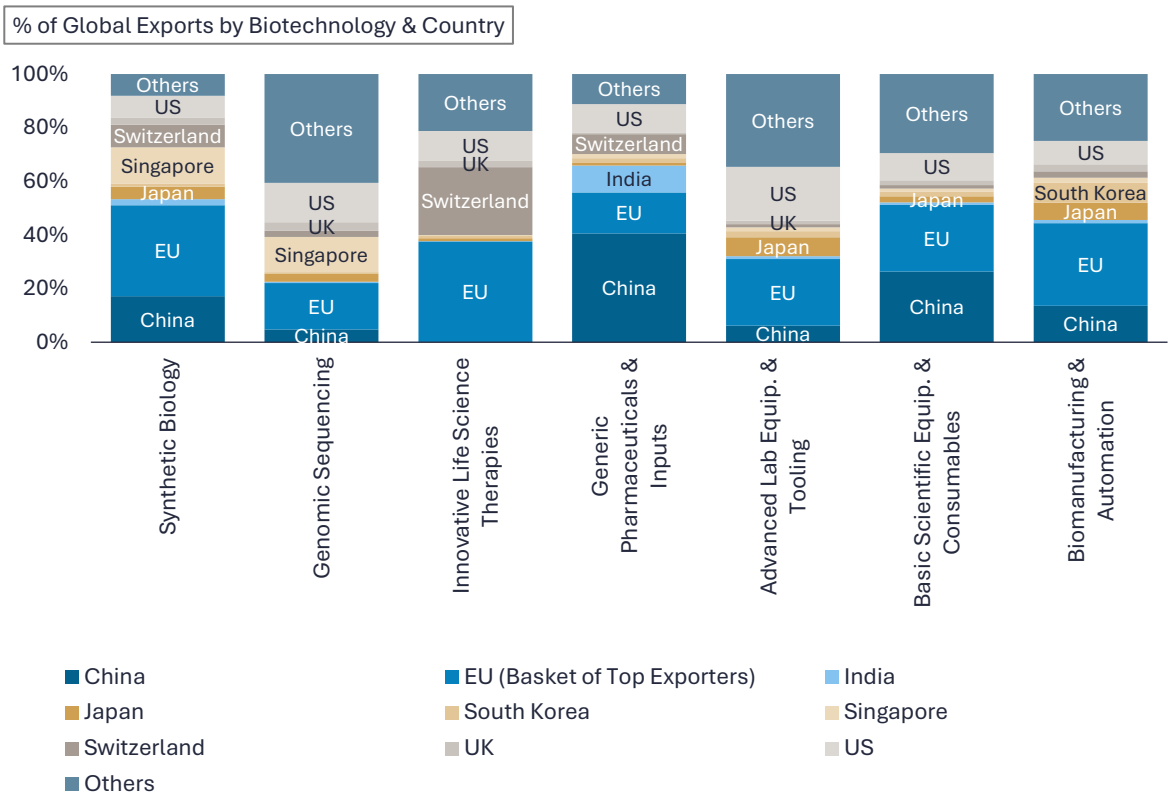
Common Types of Biotechnologies & Their National Leaders

	Common Types of Biotechnologies	Description	Notable National Leaders Based on Value of Related Global Exports[1]
Platforms	**Synthetic Biology**	Designing and engineering new biological systems with novel functions	China, Ireland, Singapore, Switzerland, US
	AI-Driven Biotechnologies	AI-driven tools for drug discovery, diagnostics, and clinical trial optimization	China, US, Vietnam, Germany, UAE
Treatments	**Innovative Life Science Therapies (i.e., Small Molecules, Biologics, Gene and Cell Therapies, RNA, Precision Medicine)**	Treatments involving the modification of cells and genes, including CAR-T and RNA therapies, stem cells, tissue engineering, and 3D bioprinting as well as therapies that harness the immune system or living sources	Switzerland, Germany, US, Ireland, Belgium
	Generic Pharmaceuticals and Key Drug Inputs	Active pharma ingredients, excipients, reagents, enzymes, buffers, solvents, and other essential chemicals for generic manufacturing and diagnostic assays	China, US, India, Italy, Switzerland
Data	**Genomic Sequencing**	Technologies that enable the rapid sequencing and analysis of DNA	US, Singapore, Sweden, Germany, China
	Metabolomics and Multi-Omics	Comprehensive analysis of metabolites and integration of genomics, proteomics, and other "omics" data to understand biology	US, Germany, Netherlands, UK, France
Tools & Manufacturing	**Advanced Laboratory Equipment and Diagnostic Tooling**	Core instruments like PCR machines, DNA sequencers, centrifuges, microscopes, spectrometers, and chromatography equipment including diagnostic assays and platforms	US, Germany, Japan, China, Netherlands
	Basic Scientific Equipment and Consumables	Everyday lab essentials like syringes, pipettes, vials, gloves, and other disposable or reusable items critical for scientific work and healthcare environments	China, Germany, US, Italy, France
	Biomanufacturing and Automation	Advanced production methods for biologics, vaccines, and diagnostics using robotics, AI, and next generation platforms including innovations like biomaterials, industrial enzymes, and biofuels	Germany, China, US, South Korea, Japan

[1]Based on value of related global exports of each type of biotechnology using 2023 UN Comtrade data. Exports for each category are an estimate based on the most closely associated harmonized system (HS) trade codes.

A few observations emerge with respect to national strengths in different areas of the biotech sector. Generally speaking, the US leads in innovation, access to capital, production, and consumption of a wide spectrum of the biotech sector, particularly in advanced biotech equipment and diagnostic tooling, multi-omics, gene editing and sequencing, and synthetic biology. Europe similarly excels in innovative goods such as advanced life science therapeutics and biomanufacturing. China, on the other hand, has a far-reaching lead in basic pharmaceuticals and raw materials for drug manufacturing as well as basic scientific and medical consumables. China has also emerged in recent years as a leader in synthetic biology and AI-driven biotech platforms, including for drug discovery. Japan, India, South Korea, and Singapore also play important and growing roles in specific parts of the biotech value chain. One of several ways to view national leadership is by looking at biotech product trade data. However, this does not account for the domestic production and local consumption of goods, and many types of biotech products and services are not clearly tracked in available trade datasets.

Share of Global Exports by Type of Biotechnology and by Country[2]



Geopolitical Risks Facing Common Biotechnologies

Given growing geopolitical competition and Chinese advances in biotech, policy pressure is growing in the West to restructure value chain dependencies and retain technological leadership in different forms of biotechnology. There is also a desire to identify specific technologies and their underlying

[2] UN Comtrade using 2023 trade data based on declared product value. EU data is a representative, combined basket of top biotech product exporters including Belgium, France, Ireland, Italy, Germany, and the Netherlands. Datasets for the Metabolomics & Multi-Omics and AI-Driven Biotechnologies categories are not available.

components or enablers that could present significant challenges to national security. As a result, we see varying geopolitical pressures across different aspects of the biotech value chain:

Geopolitical Risk Level of Various Biotechnologies[3]

	Geographic Value Chain Concentration	Technological National Security Sensitivity
Synthetic Biology		
AI-Driven Biotechnologies		
Innovative Life Science Therapies		
Genomic Sequencing		
Generic Pharmaceuticals and Key Drug Inputs		
Metabolomics and Multi-Omics		
Advanced Laboratory Equipment and Diagnostic Tooling		
Biomanufacturing and Automation		
Basic Scientific Equipment and Consumables		

Risk Level Legend:

Less Risk *More Risk*

Biotechnologies with heightened geopolitical sensitivity include gene editing, sequencing, and synthetic biology, which face scrutiny due to potential dual-use risks such as engineered pathogens or bioweapons. AI-driven biotechnologies amplify these risks by enabling rapid design and leveraging vast amounts of sensitive data for precision targeting, raising concerns about state-backed exploitation of health data. Meanwhile, generic pharmaceuticals and basic drug inputs are also facing more geopolitical risks due to high levels of supply chain concentration, particularly in China. These sorts of lower value-added segments of biotech are also the most susceptible to supply chain disruptions due to low margins and high consolidation of production among a few large players and countries.

Less geopolitically contentious areas of biotech include basic scientific consumables (e.g., lab plastics, reagents) so far as specific product supply chains are relatively diversified or have production footprints across several geographies. In general, there are some risks due to more consolidation of lower value-added equipment supply chains in East Asia, while high value-added equipment supply chains are generally consolidated across the US, Europe, and Japan. Separately, the biotech sector

[3] Lazard assessment based on available trade data, OECD technological advantage rankings, patent and publication figures, government listings of critical technologies, sectoral observations, and other sources. For illustrative purposes only.

notably features a high degree of commercial disputes over IP and control over leading-edge therapeutic technologies. High levels of competition over the control of IP—and its regulatory data protection period in the case of many life science products—can undercut global R&D collaboration and create market access barriers. A recent prominent example of this dynamic was China's insistence that Western COVID-19 mRNA vaccine developers transfer or license their technologies to local Chinese partners in exchange for market access. This regulatory obstacle ultimately dissuaded cross-border collaboration and resulted in a multi-year delay in Western COVID-19 vaccine manufacturer access to the Chinese market.

III Emerging Policy Trends

Emerging Policy Trends

Policymakers around the world are paying more attention to national and economic security risks in the biotech sector as geopolitical tensions heat up and economic competitiveness moves to the forefront. In general, the US is more focused on national security and consumer pricing challenges, while the EU and Japan are more focused on retaining economic competitiveness in industries such as life sciences. China, India, and several other developing countries, on the other hand, are focused on boosting domestic capabilities and moving up the value chain to more high value-added components of biotech. Mapping and understanding the evolving geopolitical policy environment vis-à-vis biotech is key for multinational companies and investors alike to get ahead of emerging policy trends to minimize potential risks and position themselves to maximize opportunities.

Key Emerging Policy Trends in Geopolitical Biotech Competition

Actor	Overarching Policy Goal	Select Policy Trends
US	Secure national biotech leadership, counter China's rise, mitigate dual-use risk of advanced biotechnologies or enabling tools, and lower biopharma costs for consumers	• BIOSECURE Act: limiting the influence of, and dependence on, Chinese contract development and manufacturing organizations (CDMOs) • NSCEB[4] report: boosting funding for biotech innovation and protecting US biotech leadership • Export controls and investment screening: ensuring that American technology and capital flows do not work against US national interests • Pricing and production: pushing for the reshoring of biotech manufacturing while also reducing consumer costs, including via MFN pricing and Inflation Reduction Act (IRA) price negotiations
EU	Centralized biotech governance / intra-Union standardization, boost economic competitiveness, and reduce reliance on Asia for key biotech-related inputs	• Critical Medicines Act: incentivizing domestic generic medicine production to cut foreign dependencies • Horizon Europe: investing in AI-driven drug discovery and biomanufacturing • Biotech Act: streamlining biotech regulation and centralizing sectoral oversight

[4] National Security Commission on Emerging Biotechnology.

Actor	Overarching Policy Goal	Select Policy Trends
China	Lead the global bioeconomy by 2035 and reduce reliance on Western biotechnologies / increase self-sufficiency	• 14th Five-Year Plan: making the bioeconomy core to China's growth strategy, partially through 10% annual R&D spending growth • Suzhou Biobay & biopharma free trade zones: building industrial biotech clusters
Japan	Lead in specific advanced therapies, reduce drug lags / losses, and increase the attractiveness of the Japanese market for global innovation	• Bioeconomy Strategy: streamlining biotech regulation and aligning to international standards
India	Increase biotech leadership on the global stage with the specific goal of driving economic growth	• BIO-E3 Policy: targeting $300bn biotech sector by 2030 and emphasizing self-sufficiency
Others	Increase global market share, especially in biopharma, and create regional hubs for innovation, manufacturing, capital, and talent	• UK: Genome UK regulatory standard setting • South Korea: K-Bio Initiative to invest in strategic biotechnologies • Singapore: Biotech 2025 plan to provide tax incentives for foreign CDMOs and biotech startups

United States

BIOSECURE Act: The Act was proposed in late 2024 to early 2025 and sought to prohibit US federal agencies from contracting with firms that work with select Chinese biotech firms like BGI and CDMOs like WuXi AppTec over data security and supply chain risks. The bill epitomizes escalating US–China competition for leadership in biotechnology and the willingness of policymakers to target specific firms to decouple related supply chains. Though the bill passed the House in September 2024, it stalled after exclusion from the FY25 National Defense Authorization Act (NDAA) amid bipartisan concerns over supply chain disruptions and due process. While currently dormant, the legislation could reemerge at any time, including potentially in FY26 NDAA negotiations this fall.

NSCEB report: The National Security Commission on Emerging Biotechnology's (NSCEB) final report in April 2025 warned of growing US vulnerability to China's biotech dominance and proposed a $15bn federal initiative over five years to incentivize domestic innovation, protect American biotechnology innovations, and expand partnerships with allies. The report serves as a blueprint for geopolitical policymaking in the US biotech sector. Key recommendations include establishing a National Biotechnology Coordination Office to centralize policymaking, restricting partnerships and exports to Chinese firms like BGI, and treating biotech as a "critical infrastructure" requiring added protections, similar to energy utilities and telecom. Following the report's release, bipartisan legislation was introduced in Congress—the National Biotechnology Initiative Act—to begin implementing the

NSCEB's recommendations. Many of the recommendations could also find a way into law via the FY26 NDAA and other must-pass legislative packages over the coming years.

Export controls and both inbound and outbound investment screening: The Biden administration's January 2025 biotech export controls targeted advanced biotech equipment like high-parameter flow cytometers and liquid chromatography mass spectrometers to China and other competitor countries, citing dual-use risks of AI-driven biological data sets. The action notably also created a first-of-its kind export control classification category for the biotech sector, helping set the stage for potentially more export controls to come. Several weeks later, the Trump administration put forward the America First Investment Policy (AFIP) that called for an expansion of CFIUS' scrutiny of inbound biotech investments and the Treasury's scrutiny of outbound biotech investments. These measures reflect growing bipartisan efforts to counter China's biotech ascendancy and a willingness to restrict American trade and capital flows to do so.

International reference pricing and supply chain reshoring: The Trump administration is seeking to reduce consumer costs—particularly for medicines via MFN drug pricing—while also seeking to incentivize US-based manufacturing and innovation through the expanded use of tariffs. The two goals are often seen in competition given tariffs could add to consumer costs. However, for the administration, both goals are aimed at balancing trade flows and fixing imbalances in the global life sciences market that are perceived by the administration as disadvantageous for the US. The trajectory and scope of both MFN drug pricing and tariffs (including pharmaceutical-specific tariffs) remain highly uncertain and subject to change. Yet, both could present major challenges for the sector and fundamentally shift global market incentives (e.g., erosion of margins for high-risk R&D investments), undercutting other geopolitical tailwinds for biotech discussed in this report.

European Union

Critical Medicines Act: The Act was proposed by the European Commission in March 2025, seeking to bolster the EU's pharmaceutical sovereignty by reducing reliance on foreign suppliers for critical medicines and their core ingredients. Key proposals within the Act include fast-tracked permits and specific funding for EU-based manufacturing of strategic drug products, procurement rules favoring suppliers with localized production, and more streamlined, unified regulation for the sector to simplify cross-border, intra-EU business activities. The proposal is working its way through the European Parliament and Council with potential adoption by late 2025 and implementation starting in 2026.

Horizon Europe: The program boasted a €7.3bn budget this year and marks biotech and biomanufacturing as priority sectors for investments, helping to allocate funds for projects related to food, bioeconomy, the environment, and manufacturing. The Commission has proposed a €175bn budget for the program from 2028-2034, marking a significant increase that underscores the bloc's growing commitment to invest in Europe's competitiveness and innovation. Initiatives like the Biotech and Biomanufacturing Hub launched in January 2025 aim to streamline biotech regulation and provide support to firms in navigating Europe's biotech regulatory environment.

Biotech Act: Now slated for late 2025 or early 2026, the Biotech Act aims to provide support to innovative biotech and advanced life sciences sectors, given the Critical Medicines Act focused primarily on the generic pharmaceutical industry. The Biotech Act is expected to focus on streamlining Europe's fragmented regulatory landscape and bolster biotech competitiveness by harmonizing technological standards, accelerating market access, and addressing supply chain vulnerabilities. This may include simplified regulatory pathways for novel biotech innovations and public–private financing initiatives to scale domestic biotech and biomanufacturing capacity.

China

14th Five-Year Plan: The plan prioritizes biotech as a cornerstone of China's economic growth and development, targeting 10% annual R&D growth in sub-sectors like AI-driven drug discovery, synthetic biology, and advanced life science therapies. Key goals include scaling biomanufacturing capacity and securing supply chains for basic materials and advanced technologies where China may otherwise rely on foreign imports. The plan also emphasizes the importance of biosecurity, including through genomic data localization and data export restrictions under the 2020 Biosecurity Law and 2021 Personal Information Protection Law. While progress on the 14th Five-Year plan is ongoing, China's biotech sector and capabilities appear to be rapidly growing, and it is likely policymakers will continue to double-down on this area in the coming years.

Made in China 2025 → Made in China 2035: Building off the 2015 "Made in China 2025" industrial policy plan, policymakers are reportedly advancing plans to update the plan. This would signal a renewed commitment to an export-led growth strategy centered on boosting high-end manufacturing and technological self-sufficiency. The "Made in China 2025" plan was widely regarded as successful in helping China achieve global leadership in several key technologies including notable advances in biotech and biopharma. An updated "Made in China 2035" strategy will likely emphasize sectors such as advanced semiconductors, AI, and biotech—indicating China's rise up the value chains of critical technologies will likely continue to be a key priority over the coming decade.

Suzhou Biobay: The Chinese government is actively and strategically cultivating industrial biotech clusters to drive innovation in the sector. Several free trade zones and pilot zones are in focus for these efforts, as is a major initiative called Suzhou Biobay. The initiative, established within Suzhou Industrial Park, hosts several hundred domestic and foreign companies engaged in biotech, and it has become a hub for AI-driven drug discovery, mRNA technology, and advanced life science therapy R&D. Through tax incentives, talent recruitment, and state-backed infrastructure, this and other industrial biotech clusters are helping to establish locally integrated supply chains that reduce both operational costs and foreign supply chain dependencies.

Japan

Bioeconomy Strategy: Japan's Bioeconomy Strategy was first launched in 2019 and subsequently updated in 2024. It aims to establish the world's most advanced bioeconomy by 2030, targeting a more than $800bn market across biomanufacturing, sustainable agriculture, wood-based construction, biopharmaceuticals, and digital health / AI-driven healthcare. Key policies in the plan

include regulatory reforms to fast-track approvals for leading innovations, funding for building biomanufacturing infrastructure, and the creation of "bio-communities" (e.g., industrial biotech clusters) to integrate various components of biotech value chains in one area. While the strategy has had some success in fermentation technology and other specific areas, Japan continues to lag in biopharma commercialization—this is an area that will likely continue to be a sharp area of focus for policymakers over the coming years.

India

BIO-E3 Policy: Approved in August 2024, India's Biotechnology for Economy, Environment, and Employment (BIO-E3 Policy) aims to position India as a global biotech leader by fostering sustainable economic growth, environmental resilience, and job creation. It prioritizes high-performance biomanufacturing hubs, AI-driven biofoundries, and green technologies (e.g., synthetic biology, specialty chemicals). The policy also targets sectors identified as strategic for India's economic growth including biotherapeutics (e.g., cell and gene therapies, mRNA, monoclonal antibodies), marine biotech, and carbon capture, backed by more than $1bn in funding to reduce reliance on Chinese API suppliers and scale domestic manufacturing. Key initiatives include public–private partnerships and workforce training to address skill gaps and attract global investments.

IV Trends in Trade, Innovation & Investment

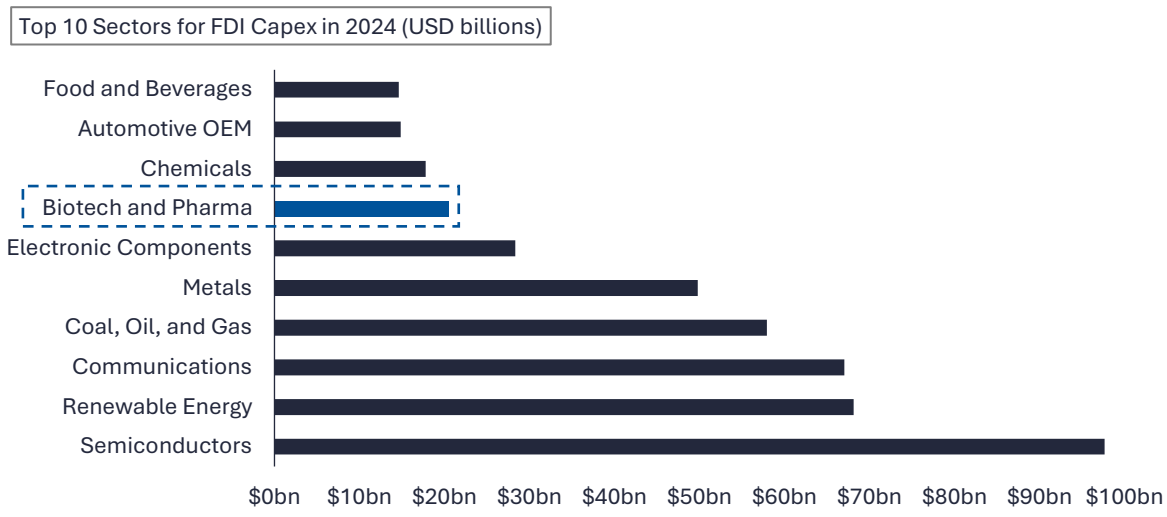
Trends in Investment & National Leadership

Geopolitics is increasingly shaping the trajectory of growth, trade, and investment flows in the biotech sector. This is, in part, driven by emerging national policy trends—described in the preceding chapter—that are creating a new set of financial incentives (e.g., state subsidies), regulatory considerations (e.g., streamlined approvals for domestically produced biotechnologies, MFN pricing), and operational hurdles (e.g., investment screening) for biotech researchers, producers, and investors.

The Future of Biotech: Following the Investment Flows

One way to consider where clusters of biotech innovation are deepening is by looking at recent foreign direct investment (FDI), where analysis from Lazard shows the growing importance of geopolitics to capital allocation decisions in biotech over the last decade. In 2024, the biotech sector saw the seventh-highest level of FDI flows globally alongside capital-intensive sectors like semiconductors, renewable energy, and extractives.[5] Based on available data, total greenfield FDI investments into the biotech and life sciences sectors reached close to $24bn in 2024 and represented about 4% of global FDI flows. Total FDI flows—both greenfield and brownfield—into the biotech sector are likely substantially higher than what is accounted for in the available data given not all investments are made public and some investments (e.g., internal capital goods procurement or infrastructure upgrades) are not reflected in available data.

Top Sectors for Foreign Direct Investment in 2024[6]



Global investments into the sector have been growing rapidly, especially since 2020. This likely represents both an expansion of fiscal support for the sector during the COVID-19 pandemic as well as the growing importance of biotech to broader technological innovation and economic growth.

[5] fDi Markets, a service from The Financial Times Ltd. 2025. All rights reserved.
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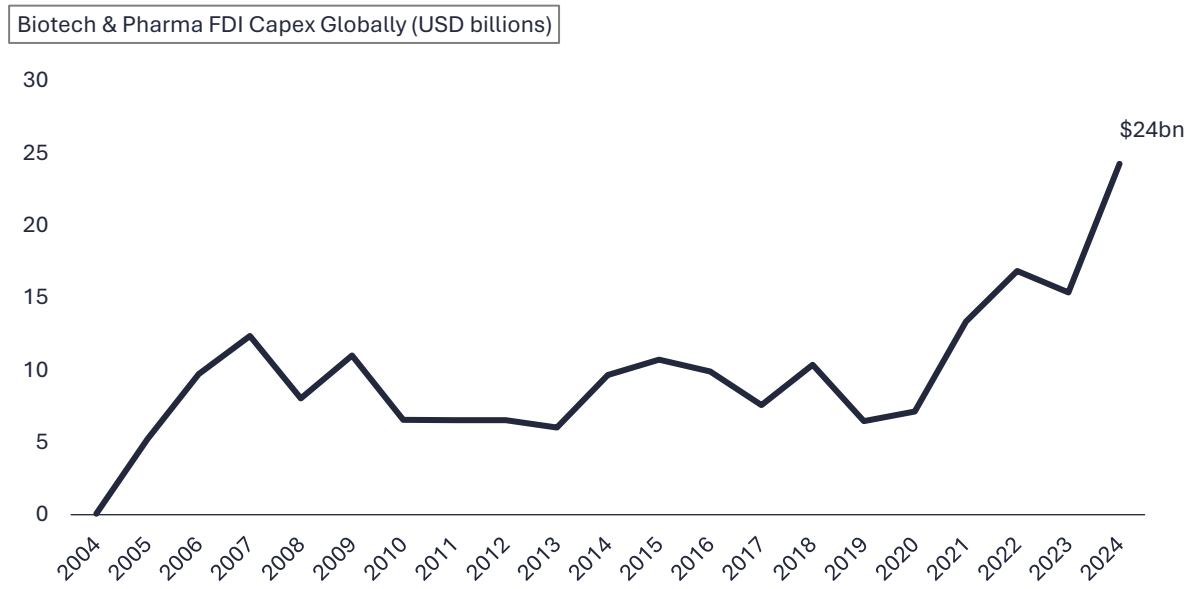
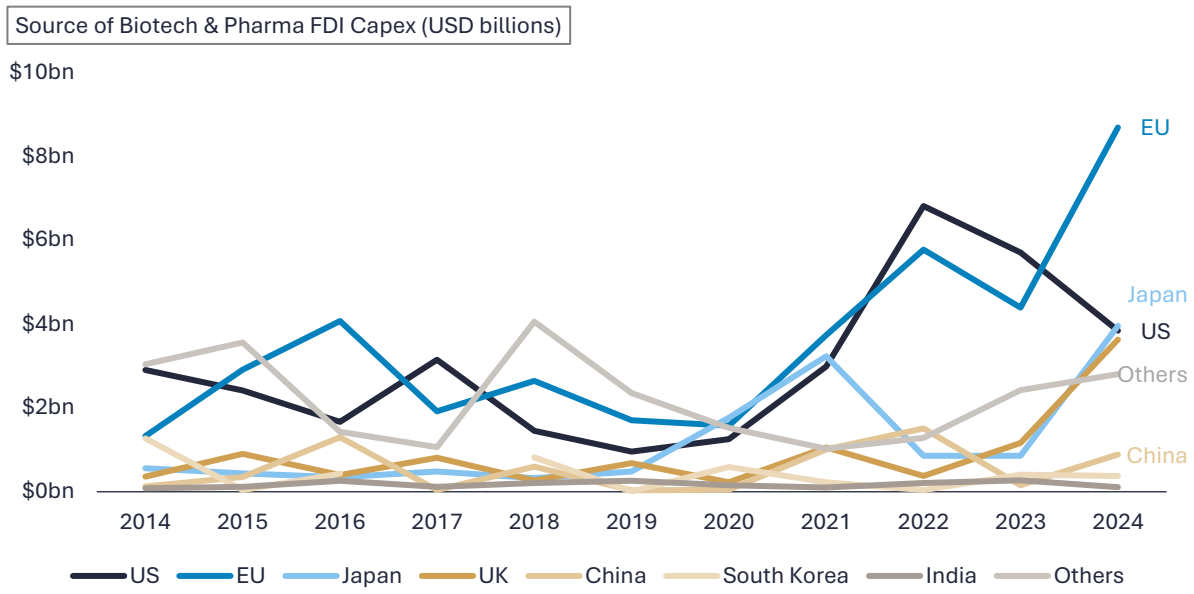
FDI Flows into the Biotech Sector over the Last Two Decades[7]



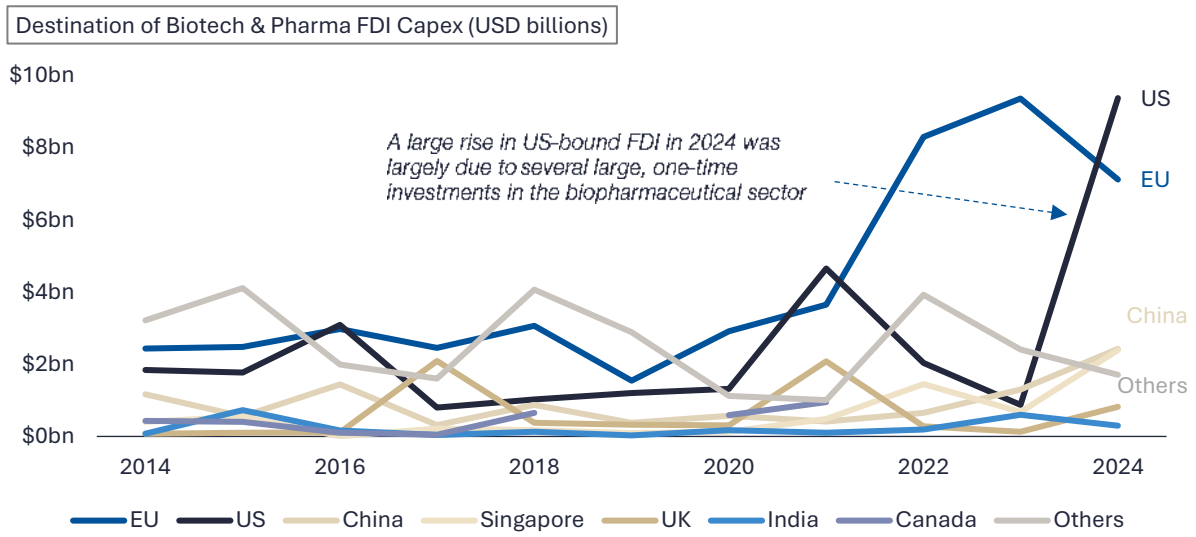
The most consistent sources of biotech FDI over the past decade have been the EU and US with a recent uptick in investment from the UK and Japan. China and Singapore have not recorded major foreign direct investment into the biotech sector at rates comparable to the West and Japan. However, both countries have seen a significant uptick as destinations for FDI into the biotech sector in recent years as they increase their foothold in R&D and supply chain segments of biotech value chains.

Sources of Biotech Foreign Direct Investment over the Past Decade[8]



[7] fDi Markets, a service from The Financial Times Ltd. 2025. All rights reserved.
[8] fDi Markets, a service from The Financial Times Ltd. 2025. All rights reserved.

Destinations for Biotech Foreign Direct Investment over the Past Decade[9]

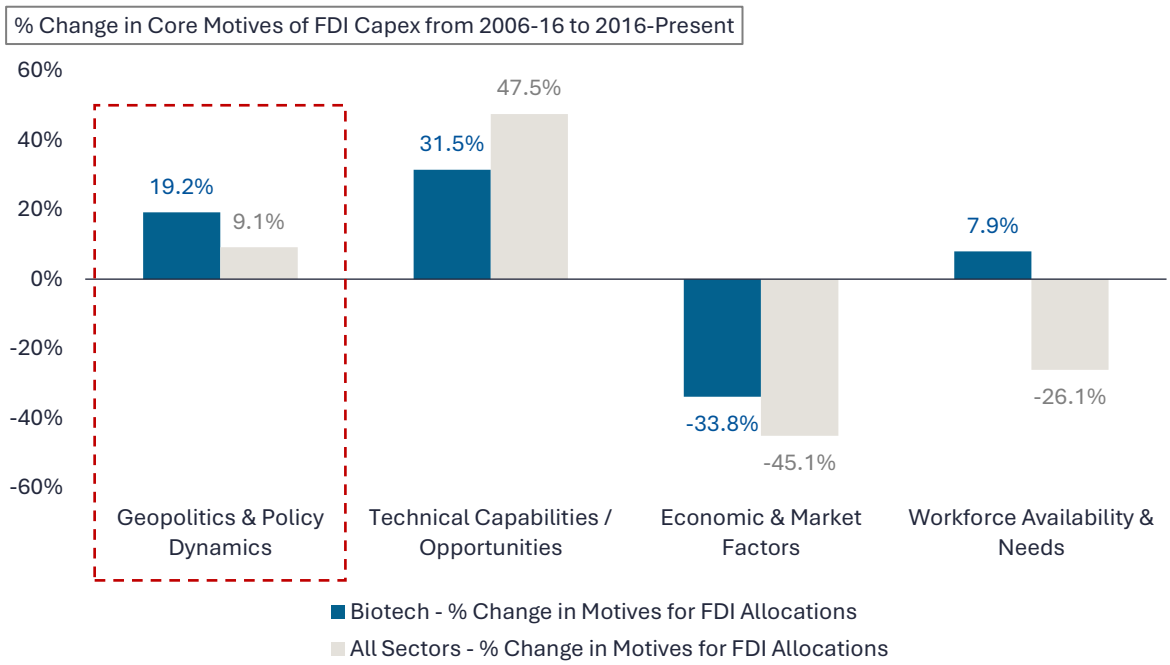


Based on a Lazard analysis of fDi Markets historical greenfield foreign investment data and the self-reported rationales for the investments, it is clear that geopolitics is playing an increasingly influential role in directing investments in the biotech sector. In the period of 2016–present, geopolitical and policy dynamics—government support and industrial incentives, for instance—were at least one of several publicly stated core motives for about 48% of biotech-related foreign direct investment projects. That means that one out of every two decisions made to allocate FDI in biotech over the last decade was, in part, influenced by geopolitical and policy dynamics.

Comparing this to the preceding decade of 2006–2016, the role of geopolitical and policy dynamics as a self-reported motive for biotech FDI allocations increased by about 20%. Meanwhile, investments motivated by technical capabilities (e.g., access to innovation) and workforce availability (e.g., destination market quality of life for workers) grew by around 31% and 8%, respectively, while investments driven by economic and market factors (e.g., local market conditions) declined by 34%. These data points underscore the growing influence of geopolitics in biotech value chains, increasingly above other motivating factors like economic and market conditions.

[9] fDi Markets, a service from The Financial Times Ltd. 2025. All rights reserved.

Change in the Core Self-Reported Motives of FDI Allocations in Biotech vs. All Sectors from 2006–16 to 2016–Present[10]



What is also notable is the increasing role of geopolitics in biotech FDI compared to all other sectoral FDI. Over the same period, total FDI flows saw the influence of geopolitics and policy dynamics grow by about 9%, half of what was experienced in the biotech sector. This indicates that geopolitics is generally playing a more influential role in FDI allocations in recent years but particularly so in biotechnology—indicating a rising connection between geopolitics and biotech.

China's Growing Role in the Biotech Sector

China's rapidly growing role in the biotech sector—from a growing body of leading innovation and research to a more prominent role in M&A deals—is both reshaping the industry and drawing scrutiny from Western policymakers. For instance, China's share of global drug development pipeline surged from 3% in 2013 to 28% in 2023 and become the world's second-largest region for clinical trials after the US.[11] China's rapid rise has, in part, been driven by state planning and industrial policies that have prioritized the biotech sector, including the 13th and 14th Five-Year Plans and the Made in China 2025 initiative.

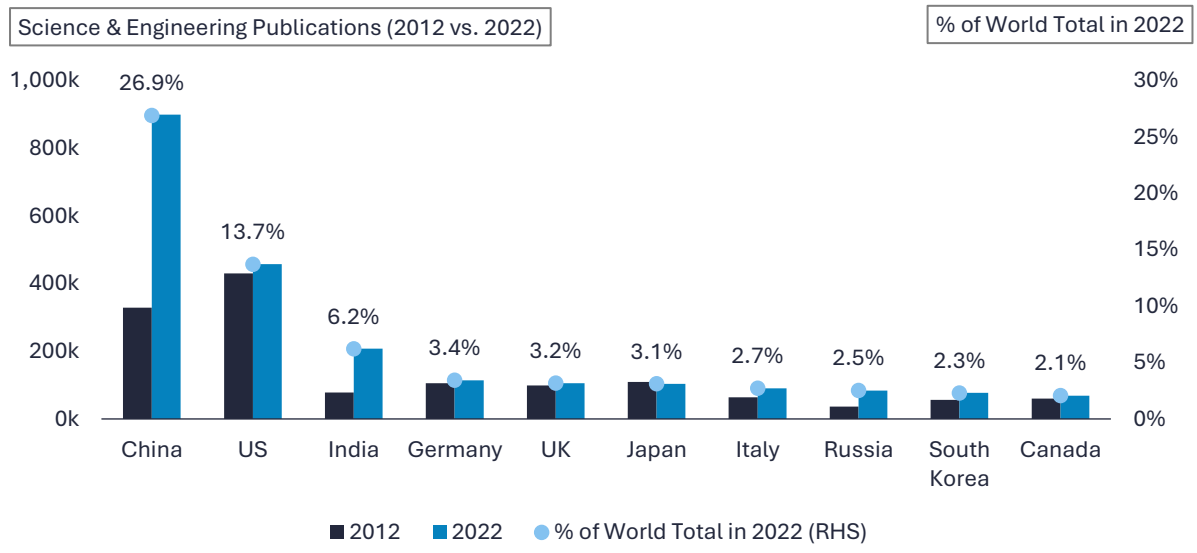
The 14th Five-Year Plan, for instance, helped introduce faster regulatory reviews of innovative medical products. China approved 113 innovative medicines—a majority of which are biologics—following the start of the 14th Five-Year Plan in 2021, about three times the number approved during the 13th Five-

[10] Lazard analysis of fDi Markets data looking at the key motivations behind publicly announced foreign direct investment allocations. Example motivations considered in the geopolitics and policy category include government support and taxes / industrial incentives to attract FDI, while example motivations considered in the workforce category include the availability of skilled workers and destination market quality of life for workers.
[11] IQVIA Institute for Human Data Science.

Year Plan.[12] On the life science tools and medical devices side, China's limited fiscal stimulus throughout 2024 placed specific emphasis on providing subsidies for industrial upgrades in the healthcare sector with particular implications for life sciences tools, diagnostics, medical devices, and other laboratory or heavy-industry equipment in healthcare settings. This included local-level incentives in cities such as Jiangsu and Shanghai, central government R&D tax deductions, and additional subsidies that could create nearly $700bn in new demand through 2027.[13] While the program has been slow moving, the whole-of-government approach indicates the significant growth in state support for the sector in recent years.

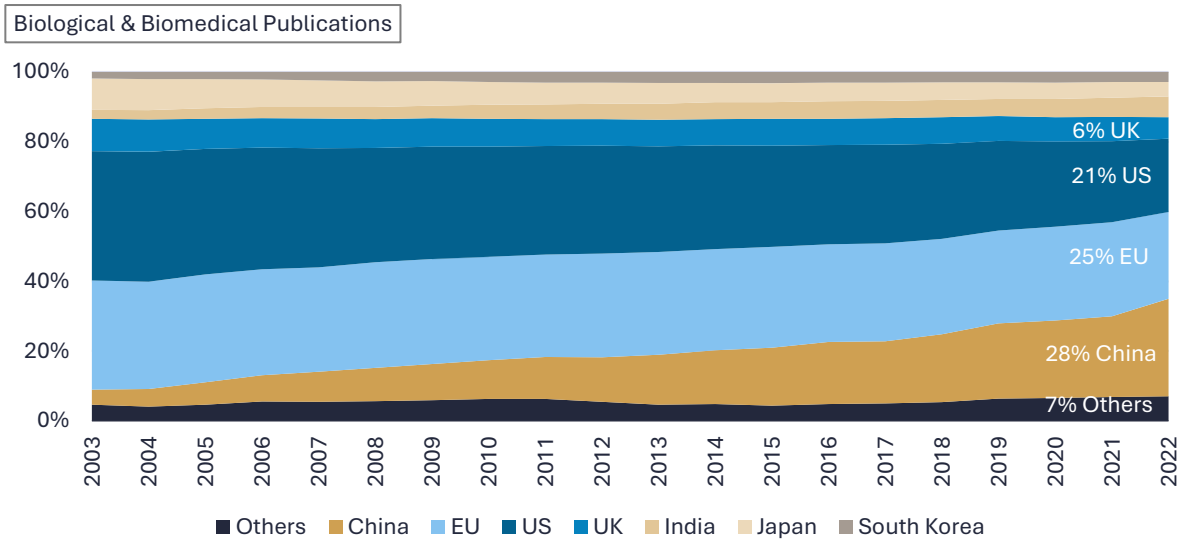
These and other state policies have emphasized the central role key biotechnologies like biomanufacturing, AI-driven drug discovery, and advanced life science therapies could play in China's economic development and growth. China's contributions to science and engineering publications have nearly tripled over the last decade, and the country generates nearly 27% of all global publications as of the latest available data—double that of the next closest country, the US.[14] And in the number of biotech-related research publications, China surpassed the US and EU for the first time in 2022, making up about 28% of global biological and biomedical publications.[15]

Change in Science & Engineering Publications by Country from 2012 to 2022[16]

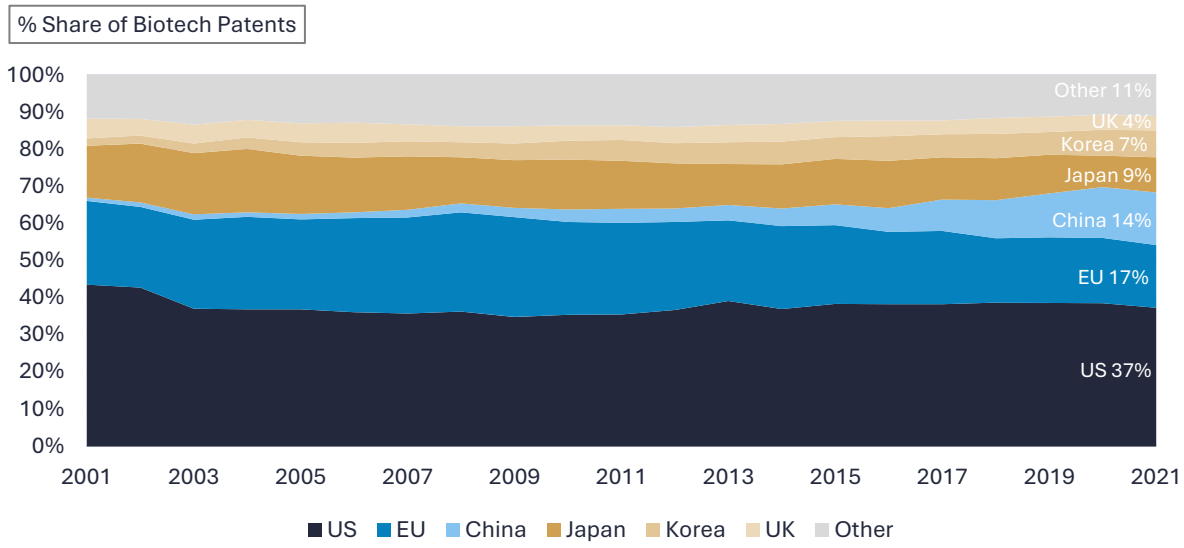


[12] China Ministry of Industry and Information Technology.
[13] China National Development and Reform Commission.
[14] OECD as of 2022.
[15] US National Science Foundation.
[16] US National Science Foundation. Source lists EU data by member state rather than as one bloc.

Science & Engineering Publications in the Biological & Biomedical Space by Country[17]



Distribution of Biotech-Related Patents by Country[18]



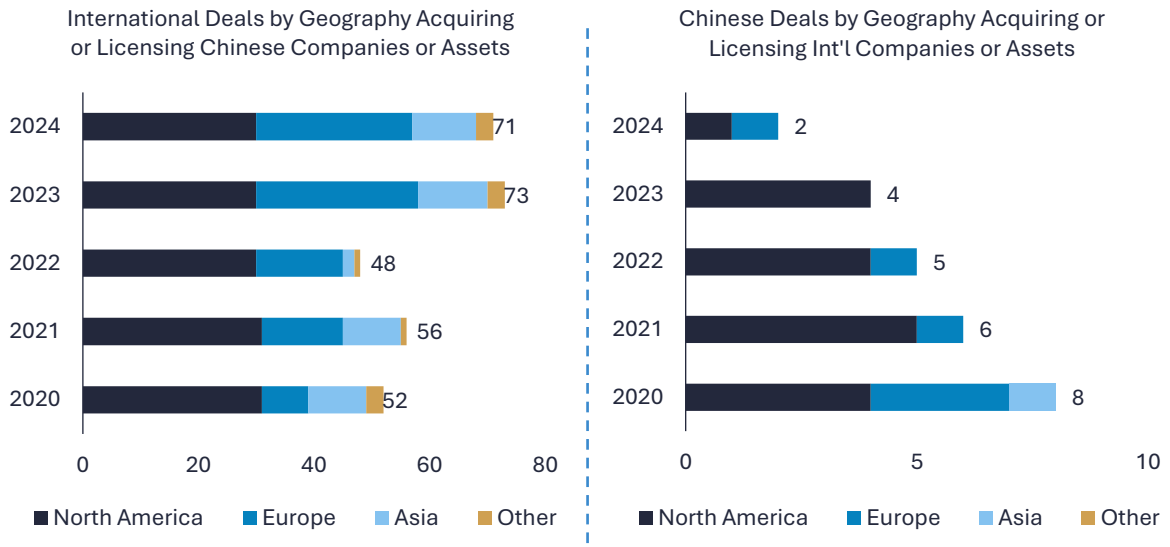
State-backed investments in China, including more than $4bn for biomanufacturing in 2024 alone and over 100 biotech-focused development parks like Suzhou Biobay, have created integrated industry clusters and value chains to spur R&D.[19] This has also created sizeable cost differences in what it takes to produce innovative biotechnologies and how much consumers need to spend. For instance, the average CAR-T treatment in China costs between $55k to $350k, while the average US price ranges

[17] US National Science Foundation.
[18] OECD using IP5 Patent Families as of 2022.
[19] China State Council.

from $500k to $1mn.[20] China has previously been perceived to lag in some areas like basic research originality and leading-edge therapy innovation. However, this is rapidly beginning to change.

A key challenge for Chinese innovators, however, continues to be global commercialization expertise. This has also led to a growing trend in recent years of Chinese biotechs partnering with non-Chinese multinational firms to out-license technologies or otherwise commercialize China-born innovations abroad. This is particularly true for biopharma and specific therapeutic areas such as oncology. Beyond this, other challenges facing China include a more nascent regulatory environment and lackluster access to private investment capital (especially in dollar-denominated currency). While China is increasingly a leader in advanced therapy clinical trials, its domestic researchers continue to rely heavily on Western clinical trial data and other information (e.g., pharmacovigilance data) for foundational work. Reliance on the West for some advanced life science therapies, tooling, and diagnostics, as well as for foundational data for research use, pose critical challenges for China's biotech ecosystem. These challenges became even more prominent following new bulk data export restrictions built by the Biden administration and more recent efforts by the Trump administration to restrict access to key National Institutes of Health databases for researchers in China and elsewhere.

International Deals with Chinese Biopharma Assets vs. Chinese Deals with International Biopharma Assets[21]



China's rise poses a core set of opportunities and challenges for the biotech sector:

- An acceleration of Chinese biomedical and bio-agricultural innovation presents clear societal and technological benefits. Finding cures to rare diseases, preventing chronic conditions, expanding access to food and therapeutic interventions, and adapting to a changing global environment are critical scientific endeavors helping to solve some of the world's most intractable problems

[20] National Institutes of Health as of 2024.
[21] IQVIA Institute for Human Data Science.

- China's growing role as a global hub of biotech innovation also presents significant and lucrative opportunities for companies to take products to international markets. This dynamic is helping to alleviate R&D funding, staffing, and other pressures at early stages of biotech value chains in non-Chinese (especially Western) markets while providing companies outside of China opportunities to buy up China-born innovations. Beyond this specific dynamic, a broader and more diverse set of researchers globally are also helping to drive cutting-edge research competition between markets—speeding up the rate of biotech innovation globally

- US concerns about China's potential dual civil and military use of biotechnology, however, are spurring new questions about the intersection of biotech and national security risks. China's growth in the sector has created dependencies on Chinese supply chains for critical goods like medical devices, pharmaceuticals, and basic research and manufacturing. For instance, 79% of US biopharma firms rely on Chinese contract research and development organizations (CDMOs).[22] This raises serious concerns among US policymakers about the risk of over-reliance on China for life-saving goods and technologies

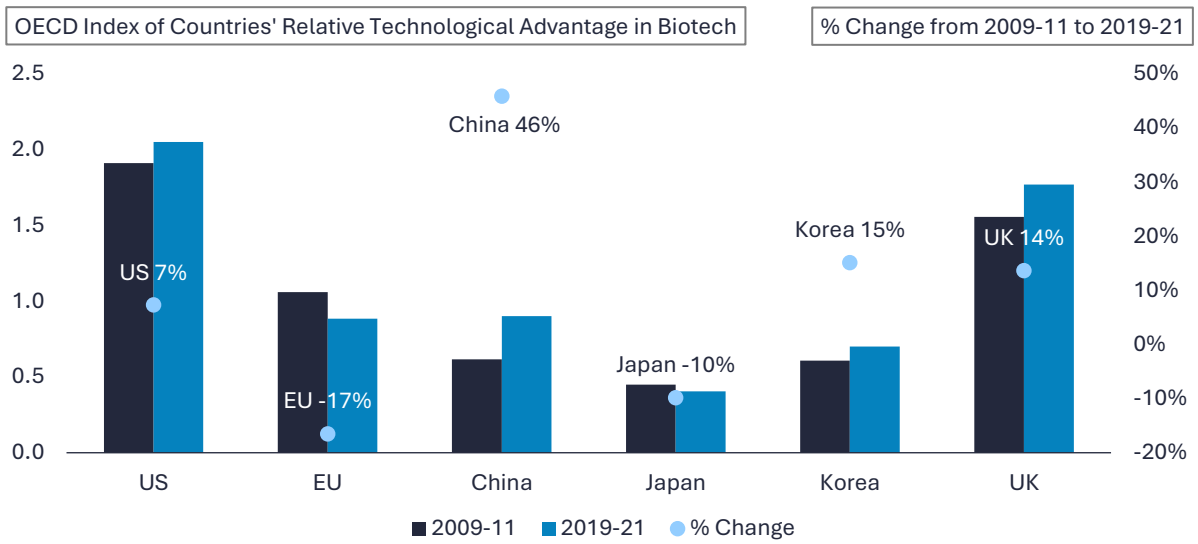
- Europe, meanwhile, is challenged by the erosion of its economic competitiveness, in many cases as a direct result of China's rise in biotech and other sectors. A key example is China's rise in clinical trial development, where Europe used to be a global leader. China overtook Europe in its global share of clinical trials around 2022–2023 with China at around 20% and Europe around 17%.[23] Similar to the US, Europe is dealing with other challenges of China's biotech rise such as heavy reliance on Chinese supply chains for key materials and risks to national security from the potential dual-use of biotechnology innovations

- China's role in producing and analyzing data for biotech innovation and product commercialization (e.g., clinical trials, gene sequencing) has also risen in recent years. However, restrictions are expanding on the export of some personal health and genetic data from China, as is scrutiny from other countries on the use of data originating from China in academic and regulatory submissions. The fragmentation of data flows poses a fundamental risk for multinational companies in the sector

Over the coming years, China's growing focus on other biotech and therapeutic areas like nuclear acids, radiopharmaceuticals, AI-driven drug discovery platforms, and gene editing tools will likely deepen China's foothold in high value-added biotech segments and further put pressure on other countries' technological leadership or supply chain dominance in these areas.

[22] Biotechnology Innovation Organization.
[23] European Biotechnology: Autumn 2024 Issue. BIOCOM Interrelations GmbH.

Relative Technological Advantage in Biotech by Country[24]



Based on OECD relative technological advantage (RTA) index[25] estimates, the US and UK remain global technological leaders in the biotech sector, and their relative advantages in the sector have risen by 7% and 14%, respectively, over the last 15 years. China, however, stands out as the most rapidly advancing player in biotech innovation with a 46% increase in its RTA ranking in the same period. This sharp rise is the result of significant Chinese policy investments in biotech in recent years, including an estimated 10% year-over-year growth in biotech R&D spending by the government. In contrast, the EU and Japan saw notable declines in their RTA scoring, by 17% and 10% over the last 15 years, respectively. Over the last 15 years, Europe fell from a 1.1 rating in the OECD's RTA index—indicating advantages in biotech above the world average—to 0.9 in the most recent period, effectively below the OECD's average. This is an indicator that the EU's traditional strength in biotech may be eroding alongside the rapid emergence of new competitors in Asia.

[24] OECD.
[25] The OECD's Relative Technological Advantage (RTA) Index measures a country's specialization in a specific technological field by comparing its share of patents in that field to its overall patent share with an RTA score above 1 indicating a relative advantage and below 1 indicating a relative disadvantage.

V Geopolitical Choke Points in Biotech

Geopolitical Choke Points in Biotech

A critical question is whether the biotech industry faces unique "geopolitical choke points" — segments of biotech value chains vulnerable to being leveraged for geopolitical gain or that could serve as key industrial constraints amid severe geopolitical conflict. While policy analysts have long debated the range and severity of geopolitical risks in biotech, identifying such choke points has presented challenges compared to analogous advanced technology sectors like semiconductors. The biotech sector is fundamentally different, due to a wider range of underlying technologies and services characterized by diffuse and decentralized value chains. However, several risk areas that recur across value chains are vulnerable to policies like export controls and regulatory scrutiny.

Biotech value chains can take a variety of forms depending on the technology and end use area in question, but a typical value chain is likely to touch on at least five different building blocks: data and digital infrastructure, talent and human capital, access to capital and R&D funding, enabling technologies and tools, and regulatory and technology ecosystems.

Building Block	Description	Leading Actors[26]	Geopolitical Choke Point Risk
Data & Digital Infrastructure *(e.g., genomic/clinical data, AI, cloud computing)*	Biological, clinical, and genomic data fundamental for biotech discovery and development. Advanced digital infrastructure (e.g., cloud computing, AI) is also essential for storing, analyzing, and leveraging data for innovation and operational purposes	US, China, Europe	■■■
Talent & Human Capital *(e.g., scientists, data professionals, engineers)*	Biotech innovation generally relies on a highly skilled workforce and access to talent hubs (e.g., graduates of leading STEM, bioinformatics, etc. programs), including scientists, data analysts, engineers, etc.	China, US, Europe, India, South Korea, Japan, Singapore	■■
Access to Capital & R&D Funding *(e.g., NIH grants, VC funding, public / private investment)*	Public–private partnerships, public funding (e.g., NIH grants), venture capital, private investments, and more are central to enabling early-stage research, product development, and large-scale R&D	US, Europe, Japan	■■■
Enabling Technologies & Tools *(e.g., sequencing, PCR, gene editing)*	The biotech "stack" includes core technologies such as DNA sequencing, PCR, microfluidics, and lab automation platforms. Access to these tools accelerates R&D and manufacturing	US, Europe, China	■■
Regulatory & Technology Ecosystems *(e.g., IP, licensing, regulatory paths)*	Mechanisms for licensing, technology transfers, and market approvals are essential to be able to commercialize innovation. Regulatory ecosystems require institutional frameworks for IP protection and compliance	Europe, US, Japan	■■

[26] Lazard estimates.

Data and digital infrastructure are a linchpin of today's biotech sector for everything from drug discovery to diagnostics and synthetic biology. The rapid expansion of accessing biological data—genomic, transcriptomic, proteomic, and clinical—has made digital infrastructure essential to make biotech innovations scalable and effective. This has been enabled by key innovations and the diffusion of tools such as DNA sequencing over the last two decades. It has also been enabled by foundational digital infrastructure to collect, store, and analyze vast amounts of biological data. This includes cloud computing platforms such as AWS, Azure, and Google Cloud that have become the backbone of biotech data management for storage capacity, elastic compute resources, imaging files, and experimental metadata. These and other platforms also help enable advanced analytics and discovery processes powered by AI and machine learning, accelerating the pace and scope of biotech innovation.

The centrality of data is also introducing significant geopolitical risks related to actors' leverage over data flows for national gain. The US, China, and Europe are principal actors vying for digital biotech dominance through leadership in cloud infrastructure, genomic data repositories, and AI-enabled drug discovery platforms. Given convergence with other technological risk areas (e.g., computing power for AI), the data and digital infrastructure building block of the biotech sector is a fundamental challenge for national security policymakers. For instance, there are wide concerns about state actors' abilities to use population-level health data or personal genetic data to bioengineer targeted bioweapon pathogens. The US' January 2025 export controls on certain spectrometry and cytometer tooling also signal pressing concerns over the ability to use biotech tooling to rapidly produce vast amounts of genetic or other personal health data for use in AI model training. Both for national and economic security reasons, policymakers have indicated that such tooling could enable geopolitical adversaries to out-innovate and out-compete other players and, in turn, help enable economic and military dominance on the global stage.

Key geopolitical dynamics and choke points related to data and digital infrastructure in biotech include:

- Data localization laws requiring a bifurcation of data collection and use across borders (e.g., China's 2021 Personal Information Protection Law), as well as restrictions on the export of certain types of information (e.g., the US' restrictions on bulk exports of sensitive data). Restrictions on the export of data present major risks to biotech value chains given its fundamental importance (e.g., clinical trial data) to innovation and commercialization
- Relatedly, several government-backed health programs control the world's largest databases for population health and clinical data, with researchers globally relying on access to this information (e.g., the US' NIH recently cut off access to several key population health databases for researchers based in China, Russia, and other nations deemed adversaries)

- Export controls on computing-related technologies (e.g., advanced GPUs) restricting the build-out of computational biology projects, and other related convergences with AI policies
- Global trust deficits—especially in the US and Europe—with respect to Chinese cloud and technology stack providers like Huawei and BGI, limiting international collaboration
- Regulatory standard setting by leading health regulators like the US FDA or EU EMA on the collection and use of clinical data and other early-stage evidence, which has global ripple effects as these institutions are often used as a benchmark in other geographies

Talent and human capital are key to biotech innovation and being able to cultivate and access highly skilled biotech talent is a core focus area for policymakers. Currently, the US largely leads in being a base for some of the most innovative centers of biotech-related human capital, particularly in Cambridge, Silicon Valley, and San Diego. China, on the other hand, has seen rapid growth in building this sort of biotech industrial clusters—especially in Shanghai—but primarily features the advantage of a large STEM graduate surplus, providing a large and growing highly skilled workforce for biotech research and production.

Europe sits somewhere in the middle: It features several prominent hubs for biotech in places like the UK, Switzerland, and France that are competitive with the US and China, and also is characterized by a large highly skilled STEM-focused workforce with the added benefit of wide cross-border research mobility. India, in contrast, represents more of an important emerging player on these factors, with a particular advantage in low-cost bioinformatics and base material production talent. India—and to a lesser extent China—features lower-cost talent alternatives that has made them hubs for Western biotech outsourcing, especially in biopharma R&D and basic drug production. South Korea, Japan, and Singapore are also important players in the human capital segment of biotech value chains.

Policymakers globally are paying more attention to national and economic security risks posed by the talent and human capital building block in biotech. Namely, the focus is on issues such as:

1. Biotech IP leakage to adversarial or competitor countries, especially in the most sensitive or national security-focused areas of biotech research;
2. Brain drain of highly skilled biotech talent emigrating to other geographies with more funding, higher wages, or greater abilities to conduct innovative research and publish; and
3. Retaining or attracting highly skilled biotech talent to accelerate national R&D priorities or boost economic competitiveness domestically.

Several key geopolitical dynamics and choke points emerge in the talent and human capital building block in biotech:

- Visa restrictions (e.g., US H-1B caps) or other regulatory scrutiny to target or deny entry to researchers from certain geographies (e.g., bans on researchers from select geographies from participating in publicly funded biotech studies relating to national security)
- Incentive programs for highly skilled biotech talent to move abroad, such as China's "Thousand Talents Program," Japan's highly skilled professional visa program
- Outsourced functions—such as biotech administrative tasks, contract research and development organizations, computational biology contractors—risk coming under national scrutiny and access to them being cut off (e.g., US' BIOSECURE Act)

Access to capital and R&D funding are fundamental to being able to conduct research and development in biotech; funding directly shapes the pace and direction of innovation and the ability of start-ups to reach market. In 2025, the biotech funding landscape is both dynamic and challenging, facing several headwinds. Despite significant growth estimates for the sector, the capital-raising environment has grown more complex and selective, increasingly prioritizing a few high-growth, clinical-stage assets in areas such as oncology, gene therapies, rare diseases, and AI-enabled drug discovery platforms.[27]

In this environment, the US continues to be the most influential player. Historically significant public sector research grant funding and deep access to capital within the private sector has made US investors key to the global biotech sector's access to funding. This role, however, is increasingly coming into question amid the Trump administration's attempted large-scale pullback of public funding for scientific research. While many of these efforts have been paused by federal courts, declining public support for the biotech research environment in the US has highlighted the risk of reliance on US funding to enable some innovations in the biotech sector. For biopharma, pricing challenges are similarly growing amid the continued expansion of Inflation Reduction Act drug price negotiations, sector-specific tariffs, and renewed attempts to implement an MFN pricing mechanism.

Europe has played a smaller but similarly important role in the provision of capital for the biotech sector historically. There is growing recognition among policymakers in Brussels and other national capitals regarding the need for more fiscal support for Europe's biotech research and manufacturing environment. However, competing priorities (e.g., boosting defense capabilities and spending) and broader fiscal constraints are limiting Europe's capacity to improve the continent's capital and R&D funding environment for biotech.

[27] Biopharma Dive.

Japan is facing a similar set of considerations to Europe: competing budget priorities and limited fiscal space reining in policymaker objectives to boost the domestic biotech funding environment. China, meanwhile, has lacked a robust private sector-led biotech funding environment. While significant government support exists for certain state-backed companies and for some areas of biotech, such as biopharma, China's domestic biotech sector has generally not featured strong private funding opportunities. That may be beginning to change, however, as state-backed support and market demand for biotech products and services continue to be the key drivers of growth in the sector domestically.

Geopolitical choke points and risks that exist within the capital and R&D funding building block of biotech include:

- The growing use globally of geopolitical policy tools to regulate the flow of cross-border investments—both inbound and outbound—which is a particular concern in the context of the US given a large concentration of global biotech investment comes from US investors and dollar-denominated currencies. Growing efforts by the US government to screen outbound investment transactions related to China's biotech sector could severely constrain the funding environment for Chinese biotechs, as well as risk cutting off US companies' access to China-born biotech innovation
- Relatedly, US influence over the biotech funding environment indicates the potential for funding channels to be cut off, leveraged to extract concessions, or come with "strings attached" to incentivize or force shifts in the biotech market (e.g., May 2025 US NIH restrictions on US scientists being able to direct grant funding to research partners overseas and banning US support for gain-of-function research in China)

Enabling technologies and tools form the backbone of most biotech value chains, covering critical components such as DNA sequencers, PCR, gene editing platforms (e.g., CRISPR), laboratory automation, and specialized software for nucleic acid synthesis. These technologies are not only fundamental to scientific progress and market commercialization, but they also represent more traditional geopolitical choke points compared to other advanced technology areas like AI. In other words, enabling technologies in biotech like gene sequencers are analogous to enabling technologies in AI like high performance computing chips. Several of these technologies and tools are relatively concentrated among a handful of countries and companies—as highlighted earlier in this report—indicating potential geopolitical choke points in biotech value chains.

The US and Europe have remained at the forefront of enabling technology innovation and production for several decades, including by pioneering gene sequencing and editing technologies and other critical tools like bioreactors. Items on the leading edge of enabling technology within biotech continue

to be most closely associated with US and European researchers, innovators, and companies. However, in recent years, China has been rapidly catching up and has a competitive edge in some areas, such as AI-enabled drug discovery and low-cost PCR tooling.

In response, policymakers—especially in the US—are increasingly setting their sights on restricting the export of advanced enabling technology and tools in biotech. This effort has been slow but has shown some recent progress, notably the creation of a new export control classification framework for biotechnologies and restrictions on the export of certain mass spectrometry and cytometer devices. On the other side of the Pacific, China has shown a similar willingness to restrict trade flows of certain enabling technologies in biotech, notably by banning the import of US gene sequencers as part of the country's retaliation to US tariffs in February–March 2025. As geopolitical tensions heat up, policymakers' muscle memory from competition over AI is likely to increasingly kick in and take the approach of restricting the trade of foundational or advanced enabling technologies used across biotech value chains.

Specific geopolitical risks and choke points in the enabling technology and tools building block of biotech include:

- Concentration of the gene sequencing and editing sector to a few multinational companies increasingly fragmented along geopolitical lines, and the fact that policymakers have often specifically focused on regulating risks related to gene sequencing in particular
- Relatedly, all biotechnologies enabled by or converged with AI platforms—particularly where the convergence allows for the rapid development of large amounts of biological data for AI model building and training—remain a key concern, particularly for policymakers in Washington and Beijing
- IP protection and patent disputes over some enabling technologies like gene editing therapies, where these sorts of regulatory pathways could be leveraged to support domestic champions or discriminate against foreign competitors
- Chinese dominance in low-cost PCR tooling and in contract research development and manufacturing organizations could create choke points in the earlier stages of biotech value chains

Finally, effective mechanisms for licensing, transferring technology and data across borders, and regulatory / market approvals are essential for moving biotech discoveries from the lab to the market. National and institutional frameworks for IP protection and regulatory compliance create a foundation for the shape and pace of biotech innovation, but these frameworks can sometimes be at odds between nations or leveraged for geopolitical gain to give competitive advantages to national

champions. Moreover, regulatory compliance can often be one of the most formidable challenges for biotech companies given the speed of innovation often outpaces existing legal and ethical frameworks—resulting in a biotech regulatory lag.

Leading actors in the regulatory and technology ecosystems building block of the biotech sector include Europe (particularly EU and UK regulatory bodies) and the US. The EU's EMA and the US' FDA and NIST are critical regulators often used as a global benchmark for regulatory standards and market approvals. Their frequent use as the "gold standard" for biotech regulation places trust and reliance on their ability to conduct high quality, unbiased, and science-based work. It also means that the actions they take, such as approving a new therapy or rescinding approvals for an existing one, can have global ripple effects into other national regulatory systems that rely on the EMA's and the FDA's guidance. This provides the EU and US a point of leverage over other countries, as well as opportunities to shape regulatory standards in ways that may implicitly favor domestic companies, such as requiring domestically collected or representative clinical data in regulatory submissions, or banning data from certain geographies.

Japan's PMDA and METI and China's NMPA and MOST are also important players, especially within the Asia Pacific region where several regional partnerships make the agencies leaders in regulatory standard-setting. Across key American, European, Japanese, and Chinese regulatory agencies in biotech, there is a growing focus on accelerating approval pathways for novel biotech innovations and reducing barriers to market entry. This is to both incentivize more innovation in each market and to better compete with the other geographies (e.g., by reducing regulation-driven lags / losses in innovative therapies). Across all geographies, IP rights are likely the most critical pillar of the ecosystem, underpinning innovation and the ability to safely bring new biotechnologies to market.

Key geopolitical choke points in the regulatory and technology ecosystem building block of biotech include:

- The ability of any country to leverage IP protections and technology transfers (e.g., restrictions on foreign-made mRNA innovations) as a geopolitical tool to seek concessions from foreign companies or governments
- Biotechnology standard-setting at the national and multilateral levels can carry explicit or implicit preferences for domestic competitors or additional scrutiny of foreign actors, resulting in competitive advantages for select firms based on national identity
- The EU's and US' leadership in biotech regulatory pathways and market approvals provides those countries additional leverage in global biotech competition. It also raises the risk of national regulatory divergences and restrictions on data from certain geographies, potentially raising the cost of data gathering and clinical trial work

VI Business Considerations & Recommendations

Business Considerations & Recommendations

As global tensions escalate—especially between the West and China—the biotech sector has emerged as a critical frontier in geopolitical competition, with nations vying for dominance in an important field with many crossovers in other advanced technology areas. As states focus on securing domestic biotech value chains and building strategic advantages, businesses will likely increasingly face a dual reality: unprecedented risks driven by value chain fragmentation, export controls, and threats to IP rights, alongside opportunities to localize innovation, partner with public entities, and access new funding. As with many advanced technology sectors, biotech is increasingly being driven by policy and geopolitical factors as much as market drivers, as shown earlier where the influence of geopolitics and policy over foreign direct investments grew by about 20% over the last decade.[28]

Business Considerations & Implications for Key Sectors Impacted by Biotech Competition

Sector / Sub-Sector	Potential Business Considerations & Implications
Generic Drugs & Basic Life Science Material Inputs	• Tariffs threaten low-margin products, risking price hikes and supply disruptions • Fierce efforts to reshore some critical generic and raw material production to the US and Europe, as well as for India to reduce reliance on Chinese APIs
Innovative Life Science Therapies	• Regulatory scrutiny of collaborations with Chinese firms, especially where there are convergences with AI-focused policymaking. This is particularly prominent for US–China corporate interactions, presenting some opportunities for increased M&A and licensing deals between European and Chinese firms • Increased focus on boosting competitiveness and reshoring in some markets could create less product pricing sensitivity and increase financial incentives in some markets • Meanwhile, US policymakers are increasingly focused on reducing consumer pricing, particularly for innovative biopharmaceuticals through voluntary MFN price commitments and IRA price negotiations
Basic Scientific Consumables	• Tariffs on basic materials like plastics will likely raise costs and strain low-margin production for items like pipette tips. Some supply chain fragmentation risks supply disruptions • Diversification will likely accelerate, with India, Southeast Asia, Latin America, and some Western developed markets likely to be the biggest beneficiaries

[28] Lazard analysis of fDi Markets data looking at the key motivations behind publicly announced foreign direct investment allocations. Example motivations considered in the geopolitics & policy category include government support and taxes / industrial incentives to attract FDI.

Sector / Sub-Sector	Potential Business Considerations & Implications
Advanced Diagnostic Tooling & Lab Equipment	• Higher risk of Western and Chinese export or import controls, along with tariff pressures to restructure global supply chains • Diversification efforts may similarly accelerate, but higher-margin production may see less movement as tariff costs are absorbed
AI & Data Infrastructure	• Underlying data collection, usage, and access could be threatened by data or computing hardware-related export controls and scrutiny of items like foreign clinical data • AI-enabled biotech platforms will likely be a core area of interest for policymakers
Financial Sponsors & Asset Managers	• Inbound and outbound investment screening—especially vis-à-vis the US—could ramp up and threaten capital flows, especially to China • India's BIO-E3 Policy, Singapore's tax incentives, and several other policy efforts will attempt to attract diverted capital and may provide a tailwind to non-China emerging biotech hubs

Recent policy developments and shifts in value chains mapping suggest that a fundamental change is underway in how biotech businesses operate or may need to operate globally. This creates a specific set of implications for businesses to consider moving forward:

- **Supply Chain Fragmentation & Localization:** As with many sectoral supply chains, geopolitical tensions are driving a significant restructuring in the biotech sector. The US NSCEB's call for decoupling from China in critical biotech goods and China's 14th Five-Year Plan to boost biotech self-sufficiency indicate growing national priorities to localize supply chains. This means potentially higher costs for both domestic and cross-border business, but this trend could also result in new financial incentives and market opportunities to invest in local production capacity in core markets
- **Tightening Export and Investment Restrictions:** The US, Europe, and China are all focused on ramping up restrictions on cross-border biotech exchanges. Between the US' new biotech export controls and investment screening measures and China's import ban on various US technologies, companies will likely increasingly have to navigate a complex regulatory environment as more of the biotech value chain is deemed sensitive to national security. This could drive the creation of parallel supply chains for different markets. It could also reduce some market opportunities abroad—for Chinese firms in the West and for Western firms in China—as certain goods, services, data, and capital are restricted from transfer to other geographies
- **Intellectual Property Warfare:** The risk of state-sponsored IP theft in biotech may intensify, including via efforts to force the transfer of advanced technologies as a condition for market access, public funding, or other regulatory approvals. IP is core to the value of

the biotech sector and its innovations, requiring a sharp focus on guarding IP protections through careful partner selections, enhanced cybersecurity measures, and vetting employees with access to sensitive information or corporate systems

- **Defense-Biotech Industrial Complex:** National security interests are increasingly shaping biotech investment priorities. In China and the US, national security officials and military organizations are playing an increasingly influential role in biotech policymaking. They are also taking a leading role in funding efforts like boosting domestic biomanufacturing capabilities. This suggests that companies could find new or growing opportunities aligned with defense priorities, but that doing so may also carry additional compliance requirements related to geopolitical biotech competition
- **Global Talent Competition:** Access to skilled researchers is becoming a key competitive factor in the geopolitical biotech race. Many national players such as the EU and China are actively recruiting US-based talent amid the US' effort to reduce public R&D funding and increased scrutiny of visa-holders. This could erode the US' current leadership in the talent and human capital building block of the biotech sector
- **Paradoxical Market Dynamics & Implications for M&A:** Despite the rising geopolitical tensions and measurable West–China decoupling in strategic sectors over the last few years, cross-border business activities in biotech continue to accelerate and reach new highs. For instance, biopharma companies sourced about one-third of their in-licensed molecules from China in 2024, an increase from 10%–12% in 2020–22.[29] This is creating a paradoxical situation where commercial opportunities for collaboration are on the rise as the geopolitical divide widens and governments erect new barriers to doing cross-border business, including via tariffs. This is increasingly driving a dynamic where US companies are more hesitant to interact or transact with Chinese entities, and where European companies are increasingly filling the gap by energetically seeking M&A and out-licensing opportunities in Asia
- **Competing National Priorities on Pricing vs. Innovation:** In several markets, policymakers are actively pursuing parallel and somewhat competing objectives: bringing down the cost of biotech therapies—especially innovative and generic life science medicines—while boosting national competitiveness in biotech, which requires higher spending on R&D. In the US, policy dynamics like IRA drug price negotiations and pressure for an MFN drug pricing mechanism may reduce incentives for more domestic manufacturing and innovation. Related US policy proposals (e.g., expanded direct-to-consumer drug distribution models, demands for foreign countries to spend more on drug innovation to offset US contributions) could drive fundamental shifts in the operating and investment environment globally if enacted, but these efforts remain at an early stage. Meanwhile, the EU's Critical Medicines and Biotech acts, China's volume-based procurement system, Japan's drug approval regulatory reforms, and India's Production

[29] BioPharma Dive.

Linked Incentive schemes are all examples of competing pricing versus innovation policy dynamics that may fundamentally alter biotech market dynamics in those geographies or more globally

Recommendations for Businesses to Adapt to a New Geopolitical Environment in Biotech

Recommendations	Corporate Considerations
Maximize Localization Strategies	• Reduce exposure to cross-border disruptions—particularly growing divides between the US and China • Minimizing cross-border activities may help mitigate compliance costs and supply chain disruptions related to emerging and ever-changing export controls, investment screening, tariffs, and pricing controls • Maintaining China+1 / US+1 / Europe+1 strategies can build resiliency across global supply chains while ensuring stability in large markets
Reduce Critical Dependencies	• Identify and map dependencies across corporate value chains to locate specific dependencies of upstream basic inputs or downstream product finalization / assembly where a geopolitical disruption in one part of the world could disrupt the company's global value chain
Diversify Data Infrastructure & Flows	• Be prepared for data localization laws and restrictions on the export of data (including data related to basic research, clinical trials, regulatory submissions, human capital, bulk health information) by ensuring redundant IT systems and backup plans for collecting necessary data in alternative locations • Ensure regulatory agility and compliance as cross-border data restrictions evolve rapidly
Optimize Engagement with the Public Sector	• In several geographies (e.g., Europe, Japan, China, India) financial and regulatory incentives are expanding to provide a boost to domestic biotech innovators and producers—these policies can present impactful opportunities to engage with and find support from the public sector • In the context of a more restrictive public funding environment in the US (e.g., cuts to the NIH and research grants), remaining agile and opportunistic for alternative funding sources will be key. Relatedly, engagement with the US administration on topical issues like drug pricing and insurance coverage may help inform executive branch approaches to sectoral reforms • Policymakers globally are sharply focused on increasing economic competitiveness and technological leadership in their geographies, and many are eager to engage with industry to help establish productive pathways to furthering national policy priorities

Recommendations	Corporate Considerations
Build Strategic Alliances	• Hedge against market access barriers by collaborating with partners across several jurisdictions • Leverage business transaction strategies like asset out-licensing and the creation of NewCos to remain engaged in global innovation activities and commercial opportunities in geographies like China, while mitigating cross-border business activity risks • Leverage China's, India's, and other lower-cost ecosystem research and manufacturing capabilities for non-core R&D, while keeping core innovation, critical technologies, and sensitive data in home jurisdictions

For biotech companies and investors in the sector, adapting to a new reality of a geopolitically driven landscape will require new compliance approaches, increased focus on national policy dynamics, and increased agility to adapt to a rapidly changing policy and economic environment. Firms will need to plan for scenarios involving further decoupling in biotech and biotech investing, as well as pressure test resiliency efforts to ensure staff and business operations can weather potential geopolitical storms. Doing so will help firms navigate an increasingly complex geopolitical environment and maximize opportunities that may emanate from a new era where biotech sits at the intersection of national security, economic competition, technological leadership, and scientific advancement.

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